

Creating dance with bytes and pixels

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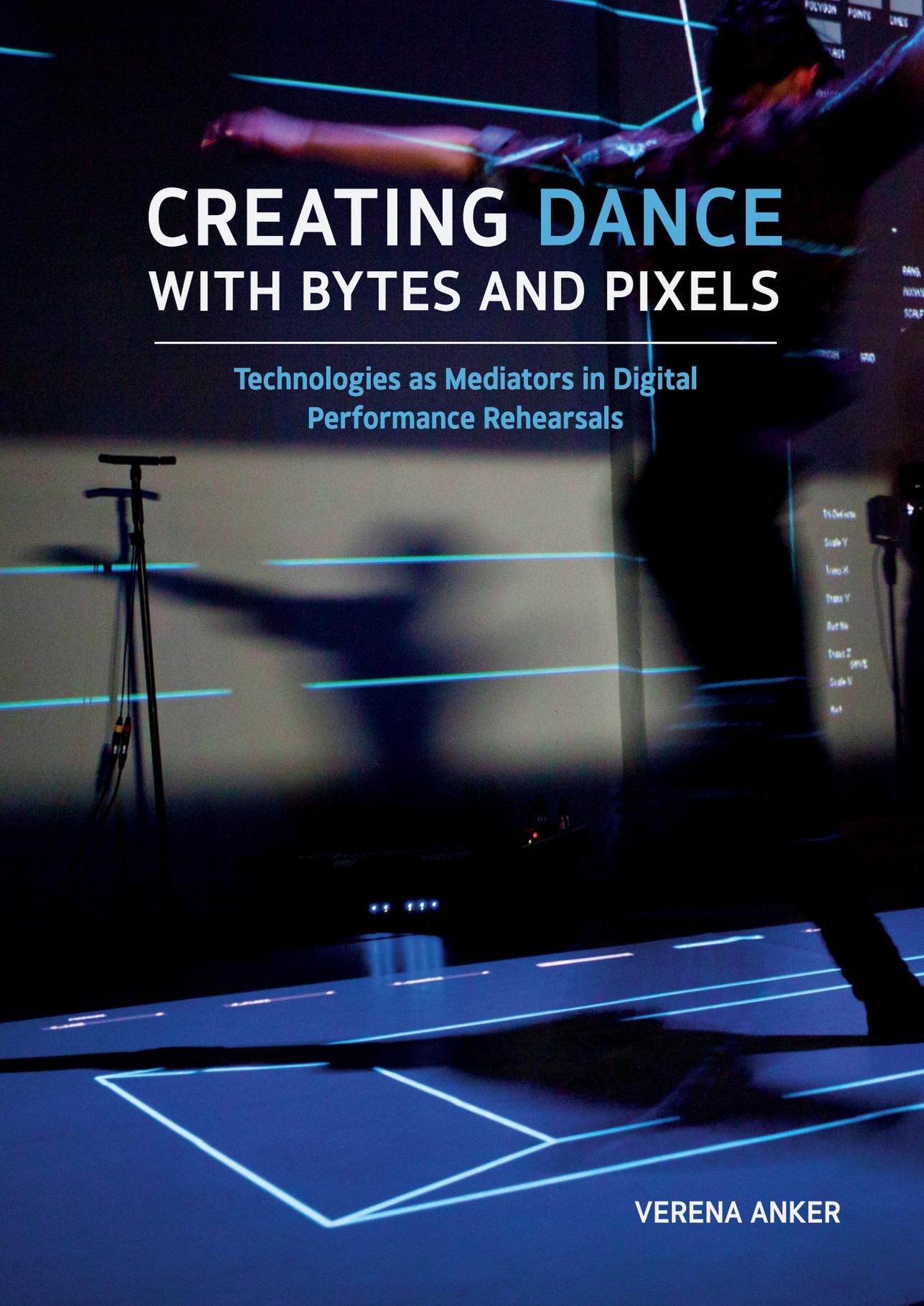
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A person is seen in a dark room, possibly a rehearsal space, with blue laser lines and a projection screen. The person is wearing a dark top and has their arms extended. The room is filled with blue light from the lasers and the projection. The projection screen on the right shows a list of parameters: POLYVA, POINTS, LINES, RANG, INVIS, SCRP, TROU, and AND. Below the main title, there is a horizontal line.

CREATING DANCE WITH BYTES AND PIXELS

Technologies as Mediators in Digital
Performance Rehearsals

VERENA ANKER

Creating Dance with Bytes and Pixels
Technologies as Mediators in Digital Performance
Rehearsals

Verena Anker

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Creating Dance with Bytes and Pixels
Technologies as Mediators in Digital Performance
Rehearsals

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1 Introduction

The space is black. That is, almost. One narrow but bright strap of light wanders on what seems to be a white floor. While most of the illuminated surface is even, one end of the light projection shines on a shape whose contours cannot be clearly identified. Then, suddenly, the entire floor is briefly flashed with bright, purple light before delving into darkness again. Although this moment of illumination is very short, it allows identifying the mysterious figure on the floor: it is a young woman's body kneeling on the ground. In the next seconds, the purple flashlight repeatedly appears, and during those moments it is possible to see the woman crawling on the floor. At some point, the narrow light ray from the beginning takes in the form of a luminous corona that gently surrounds the woman's body contours. In the following, the woman leaves her kneeling pose to stretch herself and start a dynamic dance on the ground. She performs circular movements by expanding various body limbs and creates specific rhythms through bodily contractions and releases. In the course of the woman's performance, the light corona transforms into various geometric shapes, such as ellipses, lines and circles, or forms which surround, sweep, or seemingly 'touch' her body. The performer is now moving in, and together with, a landscape of digital light projections. On the floor, a dance unfolds in which the woman's movements and the numerical shapes are closely enmeshed and partly appear to morph with each other. The different luminous images react to and trace the woman's gestures, and the dynamics and quality of her motions resonate in the animated lights: the dancer is performing a duet with digital technology.

The above-depicted scenery describes a presentation of *Glow* (2006)¹, an artistic production by the Australian dance company Chunky Move² merging dance performance and digital media. In *Glow*, a performer moves in an environment of digitally generated forms that respond to her gestures in real-time so that her movements are reflected by and in turn manipulate the video projections surrounding it (figures 1.1-1.4).

¹ A video recording of *Glow* can be found on: <https://www.youtube.com/watch?v=2AautwIOON8>, retrieved Aug 11, 2017

² I viewed *Glow*'s performance at the occasion of the Cinedans festival at the theatre 'De Balie' in Amsterdam in July 2009.

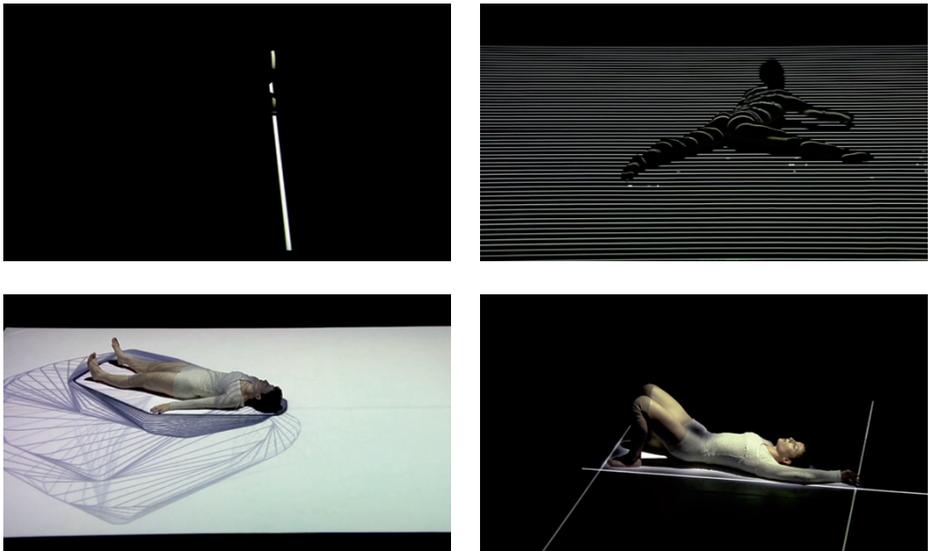


Fig. 1.1-1.4 Screenshots from a video documentation of *Glow's* performance

When watching *Glow's* 30 minutes long presentation, I was struck by the intricate relationship that emerged between the dancer and the digital imagery, as both the performing body and the light rays seemed to be intimately entangled with each other. Not surprisingly, also other spectators were impressed by this unconventional duet. In the meantime, *Glow* has been extensively presented in theatre venues on several continents, and viewers, critics and theorists praise the “seamlessness” and “organic blending” between the dancing body and the virtual imagery (Glickman, 2007). Theatre critic Stephanie Glickman from the online magazine ‘Australian Stage’ formulates an impression that is shared by others when she explains that

collaborations ... that mix the organic nature of the dancing body with the programs of a machine are often fraught and heavily weighted towards the technology side. 'Glow' is just the opposite – it works as a successful blending of computer and human form, with neither element overshadowing the other (ibid.).

Praising *Glow* as an outstanding example for digital dance because of the balanced performance of the dancer and the technological tool, Glickman’s statement implies that in other productions, the technological effects are overruling the performing human body’s presentation. The critic’s remark caught my interest as it points to a general assumption about human-technology relations in digital dance. Glickman more precisely suggests inherent tensions between the dancing body and technological means in digital

performance works which usually result in technology's dominance over the physical dancer. This tendency to consider the combination of virtual technology with the art of physical movement in terms of tensions and imbalance has also been, and still is, reflected in the general discourse on digital dance. A considerable number of artists, researchers and critics have described technology's role in dance performance as a determining instance that needs to be dominated by the artist, or as a mere functional tool. In those accounts, technology is described in terms of mechanical performance or functionality and is thus put in opposition to notions such as creativity, artistic content and experience which are associated with human qualities. In Glickman's argument, *Glow* nevertheless presents a notable exception because of this tension's absence, as here both performer and technology appear to stand in a "symbiotic relationship" (ibid.).

However, when talking with *Glow* performer Sara Black the following day, I learned that for the dancer herself, performing in the piece's digital environment did not immediately create feelings of synergy. Working with the virtual projections rather presented challenging moments for her, as she explained:

[I]t really took some time and practicing until I was able to move with the technology ... the projections are reacting to my movements, but at first I couldn't figure out how they would respond to what I did ... when you have these barriers, you have to explore them and shift your [bodily] habits ... I was losing my usual bearings in space ... I had to [find out how to] deal with these restrictions³⁴.

Black's account intrigued me, as the dancer's experience clearly differed from my and the described critics' impressions. Instead of being characterized by fluidity and balance, *Glow*'s making appeared to be accompanied by restrictions, disorientation and frictions between the dancer and the digital system. Puzzled by the dancer's report, I wondered how a digital dance production such as *Glow* had been made. Shortly afterwards, I met Gideon Obarzanek, *Glow*'s choreographer, who provided me with more information concerning the piece's creation. He narrated the following about working with the digital imagery:

³ The quotations referring to *Glow*'s production stem from in-depth interviews conducted with Sara Black and Gideon Obarzanek on July 8, 2009 in Amsterdam.

⁴ As I will explain later in this thesis, interviews present an important source of empirical data on which this thesis is based (see for instance the subchapter on my research methodology, 1.4).

I wanted to find an interesting relationship with the system, so in the beginning I looked at the many different graphics that it could produce ... and I tried to combine them with movement, in a way that I found interesting. But often the technology was not working in a foreseen way, or it was simply very sensitive ... then I ended up with something that was not intended at all ... sometimes that wasn't so [interesting] but sometimes it was actually more interesting and better than I could have imagined.

These narratives about *Glow's* making process stand in contrast with the harmonious, symbiotic character of the piece's presentation, as the fluidity that is visible in the staged performance seems to be the result of many frictions and negotiations between the participating artists and the employed new media device. In this sense, the artists' statements equally differ from the one-sided positions that have been present in the dance world for many years. In these approaches the performances are formulated in terms of domination in which either the technology or the dancing body and the artistic content are submerged by the respective other. In the account on *Glow's* creation however, the making process consisted of more complex dynamics in which both the involved artists and the technological device were participating. Here, the technology and the dance makers did not appear as opposite entities but they rather entered a process constituted by situations of irritation and ensuing mutual arrangements. *Glow* as a concrete example of digital dance production and artistic practice thus suggests that the reality of virtual performance making, and therewith the tensions between dance art and digital media, can be more complicated than the piece's presentation on stage and the biased accounts on dance-media relations insinuate.

My observations concerning the intricacy of the alliances between digital technology and dance artists and their practices chime with more recent requests by researchers and practitioners in the field of digital dance who are increasingly claiming the current lack of understanding with regard to the complexity of dance-technology relations. However, while expressing the desire to leave the conventional dualistic notions concerning new media and performance art behind, the present studies lack the appropriate conceptual tools to develop an alternative perspective on digital dance practice. As a result they oftentimes, even unwittingly, revert to ambivalent conceptions of technology that still demonstrate biased tendencies. As we have seen, these are problematic for a differentiated investigation of choreo-technical dynamics. Furthermore, in their contributions the artists and researchers concentrate on the aesthetic appreciation of digital dance *presentations*. This way, as the example of *Glow* has shown, they omit part of the intricate dynamics that *generate* virtual performance artworks.

The presented situation indicates that an alternative understanding and frames of analysis are necessary to draw a more differentiated picture of digital dance practices. This is what I intend to develop in the present thesis. The central aim of my research is the elaboration of an empirically sensitive theoretical understanding of the processes through which digital dance productions and dancing bodies take shape along with new media, therewith contributing to a more intricate conception of dance-technology relations. In this context, my research focuses on the processes of digital dance making rather than on the artworks' final presentations. As *Glow's* example has shown, I argue that in order to understand how dance makers and dancing bodies can successfully collaborate with digital media, we also need to see how these choreo-technical constellations come into being. Moreover, we have to work with more sophisticated and conceptual notions of technology than those presently used in the discussions around digital dance. The questions that this study ultimately sets out to answer are: How do dance artists and digital media collaborate in the creation of digital dance performances? What is technology's role in these processes? And how can the dynamics of these procedures be qualified?

In order to provide an alternative view on choreo-technological constellations, I will follow the suggestions of selected researchers in the digital performance field that propose to avoid one-sided accounts on digital dance with the help of a more relational understanding of technology. Instead of departing from perspectives of separation and alterity between dance art on the one hand and media on the other, I will focus on their interwoven and situative condition. I will therefore base my study on a definition of (digital) technology that derives from the field of Science and Technology Studies. In STS, technology is not understood in terms of material artefacts only, but also in terms of socio-technical constellations. This means that scholars in STS consider technology as already being embedded in socio-cultural contexts. In this view, technologies thus cannot be clearly separated from human and social processes. Here, STS-related theories on technology's mediating character⁵ lead me to suggest that understanding digital dance making as processes of mediation allows to closely examine the complex dynamics of virtual performance. For my research this signifies that I propose an innovative take on the topic by relating selected approaches of mediation from the field of STS, such as Actor-Network Theory and postphenomenology, and concepts from performance studies to the current scholarship on digital performance. These theoretical perspectives are highly suitable in this context, as they help to question and draw alternatives to several

⁵ In theories of technological mediation, technological objects are conceived as entities that possess the capacity to engage with humans by co-shaping and transforming their actions and experience (Verbeek, 2005). The notion of technological mediation and theories that are based on technology's mediating character will be discussed in more detail throughout this thesis (see 1.3, 2.2, 4.3).

recurring dichotomies in the field of digital dance, while simultaneously offering frames to critically engage with the role of technology in this specific artistic practice. An STS-inspired approach thus appears especially fruitful in the context of digital dance studies because it can help to avoid a purely ontological questioning of the compatibility of media and performance.

A research perspective informed by STS also strengthens my focus on the procedures that precede the final presentation on stage, thus the creative and rehearsal processes. Just as the accounts on *Glow's* making indicate, also STS' focus on technology in use suggests, in the light of this research context, that insights into the procedures of digital dance production can provide valuable and concrete information on the intricate nature of virtual performance. As this project consequentially embraces the complexity of digital dance's empirical reality, it also requires looking at concrete practices in which dance artists and virtual tools enter in contact, negotiate and finally mingle. Therefore, my study will focus on the making of two virtual performance artworks: *loopdiver* (2009) by the American dance group Troika Ranch, and *Habitat* (2010), a production by the German artistic collective LaborGras. By delving into how digital dance artists negotiate the grey zones between dance and new media, this thesis addresses the concrete challenges digital dance makers are confronted with when they develop, rehearse and perform digital performance productions. Moving between the detailed and material processes of the pieces' makings and my interdisciplinary theoretical tools, in this thesis I will develop empirically sensitive models to understand technology's role in digital dance production. Guided by the urgency and relevance in both artistic practice and digital dance discourse, I will specifically focus on the creative dynamics between dance artists and digital tools as well as on the formation of the dancers' physical experience in their interaction with digital media. In the context of the first focal point, I formulate the following sub-questions: In which ways can technological tools engage in the artistic dynamics of dance creation? And how precisely can this involvement co-shape artistic intentions and the resulting performances? To explore the second centre of interest, I ask: How do media integrate bodily experience in (digital) dance? And how can these dynamics be qualified? In the course of chapter 1 I will show that these two focal points require two specific theoretical frameworks as they respectively deal with how technologies transform, or mediate, both the artists' actions and their experience.

Exploring how dance artists deal with virtual media in virtual performance making, this dissertation takes an empirical approach. I specifically conducted ethnographic research methodologies like interviewing and participant observation in a technographic perspective. This means that I not only followed the human actors such as dance artists, multimedia programmers or technicians but I also examined in which ways the technological tools were relating to the observed activities.

By appreciating the many-layeredness of the dynamics in the production of digitally mediated choreographies, this thesis takes the investigation of digital dance one step further: on the one hand, it broadens the scope of the analytical methods which are currently at hand, and on the other it provides valuable insights into the concrete practices and dynamics that generate virtual performance artworks. In this sense, the present study does not exclusively present an investigation into a small but increasingly expanding area of contemporary art practice. Its implications are more far-reaching, as the reported artistic activities and results also constitute reflections on our being in contemporary digital culture. Dealing with the concrete challenges and struggles that digital dance makers are dealing with therefore can open up our sensitivity towards, and our understanding of, our navigation at the threshold to virtual spheres. This way, the concrete practices of digital dance presented in this thesis point to the conditions and transformations with regard to embodied experience and (creative) strategies that we are witnessing in our actual media-infiltrated lives (cf. Popper, 2007). This thesis' main aim thus does not consist in the development of an artistic approach towards digital media, nor is it a mere presentation of the latest and technologically most advanced virtual performance productions. This research project is rather focused on understanding the dynamics in digital dance through studying the processes of its making and the interactions occurring between the artists and their digital devices.

In the context of an intensifying interest in the study of rehearsal procedures in the performing arts⁶, this thesis also contributes to knowledge in this growing academic field by engaging in and developing methodologies of documentation and analysis.

In chapter 1, I will present the field of digital dance by tracing its development as an interdisciplinary art form and show how the dance and the academic world have discussed performance's relation with (digital) media so far. Here I will particularly point out in how far digital dance theory is currently lacking relevant concepts and approaches for a consideration of dance-technology relations in non-dualistic terms. In order to bridge the presented gaps in the digital dance debate I will introduce the field of STS and clarify its approach to technology by contrasting its philosophy with the notions of technological determinism and instrumentalism. Here I will also briefly present the theories that inform the conceptual frameworks that I will develop to answer my research questions in the remainder of this thesis. Furthermore I will present the methodological consequences of an STS-informed perspective on dance art and performance studies. This will be followed by a presentation of my case studies and an overview of the subsequent chapters.

⁶ For information on the growing academic concern with the study of performance making, see 2.1.2.

1.1 Introducing digital dance

Since more than four decades, dance artists have been experimenting with digital media on various levels, and the use of computer technologies in the performing arts is continuously increasing. New media are applied in different domains of performance, as they have become part of the stage technology apparatus and are involved in the areas of choreographic research, documentation and transmission⁷. Moreover, digital technologies are equally employed in the creation of staged dance productions. The latter practice, to which I will refer to as ‘digital dance’ in this thesis, presents the object of this research project. Digital dance, the combination of digital media and staged dance performance, developed out of the integration of computer technologies in choreographic activities. The term digital dance, or alternately digital performance⁸, is commonly used among theorists and practitioners to designate choreographic artworks in which computer technologies constitute an integral part of a performance’s creation and presentation (Dinkla, 2002; Rubidge, 2002; 2004; Dixon, 2007). In order to further define the field of my investigations, I will briefly trace the development of this rather recent but dynamic artistic practice in the next paragraphs.

While dance performances have steadily developed alongside the recent technical developments of their times⁹ such as flight machines, lighting technology and pointe shoes¹⁰, and technological aesthetics and processes have inspired artists at the

⁷ Since the late 1980s, dance artists are researching into the digital documentation, notation and transmission of choreographies by developing disc-based applications for schools, colleges or professional dancers. Early examples for these projects are Jacqueline Smith-Autard and Jim Schofield’s *The Dance Disc* (1989) developed at the Bedford interactive institute (UK), or William Forsythe’s seminal CD-ROM *Improvisation Technologies* (1994 and 1999). In the latter, the user is familiarised with the basic components of Forsythe’s particular movement vocabulary. More recent research initiatives include Emio Greco and Pieter C. Scholten’s installation *Capturing Intention* in the frame of the *Inside Movement Knowledge* project, or Forsythe’s *Synchronous Objects* (Dixon, 2007; deLahunta 2013; deLahunta & Jenett, 2017; Blades, 2015). Also the most popular dance notation styles have been transformed into downloadable computer programs, such as *Labanwriter*, *MacBenesh* and *Benesh Notation Editor*, in which the notations can also be transferred to and consequently performed by a digital avatar (Kannan et al., 2011). For a broader overview and an applied study of new media as didactic tools in dance education see for instance Leijen, 2008.

⁸ While the notion of digital performance is also employed to design an even larger range of artistic works including different forms of theatre and dance productions (cf. Dixon, 2007), in this thesis I will alternate between the two terms for stylistic purposes.

⁹ German dance critic Arnd Wesemann for instance stresses the close entanglement between dance and technological devices by declaring that “the story of dance has always been the story of technology” (Wesemann, 1997).

¹⁰ For a description of the influence of technological devices like flight machines, gas lights, reflectors and filters on ballet dance in the 19th century, see Baugh, 2005.

beginning of the 20th century to interpret mechanical procedures on the dance stage¹¹ (Evert, 2002; 2003), the first choreographic investigations into new media technology date back to the 1960s. During this decade which is on a general level marked by interdisciplinary exchange and the creative exploration of media, also dance and the performing arts witness the entry of computer technologies. Choreographers, musicians and engineers start collaborating on productions in which the technological possibilities, for instance through the use of body sensors, are supposed to codetermine the artistic process. The use of technologies such as motion sensing devices redefines the conventional functions of scenic parameters and the relation between actor and spectator because the performers or the audience can now exert movement-based control over diverse theatrical effects. Examples for such events are the seminal performance series *Nine Evenings: Theatre and Engineering* (1966) and Merce Cunningham's *Variations V* (1965). In the



Fig. 1.5: *Variations V* by Merce Cunningham counts as one of the earliest experimentations combining dance and computers.

Nine Evenings creation *Open Score* by Robert Rauschenberg, two performers execute a tennis play with electronically equipped, sound-emitting rackets. Two sensors transform the tennis ball's impact into light effects, which turns the rackets in a form of 'remote control' for the theatre lights (Goldberg, 2006). As shown in figure 1.5, the dancers in Cunningham's *Variations V* perform in physical proximity to technological equipment consisting of antennae and photoelectric cells, with the latter producing musical signals on stage (Evert, 2003). From that time onwards, also film and live video technology are increasingly used in dance performance (Dixon, 2007; Paul, 2008).

¹¹ Artistic movements such as Italian futurism or the Bauhaus circle manifested their fascination for industrial, rationalized shapes and technological processes in their performances. These periods are intensely dealt with in Dixon, 2007 and Goldberg, 2006. I will discuss the significance of these historical practices with regard to the current conception of body-technology relations in digital dance in 4.1.

The 1990s, marked by the Digital Revolution¹², present another significant moment in the development of the interplay between dance and media, as during that time the choreographic work with digital technology considerably proliferates (Dixon, 2007; Evert, 2002). With computer technologies becoming increasingly present in human daily life, and soft- as well as hardware programs being more affordable and user-friendly, computer media become also more accessible to further dance artists. Characteristic for this period is the artistic orientation toward diverse graphic animation programs, the exploration of movement sensing systems, internet-based telematic dance, creative research into motion capture technology and the resulting performance in interactive environments (Salter, 2009). Two examples of works that have been created in the 1990s and which employ motion capture technology are Merce Cunningham's *Biped* (1999) and Bill T. Jones' *Ghostcatching* (1999). *Biped* displays dancers performing with virtual figures that are projected at the back of the stage (see figure 1.6). In this piece, the human performers animate the digital dancers through their movements as the human gestures are transferred on their virtual counterparts with the help of optical motion capture (Evert, 2003). A similar procedure is used in *Ghostcatching*, as here Jones' movements are transposed onto digital animations consisting of virtual lines (Goldman, 2003). While the majority of dance artists at that time explore computer programs which have originally been conceived for other purposes than choreography¹³, several pioneering spirits tinker first interactive digital performance tools that are designed to comply with the specific requirements of dance makers¹⁴ (Dixon, 2007). One such example is Mark Coniglio's *Midi Dancer* suit which results from the programmer's work with performer and choreographer Dawn



Fig. 1.6: Merce Cunningham's creation *BIPED*

¹² The term Digital Revolution refers to the transformation of almost all areas of life through the increasing digitalization and use of digital media which has been taking place since the late 20th century. The notion alludes to the development's similarities with the Industrial Revolution which took place roughly 200 years earlier, as also here technological development considerably impacted on and reorganised socio-cultural structures (Stengel et al., 2017).

¹³ Many of the commercially available technologies derived from the entertainment industry and appealed through their graphical display, which was considerably simpler to handle than programs exclusively written in source code.

¹⁴ For a detailed account of the different software products developed during digital dance's evolution, see Salter, 2009, pp. 261-276.

Stoppiello. Thanks to a specific data transmission procedure, the *Midi Dancer* frees the performer of obstructive connections and cables which might compromise the dancing body's operating range. This setup grants more flexibility to the dancer than conventional modes of motion capture, and it allows the performer not only to produce sound and light effects, but also to control video imaging in real time. In collaboration with dancer Robert Wechsler, also multimedia engineer Frieder Weiss develops an optical motion-sensing interface and software named *EyeCon*. This system allows dancers and spectators to trigger sound and light effects.¹⁵

The intense and rapidly expanding integration of media into dance practice continues after the turn of the millennium. Through the growing presence of computers in daily life, a broader number of dance makers become new media literate, and further digital performance tools that facilitate digital dance making are developed. Among the most popular performance devices, also still at present, figures Mark Coniglio's *Isadora*, a programming environment conceived for the live manipulation of digital video imagery. In connection with a camera or another motion sensing device, *Isadora* grants the performer wireless interaction with media. Through the program's simple and modal structure, it is supposed to be more user-friendly and to provide a considerable amount of creative flexibility (Dixon, 2007). Another example is Frieder Weiss' system *Kalypso*, which equally allows real time video manipulation.¹⁶ Up to the present, digital dance has evolved within different formats, styles and aesthetics, and technologies such as real-time reactive software, Artificial Intelligence programs, virtual realms like *Second Life* or holographic images have joined the rich palette of media devices dance artists are currently working and experimenting with (Salter, 2009). Thanks to the increasing availability and user-friendliness of digital performance tools, virtual dance is no longer reserved to the pioneering spirits' communities as also inexperienced collectives have the possibility to experiment and create performances with the help of software programs and technical equipment. Currently, the most active dance groups working with digital media are spread around the globe, as they comprise the Chinese company Anarchy Theatre, the Japanese dancer Hiroaki Umeda, Austria-based director Klaus Obermaier and the collective Troika Ranch which operates between the US and Germany. Also the duo formed by the two French media artists Adrien Mondot and Claire Bardainne collaborates with dance artists such as Mourad Merzouki to create digital performance artworks. In Mondot and Bardainne's collaborations, the performers are placed in virtual landscapes that react to and morph along the performers' movements, for instance in the

¹⁵ At present, both *MidiDancer* and *EyeCon* are not employed anymore as the next generation tools have proven to be more advantageous to their artistic users.

¹⁶ The choreographic use of these two computer programs will be discussed in an empirical context in chapters 3 and 5.

works *Hakanai* (2013) and *Pixel* (2014): a snapshot taken from *Hakanai*'s presentation (figure 1.7) shows a performer moving in a three-dimensional web of laser light rays. Furthermore, theatre venues are nowadays increasingly mounted with the necessary technical supplies such as large screens and video cameras and beamers to host virtual performance productions. Digital performances are also regularly presented at numerous conferences and festivals¹⁷, and dance and theatre schools as well as universities offer workshops and study modules in which the artistic occupation with digital media is trained and explored.¹⁸

Another recent development in the field of dance and digital media is the development of workshops or 'labs' (Feitsch & Geiger, 2018) in which practitioners from the domains of dance and multimedia exchange. These formats are supposed to provide space for interdisciplinary collaborations that are not restricted to performance production but which invite for the sharing of ideas, the development of new concepts and knowledge

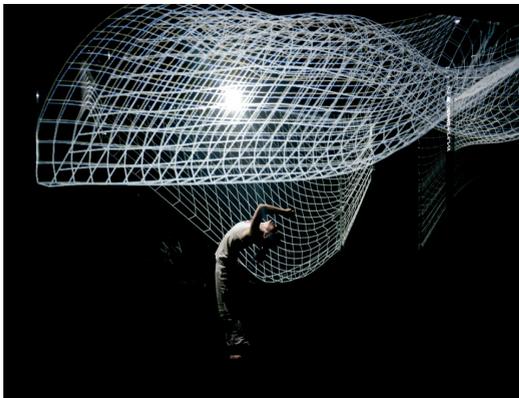


Fig. 1.7: A dancer performs in and with three-dimensional virtual shapes in Claire Bardainne and Adrien Mondot's *Hakanai*.

across disciplines (Whatley & Sabiescu, 2016).¹⁹ These workshops are oftentimes organised by educational institutions such as art academies.²⁰

As this brief overview of digital dance's evolution shows, the particular artistic sphere of virtual performance is a highly dynamic and creative field which finds itself in continuous development. Also nowadays, the technological devices used in this domain steadily progress, and further technical features and possibilities emerge.

¹⁷ Choreographies employing digital technologies have been performed and become subjects of discussion at art and technology events and conferences such as ISEA, SIGGRAPH, Ars Electronica, and several editions of the *Monaco Dance Forum* are dedicated to the combination of dance and new media.

¹⁸ In their artistic study programmes, the universities of Gloucestershire (UK) and Utah (US) for instance propose study modules on contemporary dance and digital media, and the American Arizona State University offers a Master of Fine Arts programme entitled Interdisciplinary Digital Media and Performance (<http://www.glos.ac.uk/courses/descriptors/pages/dp5903-contemporary-dance-and-digital-media.aspx>; http://catalog.utah.edu/preview_course_nopop.php?catoid=8&coid=98083; <https://film.dancetheatre.asu.edu/degree-programs/dance-interdisciplinary-digital-media-and-perform-mfa-mfa>, retrieved 17 November 2017).

¹⁹ The increasing interest in these interdisciplinary exchange workshops can be grounded in the growing interest in the study of rehearsal procedures (see 2.1.2).

²⁰ For the documentation of such a workshop see Feitsch & Geiger, 2018.

However, while the number of available performance tools and the quantity of artists experimenting with those media are constantly increasing, practitioners and researchers still wrestle with an adequate conception of technology's role in this specific art form. Currently, especially digital dance theory bears inconsistencies with regard to the status of new media in performance art. As mentioned in the introduction, these discrepancies mainly recur to dualistic legacies of thought that separate the notions of human and technological performance. To situate my research project on a theoretical level, in 1.2 I will present the current ambivalent positions in digital dance theory and subsequently introduce those contributions that provide alternatives to the problematic perspectives. These alternatives offer starting points for my proper investigative endeavour of understanding the complication inherent in virtual performance practices.

1.2 Searching alternatives to dualistic positions in digital dance discourse

Although scholars in digital dance theory and performance studies have broached the issue of the relation between dance art and digital media since digital dance's expansion in the 1990s, they are still struggling to locate technology's role in this specific art form. This situation is to a considerable part due to human-centred stances in these particular fields of study, which account for performance studies' conventional prioritisation of human over technological performance (Gündüz, 2012). While here, human performance is associated with intentionality and physicality, technology is linked to notions such as efficiency and mechanical operations which lack sense-making or affective qualities (Leeker et al., 2017; Salter, 2009). In this perspective, the contributions from the human side appear to account for the artistic aspects of a digital dance production while technologies seem to be expected to merely exert a functional role.²¹ In digital dance theory, these biased positions are equally present and they manifest themselves in different ways.

The advent of digital technologies in dance art provoked two-sided reactions within the dance community, and these biased stances persist to the present date. Media and performance scholars Chris Salter and Steve Dixon explain that among dance practitioners and artist-researchers, some were enthusiastic with regard to the artistic

²¹ In this context it is worth mentioning that the most prominent researchers in virtual performance are, or have been, active (digital) dance practitioners (Gündüz, 2012). Their backgrounds in dance and choreography might equally direct the scholars' primary interest towards the artistic and aesthetic issues, and less in the direction of the technological aspects, of digital dance.

possibilities provided by those new media while others feared that the changes induced by the devices reduce and obfuscate the human and creative qualities of performance (cf. Dixon, 2007; Salter, 2009). More than any other technologies that had previously been integrated in choreographic artworks, digital media were considered to unsettle the conventional parameters of dance, thus the human body and its movement in space and time, through their virtual nature and the capacity of recording and identical reproduction. This idea motivated researchers to engage in intense debates about the supposedly inherent tensions between technology and performance art. Certain contributors to this discourse for instance conceived of the art of performance and virtual technology as antithetical and therewith questioned the general validity of new media in the art form (cf. Gray, 1989; Klein, 2002). Influenced by the postmodern discourses on art and digital culture of their times that picked up the Baudrillardian notion of the simulacrum²² and the Benjaminian concept of the loss of an artwork's aura through its mechanical reproduction²³, a noticeable amount of artists and researchers expressed the fear that computer technologies present a threat to performance art (cf. Dixon, 2007; cf. Kozel, 2007). In this perspective, digital media "obscure the 'humanity' of movement" as well as its creation and content (DeSpain, 2000:16) by encumbering, if not substituting, artistic processes and the performing body with technological procedures (cf. Dixon, 2007; Salter, 2009), therewith turning dance art into a form of post-organic spectacle (Berghaus, 2005; Wesemann, 2000).²⁴²⁵ Arguing against this antithetical conception of dance and technology, these worries were countered by further artists and scholars who emphasised the connection between dance and digital media by drawing a more human-friendly picture of technology (cf. Hardt & Weber, 2013). Implicitly and explicitly referring to phenomenological and media theoretical approaches such as Merleau-Ponty's phenomenology of perception and Marshall McLuhan's conception of media as

²² In his work, philosopher and media theorist Jean Baudrillard refers to the simulacrum to describe a state in which media simulate a self-referential "hyperreality" instead of representing the true world (Baudrillard, 1995).

²³ According to philosopher Walter Benjamin, the reproduction of artworks through technological means transforms the status of each artwork because it interferes with their original character. Benjamin understands artworks as objects that are bound to specific spatio-temporal contexts, and which possess their own history. Technological reproduction however, the philosopher argues, can lead to artworks' mass production and their mobility, which consequently affects their aura (Benjamin, 1939).

²⁴ Another prominent aspect in this debate which is however less relevant to the present study refers to performance's ontology of liveness and its conflict with media of visual reproduction. See for example the discussion between Peggy Phelan (1993) and Philip Auslander (1999). While Phelan holds that new media reduce performance's very nature as they taint its live character, Auslander argues that performance artworks are already incorporating practices deriving from recording technologies. The question of new media's validity in dance is also taken up (and countered) for instance in DeSpain (2000), Naugle (2001), Povall (2001).

²⁵ In chapter 4 I will show that this tendency was taken up by postmodernist artists who claimed that the replacement of the organic bears rather positive effects.

extensions of man, these authors claim that digital media be understood as creative “tools” (Rubidge, 2002) and bodily extensions or “prostheses” (cf. Fritz, 2015). This perspective underlines the idea that digital technologies can provide (creative and physical) liberty to the dancer by expanding her bodily movement, sensation and expressive capacities (cf. Fritz, 2015:126; Kozel, 1994; Rubidge, 2002). Here, the tools are considered to be merely operated by and serving the human artist without possessing any essence to themselves.

These two positions draw very different images of technology, as they depict it as a determining, disempowering instance on the one hand, and as a rather neutral and serving instrument on the other. In a deterministic perspective, digital media are associated with alienation and estrangement, and are therefore considered as dangerous, transformative powers (cf. Bijker, 2006; Verbeek, 2005). These notions create a fairly threatening picture of technology which might provoke fears and the desire to control a device, and hence to instrumentalize it. From this point of view, the idea that technologies might exclusively be used for their own sake in artistic production presents a “fundamental danger” (Galloway, 1994:191). As a consequence, the tool’s status in the creative process might transcend and therewith submerge the artistic interests and skills. The resulting product risks being transformed into a mere demonstration of technological features that lack genuine artistic quality (ibid.). This fear towards technological devices is often explained with the romantic suspicion towards any mechanical intervention in the artistic process, as the latter might compromise the purity of art (De Vroomen, 2001; Galloway, 1994). From this conception arises the opinion that if technology already finds its way into the artistic creation, it should at least be dominated by the creative subject (De Vroomen, 2001). Another factor contributing to the reservation towards the artistic use of technologies appears especially important in the age of new media. The use of computational systems and software programs can take on considerable dimensions of complexity and therefore requires much engagement from the user. This aspect might equally increase the concern that the status of the art maker shifts to the (in artistic terms) ingrate role of the “*agent operateur* [sic]” (Galloway, 1994:194). In the opposite, so-called ‘instrumentalist’ view, technological devices are considered as neutral and transparent means which do not have any influence on human actions (Verbeek, 2005). In digital dance this attitude stems from a traditional perspective on artistic creation in which technologies do not exceed the status of mere tools supporting the artist’s activities and their final result, the artwork itself (cf. Galloway, 1994). As a consequence, the technological means is mostly considered as subservient to the creative act (Kusahara, 2006). This is also the case with digital technologies, as many artists make use of computers as material support and processing facilitators (Galloway, 1994).

Striking is that in both of the above-presented perspectives, technology is separated from the supposedly 'human' and 'artistic' qualities of performance. Furthermore, despite their differences, the two viewpoints reflect attitudes of domination as either the technology or the art of performance and its (human) contributors are supposedly taking over the respective other. Interestingly, although they mutually exclude each other, these two conceptions of dance-media relations tenaciously persist in digital dance discourse. Even more, they seem to co-exist in many artists' and researchers' perceptions, as digital dance practitioners for example tend to consider virtual media as tools, while in the same time demanding that these media do not take over the artistic content and creative aesthetics (Fritz, 2015). Also popular scholars in digital dance theory mingle these two dualistic approaches in similar ways. For instance, in his elaborate and seminal study of *Digital Performance* (2007)²⁶, Steve Dixon on the one hand considers virtual media as integrated, key components of virtual performance artworks but also claims the use of technology in a performance context to be an additive process, as media are, according to the researcher, simply added to a performance (ibid.). Despite his conviction that digital media should be considered as part of digital performance artworks, his description suggests that the technologies are joining an art form whose essence exists independently of the tools' use. As another example for such dualistic inconsistencies, Johannes Birringer, contributor to digital dance theory since its very beginnings, declares in his latest book that "artistic practices ... have absorbed technology as a creative tool" while explaining in the following sentence that "the [dancing] body becomes an instrument of a dynamic [digital] environment" (Birringer, 2008:xxiii). Here, Birringer on the one hand claims that virtual dance practitioners have appropriated, and therewith control, the digital means at their disposal, to subsequently state that the human performers are merely serving the technologically equipped performance spaces. While these positions reflect the general tendencies in digital dance discourse, in chapters 2 and 4 I will show that these binary conceptions have equally influenced the respective issues of technology's role in digital performance creation and the relation between the dancing body and virtual media. As I will explain in more detail in the corresponding chapters, also here the different discourses are shaped by a prioritisation and essentialisation of the human in comparison to technology.

While these binary perspectives might turn out helpful for (rather superficial) interpretations of the ways in which digital media are presented in staged performance artworks²⁷, they are problematic for a deeper understanding of technology's role in

²⁶ Dixon's definition of digital performance includes further domains of the performing arts, such as happenings, performance art and theatre.

²⁷ The example of the staging of *Glow* presented in the introduction of this thesis could for instance be easily interpreted in the sense that the technology is functioning as an extension of the human dancer.

performance art. Maintaining a discourse of supposed tensions and domination between digital media and dance (Chatzichristodoulou et al., 2009:12), they draw a picture in which the relation between the tools themselves and their artistic users can only be understood in terms of control and disembodiment. Furthermore, these approaches tend to obscure and oversimplify the multifaceted effects of the dynamics in choreo-technical entanglements, thereby mystifying the role of digital devices in this context. For instance, Dixon's and Birringer's statements presented in the preceding paragraph do not allow to adequately grasp the status of virtual media in dance as they draw unclear and contradictory pictures of the part played by digital technologies in performance art. Referring to the example of *Glow* presented in the introduction of this thesis, the mentioned dualistic positions cannot help to understand the ways in which the employed technological device presented new creative and physical possibilities but also restrictions to both the performing artist and the choreographer. This, I have argued, is however necessary. To answer my research questions, the notion of technology such as it is currently defined and handled in performance studies thus needs further theorisation.

While the presented positions in digital dance theory have hitherto known few alternatives²⁸, a small group of researchers has recently addressed the problematic character of the ambivalent attitudes concerning dance-media relations. In their publications, they claim that performance theorists need to move beyond the habit of placing performance art and virtual technologies in a (hierarchical) binary and declare the necessity for more relational approaches to digital dance practices (Leeker, 2017; Nelson, 2010; Salter, 2009). According to them "this neat separation of human agency and non-human 'procedurality' has become untenable", as "digital technologies now widely ... participate in the 'making' of culture" (Leeker, 2017:11). Starting from the approach of the 'performative turn'²⁹ in the social sciences which extends the notion of performance to the dynamic interactions between social actors and to these actors and their environment, the authors propose to decentralise the view of the human as the locus of agency which is still conventional in performance studies. In their respective

²⁸ One mentionable exception, albeit from the field of theatre studies, is Chiel Kattenbelt's notion of intermediality (Chapple & Kattenbelt, 2006; for a follow-up on Kattenbelt's approach also see Bay-Cheng et al., 2010). With this term, Kattenbelt takes a different take on the relation between new media and (theatre) performance by understanding the art form itself as a medium. In his argumentation influenced by media theory, the different media of theatre and technology can mutually contain and influence each other. Kattenbelt's ontologically oriented proposition is useful for an aesthetic appreciation of theatre performances employing new media as it allows to consider the combination of performance and technology in non-dualistic terms. Due to its perception-based approach, it unfortunately does not lend itself to an in-depth study of concrete processes of digital performance making, which as I have already argued is necessary for a thorough grasp on the multiple dynamics of digital dance.

²⁹ This intellectual movement employs the notion of performance as a heuristic tool to account for a broad variety of social interactions. See for instance Diaz-Bone (2011), MacKenzie & Millo (2003).

contributions, media artist and researcher Chris Salter (2009) and performance scholar Martina Leeker (2017) counter the understanding of technologies as neutral (artistic) means by suggesting that humans and technological devices enter into a “redistribution of agential constellations” (Leeker, 2017:12). They consider digital performance practice in line with a more general view on digital culture in which “culture and technologies are inseparable and constantly and mutually influence each other” (ibid.:21). These tight entanglements between the “agential forces and effects of digital technologies” and humans, the authors argue, bear the potential for new performative practices and interventions (ibid.: 9). Also theatre scientist Robin Nelson chimes with this perspective by stressing that in contemporary, media-integrating performance “devices, events and activities are formed out of relationships, necessary interdependencies, and mutually correlating entities” (2010:17). In this context, Salter specifies how technological tools can act by suggesting that “technology does something in and to the world by modifying existing relations and constructing new ones between humans, tools, processes and the environment in which all are deeply entangled” (Salter, 2009:xxxv).

In their works, Nelson, Leeker and Salter propose to break up the conventional human-centred view on performance by acknowledging (aesthetic and creative) agency to digital devices. In this perspective, humans and technology find themselves in an interplay whose dynamics are generated by both sides instead of a unilinear procedure that is entirely controlled by either the artists or the technology. This way, the authors introduce a new and relational perspective on dance-technology interaction in performance studies. In this context it is worth mentioning that the respective researchers implicitly (Nelson, Leeker) and explicitly (Salter) draw inspiration from the field of Science and Technology Studies (STS), an academic discipline that conceives of humans, culture and technology as mutually constitutive.³⁰ Here Salter becomes even more concrete as he suggests to understand technology in the spirit of what STS scholar Bruno Latour calls ‘mediation’. Explaining that while the performance of (technological) artefacts can lie in their efficiency, Salter claims that these same tools can also perform “by expressing things through material transformations that do things to the world” (Salter, 2009:xxiii). In the context of digital performance, this approach presents an interesting alternative as it can help to avoid a purely ontological questioning of the compatibility of media and performance which lie at the base of many of the dualistic studies mentioned earlier. By considering technology’s agency and its mediating character, this perspective leads to “explore what [technology] does, how it does it, and what the repercussions are across the artistic practices that utilize it” (Salter, 2009:xxxv). It thus directs our attention to the concrete activities and dynamics emerging in choreo-

³⁰ For a brief introduction of STS, see 1.3.

technical constellations and therewith potentially offers new insights in digital dance theory.

Nelson's, Leeker's and Salter's works are important because they present an alternative, relational view on the constellations between dance artists, their practices and technologies in the context of (digital) performance, and they indicate that the field of STS can contribute to this new perspective. Therefore, their works present valuable starting points for this thesis' investigation into the role of digital media in virtual performance. However, the authors present their lines of thought on a rather general level. The researchers demonstrate the relevance of a relational approach to technology by mapping the broad links between performance and digital culture (Nelson, Leeker) or reporting on different artistic projects that mingle (performance) art and technology by tracing their history (Salter). When it comes to the discussion of concrete artistic works, the authors limit themselves nevertheless to aesthetic descriptions of staged productions. The example of *Glow* however indicates that a profound examination of digital dance creation processes can provide crucial insights and therewith add to a thorough understanding of digital dance practice. While it is true that technological devices make new formats and forms of dance presentation possible, the danger of a purely aesthetic approach is that it tends to neglect, if not ignore, the struggles, negotiations and skills which are necessary to realize these practices. The latter can moreover reveal essential aspects concerning the status of new media in art making and embodied processes. As I have argued earlier, following how dance artists concretely learn to work and move with digital media can thus offer fundamental insights into virtual technology's role in digital dance.

Starting from Leeker's, Nelson's and especially Salter's contributions, I will in the following present the field of STS and its theories of technological mediation. I will demonstrate the program's relevance for studying the status of new media in digital dance making by pointing out the STS-related conceptual tools that are especially convenient for this research undertaking.

1.3 Technologies as Mediators in Science and Technology Studies

The interdisciplinary program of Science and Technology Studies (STS) is a relatively recent field of research that investigates the links and interplays between the socio-material dimensions in the formation of (scientific) facts, the production of knowledge, and their materialization in objects and technological innovations. The research program

is shaped by various theoretical and methodological perspectives that stem from fields such as history, philosophy, sociology, politics, law, economics and anthropology (Jasanoff, 2004a). The foundations of STS lie in the 1970s when social researchers formulate a constructivist perspective on the place of science and technology in society that is based on empirical explorations of scientists' and engineers' practices.³¹ With the constructivist view, STS scholars direct themselves against what they name the "standard conception" of science and technology (Bijker, 2006; Verbeek, 2005). The latter perspective implies deterministic ideas of the relation between science, technology and society. In the standard picture, technology is considered as an autonomous and independent force which follows an internal logic and which shapes society (Verbeek, 2005; Rammert & Schubert, 2005). Claiming this view to be empirically wrong, STS scholars argue that instead of being clearly separated, the technological and the cultural domains are closely intertwined as "we are caught up ... [in] a sociotechnical world" (Bijker & Law, 1992:306). Basing their research on empirical observations, they develop different concepts and theories to gain an alternative understanding of "how ... people and machines work together, how they shape one another, how they hold one another in place" (ibid.).³²

In STS, the notion of technology implicates a socio-cultural dimension. Arguing against essentialist conceptions of technological artifacts, scholars from the field postulate that "the technological domain cannot be considered as something apart [because] the technological is social" (ibid.:4). This statement is based on the idea that technologies are influenced by both social and cultural factors, which they in turn shape as well. The intimate entwinement of technology and culture is underlined by different researchers within STS. They for instance suggest that a (technical) artifact's identity and its success as a technological tool are not inherent characteristics of the object itself but that they are also shaped by different user groups, their needs and preferences (Bijker, 2006)³³, and that technical artifacts can have varying meanings and identities for their human users, which depend on different cultural contexts (Ihde, 1990; 2001).³⁴ These perspectives thus claim that technological objects cannot be merely considered as entities in themselves, but that they are always context-dependent "technologies-in-use" (Bijker, 2006; Verbeek, 2005). In turn, during their employment these devices become

³¹ This early work by sociologists, historians and philosophers was organized in the STS-related research disciplines such as Sociology of Scientific Knowledge (SSK) and Social Construction of Technology (SCOT) (Bijker, 2006).

³² In STS, the dynamic interaction between technology and society is dealt with in approaches such as the Social Construction of Technology (SCOT), the coproduction of technology and society, Actor-Network- or postphenomenological theory.

³³ SCOT scholar Wiebe Bijker refers to this notion as technology's "interpretative flexibility" (Bijker, 2006).

³⁴ Postphenomenologist Don Ihde formulates this idea as technology's "multistability" (Ihde, 2001).

part of and shape social practices, identities, networks and norms and therewith present components of the social and the cultural. Here, technologies are understood as heterogeneous and emergent because they come into being within the circumstances and processes of their use, and they continuously evolve along with their users instead of presenting 'fixed' and autonomous forces apart from human activities and social life (Bijker, 2006; Bijker & Law, 1992). Within STS, the idea of technology is thus not limited to mere technological objects but is expanded to a broader relational understanding that includes the tools' creation and their users, the latter's activities with the artifacts, but also their knowledge and experience that result from interacting with these technologies.

These first insights into STS-related theory confirm the importance of an STS-informed approach for an investigation of dance-technology relations which has already been raised in 1.2. As the author Chris Salter suggests³⁵, an STS-inspired definition of technology avoids the separation between human and technological realms which is still present in the domain of performance studies but which remains problematic for a closer analysis of dance-technology relations. Consequentially, an STS-informed view can prevent digital dance theory's tendency to conceive of human-technological relations in terms of domination and ambiguity, which as I have shown makes a profound understanding of digital media's role in virtual performance impossible. Rather, STS suggests that neither technologies nor their users are in the position to entirely control the situation and therefore co-shape it (Akrich, 1992). Furthermore, just like the negotiations between *Glow's* artists and their digital tool in the introduction of this thesis already indicated, also STS' focus on concrete situations of technologies' use underlines the urgency to study the events occurring during the making of digital dance productions because they render the complexity of choreo-technological constellations visible. As STS moreover provides conceptual tools to analyse those situations of use, its theories provide perspectives for a differentiated understanding of the dynamics occurring when dance makers employ digital media.

In order to make the relational perspective of STS operable for a study of the processes occurring between dance artists and their digital tools, I follow Salter's proposal to consider technologies as they are understood in the STS-related notion of technological mediation.³⁶ In theories of technological mediation, technological objects are conceived as entities that possess the capacity to engage with humans by co-shaping and transforming their actions and experience (Verbeek, 2005). In this perspective, technologies can thus act by transforming, changing or affecting human activities and

³⁵ See 1.2.

³⁶ While Salter exclusively refers to the Latourian definition of technological mediation in 1.2, I will in the following not only introduce Latour's Actor-Network Theory but also present the postphenomenological understanding of technology's mediating qualities.

(bodily) perceptions. Understanding technology's agency in terms of mediation appears pertinent in the context of digital performance because it refers to dynamics that are similar to those described in the case of *Glow* at the beginning of this chapter. Also here, the involved artists underwent transformations on the levels of their creative activities, and in the case of dancer Sara also experienced changes in their physical capacities and sensations through their work with digital tools. Therefore I will in this research project recur to STS-related approaches that conceive of technology's mediating character and provide theoretical means to examine how technology and the socio-cultural domains engage with each other. However, as the two focal points in this thesis deal with technology's involvement on two different levels, namely the artists' creative actions on the one hand and their bodily experience on the other, I will recur to two different theoretical approaches to technological mediation in order to structure my investigations. Each of the selected perspectives will allow me to explore one respective focal point of this research project. Actor-Network-Theory provides suitable concepts to investigate the role of digital media in the creative process and in the artists' activities. The postphenomenological theories of 'mediation relations' and 'bodies in code', together with concepts from performance studies that articulate the formation of dancing bodies, will help me to examine how the performers experience the virtual tools' integration on a physical level. In the course of this thesis, I will present and evaluate these approaches in more detail, and develop conceptual frameworks based on their respective concepts in order to examine the concrete creative and bodily processes occurring during the making of the two case studies *loopdiver* and *Habitat*. This way, this thesis will finally present two different theoretical frameworks that respectively allow to investigate one centre of interest in each of the two cases. As the approaches will be dealt with in more depth in the corresponding chapters³⁷, I will in the following briefly present them with the aim to explain how the particular theories precisely conceive of technology's mediating character, and therewith to provide a general theoretical orientation of this research project.

Presenting a major approach in STS, Actor-Network-Theory (ANT) offers a material-semiotic perspective on socio-technical entanglements. According to ANT, the world is constituted by networks of relations between 'actants' which can be human and nonhuman. STS scholar and ANT co-founder Bruno Latour conceives of these actants as 'symmetrical'. By avoiding a categorical distinction between human subjects and nonhuman objects, this approach aims to make visible the continuity between humans and nonhumans (Rosenberg & Verbeek, 2015). ANT conceives that the actions occurring

³⁷ I will elaborate on Actor-Network-Theory's relevance for a study of technology's role in digital dance creation in chapter 2. In chapter 4 I will evaluate postphenomenological theory in the context of technology's integration in performers' bodily experience.

in networks do not spring from one particular actant but are the result of a specific actor-network. In this logic, agency is distributed among the various actants comprised in a network, and hence not only humans but also things can act (Latour, 1994; Rosenberg & Verbeek, 2015:19). Starting from this premise of symmetry³⁸, ANT provides conceptual tools to analyse the complexity and the dynamics in which human and nonhuman actors engage in actions and co-shape the latter's development. In an ANT-informed and Latourian sense, technological mediation thus consists in the ways in which technological artifacts engage in and co-shape transformations that occur within heterogeneous constellations. In this perspective, technologies have a mediating function as co-producers of action (Latour, 1994). In his work, Latour defines also technological artifacts as nonhuman actors, which allows him to examine their roles in diverse socio-material situations (Latour, 1994; 1999; 2005).

In the context of this research project, ANT presents a suitable approach to study how technology integrates the making of digital performance. I will hence employ ANT to consider technological artifacts as nonhuman participants that are involved in the making of digital dance. Here, selected concepts from Actor-Network-Theory will enable me to zoom in on the creative processes of *loopdiver* and *Habitat*, and provide a vocabulary to articulate how digital media enter the development of creative practices and artistic intentions. These examinations will finally help us to clarify how artists and technological devices negotiate the frictions emerging during these procedures, and how these dynamics materialize in *loopdiver's* and *Habitat's* concepts and aesthetics. Through these analyses, we will finally gain a differentiated understanding of technology's role in processes of digital dance creation.

The second focal point of this research project concentrates on the dynamics in which digital media integrate the performers' bodily experience. As ANT is centred on the mediation of action and intention, it does not allow to articulate the mediation of physical sensations. Therefore I turn to postphenomenological approaches to human-technology relations. Postphenomenology is a fairly recent approach within STS. It expands phenomenological perspectives on human-technology relations by providing conceptual

³⁸ In the context of ANT's symmetrical approach between human and non-human actants, it might be argued that objects nevertheless cannot act on their own, as it is only through their use by humans that artifacts can become parts of heterogeneous networks of action. This point also holds true for a study of digital media's role in virtual performance, as also technological tools need to be employed by human participants such as choreographers, dancers or programmers to engage in processes of dance creation. Therefore I would like to emphasise that Latour's understanding of a symmetrical relation between humans and nonhumans is based on the idea that there exists no a priori distinction between intentional-social and material-causal dimensions when it comes to the generation of action. The notion of symmetrical associations should thus not be taken too literally, as an object's scope of action cannot be directly compared with a human being's latitude. Rather, through their capacity to engage in associations, objects can be understood as actants because they participate in a course of action (Latour, 2005:71).

frameworks that ascribe a central role to technologies in concrete situations of human experience and existence (Rosenberger & Verbeek, 2015).³⁹⁴⁰ Postphenomenological theory takes up the idea that technology takes in a mediating role between humans and world, and that it therewith co-shapes how humans perceive their surroundings and themselves. In this context Peter-Paul Verbeek, one of postphenomenology's most prominent adherents, specifies that technological mediation does not simply take place between a given human subject and a self-contained world, but that subjectivity and objectivity are shaped through the mediation of artifacts. Thus humans, their world and their bodies emerge through technologically mediated actions (Verbeek, 2005). That is to say that artifacts affect human interpretations of reality because they mould people's sensory perception, which in turn informs experiences and interpretative frameworks. From a postphenomenological perspective, technologies intervene on a perceptive level as they mediate the ways in which humans experience reality and how they conceive of themselves. According to this approach, digital technologies are thus co-constitutive of humans' bodily experience.

To investigate this study's second focal point concerning digital technology's involvement in dancers' bodily awareness, I will enrich notions of physical formation from the field of performance studies with specific postphenomenological concepts that allow to explore the dimensions and concrete dynamics in which technology co-constitutes these bodily processes. Starting from dance scholar Susan Foster's theory on the training of performers' bodies which frames and locates the development of bodily experience in a dance context, I will subsequently turn to the postphenomenological works of philosopher of technology Don Ihde and new media theorist Mark Hansen. Ihde's categorization of 'mediation relations' provides a vocabulary to describe the different ways in which technologies can affect and transform human perception. In the context of this research, Ihde's theory permits a more nuanced apprehension of how digital technologies and dancing bodies can engage with each other, and to explore how these different combinations can impact on the performers' experience of themselves, their bodies and their technological tools. Mark Hansen's theory of 'bodies in code' furthermore deals with the concrete dynamics through which humans learn to incorporate digital media in their bodily perception.⁴¹ It will allow me to describe the

³⁹ Postphenomenology entertains a mixed relation to phenomenological lines of thought. On the one hand, it is inspired by phenomenology's emphasis on experience and concreteness, but on the other it distances itself from the conception of technologies as mere extensions of human beings or alienating forces and adds the importance of empirical analyses of concrete technological use (Rosenberger & Verbeek, 2015).

⁴⁰ I will discuss phenomenological perspectives in the context of digital dance in 4.1.2.

⁴¹ While Mark Hansen does not explicitly situate his work in the postphenomenological domain, his research implies a postphenomenological perspective as it describes the mechanisms in which (digital) technology co-constitutes human bodily experience.

physical processes that make it possible for the dancers to overcome situations of friction with digital devices and to finally move with those tools. The combination of the presented theories will finally allow to describe how the dancers experience moments of irritation with virtual media, and to follow the performers' subsequent negotiations with those technologies. By examining the ways in which the work with digital media transforms digital dancers' physical perceptions, we will eventually understand how and with which (bodily) consequences dancers learn to perform with new technologies.

The preceding paragraphs have shown that the presented theories relating to technological mediation acknowledge agency to technological devices by conceiving of technology's capacity to engage in and alter human activities and humans' relations with their environment and themselves. While I have shown that this proves Actor-Network-Theory and postphenomenology to be viable approaches for this research project, I am thoroughly conscious of the critical moment that the combination of these two angles entails. The reader might have discerned that these two theoretical strands deal with the notion of technological mediation in different ways. On the one hand, their different positions turn the presented approaches into pertinent tools to find answers to the two focal points. On the other however, these two theories seemingly oppose each other in certain aspects. On the one hand, ANT focuses on tracing how heterogeneous networks and their constituting entities emerge into presence. To do so, it adapts an 'external' view on the associations of the different actors within a network and analyses their activities. As we have seen, postphenomenology on the other hand is not focused on following heterogeneous networks of relations and interactions as it rather seeks to understand and characterize the relations that humans can have with themselves and their world through technological entities. For this, postphenomenology adapts an 'inside' perspective as it describes how humans experience these relations. Furthermore, to avoid a dichotomic understanding of subjects and objects, ANT refrains from distinguishing between humans and non-humans altogether and refers to the inclusive term of 'actants', while postphenomenology differentiates subjects from objects. In ANT, technologies are conceived as mediators of associations between actants, whereas they present transformers of human perception in a postphenomenological perspective. In this context I would like to advance Verbeek's claim that instead of presenting two opposite views on technological mediation, the two theories rather complement each other (Verbeek, 2005). First of all, despite their discrepancies, both ANT and postphenomenology are based on a primarily relational understanding of human-technology constellations. While ANT explicates this position through its symmetrical approach, postphenomenology avoids deterministic stances as it does not conceive of both humans and (technological) objects as predefined entities that engage in relations, but as entities that mutually constitute each other in their relations (*ibid.*). This shows that while both ANT and postphenomenology share the same overarching perspective,

they tackle it in distinct ways. The theories' varying foci of interest present different lenses to the same subject: while ANT can make the relations between actants in a network visible and trace them, postphenomenology offers a more differentiated view on the connections between specific entities in these networks' associations (ibid.). In the context of this research project, I therefore suggest that both ANT and postphenomenology allow to examine the relational dimension of choreo-technical constellations in virtual performance practice from two complementary perspectives which help to grasp different aspects of virtual performance's reality. In this sense, in this thesis I will use the different theories and their concepts as heuristic lenses that allow me to highlight and explore the diverse layers, and hence the complexity, of digital dance practice. As a consequence I refrain from full-fledged analyses that apply ANT and postphenomenological theory with the ambition of exhaustive conceptual use. Rather, the respective frameworks that I will develop include only selected concepts from the presented theoretical strands, which will provide necessary and viable tools to explore my research questions. This way I am rather interested in employing theoretical concepts as means that help to render visible and understand as many aspects of digital dance's reality as possible, instead of using them to define the laws according to which digital dance functions (Verbeek, 2005).

Thinking technology in its entanglement with socio-material dimensions in the field of digital performance allows to make the activities and dynamics emerging between digital media and dance artists visible, and to trace how these particular procedures finally materialize in virtual performance artworks. The perspectives based on technological mediation therewith permit to analyse digital dance practice and technology's role in it in its materiality, complexity and concreteness. In other words, making the processes of mediation in virtual performance practice visible helps to understand how dance artists and technologies precisely engage and 'act' in digital dance. Inspired by the presented theories, I therefore suggest to understand digital dance making as processes of mediation and negotiation between the artists and their tools.

1.4 Studying digital dance making: Methodology

By introducing an STS-inspired, relational understanding of socio-technical constellations to digital dance theory, this research project places its focus on the activities occurring during the production of virtual performance. It therewith presents a process-oriented perspective on dance: instead of following the conventional approach within dance, theatre and performance studies which takes a choreography's

presentation as the principal artwork and object of study⁴², this thesis chimes with alternative positions that stress the importance of the contexts of production which precede and follow the moment of a choreography's staged performance (cf. Husemann, 2009; Kunst, 2009; McAuley, 1998, 2012; Mock, 2000; van Imschoot, 2004). The proponents of the latter approach claim that knowledge about a piece's rehearsal process can contribute to a differentiated discussion and perception of the resulting choreographic artwork. As argued in 1.3, paying close attention to the creation of digital performances will allow me to follow the ways in which virtual media integrate dance art. It will help me to describe the dynamics occurring between dance artists and their tools that remain obscure when the research focus is exclusively oriented towards the final choreographic creation. Following different actors such as dancers, choreographers, but also technicians and the technological tools themselves, this thesis also builds on a collective understanding of performance making. Moving away from the traditional conception of the choreographing subject as the only creative instance in the artistic process, it joins a decentralist line of thought as it sheds light on the many participants involved in the production of a dance artwork.⁴³ While these processes have hitherto exclusively been understood as the actions of subjects, in this thesis I argue in line with my STS-inspired approach that agency in (digital) dance is distributed and circulates along both subjects and material, and therewith also technological, actors.

To explore the role of digital media in dance performance, I intend to make the socio-material dimension of digital dance visible. Here, the STS-deriving concept of technological mediation leads me to concentrate on the struggles and negotiations between dance artists and their tools to uncover the adaptation strategies and skills that the involved participants need to develop in order to engage with each other. Drawing attention to changes, transformations, and places of friction, my constructivist, STS-related theoretical approach allows to shed light on those rehearsal and creative practices which usually remain obscure to the open public, and which still present an understudied phenomenon in (digital) dance theory and in dance, theatre and performance studies in general.⁴⁴ This way, this research project takes an innovative

⁴² In the tradition of dance and performance studies, a choreography's staged performance, its patterns of composition, movement language and narrative arc serve as the main criteria for analysis, and they are mainly considered in isolation from the creative process.

⁴³ For a discussion of the current positions on performance production as a collective undertaking, see 2.1.2.

⁴⁴ While the creative process in dance and performance making is increasingly attracting scholarly attention, systematic analyses of concrete choreographic rehearsal procedures and practices are nevertheless missing in current dance theory. One notable exception presents Katarina Kleinschmidt's empirical study of the routinized generation of creative ideas in dance making (Kleinschmidt, 2016). Her praxeological approach however is primarily subject-oriented and only slightly opens up to non-human participants (see 2.1.2). In the field of theatre studies, Gay McAuley's ethnographic study of theatre rehearsals (2012) emphasizes the importance of the creative process for a deeper understanding of the

position as it paves the way towards a material- and technology-inclusive understanding of digital dance practices by considering the constitutive role of technology through the systematic analysis of the processes occurring during virtual performance production.

In closely following how dance artists concretely deal with virtual media in digital dance making, this dissertation takes an empirical approach. I refer to ethnographic research methods because their strong focus on practices, processes and contexts (Hammersley, 2017) allows to tell the particular stories I seek to describe in this thesis in their details and complexity (cf. Cheshire, 2016). While the term ethnography currently knows multiple definitions, it is broadly understood as a methodological measure within qualitative research that includes observation activities in a specific social setting (Hahne et al., 2005; Hammersley, 2017). In this thesis, the notion of ethnography is mainly associated with practices of fieldwork. Such ethnographic research methodologies like conducting interviews and participant observation have mainly been elaborated in anthropological studies (Mesman, 2008), but they also present important methodological variations in further disciplines such as Science and Technology Studies (van Saaze, 2009). However, as classical ethnographic perspectives commonly understand technology as a rather unchanging and passive variable (Hahne et al., 2005; Braun-Thürmann, 2005), they collide with this thesis' underlying philosophy of technology's social dimension. Therefore I suggest to undertake my ethnographical investigations in the spirit of a technographic approach. Acknowledging technology's symbolic and practical involvement in socio-cultural practices, technography refers to ethnographic methods to make the cultural dimension of technology visible.⁴⁵ Through the description of local contexts of action, it intends to facilitate research into the shaping, use and impact of technologies in concrete social situations (Braun-Thürmann et al., 2005; Jansen & Vellema, 2011). Avoiding dualistic stances between social and technological worlds in social science research (Jansen & Velleman, 2011; Rammert, 2005), technography thus requires a shift in the ethnographic researcher's perspective as it not only takes subjects' actions and beliefs into account but also pays attention to the relevance of technological artefacts in concrete activities (Braun-Thürmann et al. 2005).

resulting presentation of a play. Her work provides many anecdotal insights into theatrical rehearsals but it does not provide any further analytical insights.

⁴⁵ While technographic research makes use of ethnographic methods, it is not understood as a mere application of existing ethnographic approaches on the field of technology and its use (Hahne et al., 2005). Instead of recurring to a standardized methodological set, technographic studies also expand the repertoire of ethnographic practices by developing new forms of data gathering and new types of data (ibid.; Rammert & Schubert, 2005). In the course of this research project, I however recurred to rather classical ethnographic methods such as participant observation and interviewing. In this sense, this thesis does not aim at presenting new forms of technographic research activities but shares technography's underlying attitude of introducing a technology-inclusive focus in ethnographic studies. I thus suggest to conceive of technography as a conceptual focalization of the ethnographic approach onto the technicity of culture (Braun-Thürmann, 2005).

In the context of this research project, this means that I not only followed the human actors such as dance artists, multimedia programmers or technicians but also attentively traced whether and how the technological devices were involved in the observed activities.

When initially setting out to conduct empirical research on rehearsal processes in virtual performance, I quickly realized that being an outsider to the field of digital dance presented a considerable obstacle as I could not easily find information concerning ongoing rehearsal procedures. The simple reason for this is the fact that dance companies or theatres only tend to inform the general public about their productions or programme once the latter are ready to be staged, and not while they are still in the process of creation. Furthermore, as the rehearsal procedure can contain phases of insecurity and conflict, dance companies usually do not invite strangers to accompany them during this intimate process. During the exploratory phase of this project which took place in 2008 and 2009 I therefore sought to get in contact with actors in the field of digital dance on a general level. For this, I conducted first interviews with dance artists who had already worked with digital media to learn about their experiences during the making processes of their past productions. I found these people through online research and via institutions such as theatres and performance venues that had hosted virtual performance productions or workshops in the past, and in which dance artists were invited to experiment with digital media.⁴⁶ The attendance of festivals and symposia dealing with the combination of dance and virtual technologies also facilitated my access to and discussion with relevant artists and furthermore allowed me to exchange with scholars about ongoing topics in digital performance.⁴⁷ While participating in workshops that offered dance students the possibility to collaborate with graduates in media art, I gained hands-on experience with regard to the particular issues involved when moving bodies and digital tools engage with each other for the first time.^{48,49}

While the data gathered during this initial research phase do not explicitly figure in this thesis, this period of orientation was important for this project and my subsequent research activities in two ways. Firstly, it provided me an overview of digital performance

⁴⁶ Among the institutions in question, especially the Germany-located tanzhaus nrw (Düsseldorf), Pact Zollverein (Essen), and Trans-Media-Akademie Hellerau (Dresden) provided me with important contacts.

⁴⁷ I specifically attended several editions of the *Temps d'Images* festival and their affiliated symposia which were held at tanzhaus nrw in Düsseldorf.

⁴⁸ I notably took part in the workshops 'Collab Lab' organised by and held in May 2008 at the Piet Zwart Institute in Rotterdam, the Netherlands, and a motion capture seminar which took place in December 2009 at the Academy of Media Arts in Cologne, Germany.

⁴⁹ During this exploratory phase, the spatial location of the visited artists, workshops and symposia presented an important criterion of selection. To be able to participate in the events and to meet the digital dance makers and observe their rehearsal work in person without spending too much time for travelling, I chose to contact those artists that were working in spatial proximity to my bases in Germany and the Netherlands.

as an artistic practice by introducing me to some of its actors and their activities, and it critically sharpened my understanding of the issues at stake during digital dance making. This way, learning about how practitioners in the field of virtual performance conceive of their work and the role of media in their projects particularly strengthened the empirical relevance of the points discussed in this thesis. Secondly, it occurred almost as a side-effect that especially during personal meetings and interviews, artists involved in digital dance production informed me about their ongoing projects or the current works of their colleagues, and subsequently invited me to attend one of their rehearsal sessions. These informal invitations finally provided me knowledge about and access to upcoming procedures of digital dance making.⁵⁰

During my first visits of different companies in their rehearsal studios⁵¹, I already became aware of the intensity and the complexity of (digital) dance rehearsals. I specifically noticed the unpredictable character of processes of dance creation, as the rehearsals' course and contents could tremendously change within relatively short time spans, for instance during one day, because of unforeseen events and ideas. As I already put my focus on the struggles and negotiations between dance artists and their tools during these initial observations, I for instance witnessed that the adaptation of a technological tool's functioning to specific artistic ideas unexpectedly required further technological equipment. These changes in turn affected the tool's operating mode, which succeedingly demanded that the performers deal with the technology in new ways, which finally impacted on their movement style. I have witnessed that dynamics of this kind occurred in nearly any of the observed processes.⁵² This observation illustrates that possible frictions between dance makers and their devices cannot always be anticipated beforehand, and it furthermore shows that the ensuing negotiations between the involved artists and the technologies can occur on several different levels because the described process involves artistic ideas, adaptations on a technological level, the technology's handling and the change or development of physical practices. These experiences finally led me to exclusively concentrate on two case studies in this thesis. This focus allowed me to intensely observe and therewith trace the development of two digital dance productions with the necessary attention for concrete details. As time presented a considerable factor during my ethnographic research, concentrating on two

⁵⁰ While I also visited rehearsal procedures that came about through email requests from my part, I noticed that I was received in a more open and trustful way when the meetings had been arranged in a more personal and informal manner, i.e. through contacts in the field.

⁵¹ I observed selected rehearsal sessions for the following productions: *Mortal Engine* (2008) by Chunky Move, *As If Stranger* (2006) by Richard Siegal, *ICI* (2010) by Contour Progressif, *Recycling* (2006) and *Habitat* (2010) by LaborGras and *loopdiver* (2009) by Troika Ranch.

⁵² For more concrete accounts of two procedures with similar rhythms and their systematic analysis, see chapter 3.

rehearsal processes permitted me to pursue the making procedures of the selected works in their entirety, from their conception to the pieces' premiere.⁵³ Following the complete rehearsal processes with a clear focus on the interaction between dance artists and their tools thus allowed me to look at the flow of actions as it occurred, without missing out on the crucial (and partly unexpected) moments of struggle and conflict coming up during the course of action, and to embrace the many-layeredness of the ensuing negotiation procedures. As a consequence, having observed these dynamics in their necessary details makes possible to articulate and systematically analyse the concrete creative and bodily interplay between digital dance artists and their devices, and thus to describe the particular contexts of technologies' use.

The qualitative empirical materials on which I base my findings in this thesis were mainly produced during several ethnographical phases between 2009 and 2011. During this time, I followed the rehearsal periods for the two digital dance productions *loopdiver* (2009) by the American dance group Troika Ranch and *Habitat* (2010) created by the German collective LaborGras. I primarily gathered my empirical data through stages of participant observation and interviewing with the aim to provide thick descriptions (Geertz, 1983) of the rehearsal processes for the mentioned productions. During my research stays, I mainly attended and assisted in the actual rehearsal processes in the companies' dance studios.⁵⁴ True to my technography-inspired perspective, I particularly focused on the ways in which the artists such as choreographers, dancers but also programmers, technicians, set and light designers interacted with each other and with the employed technological tools. I concentrated on the situations of friction that directly or indirectly involved the companies' devices which presented unique windows into negotiation moments that showed how the different actors arranged to overcome those problems. Here I paid particular attention to the ways in which the artists but also the technological tools were both adapted and adapted to, and to the artistic and bodily practices that were thus developed. In order to receive information about the artists' ideas and beliefs concerning technology in their work and their experience while operating with digital tools I furthermore conducted open, semi-structured interviews with all participants engaged in the rehearsal procedure. The personal exploration of the technological tools and environments in question provided me hands-on experience that sensitised me as an amateur dancer to the physical

⁵³ As in both cases, the pieces' very first rehearsal phases had already taken place before the start of my research project, I interviewed the involved artists about these initial creative stages and (in the case of *loopdiver*) referred to the company's blog documentation to reconstruct the story of *loopdiver*'s beginning.

⁵⁴ While I was first exclusively observing the activities occurring in the dance studio, with time I started participating in the daily course of the company's rehearsal process in the sense that I took over assisting tasks such as holding objects, assisting in stage measurements etc.

challenges faced by the performers when struggling with my own limitations.⁵⁵ In addition, spending time with the company members outside of the dance studio provided me further qualitative information as the artists also tended to discuss important production-related issues during work breaks, for instance during lunch or dinner.

I selected the digital performance productions *loopdiver* and *Habitat* as case studies for two reasons: first of all, and rather on a practical side, both processes were available in suitable time frames. Moreover, the chosen cases bear interesting parallels because in both pieces, the respective companies employ similar technological tools. Both computer programs *Isadora* (used in *loopdiver*) and *Kalypso* (*Habitat*) present programming environments that have been specifically conceived for the domain of digital performance, and they allow the real-time manipulation of audiovisual material which can for instance be created for live effects onstage.⁵⁶⁵⁷ Both programs function on the base of algorithms that can provide modifications in video footage through the input of live audio or motion tracking data. Given the similarity of the technologies' function and their operating mode, these two cases present compelling objects of study as following their respective processes of creation allows to closely examine how the members of the two artistic companies engage with these tools, and therewith to find out whether and how the rehearsal dynamics and thus the devices' concrete situations of use resemble or differ from each other. As my principal aim is to follow the respective rehearsal procedures in their individuality, I do not operate in an overall comparative matrix but will point out the two cases' similarities and contrast them in moments where similar problems are solved with different artistic or physical strategies. This will allow me to explicate the particularity of technologies' situations of use.

To provide the reader an idea of *loopdiver's* and *Habitat's* performances, I briefly describe the two pieces' main concepts and their staged presentations in the following paragraphs. Throughout this thesis, I will then clearly focus on both works' making processes.

At the beginning of *loopdiver* stands a videotaped choreography. With the technique of 'looping', thus the modification of the video footage by introducing

⁵⁵ My level of physical performance expertise being certainly less developed than the bodily knowledge of a professional dancer, my try-outs of the technological devices nevertheless provided me an idea of how it feels to move in a digitally equipped environment which provokes physical and spatial disorientation (*Habitat*), or to apply the same technologically influenced moving techniques that my subjects of study were working with (*loopdiver*).

⁵⁶ As an example, the production *Glow* presented in the introduction of this thesis has been co-created with the software *Kalypso*.

⁵⁷ For more information on the software *Isadora* and its use, see <https://troikatronix.com/> (retrieved June 23, 2018). While *Isadora* is available for purchase, *Kalypso* has not yet been commercialized. To learn about *Kalypso's* predecesing software program *Eyecon*, see <http://www.friederweiss.de/eyecon/index.html> (retrieved June 23, 2018).

numerous repeats in backward and forward mode, the original choreography is transformed into a new, interrupted and staccato-like assemblage of movements which *loopdiver's* dancers are supposed to physically imitate. During *loopdiver's* presentation, the spectator observes six performers entering and wandering around a two-faced stage and sitting down on chairs that are either placed in front of or in the auditorium. After the dancers have been leaving their seats, walking on the dance floor and returning to their chairs several times, the light in the theatre suddenly fades and six transparent screens unfold on the stage, each surface reflecting the figure of one respective performer. From that moment on, the dancers start moving in a looped way which provides their gestures a fragmented character. Although it is possible to identify certain of the performers' gestures as pedestrian movements such as getting up, stretching the arms or moving through space, the movements' original continuity is constantly disturbed by various repetitions that lead the performers back- and forward in the same movement sequence. While each dancer executes individual gestures, the movements of all six performers are guided by the same loop rhythm. Through this effect, the dancers appear to be trapped in numerous series of discontinuous gestures which generates the effect of watching a scratched, three-dimensional DVD presented by human bodies. In the end of the performance, one performer 'dives the loop' by standing still, watching the other dancers, then moving in a slow and continuous manner and starting to speak before the stage lights fade out.

In *Habitat*, one dancer performs on the dance floor while simultaneously animating her live and delayed video images. Instead of sitting in front of a stage, *Habitat's* spectator enters a space equipped with rough wooden sculptures and a small dance floor that is surrounded by three video cameras. In the dance area, a performer is moving during short sequences of several minutes. Each of her respective performances is characterised by a specific movement and expressive style, varying from slow and hesitant gestures to heavy floor exercises or agitated and bustling motions. Wandering through the performance space and amidst the sculptures, the spectator furthermore discovers that several of the bulky objects are endowed with specific accessories as little screens have been installed in their wooden material. A closer view shows that each screen displays an individual virtual architecture. Suddenly, a human figure appears in one of those screens and starts moving in the displayed virtual spaces. At close sight, one can identify the dancing video image as the digital reflection of *Habitat's* performer who is moving in the dance area. The visitor can thus simultaneously watch the performer dancing both on a physical and a virtual stage. By now it also becomes clear that the performer's movements in the dance area are geared to the structure of the digital spaces. After several minutes, the dancer's video image disappears from the screen. Continuing her way through the sculptures, the spectator eventually observes another screen, which presents yet another virtual design. After some time also here, the dancer's live video

image appears and starts performing in the digital architecture. The performer's movement style has changed again, and her gestures are anew adapted to the virtual space her image is currently moving in. This time, the dancer's live video image multiplies, and its double moves with a temporal delay as it repeats the actions that the live dancer has executed several seconds ago. Now, the performer's live video image and its delayed double interact as they approach, follow and seemingly touch each other. Also this episode ends with the dancing images vanishing from the virtual space. In a similar way, the dancer's image successively appears on each of the individual screens, performing particular choreographies in different constellations composed by the performer's live reflection but also by one or several of its doubles. Throughout *Habitat's* presentation, the spectator can also follow the dancer's performance in the physical dance area. Once her image has appeared in each of the displayed virtual spaces, the performer stops moving, bows, and leaves the dance area and *Habitat's* performance space, leaving the spectators alone among the sculptures.

While the periods of observing the rehearsal procedures for the two dance productions *loopdiver* and *Habitat* provided me valuable insights into the struggles and decision-making processes during digital dance production, my ethnographic activities also presented a challenge for my researcher's perspective. As I shared most of my time inside and outside of the dance studio with my subjects of study, I experienced these creative phases as utterly intense. Having the ambition to understand the dance artists' points of view, I at times had the impression to lose my observer's distance with regard to the occurring events and the artistic interests. In the ethnographic domain this issue is broadly known as 'going native' (cf. O'Reilly, 2009). In those moments, escaping the intensity of the rehearsal process and leaving the theatre space and reminding myself of my research interest, or reading my fieldnotes in alteration with the theories I considered relevant with this project presented effective solutions to this problem and to contemplate the observed events from my researcher's point of view.

My ethnographic activities finally resulted in transcribed interviews and a considerable amount of fieldnotes and observation protocols. In the subsequent analytical phase, these notes allowed me to examine the particular dynamics taking place between the digital devices *Isadora* (in the case of *loopdiver*) and *Kalypso* (in the case of *Habitat*) and their artistic users in their concrete details. During this process I aimed at a fruitful relation between theory and empirical data: while the empirical findings indicated those conceptual lenses that were most helpful to understand the occurred events and their analytical significance in the context of my research scope, I also integrated theoretically informed questions in the process of data analysis (cf. Ezzy, 2002).

As explicated in the previous paragraphs, the strength of a qualitative ethnographic approach lies in its capacity to provide many details and its emphasis of the

actors' perspectives (Cheshire, 2016). It departs from the humanist ambition to understand phenomena rather than finding an absolute truth. Qualitative ethnographic research therewith contrasts with a positivistic definition of science and its preoccupation with truth through objectivity, detachment, replicability and causality (ibid.:3; Walsh, 1998). A scientist applying qualitative methods thus cannot explain the world as if it could be grasped in its entirety through scientific analysis. In this sense, I do not claim to present in this thesis any universal laws according to which the world of digital dance works, but rather to describe the world as it is seen, experienced and acted upon by the particular dance companies and their digital devices.

Another point acknowledged in qualitative ethnographic research is the fact that the observing scientist does not present any neutral instance as she brings her own values, choices and interests to the field site. This way, each observation and analysis incorporate the researcher's subjectivity. This also means that the stories of the two cases *loopdiver* and *Habitat* are not the only stories that can be told about their creation. In this thesis, I nevertheless refrain from constantly expressing my textual presence through 'active voice'. Given that it is commonly agreed that each text includes the author's signature, I do not consider it necessary to continually explicate this subjectivity throughout this study.

It is furthermore recognised that within ethnographic studies, substance and method cannot be clearly separated from each other as the ethnographer gathers information through interaction with the field (Emerson et al., 1995). This way, also her presence can have effects on the practices studied. During my ethnographic activities I became aware of this dynamic several times. Although I tried to act as discreetly as possible while being in the rehearsal space and mostly watched the events sitting in a corner of the dance studio, I learned that my sheer presence in the theatre space affected the actors' behaviour and thoughts. For instance, the members of an observed group appreciated the regularity of my presence and started to use it as a temporal mark to the point that they only started rehearsing a specific part of the choreography when I came back from my lunch break, as "now that she's back it's time for the next part". The artistic director of another dance company furthermore told me that the fact that I invested a large amount of time to study his group's creative occupations made him bring even more consideration to his own work. These anecdotes show that my presence unintentionally impacted on the artists' working rhythm and their perspectives on their creations. As I learned about these aspects only accidentally during daily conversations 'off record', it is very possible that my observing activity affected the dance makers' work in further ways that neither I nor the artists intended, and which we were (and still are) even not conscious of.

Despite my qualitative ethnographic approach and my emphasis of each rehearsal procedure's individual character, the presented empirical material should

however not be misunderstood as mere ‘storytelling’. Beyond their strength of describing the inherent complexity of individual digital dance making processes, the case studies presented in this thesis also function as epistemic tools on two levels. First of all, as chapters 2 and 4 show, the empirical material gathered helps me to develop analytical frameworks for the study of the dynamics of digital dance production. It informs us about the questions that need to be asked and the theoretical concepts to be considered for examining digital dance and its making. Moreover, apart from depicting the diversity and complexity of particular examples of digital dance making, I will show that the case studies allow to deduce patterns and mechanisms that go beyond single individual situations, and which can thus be relevant on a broader level. The empirical cases therewith present meaningful ethnographic objects that do not exclusively operate on a descriptive level but are also significant contributors in an analytical context (Geels, 2007).⁵⁸

1.5 Overview

This thesis is structured around its two focal points which respectively deal with virtual technology’s integration in digital dance creation and in the dancers’ bodily experience during the choreographic process. Each separate point of interest is conceptually explored in one theory-informed chapter which provides the grounds for the ensuing analysis of empirical material in a practically oriented chapter. Methodologically chapters 2 and 4 are based on and add to scholarly work on digital dance, on philosophical reflections and concepts of socio-technological constellations (chapter 2) and bodily experience in digital environments (chapter 5). Chapters 3 and 5 build on this conceptual material by combining it with ethnographic information such as interview transcripts and observation notes. This way, chapter 2 provides theoretical knowledge about how the process of digital dance creation and digital media’s participation in it can be conceptualized⁵⁹. The resulting analytical framework subsequently allows me to present

⁵⁸ By considering the broader relevance of qualitative case studies, this research project is inspired by the suggestion of introducing the sociological approach of middle range theory to the field of STS. In order to bridge the gap between detailed case descriptions and simple analytical schemes, different STS scholars propose to introduce further scales of analysis by deriving generic patterns in their empirical examples (Wyatt & Balmer, 2007; Beaulieu et al., 2007). Contrary to all-encompassing topics and theories, the middle range theory approach furthermore focuses on a particular topic, makes explicit efforts to combine different concepts in an analytical model and searches for explanations such as patterns and mechanisms that go beyond an exclusively descriptive level (Geels, 2007).

⁵⁹ In the theoretically oriented chapters, the empirical material relating to the production *Glow* which has been introduced at the beginning of this thesis will help me to develop the conceptual frameworks

and examine how virtual tools engage in the making procedures of the case studies *loopdiver* and *Habitat* in chapter 3. In a similar structure, chapter 4 clarifies the theoretical background relating to digital media's participation in the physical perception of virtual performers, and suggests a conceptual grid for the analysis of bodily processes in digital dance. This analytical scheme is taken up in chapter 5 to depict and evaluate the bodily practices and experiences of *loopdiver's* and *Habitat's* dancers. Through its organization, this thesis thus describes and analyses the same empirical material, namely *loopdiver's* and *Habitat's* rehearsal procedures, from two different conceptual perspectives. This strategy allows to articulate the complexity of the respective processes and to flesh out the different layers at play in digital performance making. The two focal points and their particular theoretical approaches thereby function like a prism that makes possible to discover the multiple but yet distinct aspects involved in virtual dance production.

In chapter 2, I show that in the field of digital dance, both practitioners and scholars demonstrate biased stances concerning technology's role in virtual performance creation. These perspectives, I argue, are incompatible with the empirical reality of digital dance making because they do not recognize any creative agency to digital devices. To develop a differentiated conceptual view on how digital media integrate the artistic aspects of digital dance production, I start with the notion of collective dance creation which acknowledges that a choreographic artwork is the result of several contributors instead of one single genius, but in which hitherto only humans have been granted the status of creative co-producers. I therefore propose to enlarge this human-centered scope to material actors with the help of Actor-Network-Theory (ANT). I explain that ANT allows to consider digital dance creation as a process in which human and non-human actors co-determine the course of a choreographic artwork's production by engaging with each other. This leads me to develop an analytical framework by referring to selected ANT-related concepts. The conceptual grid makes possible to trace the ways in which human and non-human participants, and thus also digital media, engage in dance-making procedures and co-shape the evolving dynamics, artistic intentions and results. It therewith permits to describe virtual media's creative agency in digital dance production.

Chapter 3 leads us to the rehearsal spaces of *Habitat* and *loopdiver*. Here I trace the evolution of these two digital dance productions by focusing on the formative role of virtual technologies in the rehearsal procedures. Recurring to the ANT-informed framework developed in chapter 2, I examine the dynamics in which the software

with which I will subsequently describe the two case studies *loopdiver* and *Habitat* in the empirically informed chapters.

programs *Isadora (loopdiver)* and *Kalypso (Habitat)* engage with the other (non-)human participants involved in the respective creative processes. I show that the tools' interactions with the other engaged actors generate diverse unexpected dynamics and frictions that directly and indirectly shape the artworks' development and final form on different levels. I also demonstrate that the technological tools themselves are equally affected during the creative process in different ways. My analysis therewith discloses an alternative perspective to dualistic viewpoints as it indicates that the rehearsal and creative procedures rather resemble moments of negotiation and continuous transformation in which neither of the participating actors remain the same.

Chapter 4 focuses on the status of new media in the bodily experience of digital dancers. I demonstrate that the relation between dancing bodies and (digital) technologies is often conceived in terms of domination, and that this binary understanding dates back to dualistic legacies of thought that emerged during earlier choreo-technical experiments in the 20th century. Claiming that these one-sided views do not allow to grasp the complexity of digital dancers' concrete physical sensations, I present a current alternative position that understands performing bodies and virtual media as comprised in processes of "relational dynamics". Scholars of this approach consider that contemporary dancing bodies find themselves in a fluctuating mode in which dancers' work with digital tools interferes with and reconfigures the performers' physical perceptions and movement sensations. While this physical condition is presented as a rather fluid procedure, I refer to dancers' reports to add that these "relational dynamics" include series of frictions and physical destabilization that emerge through the dancers' interaction with digital media. I identify these situations as significant because they generate the performers' bodily negotiation with the digital tools, and these learning procedures consequentially shape the dancers' physical experience. To render the notion of "relational dynamics" operable on a theoretical level, I subsequently develop a conceptual framework from theoretical approaches deriving from dance studies and postphenomenology that deal with the formation of dancing bodies, human-technology relations and the ways in which technologies infiltrate in bodily experience. The resulting interdisciplinary analytical toolkit, I argue, allows to describe situations of friction between dancing bodies and new media during digital dance rehearsals, to investigate the dancers' consequent negotiations with digital tools, and to explore how these learning procedures impact on the performers' physical sensations. I claim that articulating these processes makes possible to formulate the "relational dynamics" in digital dance and therewith to define a technology-inclusive understanding of bodily experience in virtual performance.

In chapter 5, we return to *loopdiver's* and *Habitat's* dance studios to examine how the digital performers concretely learn to dance with their digital devices. Here I specifically concentrate on the moments of friction between dancing bodies and virtual

media to find out how the performers' physical disorientation is brought about, and on the consequences these situations of conflict have for the dancers' subsequent rehearsal activities and their bodily experiences. In *Habitat* and *loopdiver*, the performers undergo moments of disorientation while being confronted with digitally manipulated video reflections of their own bodies. With the help of the interdisciplinary conceptual toolkit elaborated in chapter 4, I show that during the subsequent rehearsal phases, the dancers undertake various activities to realign their inner bodily sensations and motoric capacities with their digitally modified video reflections. The two examples illustrate that these realignment strategies are influenced by the technologies' specific characteristics. By presenting and analyzing the performers' particular readjustment activities, I find out that the employed media are involved on an imaginative, a didactic and perceptive-kinaesthetic level in the dancers' bodily work and experience. I furthermore discover that also the tools themselves are adapted to the performers' physical and cognitive needs. Following the impact of these procedures, I notice that the moments of conflict and the ensuing negotiations with the technological devices impact on the performers' physical experience in the sense that they expand the dancers' bodily sensitivity, their movement vocabulary and bring the performers to develop new motoric capacities. Describing the "relational dynamics" in digital dance therewith allows to disclose different ways in which digital technologies can mediate physical experience in virtual performance, which I argue presents an alternative perspective to dualistic viewpoints in which digital media and dancing bodies are considered to dominate each other.

Chapter 6 finally concludes by discussing the findings of this research project and providing a perspective for further investigations in the field of digital dance and performance studies in general.

2 Technology's creative agency in digital dance

In the area of the performing arts, the question still persists as to what extent the aesthetic qualities of dance and the technology mutually influence each other.

(Dinkla, 2002:14)

After watching *Glow's* presentation⁶⁰, I met the piece's choreographer Gideon Obarzanek for an interview. During our talk, Obarzanek explained how *Glow* had come into being. He pointed out that *Glow* was the result of a long and intense collaborative process between himself and software engineer Frieder Weiss, who had designed the reactive video system employed in the performance. Then he added the following:

When you create such a piece [with digital media], you can't just tell the programmer: 'these are my ideas, I need this or that effect', and then he makes it and you create the dance steps. That's not how it works. You rather work together on the piece (Gideon, 6 June 09, Amsterdam).

When I asked him further about this collaboration, Obarzanek told me:

*In the beginning of *Glow*, Frieder [Weiss] came to our studio in Melbourne ... [he] showed me different ways of how his system could generate video according to information from movement, and I was just trying to get a sense of it ... I wanted to find an interesting relationship with the system ... together [with Frieder] we started looking at a lot of graphics and algorithms ... sometimes I would find things that supported already choreographic ideas, sometimes I would create choreographic ideas specifically for the graphics to see how that would work. For example, I liked an image very much, and I wanted to see how I could find a way that it worked with the [dancer's] body. But often also something else happened, something that I would have never imagined, because the technology was not working in a foreseen way, or it was simply very sensitive ... then I ended up with something that was not intended at all ... sometimes that wasn't so [interesting]*

⁶⁰ For a brief description of the artwork see 1.1.

but sometimes it was actually more interesting and better than I could have imagined ... and when the dancers joined us in the studio, they found even other ways to move with the images, which triggered my and Frieder's ideas again ... we then started to work with these results ... and slowly, the piece emerged.

Obarzanek's account of *Glow's* making revealed that not only the choreographer and the software programmer had created the piece but that even further participants had contributed to it. More precisely the dancers and, interestingly enough, also the digital video technology itself had given shape to *Glow*: the choreographer described that the computer program's unforeseen features and reactions had influenced his artistic intentions. It thus seems that *Glow's* creation had resembled an intricate, collaborative process involving a choreographer but also a computer programmer, dancers and digital video programming software.

The details on *Glow's* creation intrigued me even further because they challenge two positions concerning the role of technologies in the creative process that are widely spread in the digital dance community. On the one hand, digital technologies are still considered as merely subordinate tools serving artistic aims. This functional and instrumentalist notion of technology excludes the tools' possible contribution to any aspect relating to the creative qualities of a choreographic artwork. On the other hand, even if practitioners express their desire to exchange with digital media, they report their concern that occupations with the technology should not disturb nor interfere with the artistic idea of the piece. These worries are based on the deterministic thought that technical issues take over the creative process. Thus here again, technological tools find themselves separated from the creative line of digital dance production. The account on *Glow's* development however described a more complex reality, as the technology neither functioned as a 'plug and play' tool, nor did it entirely curtail the development of artistic ideas. It rather seems that within this particular example of creative practice, the digital video system was co-shaping the art making process, along with other artistic actors like the choreographer, the video programmer and the dancers. Here, the digital tool, and especially the artists' interaction with it, contributed to the final form of *Glow*. The piece thus rather seems to be the result of a collective process in which technology took on a creative and formative role.

The tensions between the dualistic conceptions of technology's status in the creation of digital dance artworks on the one hand and concrete artistic practices on the other lead me to suggest that further investigations into the digital tool's status in virtual performance might help to clarify the role of new media in the creative process. Like the example of *Glow* shows, closer insights into the interaction between the different creative participants can help to draw a more differentiated and complex picture of digital dance

making. They could help to evaluate technology's formative role in digital dance practice: in which ways can technological tools engage in the artistic dynamics of dance creation? And how precisely can this involvement co-shape artistic intentions and the resulting performances? However, to date the dance field is still lacking the conceptual tools to undertake these analyses. Here it is worth mentioning that scholars in the academic disciplines of dance and performance studies such as Bojana Kunst (2009), Rudi Laermans (2015), Annemarie Matzke (2012) or Martina Ruhsam (2010) increasingly understand the creative act in terms of a collective process rather than an individual procedure. Contrary to the adherents to traditional approaches in which the choreographer counts as the only individual in dance making, the more recent and alternative perspective grants increasing importance to the rehearsal process. Adherents to this position furthermore claim that also non-human elements can affect and shape the creative procedures and the final artworks. In the context of this chapter's focus on the formative role of digital media in digital dance creation, these studies present helpful starting points as they introduce a processual and collective perspective on performance practices. Nevertheless, until now these works mainly focus on the social constellations between the human participants in the creation of performances. They provide only limited methodological means to describe and analyse the creative dynamics emerging in artistic collectives, and they do not yet sufficiently articulate the aesthetic role of non-human participants such as material objects or technological tools during the making of dance productions. As I have argued earlier in this paragraph, the latter are however necessary for a thorough examination of the concrete dynamics in digital dance production.

In this chapter I suggest to expand the notion of collective dance creation by developing a conceptual vocabulary that allows to analyse the ways in which digital technologies are invested in the production of digital dance artworks. I will use this framework to closely investigate the dynamics occurring during the creation of the two case studies *loopdiver* and *Habitat*. My analytical scheme will be based on the following criteria: first, it should provide tools that allow to closely study the concrete interactions between the different participants involved in choreographic processes and to evaluate their generated dynamics. Second, the framework should also permit to articulate and examine how non-human participants, for example material objects and thus also technological tools, can engage with the other contributors and therewith co-shape the evolving procedure and artistic intentions. The relevance of the analytical scheme that I will develop in this chapter is twofold: on the one hand, it contributes to the current scholarship on dance and performance creation as a collective process, and on the other it helps to draw a more differentiated picture of technology's formative role in digital dance making.

In the first part of this chapter I will revise current perspectives on the role of new media in digital dance creation. This will lead me to methodological considerations for the development of an analytical framework that allows to consider digital dance making procedures as collective, technology-inclusive undertakings. In this line, 2.2 will be dedicated to a closer examination of Actor-Network-Theory (ANT) which understands actions as the results of networks composed by human and non-human agents. After evaluating ANT's relevance for a non-dualistic study of virtual performance creation, I will render the theory's concepts more operable by describing how they help to elucidate dynamic processes in the fields of dance and installation art. In 2.3, I will reorganize the presented ANT-related concepts in order to build an analytical scheme for the assessment of new media's status in digital dance rehearsals. The developed framework will allow me to investigate the creative procedures of the two case studies *loopdiver* and *Habitat* in chapter 3.

2.1 Towards digital dance making as a collective process

In this subchapter I evaluate how digital dance practitioners and theorists in the field of digital performance conceive of the relation between digital media and art making procedures. I will show that these positions lead to a reflection on the notion of authorship in (virtual) dance. By recurring to current contributions in the fields of dance and performance studies I will explain that dance and performance making processes can be considered as collective, and not as the activities of one singular genius as has been traditionally argued. This will support my argument that a perspective which is based on the idea of collective performance making allows a technology-inclusive assessment of the creative dynamics in digital dance practice. These observations will subsequently lead me to a methodological consideration in which I will identify the theoretical needs for a framework that allows to articulate the status of new media in virtual performance. In this context, I will finally present and discuss the proposals by digital performance scholars who suggest the approach of the Actor-Network-Theory as an appropriate conceptual tool for the description of creative processes in digital dance.

2.1.1 Binary conceptualizations of technology's role in digital dance production

Since digital performance's inception, a considerable number of artists and artistic researchers who contribute to digital dance theory claim the necessity and importance of new media's presence in the art of dance. However, although they urge to leave conventional dichotomic notions of human-technology relations behind, they possibly unwittingly stick to binary assumptions of technology that do not permit the technological device much, if any, creative participation in the art making process.

In his plea for the use of interactive environments in dance, Richard Povall (2001) for instance claims that in digital dance "the technology has to be made subservient to the ideas the piece is trying to work with", adding that "if the makers are more concerned with the tools than with the content, then the piece will probably fail" (2001:2-3). In a similar vein, Mark Coniglio explains that he and his performance company Troika Ranch strive for the creation of "content-based" artworks⁶¹, that is dance productions in which technologies "support the aesthetic intent of the piece" (2007:80). While reporting on another approach by fellow artists that consists in the exhaustive exploration of a technological device and its manifold possibilities within a choreographic production, Coniglio criticizes that these artworks cannot create any proper narrative as they are primarily dealing with their technological tools. In their descriptions of a digital dance workshop series, Sita Popat and Scott Palmer (2005) note that the artistic team tried to avoid that technology-related activities "interfere with the momentum of creative discoveries", claiming in the following that "creativity in an arts project is centred on finding solutions to non-functional problems associated with aesthetic outcomes" (13-19). Or, in the words of performance artist and scholar Steve Dixon, "creativity resides with the practitioner, not the software" (Dixon, 2007:207). It is striking that in these statements, technological tools are considered as separated from the aesthetic and creative aspects in artistic production. Here technology is reduced to its functional purposes, its essential contribution to dance (makers) being restricted to an assisting, and therewith subordinate, role. It seems that these artists and researchers share a highly instrumentalist view of technology, in which the technological interface is supposed to be as transparent as possible, and thus unobtrusive, to its creative user.

In the same time, other researchers-practitioners in digital dance conceive of technology in deterministic terms. In this perspective, technology appears as a restriction to artistic creativity. Povall (2001) for instance refers to the idea that a device might

⁶¹ Coniglio borrows this term from digital dance researcher Isabel Valverde (2004).

follow an inherent logic which does not contribute to a choreographer's initial creative ideas. This view is shared by Wayne Siegel (1999; 2009), an artist experimenting in the area of digital dance and interactive music composition, who claims that "clearly, certain types of dance interfaces cater to certain types of choreographic and compositional ideas" (1999:14). The artist can thus only follow a path determined by her tool. In this sense, German theatre director Jo Fabian for instance fears that the choreographer's future status will transform from dance maker to machine operator (Leeker, 2002b). This process can lead to an effect which Isabel Valverde refers to as the (creative) "void", a situation occurring when a performance is solely geared towards the demonstration of technological features (2004:107). In these perspectives, technology is not considered as a tool in the service of the artist, but it rather takes on an adversary role because it cuts back the space for creative development.

In the above-mentioned perspectives, technology is considered as a non-artistic entity: it either dominates the creative process and therewith makes the development of truly artful content impossible, or it is excluded from the creative act through its mere instrumental function. These binary views are however problematic for an evaluation of technology's capacity to co-shape artistic procedures. As they exclusively allow to consider the relations between technological tools and artistic practices in terms of domination, they prevent a more balanced, or collective conception of the creative activities. Furthermore, these ideas testify of a rather unilinear understanding of the art making process in which the artists are the only possessors of creative and aesthetic power. In the example of *Glow* however, artistic ideas and intents took shape during a more intricate procedure in which different artistic participants and the technological tool interacted. Interestingly, this collaborative aspect is also roughly reflected in the contributions of several artistic digital dance researchers. Popat and Palmer (2005) for example speak of a "dialogue and play" taking place during their workshop series, as the performers' and the multimedia engineers' efforts to "create common ground" generated situations for creative development (18). In a similar vein, researchers Sarah Whatley and Amalia Sabiescu (2016) describe the making of digital performance as "emergent and dynamic [and] continuous processes of negotiation between the involved participants" (22). However, Popat and Palmer's as well as Whatley and Sabiescu's descriptions neglect the formative role of the technological device in this process; if the tool is accorded any function it serves as a nexus, a passive connecting element between computer programmers and dancers. Siegel (1999) grants a more active role to the digital tool in his observations, as "the restrictions imposed by the interface served not only as limitations, but also as a source of inspiration for composer, choreographer and dancer" (42). Digital dance choreographer Robert Wechsler (1997) seems to refer to the same phenomenon when articulating the process of "[making] art which speaks to issues of computing [as] a back-and-forth of energy and impulse" (9).

Similar to the accounts on *Glow's* making, these depictions point towards the collective character of the creative process in digital dance production. However, in the presented and rather general statements the role of new media in digital performance remains rather obscure. It furthermore might not have escaped the reader that several of the introduced artists suggest technology's co-shaping potential while still adhering to dualistic notions concerning the artistic work with digital means. This tension between opposed perspectives proves the need for a shift of thought and new approaches that allow to seize and articulate the ongoing dynamics in digital dance creation in more differentiated ways. To do so, I will now elaborate on academic contributions in the fields of dance and performance studies which are currently investigating a collective understanding of performance processes. In 2.1.2 I will therefore present studies which understand performance artworks as projects that emerge through the involvement of different participants. This will allow me to subsequently evaluate in how far these theories provide viable approaches for the analysis of digital dance creation and technology's role in the art making procedure.

2.1.2 Theoretical perspectives on collective performance making

While rehearsal processes have for a long time been neglected in the fields of dance, theatre and performance studies,⁶² they are increasingly receiving scholarly attention. While the phases during a performance's development are commonly deemed as an opaque, "hidden world" (Cole, 1992) and are therefore mostly discarded from their final outcome, since the last decade an increasing number of scholars in dance, theatre and performance theory acknowledges the relevance of studying creative and rehearsal processes.⁶³ The intensifying interest in "rehearsal studies" (McAuley, 2012) manifests itself also in the fact that research societies such as the European Association for the Study of Theatre and Performance (EASTAP) present special journal issues that invite the critical discussion of working methodologies on all levels of the creative process.⁶⁴ Focusing on the processes of performance making, theorists and artistic researchers attempt to redefine the notion of authorship by presenting performance works as

⁶² In the tradition of dance and performance studies, a choreography's presentation is considered as the principal artwork and object of study. The staged performance, its patterns of composition, movement language and narrative arc serve as the main criteria for analysis, and they are mainly considered in isolation from the creative process.

⁶³ See for instance Harvie & Lavender (2012), Hinz & Roselt (2011), Husel (2014).

⁶⁴ See for instance <https://eastap.com/blog/2019/06/16/european-journal-of-theatre-and-performance-deadline-20-july-2019/>, accessed 10 August 2019.

collaborative results and not, like has been argued in a traditional perspective, as the creative products of a sole artistic genius (cf. Husemann, 2009). In this sense they also strive to acknowledge the influence of the socio-economic field on the modes of performance production and its final shape (cf. Kunst, 2009; Müller-Schöll, 2014; van Imschoot, 2004). In this context, the collective rehearsal process as part of the staged performance is moving into the focus of various researchers. Distinguishing current collaborative practices from the politically and ideologically influenced collectives of the second part of the 20th century⁶⁵, the authors seek to define collective creation by tracing its historical development (Matzke, 2012) and by characterizing the different constellations of collaborative performance making (cf. Brandstetter et al., 2007; Kurzenberger, 2009). Recent studies analyze the social dimensions of varying collectives with regard to hierarchies of creative authority and artistic decision-making (Laermans, 2015; Matzke, 2012) or the status of the individual within the respective collectives (Ruhsam, 2010). In these contributions, dance (or theatre and performance) creation is presented as interplay between social and aesthetic energy, in the sense that the different persons involved in the production process and the (organizational) structures surrounding them shape a performance's aesthetics. Here, collective creativity does not emerge in a harmonious whole as it rather results from negotiations or fruitful tensions between the different actors and their respective backgrounds and competences. Rehearsal practice is thus understood as a field of forces which, according to the individual constellations of its contributors, generates "unpredictable joint actions" and "surprising results" that cannot be entirely controlled (Laermans, 2015:324). In his sociological study of rehearsals in dance, Rudi Laermans for example explains that these situations bear creative potential because they cause the collaborating artists to reformulate particular aspects of the work or even to reconsider their creative intentions (ibid.). The resulting unforeseen solutions and decisions bring forth particular movement sequences and the shape of the final artwork.

In the context of this chapter's focus on digital dance creation, these approaches towards collective performance making present interesting perspectives because they acknowledge an important role to the creative process for the study of performances.⁶⁶

⁶⁵ The period of the 1950s-1970s witnessed various approaches to create performance events within differently composed collectives. Adherents to these artistic tendencies were principally seeking alternatives to modern dance practice. The Judson Dance Theater for instance generated its specific movement style through the collaboration between artists from different backgrounds, and the artistic members of the famous 'Happenings' series initiated by Allan Kaprow referred to aleatoric elements and the audience members as formative participants in the performance process (Goldberg, 2001).

⁶⁶ In the presented studies, "[staged] performances appear ... as rehearsals put on hold ... and not as scenic final products theatre practitioners naturally strived for" (Kurzenberger, 2009:17). This way, these works introduce a rehearsal-inclusive view on the study of performance productions, which as I have explained is also relevant in the present research objective.

The authors' conceptions of rehearsal processes as collective undertakings are furthermore viable because they suggest that dance and performance artworks are the results of dynamics that cannot be described in terms of unilinearity as they unpredictably emerge between various contributors. They explain that the interaction between different artistic participants shapes the rhythm of a performing artwork's creation in unforeseen ways. However, while the studies mentioned provide valuable points of departure for a closer examination of (digital) dance making, they do not formulate any conceptual approaches that allow the description and analysis of concrete rehearsal processes. Despite their emphases on the creative benefit of collective artistic interaction, the authors rather episodically delineate such moments of collaboration without clarifying their aesthetic consequences for the rehearsal processes or the final artworks. Moreover, in the presented studies performance production is articulated as a social process taking place between human partners. Here the authors' focus mainly concentrates on the groups of the performers and the choreographers or directors. A thorough examination of digital dance making however requires to extend the collective perspective to further aesthetic contributors and to include the role of non-human participants such as material objects and technological devices in collaborative processes of creation. In this context, two further contributions deriving from the field of dance studies expand the scopes of the already mentioned works on collective performance practices. In their analyses of choreographic processes, dance theorists Pirkko Husemann (2009) and Katarina Kleinschmidt (2016) consider the aesthetic involvement of non-human participants in rehearsal procedures.

In her dissertation on *Choreography as Critical Practice* (ibid.), Pirkko Husemann describes rehearsal procedures in the free dance scene. According to the scholar, choreographic practices come into being through artistic interaction with the social dance field. She explains that not only a choreographer's decisions, but also her and the performers' dialogues with the "social field" consisting of critics, policies and the performing arts market influence a choreography's making and shape. Husemann for example argues that the ongoing economization of the dance market can affect the working rhythms as well as the structures and contents of dance creations. In this context, she notes that also non-human contributors like financial plans or critical reviews can impact on aesthetic processes in performance making. Husemann thus extends the notion of the collective to further artistic contributors as she includes non-human participants in processes of collaborative creation. With regard to this research project's investigation in the formative role of new media in digital dance making, this perspective is especially relevant as it allows to consider also material objects such as technological devices as potential participants in the rehearsal procedure. In her analysis

of two specific production procedures⁶⁷, the author however refrains from a thorough description of the concrete interactions between the different participants involved. Therefore, the specific dynamics emerging between the respective contributors and their artistic strategies remain fairly obscure.⁶⁸ As I have already explained, an analysis of digital dance creation however requires further clarification on how the involved (non-human) actors are comprised in the field of forces of collective creativity. This aspect is taken up by dance theorist Katarina Kleinschmidt. In her study on the production of artistic knowledge in dance rehearsals (2016), the researcher deals with the participation of artifacts in choreographic processes.

In her dissertation, Katarina Kleinschmidt analyses how artistic ideas are generated in dance making procedures. Following the rehearsal practices of dance artists, Kleinschmidt demonstrates that contrary to the widespread notion that creative ideas occur during unplanned, accidental moments, the artists revert to field-specific routines which help them bring forth new movement qualities and material⁶⁹. Referring to Stefan Hirschauer's suggestion that practices are constituted by different participants which need not necessarily be human, Kleinschmidt proposes that next to the choreographer and the performers, also non-human elements like sheets of paper and a digital video recording program are part of these "generative routines" (ibid.:3). The scholar for instance explains that paper sheets and post-it notes are regularly used in the context of movement research⁷⁰. She shows that the objects' materiality invites specific ways of employment which are adapted to the individual rehearsal situation. To describe this dynamic, Kleinschmidt refers to the term of 'affordances' which derives from cognitive psychology. This notion, first coined by psychologist James Gibson (1977; 1979), stands for the idea that objects are not merely being used by humans, but that they also provide possibilities of action, or 'affordances', which invite specific kinds of use⁷¹. Kleinschmidt

⁶⁷ Husemann studies the choreographic processes of the pieces *PROJEKT* (2003) by choreographer Xavier Le Roy and *Schreibstück* (2002) by Thomas Lehmen.

⁶⁸ Although Husemann underlines the unpredictable nature of the choreographic act, her report on the dance productions *PROJEKT* and *Schreibstück* does not shed any light on the actual procedure of creative decision-taking. In her account, the pieces' artistic concepts appear as given and are still in the choreographers' control. It is merely in the concrete realizations of *Schreibstück* that the dancers, which Husemann anonymously refers to as 'the group', are proposed a certain creative maneuvering space. The researcher reports that tensions emerge within 'the group', and that several of its members develop strategies to assert their personal ideas, albeit without going into further detail.

⁶⁹ According to Kleinschmidt, such creative routines are shaped by collective practices like the formation of specific terms, developing different forms of confirmations and moments of reflection.

⁷⁰ Kleinschmidt specifies that paper sheets are habitually used during rehearsal processes but also in training situations like choreographic workshops (2016:204-205).

⁷¹ One affordance of a knob might for example be to be pulled. While objects carry these possibilities of action, their users also need to possess the capabilities to recognize them. An infant for example is not yet able to identify a ladder's affordance to be climbed. Hence, affordances can only be realized in relation with agents.

explains that the paper sheets bear the affordances of being written upon and being moved. Their use by the dance artists co-structures the choreographic process and thereby has a stabilizing effect on the course of the rehearsals. The researcher furthermore follows the use of a digital video recording program during the creation of the piece *You Are Here* by German choreographer Antje Velsing (2013). Kleinschmidt observes that during the course of the rehearsals, the activity of recording and subsequently watching choreographic sequences turns into a generative routine for Velsing: through viewing the videotaped rehearsals, the choreographer can seize different nuances in her movements and develop new material. Kleinschmidt hence argues that the video recording device presents a constitutive participant of the rehearsal practice because it makes this procedure technically possible, and its use provides a specific rhythm to the creative process. The researcher moreover notes that the recording program affects the rehearsals even further as it influences the use of choreographic material. To view the recorded dance sequences, the video device requires that these recordings be imported to a specific place on the computer. To keep a maximum of saving capacity, the program automatically deletes those recordings that are not imported. Because Velsing only imports the video sequences that she finds interesting, the video device does not register those recordings that do not match the choreographer's taste. As a consequence, Velsing's artistic colleagues can only view the material that has been previously selected by the choreographer. According to Kleinschmidt, the recording program's characteristics thus co-determine the use of choreographic material. She argues that the device more specifically unfolds its agency in the zone lying between its affordances and its (social) use (206).

Kleinschmidt's study presents a valuable contribution to this chapter's focus on the status of digital media in choreographic processes because it provides conceptual means to show that material objects like technological tools can be part of dance-making practices. Describing the use of paper sheets and a digital video recording device in rehearsal situations through the perspective of 'affordances' allows the researcher to observe that through their use, the objects can influence, or co-determine, the rehearsals' course of action. While this view allows to consider objects and technological devices as constitutive parts of generative routines, it does however not permit to qualify the changes in these practices, nor does it help to trace the objects' aesthetic impact on the final artwork. For instance, using the notion of affordance does not permit to follow the ways in which *Glow's* video projection device influenced the artists' creative ideas or the development of their choreographic material. To analyze the formative role of technological devices in the making of (digital) dance, I thus need further conceptual tools.

In this section I have shown that researchers in the fields of dance, theatre and performance studies increasingly define staged performances as the joint products of

different artistic contributors. They describe rehearsal practices as complex series of actions whose unpredictable dynamics generate artistic intentions and shape the final artwork. Katarina Kleinschmidt's study furthermore suggests that also material objects and technical devices can be considered as non-human contributors to these rehearsal practices. In the context of this chapter's focus on digital media's status in virtual performance production, this line of reasoning presents a first analytical starting point because the notion of collective creation acknowledges the complex character of (digital) dance making. This perspective furthermore allows to understand digital tools as potential participants in the collective procedures that generate virtual dance. However, I have also shown that the presented works do not yet provide the conceptual means to articulate the individual and intricate working rhythm within an artistic collective. They furthermore lack a theoretical frame that allows to analyse the ways in which non-human participants concretely affect the rehearsal dynamics and the resulting aesthetic outcomes. These are however necessary for an exploration and evaluation of new media's involvement in digital dance production. Therefore I suggest to expand the current approaches on collective processes in dance and performance creation with further conceptual tools that permit to study the interactions between the different human and non-human participants involved in (digital) dance rehearsals. Interestingly, while the field of digital dance is still missing the conceptual approaches for this undertaking, several publications on virtual performance propose a specific theoretical angle as a possible solution. These studies explicitly refer to Actor-Network-Theory (ANT), a constructivist approach deriving from the field of Science and Technology Studies, which I have briefly presented in 1.3. ANT considers collectives as associations between human and non-human actants, and whose concepts particularly investigate the nature and shape of these relationships. In 2.1.3 I will present why the digital dance researchers advocate ANT as a potential framework and evaluate the theory's general relevance for a study of technology's formative role in digital dance rehearsals.

2.1.3 Methodological considerations for a collective evaluation of digital dance rehearsals

In their works on the relations between dance, performance and digital media, several researchers address the question of how virtual performance artworks are generated, and how new media's role can be evaluated in these processes. Interestingly, those contributions propose to understand digital performance practices in the light of Actor-Network-Theory (ANT), a perspective originating from the academic discipline of Science

and Technology Studies⁷². In 1.3 have already explained that one of ANT's characteristic features is its acknowledgement of agency not only to human, but also to non-human actors. This approach makes ANT a relevant tool in the eyes of certain performance scholars in digital dance theory.

Chris Salter for instance argues that instead of lingering on the ontological differences between humans and technologies, contributors to the discourse on virtual performance should perceive (digital) technology through its mediating nature. He advances ANT as a theoretical means to explain that technology is capable to affect and foster relations between humans, tools and their environment. According to the researcher, this perspective can help to circumvent the "artificial but continually propagated tension between the technical and the human" when it comes to the study of digital performance practice (ibid.:xiv). In her dissertation on *Digital Dance* (2012), Zeynep Gündüz takes a more concrete stance with regard to the potential contribution of ANT to the understanding of virtual performance. She argues that using ANT as a theoretical lens allows to consider a choreography's realization as the operation of a heterogeneous network which consists of human and technological entities (ibid.:189). This view, Gündüz claims, confronts the dominant understanding of technology as either a supportive device or as an overtaking power by introducing it as a "serious player" in techno-choreographic relations (191). Theatre scientists Meike Wagner and Wolfgang Ernst join this perspective in their article on 'Networking' in digital culture and performance (2010). Defining networking as a characteristic practice within new media culture, they suggest that dance or theatre productions emerge within performative networks instead of being the mere results of one particular subject's intentions. According to the two scientists, ANT's strength lies in the fact that it helps to perceive performance artworks as "un-intentional" (182) as they are the outcomes of accumulated activities, and that it opens up the notion of agency to the non-human participants that can influence a performance's making, such as technological and economic factors.

In the light of these contributions, ANT thus indeed appears as a promising theoretical angle for the analysis of digital media's status in digital dance creation, as the studies present ANT as a theoretical tool that possesses the potential to open up performance studies to technology's participation in dance making. The studies suggest that ANT makes possible to understand (digital) performances as the results of collective action, and to consider this action not only as the product of subjects but also of non-human actors such as "animals, inorganic matter, language and technology" (Wagner & Ernst, 2010:179). It therewith grants potential creative agency to technological devices in the making of digital dance production. This way, the different authors argue, ANT

⁷² A detailed description of ANT and a selection of its main concepts will follow in 2.2.

allows to consider new media as non-human members of artistic collectives in which agency circulates (ibid.). In this context, Salter proposes that technologies can act within collective processes through the association with further (non-) human actors and the mediation of these relations. By explicitly referring to ANT, he explains that technologies can modify existing alliances and establish new ones between humans and tools (Salter, 2009:xxxv). An Actor-Network approach thus makes possible not only to identify digital technology as an active participant in creative networks, but also to describe the dynamics through which these associations come into being and follow their possible evolution. This way, the mentioned studies show that ANT can enable us to follow how digital media concretely intervene in artistic procedures, and which consequences their participation has on the creative collective's work and the final aesthetic result. In the case of *Glow*, ANT could for instance allow to examine how the video projections were particularly involved in Chunky Move's rehearsal practices, and to analyse in which ways the digital imagery contributed to the process of artistic decision-taking.

This subsection has shown that the presented studies in digital performance point towards ANT as a valuable approach to elucidate digital media's participation in choreographic rehearsal practices. However, the current studies do not yet operationalise the theory and its particular concepts. Therefore I suggest to shed a closer view on ANT and its theoretical tools in 2.2.

2.2 From collective creation to co-agency

To further examine how ANT can contribute to the analysis of new media's formative role in digital dance rehearsals, I will now present the theory's basic approach and its main concepts. I will then show how researchers in the fields of material, cultural and art studies use the theory to articulate objects' participation in artistic processes in dance and installation art. These examples will then allow me to develop an analytical scheme for the examination of digital technology's role in virtual performance making in 2.3.

2.2.1 "Objects too have agency"⁷³

"Action is simply not a property of humans *but of an association of actants*", claims Bruno Latour (1999:182), sociologist of science and co-developer of the Actor-Network-Theory (ANT). In 1.3, I have already briefly explained that ANT presents a material-semiotic

⁷³ Latour (2006)

perspective on collectives and the relations between their different components. It supposes that agency is distributed within both material and social worlds and provides conceptual tools to unravel the complexity and the dynamics of the amalgams between human and nonhuman entities.

As outlined at the beginning of this thesis⁷⁴, ANT is based on the premise that action is spread within heterogeneous networks composed by what STS-scholar Bruno Latour refers to as 'actants'. This term comprises both the human and nonhuman components of a network, and therewith aims to dissolve the distinction between (human) subjects and (material) objects. Thus, from an ANT perspective, diverse actants such as people, tools, objects but also organisms and organizations can be active and intricately linked components of an actor-network (Latour, 1987). According to Latour, these conglomerates between various actants, characterized by continuous evolution and transformation, bring technology, machinery, artifacts and scientific theories and societies forward. With the help of ANT's concepts, Latour articulates different meanings of technological mediation (1994). I will in the following present those concepts and notions that are important for the present study as they provide terms that allow me to analyse and explain the different dynamics occurring between the artists and their digital tools during virtual performance creation.

A network comes into being through the connection, or 'association', of at least two actants. To enter such a relation, these actors often need to engage into multiple exchanges and negotiations in order to establish, stabilize and maintain their rapports. In these dynamic moments, the actors equally configure their roles within the network, as their identities are constituted by their relation to the other actants (Latour, 1999). Latour refers to this process of mutual adaptation as 'translation'. This notion presents a central concept for the present research undertaking. According to Latour, each actor possesses an individual goal, which the actant tries to attain with the help of a specific strategy, or 'program of action' (1999:178). While actors can develop programs of action on their own, the latter can also be inscribed in a specific actant by other actors. These prescribed programs of action can also be designed as 'scripts' (Akrich & Latour, 1992). When two actors meet each other, it is very possible that they cannot pursue their respective goals, as the latter might be incompatible. In that case, the actors' programs of action present 'anti-programs' that conflict with the other actant's goal. This moment, Latour argues, generates "the creation of a new goal that corresponds to neither agent's program of action" (1999:178). Instead of one actor taking over the other, which is the propagated trajectory in socio- or technodeterministic views, ANT considers the emergence of a new link between the two actants, a common program of action, which

⁷⁴ See 1.3.

renders their co-existence possible. Latour advances the example of gun use to illustrate this point: he explains that it is neither the gun, nor the human alone that is able to shoot. Rather, the combination of both actants provides this possibility as a common program of action. This situation does not leave the respective actants unaffected, as their goals but also their roles and opportunities are defined through their association: “you are a different person with the gun in your hand ... the gun is no longer the gun-in-the-armory ... but the gun-in-your-hand, aimed at someone” (ibid.:180). Here, neither the subject’s nor the object’s identity is fixed (Latour, 1994). Also multiple actors can be entangled in this process in which two (or several) entities ‘translate’ their individual programs of action according to a goal shared by all agents. Processes of translation can complexify the network, as certain actors for instance need to mobilize further actants, or ‘allies’, in order to build alliances with other entities. This is for example the case when a specific computer program requires particular technical equipment or a (human) programmer. This way, procedures of association and translation determine the network’s actual shape and constellation. According to ANT, translation as the activity of redefining other actors’ identities, characteristics, and programs of action, is the elementary operation of network building (Callon, 1991:143).

In the concept of translation, action appears as the result of several entities which collectively determine a common goal. As illustrated in the gun example, the shared course of action is co-shaped by humans and nonhumans in equal parts. ANT thus grants agency to material objects, e.g. guns, as they possess the power to influence the constellation of a specific association of actants. Although objects might not be able to ‘act’ in the same way humans do, Latour insists that “things might authorize, allow, afford, encourage, permit, suggest, influence, block, render possible, forbid, and so on” (2005:72), and therewith shape a course of action with a similar impact. In this perspective, agency is rather symmetrically distributed⁷⁵ among the various actants comprised in a network and not held under the control of one particular instance; it reveals as the dynamic emerging within socio-technical entanglements. In other words, the opportunity for an action to take place is the diffused result of a heterogeneous actor-network.

Latour furthermore explains that the more fluid and successful the interaction within a network becomes, the more its internal complexity turns invisible (Latour, 1999:304). In more concrete terms this means that when making use of a piece of machinery, we do not think of the many actors and processes through which the tool has become what it is today. When driving a car for instance we usually do not think about

⁷⁵ For a clarification of Latour’s understanding of a symmetrical relation between humans and nonhumans, see footnote 38.

the many components, materials and actors that participated in the car's making, nor do we reflect about the decisions, uncertainties and risks involved in its production. Latour refers to this effect as 'black-boxing': the car's internal complexity has become opaque, and the artifact itself is considered as given and accepted. Although these networks might turn invisible, each singular component in a black-boxed artefact refers to other, possibly faraway places, times and contexts (1999:185). These reappear if the black box is opened again, which happens for example when an artifact breaks down. In these situations, the many components of a tool resurface, and it is possible to reconstruct the processes in which the object finally substantiated. Black boxes thus can be opened by following the actors.

In the preceding paragraphs I have described a selected number of ANT's basic concepts that allow to consider collectives as conglomerates of human and non-human actants, and that make possible to study the relations between the different members of such a network. While the theory has originally been conceived with the aim to understand the processes of innovation and knowledge creation in science and technology, I have shown in 2.1.3 that a selected number of digital performance scholars propose an Actor-Network approach as potential means to elucidate rehearsal procedures in (digital) dance. In line with this reasoning, I suggest that also dance making can basically be understood as the creation and evolution of a specific assemblage of heterogeneous subjects and objects that are connected with each other through different kinds of relations. The production of choreographic artworks for example involves human actants like dancers, choreographers, musicians, stage and light designers, technicians and tailors, but also objects like specific footwear, stage props, the dance floor with its particular characteristics as well as light machinery and funding policies. In this light, digital tools such as computer technology and specific software programs can as well count as actants among many others, tightly knit into the heterogeneous conglomerates that shape digital performances. Considering choreographic collectives as actor-network assemblages thus allows to shed a closer look on how the different participants relate to each other to follow how their connections evolve through processes of association and translation. In the light of this chapter's focus on technology's status in digital dance rehearsals, ANT's emphasis on the relations between various actants is especially interesting because it presents a means to avoid dualistic stances concerning technological tools and collective creation. Instead of conceiving from technology as either a determining power or as a neutral and passive device, ANT's concepts allow to interrogate how digital tools are concretely involved with the other participants in a creative network. The notions of association and translation for example make possible to trace how digital media engage with choreographers and dancers, and in how far this association transforms, or 'translates', creative ideas and intentions, or 'programs of action'. In this line it seems that the status of the digital device in dance

production can be more clearly described, and therewith alleviated from much of its present mystification, with the help of an ANT-inspired point of view. Through its non-linear approach, the theory furthermore appears suited to describe the complex reality of digital dance making. In order to further operationalise this theoretical perspective for the field of virtual performance, I will therefore in 2.2.2 present different studies on dance and installation art that employ ANT to understand the role of objects as non-human (creative) contributors. These examples will subsequently allow me to reflect on a theoretical framework for the analysis of new media's role in processes of digital dance making.

2.2.2 Actor-Network inspired perspectives on dance and installation art

The preceding sections have shown that Actor-Network-Theory provides valuable tools for the analysis of new media's involvement in choreographic practices. To illustrate how ANT-inspired views can help to untangle creative collectives and to render the agency of particular (non-human) actors visible, I will now turn towards works from the fields of material and cultural studies that deal with dance and installation art. In the following contributions, ANT-informed approaches allow the researchers to identify non-human participants in artistic contexts and show their ability to co-shape aesthetic processes.

In her interdisciplinary study on conceptions of materiality (2008), Maartje Hoogsteijns reverts to an Actor-Network perspective to analyse the agency of objects in the dance world. She shows that pointe shoes and audition forms can be considered as constitutive entities in classical ballet. Hoogsteijns emphasizes that pointe shoes are not simply passively 'used' by ballet dancers, as through their particular requirements they mobilize a diverse network to assure their very presence in dance art. This way, the specific footwear does not only demand particular (physical) skills and material preparations from the performer; also experts like educated teachers and highly specialized therapists gain in importance to supply pointe dancers with the necessary knowledge and care. Furthermore, Hoogsteijns explains that the shoes produce particular demands with regard to the dance floor's material because it is extremely hard, if not impossible, to exert movements 'en pointe' on a floor which is either too solid or too smooth, or which varies in height. This way, the work with pointe shoes ties the performance of ballet pieces to specifically equipped spaces like theatres. Moreover, the use of pointe shoes equally bears on the choreographer's language because the footwear influences the movement vocabulary's range. Hoogsteijns' second case relates to the importance of the theatrical audition in the construction of a dancer's identity. She

considers these selection procedures as heterogeneous networks in which the examination committee, its members' specific experiences and personal preferences, selection procedures and structures generate a standard idea(l) of the qualities and skills a dancer needs to possess, and which is applied in the choice for a suitable candidate. In this context, Hoogsteyns shows that the audition forms take in a crucial role: categorizing a candidate's various characteristics, such as her physical composition, shape and expression, these documents make it possible to create a certain order among the numerous participants. This way, audition forms turn into significant points of reference for the committee members and therewith function as important mediators in the process of defining what constitutes a 'true' dancer (2008:132). By adopting an Actor-Network perspective, Hoogsteyns considers dance art as a heterogeneous assemblage of multiple actors, ranging from humans over specific practices and procedures to material objects. Her examples point out how two particular kinds of objects, dance shoes and audition forms, exert agency by establishing relations with and between further actors, and how these associations co-construct ideas and routines that shape classical ballet. The ANT-inspired perspective thus allows Hoogsteyns to demonstrate that both the pointe shoe and audition forms are significant parts of the dance world as they are co-constituting its dynamics and aesthetics through processes of association. It furthermore helps Hoogsteyns to provide an overview of the multiple connections existing between pointe shoes and audition forms and further actors in the world of dance. However, in the light of this chapter's interest in the formative role of new media in digital dance rehearsal, it would be interesting to learn more about the concrete interactions through which the creative agency of the discussed objects comes into being, and how the latter co-shape a specific choreographic artwork. As this aspect has not yet been explored in studies dealing with dance art, I will now present two contributions that observe processes in installation art. These analyses articulate the creative agency of non-human actors in more concrete terms.

In her work on contemporary art installations, sociologist Albena Yaneva argues that the conservative conception of the artwork as a given entity does not hold as it omits the contribution of further participants in the creative process. She therefore proposes to consider artistic objects as materializations of collective (material) transformations and negotiations which are performed by multiple human and non-human actors. In her ethnographic studies on the installation of art objects in museum buildings (2003a; 2003b), Yaneva describes the daily practices effectuated for the setup of artworks before their exhibition. Her accounts show that instead of being guided by a sole artistic vision the installation process rather resembles a "collective chaotic hubbub" as it is generated through the partly unpredictable activities and interactions of various actors (2003a:122). In this context, Yaneva reveals that material objects are not mere vehicles of artistic strategies because they shape the course of action as non-human actants. As an

example, the sociologist reports on the installation of a chalk painting which is supposed to be drawn on the floor of a French museum (2003b). Because the artistic vision envisages the chalk painting to be painted on the ground but the museum staff intends to protect the floor from any lasting traces, the floor demands particular care measures. In this way the museum floor, hitherto considered as a mere object to be worked on, turns into a potent actor because of its specific requirements; as a consequence it mobilizes further actors such as self-adhesive paper and chalk in different colour shades, fixing liquid, scotch tape and carpets to make the artwork's realization possible. This example illustrates that the resulting objective differences cause derivations from the original artistic concept. Although the use of, for instance, self-adhesive paper on the floor does not cause an essential change in the chalk painting's shape, it nevertheless produces an artistically powerful transformation as "the differences of colours and reflective properties [caused by the adhesive paper] ... may lead to a completely different ability of a contemporary art installation to communicate something to the visitors" (2003b:178). Furthermore, these "infra-small" changes become even more visible through their multitude, as the installation process consists of numerous minuscule material modifications. According to Yaneva, these successive transformations caused by objects' requirements and the "affluence" (180) of new actors significantly guide the rhythm of installation and shape the resulting artistic object. Adopting an ANT-informed perspective helps the researcher to show that the process of art installation can be conceived as the creation and stabilization of hybrid networks in which artistic agency and intention are mediated. Thus, instead of simply being raised to the artistic status by one creative subject, the artwork rather appears as a "nexus of relations" which is not only formed by a single vision but which emerges out of collective (human and non-human) interaction, negotiation and transformation (ibid.). While Yaneva uses ANT as a rather general lense to describe how installation processes affect the shape of an artwork, artist and researcher Mark Cypher becomes more concrete as he applies specific concepts from Actor-Network-Theory when reporting on the story of his art installation *Biophilia*.

In his dissertation on the interaction with digital installations, Mark Cypher (2011) equally ties in with a relational perspective on (the making of) artworks. He recurs to selected concepts deriving from ANT to examine and formulate the multiple dimensions of human and non-human engagements to create, maintain and participate in interactive art objects. Taking Yaneva's suggestion of the distributed creation of artworks as a starting point, Cypher takes a closer look at actors' associations by investigating the installation of his own creation *Biophilia* (2005-2007) in a new exhibition venue. In *Biophilia*, the visitors are able to interact with their shadows that

have been transformed into organic forms.⁷⁶ With the help of Latour's concept of 'translation', the researcher shows that the different actors involved in *Biophilia's* development need to adapt their individual 'programs of action' in order to make the artwork's realization, or rather exhibition, possible. This way, Cypher shows that the installation's technical components require more space than the new gallery room initially offers. To allow for *Biophilia's* display, the gallery thus has to enlarge the foreseen exhibition area. However, once the exhibition space is adapted, the technical equipment equally needs to be adjusted to fit in the newly defined area. This again implies the respective modification, or 'translation', of further actors and their individual functions, such as network cables, computer hardware, a game engine code and camera components. These changes in turn impact on *Biophilia's* appearance and characteristics. Cypher argues that through the successive colonization of the actors' individual programs and their adaptation towards the common goal *Biophilia*, the collective exerts cumulative influence on the artwork's shape. As throughout the artwork's 'career' unforeseen actors (like the restricted size of the gallery's exhibition space) appear and associate with the network, the latter's evolution and shape remain largely unpredictable. In this light, *Biophilia* seems to be intensely marked by intimately mediated and distributed effects of actor-networks (65). Furthermore, with his example Cypher demonstrates that there exists no such thing as *one* particular artwork: *Biophilia* evolves over time because each exhibition venue requires further modifications in the actor-network constellation. Therefore, *Biophilia* is "neither the beginning nor the end of a long chain of delegated agencies but rather a particular collective ... with many intermediate degrees of realization" (92).⁷⁷ The application of ANT's concepts of 'translation', 'program of action' and 'delegation' allows Cypher to trace the artwork *Biophilia's* evolution during the installation process. This way, the notions help the researcher to describe that specific objects within the artwork's collective such as the gallery space gain in importance by associating with further actors because they generate the unpredictable character of *Biophilia's* development and co-shape the installation.

The studies presented in this subchapter provide a more concrete picture of objects' creative agency by describing the ways in which material artifacts participate in artistic actor-networks. They therewith explicate how Actor-Network-Theory can

⁷⁶ For more information on the interactive installation *Biophilia*, see <http://www.markcypher.com/biophilia/biophilia1.html>, retrieved Nov 5, 2016.

⁷⁷ The continuous evolution of artworks as relational composites is equally examined by cultural scientist Vivian van Saaze (2013). In her study on the conservation of contemporary art installations, she adopts an ANT-inspired perspective to deal with the question how the museum activities of collecting and conserving co-shape the constitution of artworks. Van Saaze shows that rather than stabilizing and thus 'fixing' installation art, the acquisition procedure with its mundane and technical practices plays a formative role.

contribute to a more differentiated understanding of objects' roles in art worlds and creative (collective) processes. Hoogsteyns, Yaneva and Cypher respectively demonstrate that different material artifacts like pointe shoes, a museum floor or technical equipment can shape artistic intentions or the course of an artwork's creation by associating with further human and non-human actors such as a dance floor, a gallery space, specific conservation practices or human actors like physiotherapists. The researchers thus concretely illustrate how these multiple engagements co-determine the dynamics within an art world (Hoogsteyns) and the rhythm of an artwork's installation (Yaneva, Cypher). Here, the actor-network approach especially helps Yaneva and Cypher to show that objects' mobilizations of further unexpected actants account for the partly unpredictable nature of the installation process. In the context of this chapter's focus on digital media's role in virtual performance rehearsals, these studies are particularly interesting because they illustrate how material objects can influence the course of an artwork's shape. They show that seemingly mundane artifacts and practices can turn into meaningful contributors to the development and form of an artistic piece, and therewith underline the importance of examining the processes through which these works come into being. Therefore I propose to equally follow the creation of digital dance productions with a specific focus on how digital devices involve with further actants, in which ways the emerging associations translate the individual goals of the respective participants, and how they therewith impact on the creative dynamics as well as the resulting performance.

In this section I have exemplified how ANT-related approaches can help towards an articulation of creative dynamics in dance and installation art. In 2.3, I will recapitulate the concepts that I have presented so far in this subchapter by developing a framework for the assessment of new media's status in digital dance rehearsals. The resulting analytical scheme will guide the analysis of the two case studies *loopdiver* and *Habitat* in chapter 3.

2.3 Towards a technology-inclusive analysis of digital dance rehearsals

In the following paragraphs I will show how selected concepts from ANT permit to elucidate the particular dynamics emerging in virtual performance making and the ways in which digital media can participate in these processes. I introduce my conceptual vocabulary by suggesting to open the 'black boxes' of digital dance performances. Understanding virtual performances in this Latourian term helps to conceive of those

productions that are rehearsed and ready to be staged as stable networks whose internal complexity has become opaque (cf. Latour, 1999). Opening the black boxes of digital choreographic artworks will thus allow me to consider the creative processes in which these performances materialized as continually transforming associations of human and non-human actors, and to make the engaged participants come to the fore. This will permit me to address the varying constellations of choreographers, dancers, technicians and software engineers, but also and especially of digital devices and further technical equipment that are involved in virtual performance making. This way, I can provide nuanced insights into the actors' respective roles during the rehearsal process and the dynamics that their interactions generate.

Throughout this chapter, both artists' accounts and theoretical approaches have shown that (digital) dance creations emerge during the collaboration between different artistic participants. Also the case of *Glow* shows that the piece is the fruit of the interaction between multiple human and material actors. For a more profound understanding of how the diverse participants engage in a piece's creation, the presented ANT-related concepts help to describe the creative dynamics occurring in digital performance making. The Latourian notion of 'goal' presents a first analytical tool because it allows to describe the rhythm in which networks develop, and therewith also how choreographic artworks come into being. It for example permits to conceive of *Glow*'s creation as a process that evolves around the definition and realization of different creative goals. This way, Obarzanek's initial desire to develop a choreographic piece with digital video projections can be identified as a first artistic interest. In order to achieve his goal, the artist develops a particular 'program of action'. In the case of a choreographer, this can for instance be the development of movement material. However, the artist knows that he cannot fulfill his goal alone. He needs to mobilize the software program *Kalypso*, the necessary technical equipment, and *Kalypso*'s developer Weiss to solve his creative problem. The different participants function as 'allies' to support the realization of Obarzanek's goal: a network consisting of different human and non-human actors is taking shape. However, for the network to function and stabilize, the different actors need to 'associate'. The concept of 'association' leads us to interrogate how the actors of a creative network are engaging in their mutual relationships. A closer look at Obarzanek's account for instance shows that the presence of the digital tool and the software engineer have lead the choreographer to redefine his artistic goal, as he now intends to "find an interesting relationship with the system". The choreographer's new objective has thus been influenced, or 'translated', by the presence of the further human and non-human actants in the network. In this context, the notion of the 'program of action' allows to analyse whether and in how far the concerned actors themselves transform in order to create alliances with each other. In the case of *Glow*, this could for instance signify that choreographer Obarzanek, software programmer Weiss and the

computer program *Kalypso* develop a common program of action to make the desired collaboration possible. In this process, the actors' individual programs of action might shift. Obarzanek's program might for instance develop from 'generating movement material' to 'generating movement material with digital graphics', while the programmer's program of action might turn from 'developing digital video projections' to 'developing digital imagery for dancing bodies'. To reach the common goal, also the software program itself might need to undergo certain changes, as it might have to adapt to fit the requirements of fast-moving or turning dancing bodies. This way, the concepts of 'program of action' and 'translation' allow to trace the possible dynamics of transformation in the respective participants of a creative actor-network. These insights in turn can explain the emergence of new practices, as the different actors might adapt or develop new activities in the frame of their new programs of action. Consequentially, the formulation of new creative goals and the undertakings to realize the latter can manifest themselves in the piece's shape. In the context of associative processes, the concept of 'anti-program' indicates that associations do not always occur in a quasi-fluent way, as they can entail moments of resistance or friction. This is for instance the case when not all actors' programs of action are compatible. In his account on *Glow's* creation, Obarzanek provides a concrete example of such a situation by explaining that in a later rehearsal phase, "the technology was not working in a foreseen way", for example by being more sensitive than expected. In this moment, the choreographer encounters a problem, as the technological device might not allow him to achieve his specific goal. One reason for this might be that the technology's 'script' is difficult to deal with for other actors in the network. The tool therewith presents an 'anti-program' to the achievement of his artistic goal. This situation requires negotiations which in turn generate unpredictable turns in the creative process and therewith can potentially bring forward unexpected aesthetic results. Obarzanek for instance reports that in such situations, he "ended up with something that was not intended at all". This way, both human and non-human actors such as digital devices are involved in the dynamics of virtual performance rehearsals and their final outcome.

As has become visible in the example of *Glow's* first production phase, the piece evolves because different human and non-human actors join the artistic collective and therewith mediate the artistic goals related to the choreographic creation. A short look at *Glow's* further development reveals that the rehearsal procedure continues the circular progress of redefining and subsequently achieving the artistic goal: once Obarzanek has discovered those visual effects that appeal to his creative interests, he wonders how these graphic projections "work with the [dancer's] body". To solve this new issue, the choreographer mobilizes further actors, namely dancers, to make the necessary try-outs and seek for new creative stimulation. Subsequently, also the dancers need to associate

with the other participants in the network, which develops again through the ensuing procedures of negotiation.

With the help of *Glow's* example, I suggest that the presented conceptual tools allow to trace the gradual development of a (digital) dance artwork and its creative dynamics from its very beginning until its final materialization in a (virtual) performance. The analytical concepts furthermore permit to zoom in on the specific negotiations occurring between the different actors involved in the rehearsal procedure. In this sense, I have shown that it also becomes possible to concentrate on one specific actant, for instance the technological device, and follow its engagement in the creative network and the ways it co-shapes the course of artistic action. Looking at the example of *Glow's* making through an ANT-inspired perspective allows me to suggest that a technological device can exert creative agency in an artistic network for instance by transforming interests and activities or presenting obstacles to the realization of artistic aims. We have furthermore seen that through these processes, the tool itself can transform as well, which might again have consequences on the network and its dynamics.

In chapter 3, I will employ the presented analytical frame to examine the empirical reality of the creative processes for the digital dance productions *loopdiver* and *Habitat*.

3 Technology's creative agency in *loopdiver* and *Habitat*

In this chapter I will use the ANT-inspired framework that I have developed in 2.3 to concretely examine the rehearsal processes for the two digital performance productions *loopdiver* and *Habitat*. Considering the pieces' making procedures as dynamics of collective creation, I will in ANT-parlance open the 'black boxes' of both digital dance artworks in order to identify the different human and non-human actors that participate in the pieces' makings. Tracing the evolution of the respective actor-networks will allow me to analyse whether and in which rhythms their individual constellations transform over time, and how these developments materialize in the resulting artworks. In this context, my examination will focus on the formative role of digital media in those rehearsal procedures. How do digital media integrate digital dance production? How do virtual devices engage with the other participants involved in the creative procedures? And how do these activities consequently co-shape artistic intentions and practices? Describing the concrete dynamics occurring during *loopdiver's* and *Habitat's* creation in ANT-inspired perspectives will allow me to present the ways in which the employed digital tools exert creative agency in digital dance rehearsals. Following both performances' makings in the light of the analytical framework will thus enable me to articulate the sophisticated reality of virtual performance creation and the status of digital technologies therein.

Loopdiver and *Habitat* present two distinctive case studies in the sense that the human actors involved in their respective productions have different conceptions of (digital) technology's role in the creative process. In both cases, the artists share deterministic attitudes concerning dance-technology relations. In the same time, the two creative teams have different perspectives on their artistic work with digital media: while *loopdiver's* makers think that they willingly submit themselves to the technology's choreographic dictate and purposely grant much creative space to the tool they are working with, *Habitat's* creators try to control the medium's activities and its involvement in the course of action. These two different approaches towards the role of digital media in virtual performance are interesting insofar as the two groups of artists seem to grant different degrees of agency to their respective tools as they suggest that either the device itself (*loopdiver*) or the artists (*Habitat*) should direct the pieces' developments. In the logic of my ANT-informed approach however, the artists' prevalent ideas of domination do not hold because the employed technologies unfold creative agency in processes that transform every participant. These changes furthermore give way to new and partly unforeseen artistic developments and results that cannot be

controlled by one sole actor. By following *loopdiver's* and *Habitat's* creative procedures in the light of my conceptual lenses I also challenge the artists' deterministic stances. In 3.1 I will study how the software program *Isadora* participates in *loopdiver's* creative dynamics. 3.2 is then dedicated to the analysis of how the digital programming environment *Kalypso* engages in the artistic network that evolves during the making of *Habitat*.

3.1 The loop as creative starting point in *loopdiver*

loopdiver's beginning can be located in the summer of 2007 in New York, when choreographer Dawn Stoppiello is retrospecting on her earlier life and career. She reports⁷⁸:

*Mark [Coniglio] and I ... have made a lot of works that use computer technology and video projections onstage. So I've looked at video clips of myself from the past twenty years. I've been seeing myself in various places ... videotaped, looped in all kinds of different ways, and I got really curious one day, just wondering, what would it be like if I actually try to do that, what would it be like in real life? This curiosity ... was half of the inspiration, the other half was when I turned 40. And I [thought that] my life is a big loop, I'm just doing the same thing over and over and over again ... it's harder to surprise me, now that I'm forty. So, those two things combined were inspirational.*⁷⁹

Leaving her thirties, Stoppiello reflects on the repetitive character of her life and wants to be surprised. Moreover, she is intrigued by a real-life looping experience. In other words, she feels inspired. In ANT terms, Stoppiello has an artistic 'goal': she wants to create a choreographic artwork around the idea of the 'loop'. The notion of 'goal' directs us to investigate how precisely the artist realizes her ambition. It shows that she cannot

⁷⁸ As I joined the rehearsal process for *loopdiver* in a later stage, I will partly rely on the accounts of Troika Ranch's artists to render the various phases of *loopdiver's* creation. This means that next to my personal observations I will also refer to information gathered during interviews, artist talks, and in the entries of a blog Troika Ranch entertained at the time of *loopdiver's* early creative stage.

⁷⁹ Dawn Stoppiello, post-discussion following *loopdiver's* presentation at Columbia College Chicago, 04.04.2010.

reach her individual goal alone: she needs ‘allies’ in order to follow her inspiration and therefore turns towards her longtime artistic partner Mark Coniglio.

I told Mark about these ideas, and he then started thinking about how to create a tool in [his software program] Isadora that would somehow integrate the notion of the loop.⁸⁰

The first collective dynamics have been generated, as to realize her goal, choreographer Stoppiello associates with her artistic partner Mark Coniglio. To make the choreographer’s aim of the loop as a form of bodily movement possible, Coniglio mobilizes a further actant, namely his software program *Isadora*. He more precisely reflects about a technological feature that permits to give shape to the idea of the loop. Considered from an ANT-informed perspective, Stoppiello’s report describes that a heterogeneous ‘actor-network’ is taking shape. This notion directs my attention to further explore whether and how the two artists associate with *Isadora*’s looping tool, and which consequences the actors’ engagements have on *loopdiver*’s creative process and final form. In 3.1.1 I will therefore follow the ways in which Stoppiello, Coniglio and the looping device attempt to stabilize the initiated network.

3.1.1 Transformations with and through the looping device

Intrigued by Stoppiello’s idea of the loop as a form of bodily movement, Coniglio designs a specific looping patch in *Isadora*. This feature allows to create diverse kinds of loops with pre-recorded video sequences. Coniglio explains:

You can create several types of loops [with the looping device] ... the loops may shift or grow, restart from the beginning or go backwards in time, they may be played at any rate you desire, or they may endlessly repeat themselves ... but these are only some of the basic options. You can also accumulate any of these various ‘basic’ loops, and the patterns of the resulting video can get very complicated very quickly⁸¹.

⁸⁰ Ibid.

⁸¹ Interview with Mark Coniglio, 18.8.2009.

Originally, *Isadora* is a programming environment for the real-time modification of digital graphics and video footage, which means that it has been conceived to facilitate the development of live interactive digital performances⁸². The new patch in turn enables *Isadora* users to modify any video sequence by producing interruptions, edits and repetitions and therewith 'loop' it. This shows that in order to associate with Stoppiello and Coniglio, and to cater to Stoppiello's goal to create a choreographic artwork around the notion of the 'loop', *Isadora* is adapted to the artistic interest by receiving an additional looping patch. Interestingly, the new looping patch changes *Isadora's* function: instead of converting dancers' movement data into digital graphic or video effects as has hitherto been the case, *Isadora* now modifies already recorded video footage through a looping procedure. In other words, during the association with Stoppiello and Coniglio, *Isadora's* 'program of action' has been 'translated'. This change also has consequences on the way in which *Isadora* engages with and thus can be used by the artists, in particular the dancers, because unlike before the looping tool cannot anymore be merely activated through particular gestures. To generate bodily loops, the performers rather need to register their movements on video, loop them with the help of the looping device and subsequently physically copy what they see on the manipulated videotape. This observation shows that not only *Isadora's* program of action but also its 'script' has been altered through the new looping function: the software program now requires a different way of use. As I have shown in 2.3, ANT suggests that the presence of one actant might cause transformations in its other associates (Latour, 1999). This leads me to investigate whether also Coniglio and Stoppiello are affected by *Isadora's* new operation mode. And indeed, the changes in *Isadora's* program of action and script also reverberate on the two artists as the software's new characteristics urge them to revise their conceptions of media use in digital dance making.

According to the artists, digital media belong to an inert and rigorously organized realm, and the dancing body offers a means to "enliven" technology's inherent passivity. It is notably through its capacity to develop improvised, spontaneous movement⁸³ that the performing body can animate the calculated and predictable world of technology.

⁸² In these choreographic pieces, the software reacts in real time to the movements and sounds produced by the dancing body.

⁸³ The association of improvised movement with the notion of spontaneity is deriving from Troika Ranch's understanding of the work with improvisation techniques. In the field of dance studies, improvised movement is not per se associated with spontaneity as also improvisation is based on specific constraints. It is through the work with these limitations that the performer can develop unknown movement material. However, the intensity of the constraints is important in this context as rather than generating 'new' gestures, a too 'open' structure rather brings forth habitual movement patterns (Brandstetter, 2000; Lampert, 2007).

When we impose organic control over computer media, we are bringing the chaos [of] a living organism to a world that we typically consider [as] one of complete order. The gift that the performer's body gives to technology is the one thing that it absolutely lacks: unpredictability ... we impose this chaos upon the order of technology when sensors transform the performer's movement or vocalizations into real-time, qualitative changes to the media. In short, the performer's body brings the technology to life⁸⁴.

Until now, Troika Ranch's directors have understood their work as employing the human body to impregnate medial structures with its "chaotic" liveliness. Stoppiello's and Coniglio's discourse indicates that the performance makers conceive of the relation between dance and (digital) media in terms of domination. The artists themselves are thus not free from dualistic perceptions concerning choreo-technological constellations. However, during the production of *loopdiver* the requirements of *Isadora*'s new script invert the artists' working approach, or 'program of action'. Stoppiello and Coniglio realize that *Isadora*'s new looping function demands that the dancers imitate the gestures displayed by the looped video. Therefore, instead of asking the performers to impose their bodies on the technological tool, Stoppiello and Coniglio want the dancers to physically imitate the manipulated videotape. As a consequence, the artistic directors share the impression that "the technology is used to enliven and infiltrate us".⁸⁵ The association with the looping tool thus also causes changes in the sense that it has altered Troika Ranch's views concerning technology's characteristics. While hitherto considering media as passive recipients that are animated by performing humans, in *loopdiver* the artists understand the looping device as an instance that enlivens the dancers in a random, if not unpredictable, way. In this phase of the rehearsal process, Troika Ranch's conception of technology's role in dance productions is thus inverted.

In this section, the notions of association, program of action and script have helped us to understand that in *loopdiver*'s first creative phase, each participant engaging in the artistic network undergoes transformations in order to associate with the other actors involved. While the software program *Isadora* is adapted on the level of its functioning, Troika Ranch's directors inverse their artistic leitmotiv concerning the relation between digital media and dancing bodies. This association procedure brings forward the next step in *loopdiver*'s creation, as once Troika Ranch have engaged with the

⁸⁴ Interview with Mark Coniglio, 18.8.2009.

⁸⁵ Dawn Stoppiello, post-discussion following *loopdiver*'s presentation at Columbia College Chicago, 04.04.2010.

looping device, they start to experiment with it. During these first try-outs, Stoppiello and Coniglio realize that they want to find out how to use *Isadora's* new feature in an artistically interesting way. In short, a new artistic goal emerges. The next section will show that Troika Ranch need to mobilize further actants, namely dancers, to reach this new goal.

3.1.2 Conflicting actants: *Isadora* and the dancers

“We wanted to find interesting ways to make [the looping tool] work”, Coniglio formulates Troika Ranch’s new artistic goal. To underline that the appropriate manner to employ a medium does not necessarily lie in its complexity, but rather in the intensification of human experience, he refers to the metaphor of playing a musical instrument: “one single tone played on a violin can make someone weep because it appeals to emotions. That’s what we want to achieve”.⁸⁶ During the following weeks, the group members therefore commit themselves to exploring the looping device in the dance studio. To develop ideas on how to work with *Isadora's* new feature in a choreographically appealing manner, Troika Ranch mobilize further actors: dancers. *Loopdiver's* network thus expands further, and the process of collective creation complexifies. Together, the group follows an exercise in which the dancers produce improvised movement sequences which are recorded on video. The resulting tapes serve as material for the experimentation with various looping structures that either Stoppiello or a dancer generates with the help of the looping tool. Subsequently, the dancers physically copy the looped movements as they are displayed on the manipulated video. Figures 3.1, 3.2 and 3.3 illustrate the dancers’ exercise of physically copying a looped video sequence they just watched: we can see that the performers start lifting their arms and shirts (3.1, 3.2) to subsequently reverse this movement and pull their arms and upper clothes down again (3.3). Through this procedure, Troika Ranch rather quickly notice that the physical imitation of the modified videotapes generates new and particular movement characteristics which strongly appeal to the company, as “the looped structures [create] choreographic results that would not come naturally out of a choreographer’s body – and this is precisely what interests us”.⁸⁷ Stoppiello and Coniglio are interested in the abrupt and haphazard changes which the loops introduce in the

⁸⁶ Mark Coniglio, post-discussion following *loopdiver's* presentation at Columbia College Chicago, 04.04.2010.

⁸⁷ Interview with Mark Coniglio, 18.8.2009.

dancers' movements and they thus decide to further investigate the approach of imposing the video loops on the dancing bodies.⁸⁸ In pursuit of their artistic interest, Troika Ranch continue their creative experimentation in the dance studio by producing diverse looped video sequences which are subsequently learned and imitated by the performers. At this stage, the dancers and the video tool are thus participating in a process of association in order to stabilize the expanded network.



Fig. 3.1-3.3: Troika Ranch's performers experiment with looped movement sequences.

Shortly after the beginning of this explorative phase, the group however realizes that working in a constellation that comprises both the looping tool and the dancers is a difficult undertaking. Stoppiello and Coniglio notice a drastic change in the working atmosphere, as the dancers' mood considerably diverges from its usual dynamic and positive nature. The artists observe that "there was just a negative energy in the room".⁸⁹

⁸⁸ While for Troika Ranch, the work with aleatory (loop) structures presents a new artistic approach, on a general level the dance field has witnessed the application of random procedures since several decades. Already in the 1950s, pioneering choreographers like Merce Cunningham defined the array of specific movement sequences or the arrangement of different body parts through practices such as coin-tossing or the throwing of dice (Huschka, 2000). During the 1980s, Cunningham and later also William Forsythe furthermore reverted to digital media and techniques referring to filmic montage in order to produce aleatory effects in choreographic structures. A prominent example for these practices is Cunningham's work with the software *LifeForms* that allowed him to create randomized movement sequences with virtual bodies which needed to be learned by the dancers (see for example the production *CRWDSPCR*, 1996). In parallel, the repetition of extremely short movements and the work with abrupt changes has also been explored by dance artists such as Belgian choreographer Meg Stuart, for instance in her production *No longer readymade* (1993) and her "change" exercise (Stuart & DeLahunta, 2009). Similar to the looping effect explored by Troika Ranch, these works produce unexpected movement shifts and transitions "you never thought of" (Cunningham in Suquet, 1999:107) and experiment with the physical states and visual effects resulting from repetitive movement. As also *loopdiver's* makers are in contact with and even part of the dance scene, they might view spectacles of other dance groups and exchange with other choreographers and dancers about their creative approaches and rehearsal practices. This suggests that *loopdiver* is not created in complete isolation, and therefore the dance world, its artists and aesthetic trends might equally account as actors involved in *loopdiver's* network. In this perspective, Dawn's and Mark's earlier experiences and observations in the dance field might equally co-shape their creative intentions in the moment of *loopdiver's* production.

⁸⁹ Interview with Mark Coniglio, 18.8.2009.

*A week after we had begun this process, the [dancers'] mood just changed into something we had never experienced in our career before. Everyone was just coming in [the studio] either angry or depressed ... that was something we were not used to.*⁹⁰

*We knew something psychological was going on, we could feel that in the room. There was tension, it was heavy, it was depressive, almost oppressive ... some dancers would just break out into tears after performing... there were a number of moments where two dancers would walk out, and they would be so frustrated and oppressed that they would just get their things and leave.*⁹¹

Troika Ranch's new allies, the dancers, are in a very bad mood. This situation presents a considerable friction in the rehearsal process because the performers' negative feelings do not allow for a productive working atmosphere and hence hinder *loopdiver's* further development. In ANT terms, this stage shows that the stability of the recently enlarged creative network is in danger, as the dancers have problems to associate with the creative network. Alarmed by the situation's emotional impact, Stoppiello and Coniglio decide to make the dancers undergo a series of experiments to learn more about its cause. To find out which issue lies at the origin of the dancers' conflict, Stoppiello reverts to an unplanned rehearsal practice which she calls the "rap exercise": she asks each performer to execute one single, looped movement for the duration of thirty minutes, and "to listen to what was happening in their minds while they were looping".⁹² Subsequently the performers are invited to write down the thoughts and emotions coming up during this exercise and to finally speak freely while being recorded on camera. With the help of this rather intense operation Stoppiello wishes to gain deeper insight into the loops' repercussions on the performers. And indeed, the choreographer makes a revealing observation, as during the associative speaking exercise all dancers depict strikingly desolate pictures.

*They talked about pain, they talked about being crazy, about their skin falling off, about not being able to breathe, of being trapped in a cage ... you could just tell that they were kind of going crazy.*⁹³

⁹⁰ Ibid.

⁹¹ Interview with Dawn Stoppiello, 08.10.2009.

⁹² Ibid.

⁹³ Ibid.

Through the “rap” experiment, Dawn understands that performing the looped video considerably affects the dancers’ mental constitution “because the process of starring in a little bit of looped movie clip and trying to recreate it is tedious and not natural for the human body”⁹⁴. It seems that working with the modified video recordings presents particular challenges to the performers which turn the rehearsals into an utmost painful activity. In this context, Troika Ranch dancers Johanna Levy and Jennifer Kovacevich describe their experiences during this peculiar phase:

As a dancer you want to go in a studio and dance, and here I couldn't. I had to sit in front of my computer and understand what was going on, because the digitally looped movements are quite complex ... the sheer tedium and insanity of standing in front of the computer for hours and looking at every little intricate detail, and doing it over and over again ... it was new for us, we had never seen and done that before. It was frustrating ... I was not happy doing that, it was not fun for me.⁹⁵ One of the most frustrating things is when you have those moments when you just stare at the computer, and it seems so unreachable ... some loops are just physically impossible for a human to perform ... so sometimes I just watched this material and didn't absorb any of it”.⁹⁶

The dancers’ statements show that learning the modified video sequences generates a high level of irritation among the performers. Their frustration seems to emerge from the specificities of (working with) the looping tool, as the dancers find themselves confronted with various difficulties. The performers realize that instead of researching into new forms of movement or physical expression, which is a common practice during the creative phases of choreographic projects, they dedicate most of their time to the viewing and memorization of various looped video clips. In other words, the looping tool’s new ‘script’ presents several ‘anti-programs’ to the dancers’ habitual ‘programs of action’. This way, the dancers’ association with *Isadora*’s looping function causes changes in the performers as their experience of working with the programming environment has altered: while they hitherto considered performing with this particular tool as a rather “playful” and “fun” exercise, they now describe the looped movements as “straining” and “frustrating”.⁹⁷ Figure 3.4 shows that the performers’ attempts to express their high degree of frustration and to cope with the situation can take ironic stances, as the

⁹⁴ Ibid.

⁹⁵ All quotations by Johanna Levy stem from an interview held in Lincoln on October 14, 2009.

⁹⁶ All quotations by Jennifer Kovacevich stem from an interview held in Lincoln on October 10, 2009.

⁹⁷ Quotation by performer Travis Sisk. All quotations by Travis Sisk stem from an interview held in Lincoln on October 13, 2009.

photograph presents a training situation during which choreographer Dawn wears a T-Shirt with the imprint “LOOP = DEATH”.

The performers’ irritation results from the fact that they primarily experience the work with the looping tool as negative. One should be aware that Troika Ranch’s performers have been educated in a rather conventional way as they graduated from conservatories or dance academies. It is very possible that dancers with a more experimental background, or which have already been working with abrupt movement exercises or even looped gestures might conceive of performing with the looping tool differently: they might for example consider the physically impossible looping exercises



Fig. 3.4: The imprint on choreographer Stoppiello’s T-shirt (“LOOP = DEATH”) is an ironic reflection of the dancers’ frustration level during the initial work with the looped movement material.

as an intriguing or interesting challenge, which consequently might provide another, less negative atmosphere to the rehearsal procedure. The dancers’ and Troika Ranch’s ideas and intentions are thus tightly enmeshed with their conceptions of art and its making, which are influenced by the artists’ (educational) backgrounds and previous experiences. This way, *loopdiver’s* (and as a consequence any digital performance’s) creation should

not be understood as a sterile process, as the performers’ activities and sensations are shaped by previous experiences and actors that have brought forward the artists’ specific working practices, ideology and culture. This aspect also underlines the individual character of the rehearsal process because it refers to the particular constellations of actors that constitute a specific techno-choreographic actor-network.

The dancers’ discomfort with the looped movements considerably aggravates their association with the looping device. In order to associate with the looping tool and stabilize *loopdiver’s* network, the dancers need to transform their original working approach, which is ‘producing movement material in space’ (with the aim to trigger *Isadora’s* live video effects) to a new program of action, namely ‘imitating the movements displayed by the computer loops’ (in order to produce physical loops). As has become visible in Levy’s and Kovacevich’s descriptions, these new programs of action however require adaptations and innovations in the performers’ rehearsal practices which challenge the dancers’ usual working habits and their physical capacities. This is mostly due to the fact that the looping procedure considerably alienates the movements lying at

the base of each recording. In the looped videos, the original gestures are split into numerous abrupt repeats and edits which shift and vary in duration, and which transform a formerly coherent movement into minimal, fragmented sections. On the one hand, the complex and arbitrary loops create movements that are oftentimes so abrupt and physically illogical that learning them requires considerable efforts from the dancers' side. This is why the dancers need to intensely study the manipulated video sequences to memorize them. This practice also requires a high temporal investment, as dancer Kovacevich explains:

It's very time-consuming to learn the loops. I spend twenty minutes to learn and memorize a looped pattern, and then I go to the dance floor to execute the actual movement. So I move, forward, backward, in and out, and in two or three seconds it's over.

On the other hand, the looping procedure generates movement sequences which cannot always be imitated by a human body. Dancer Morgan Cloud illustrates the difficulties he encountered:

The computer is changing the movement in a way that you as a person in physical space can't always change, and a lot of things are really subtle. Like the body position that you would switch directions in is not physically holdable, and you can't physically pause in that shape and then reverse your weight. Or for example ... you can't stop in the middle of a run and decrease to zero momentum, and then immediately go back with the exact same amount of momentum. You just physically can't do that, even though you're doing that on the video ... it got me ... frustrated.⁹⁸

Cloud's report suggests that many of the video's fragmented steps are impossible to translate into human movement, as abrupt shifts and interruptions work against the body's momentum, and cuts in the video, so-called 'edits' which often include immediate changes in the body posture and position, cannot be physically reproduced. As the dancers' organic bodies cannot mirror the technical accuracy of video technology, the performers need to develop different strategies to cope with the various types of loops in order to still physically perform them.⁹⁹ Thus, as the process of association between the

⁹⁸ All quotations by Morgan Cloud stem from an interview held in Lincoln on October 12, 2009.

⁹⁹ The practices through which the performers learn to embody the various looped movements are more precisely described in 5.2.

dancers and *Isadora's* looping tool develops, the dancers' involvement with the software's new script translates the form and rhythm of the performers' working methods. Interestingly, also the looping tool itself undergoes transformations during the dancers' learning procedure because it is in turn adapted to the performers' needs. In order to help the dancers orient themselves in the intricate loop structure, Mark Coniglio for example adds information bars to the video which indicate the loops' particular characteristics and duration. The learned multimedia specialist furthermore inserts aural 'music cues' which announce the beginning and end of a specific loop.¹⁰⁰

This section shows that next to affecting the program of action of Troika Ranch's directors, *Isadora's* new script also impacts on the new actors, the dancers, who join *loopdiver's* creative web. The dancers' association process requires an unforeseen rehearsal strategy from choreographer Stoppiello, and the performers themselves need to adapt their working approaches and develop new and challenging rehearsal practices to engage with the looping device and thus integrate the artistic network. During the process of association, the looping tool itself is also changed on the level of its appearance in order to make the engagement with the dancers possible. The expansion of the creative network thus involves and causes multiple translations in the engaged actors. The presented procedures illustrate how a digital device, namely the looping tool, can influence and complexify the course of collective action occurring in a creative network, for instance through a change in its script. The performers' story furthermore shows that in this stage of *loopdiver's* creation, the technology's status within the process has changed: while the looping tool has previously allowed Stoppiello and Coniglio to solve their first creative goal, the technological device presents a central problem to the dancers because they have to produce many efforts to cope with *Isadora's* new script. This situation demonstrates that one actant, in this case *Isadora's* looping feature, can have different identities for the various actors involved in one and the same network (Latour, 1999): the looping tool for instance presents a facilitator to reach choreographer Stoppiello's initial creative problem while it impedes the dancers' integration into *loopdiver's* network in the next rehearsal phase. However, *Isadora's* new program of use bears even more far-reaching and unplanned consequences because the artists' work with the looping tool also shapes the theme of the dance piece and distributes Stoppiello's choreographic responsibilities to further actors. These aspects will be respectively dealt with in the sections 3.1.3 and 3.1.4.

¹⁰⁰ For more information on the didactic additions to the looped video see 5.2.2.

3.1.3 Fruitful frictions: the emergence of *loopdiver's* theme and shape

As I have described in 3.1.2, the frictions occurring during the dancers' association with the looping device heavily influence the performers' mood. For the dancers, the difficulties encountered throughout the work with *Isadora's* new script turn the rehearsals into a highly "straining", "tedious" and "obliviously repetitive" experience. However, this unexpected side-effect presents a pivotal point for *loopdiver's* further development because of its considerable psychological implications as it inspires Stoppiello and Coniglio to develop *loopdiver's* thematic content.

Once Troika Ranch's directors have identified the origin of the negative working atmosphere, they realize that

*in asking [the dancers] to copy the video loops as closely as possible, we actually perpetrated an act of violence on the performers. Because it was so unpleasant to do it, both physically and psychologically.*¹⁰¹

The unanticipated effect of the dancers' frustration during their struggle with *Isadora's* new feature turns out to present an important moment in *loopdiver's* creation on an artistic level, as

*understanding that the dancers were going crazy because of the physical process we'd asked them to do ... was the first notion of an idea that was bigger than just the process ... it made us realize that this piece was about violence".*¹⁰²

Stoppiello and Coniglio thus label the enormous friction between *Isadora* and the dancers as 'violent'. Recognizing the disturbing connotation of their previous looping experiments makes Troika Ranch associate ideas and experiences that equally evoke the notion of violence. Coniglio explains:

When we began the work on the piece in New York, we were three blocks away from where the World Trade Center used to be. And we noticed it was missing every time we looked up, it was a really strange thing ... during that period, I also saw a

¹⁰¹ Interview with Mark Coniglio, 18.08.2009.

¹⁰² Interview with Dawn Stoppiello, 08.10.2009.

*man sitting on a bench, and he was rocking his upper body forward and backward without stopping, like he was suffering from a severe psychological trauma. Another thing was that [Troika Ranch] were invited by a hospital to employ Isadora's interactive features to help patients who were in rehab after having experienced heavy accidents. Those people needed to relearn how to move, and they did so with many repetitive exercises, they made all those tiny little movements over and over again, so we also thought about physical pain. So we thought about violence and its resonance, and what happens inside of you after the violent act.*¹⁰³

Through these reflections on physical and psychological trauma, the artists start thinking about the various manners in which violence can reverberate in human relationships. During this procedure, they attach a new significance to the looped movement material.

*We started thinking a lot about all the different ways we see violence manifested in people in real life ... like physical reactions to traumatic experiences, or all kinds of repetitive behaviours ... and then we talked about the conflicts and repetitions we get into our own lives with our parents, our partners and friends ... if you're in a relationship with someone, you sometimes inflict violence on each other, like little psychological offense. When this happens, you have to process this violence and possibly accept it. But when it's something more important, sometimes you can't simply accept and get out of it. And this is where the loop gains a new meaning for us. Because ... repeating a behavior that we know is bad for us or is not helping us growing into a fuller person, that's the loop we're stuck in, and getting out of a loop, that becomes the story of the piece ... we want to make the audience feel that the dancers on stage are disturbed, and that the audience also feels disturbed because they have to watch it. This piece is not about technology. It's about something else, about a human process".*¹⁰⁴

From now on, Troika Ranch intend to make the notion of violence *loopdiver's* central theme, with the aim to "take that intense depression or feeling of inhibition and put it into the performance, rather than have it pondering in ourselves".¹⁰⁵ Through the gateway of the dancers' conflict with the looping tool, Troika Ranch have found a starting point for the formulation of *loopdiver's* thematic content. In other words, Stoppiello and Coniglio

¹⁰³ Interview with Mark Coniglio, 18.08.2009.

¹⁰⁴ Ibid.

¹⁰⁵ Interview with Dawn Stoppiello, 08.10.2009.

have defined a new artistic goal. The association between the dancers and *Isadora's* looping feature thus has brought forward unpredictable dynamics in *loopdiver's* creation: the combination of Troika Ranch's directors, the looping device and the dancers provides a further, unanticipated goal (cf. Latour, 1999). The situation presents an interesting example of how technological devices, in this case the looping tool, can co-shape the dynamics of digital dance rehearsals in unexpected ways, for instance through a script that is problematic to deal with for further actants. In the same time this phase equally shows how a digital tool co-forms creative ideas within dance making, as the dancers' problems with its script inspire Stoppiello and Coniglio to elaborate on *loopdiver's* artistic content. Henceforth, the idea of violence serves as a guiding principle during Troika Ranch's further creative undertakings. As Troika Ranch's directors have defined their new goal, they start searching for ways to communicate the notion of violence to their audience. In the following subsections I will therefore respectively present the performers' efforts to find an adequate gestural vocabulary and a choreographic structure that correspond to their artistic perspective. It will become visible that also here, the technological device co-shapes the resulting movements and the performance's shape, albeit in different ways.

Translating *loopdiver's* movement style

Searching for a way to communicate the notion of oppression in the dancers' bodies, the artists around Troika Ranch start another series of experiments in which they explore the possibilities of 'violent' movement material. In a first instance, choreographer Stoppiello and the performers feel inspired to develop fast and complex gestures as in their eyes, these movements lend themselves best to express the idea of brutality. However, the group realizes that these gestures lose their dramatic potential once they are looped, as they transform into rather abstract and "dancey" movements which moreover obscure the loop structures. This effect undermines Troika Ranch's new aim, as Stoppiello explains:

It's my intention that this piece is not going to be fun for the audience. It's not comfortable. They should be feeling the same pain that we're feeling. But for this, every single loop must be clearly recognizable. And if anything starts to look too much like interesting, pleasant choreography that awkward feeling goes away.

*Then [the spectators will] just think, 'oh, isn't that lovely', and I just didn't want this kind of pleasure to emerge.*¹⁰⁶

The group thus notices that their search for adequate movement material needs to change from the idea of 'developing gestures with a violent impact' to 'developing gestures that bear a violent impact once they are looped': again, the artists' programs of action are translated during the work with *Isadora's* loop feature. After a phase of creative exploration, Troika Ranch's directors and the dancers realize to their surprise that a rather "pedestrian", banal movement vocabulary like getting up from the floor, walking, following or reaching out for another person produces the most interesting results once it is looped. The artists decide that the aesthetics of looped pedestrian gestures convey the notion of violence and disturbance best as their simplicity clearly renders the loop structures with their heavy, brutal interruptions. The group furthermore notices that the performance of everyday movements allows the generation of "emotional content"¹⁰⁷: as the pedestrian steps bear more concrete connotations than abstract gestures, their modification through loops can distort their original meaning. This makes it possible to play with common assumptions about the gestures' significations. Dancer Kovacevich illustrates this idea:

*The less abstract the movement is, the more the viewer gets an expectation of what will be coming next. Like, if I reach for your hand, the viewer might think that we're gonna shake hands, but when the movement develops with the loops I finally might start reaching for your face and even slap you. This is something intriguing about the loops, as we allow the viewer to make an assumption of what's going to happen, and this is where we can surprise them or twist their perception because the movement might turn into something completely different.*¹⁰⁸

Troika Ranch's search for an appropriate movement style shows that the looping tool's presence, together with the group's new aim, mediates the artists' criteria for suitable movement material. This situation thus provides an example for how a technological device, notably the looping feature, can co-shape the aesthetic aspects of a (digital) dance creation, such as the style of the dancers' gestural vocabulary.

With the help of the pedestrian movement style, Troika Ranch have come closer to their artistic aim of expressing the notion of violence to their audience. In a next phase,

¹⁰⁶ Dawn Stoppiello, post-discussion after *loopdiver's* presentation at Columbia College Chicago, 04.04.2010.

¹⁰⁷ Interview with Jennifer Kovacevich, 09.10.2009.

¹⁰⁸ Ibid.

the group reflects on how the looped gestures need to be organized to form an aesthetically powerful choreography.

Mediating the choreographic format

Having defined the dancers' gestural vocabulary, Troika Ranch's directors think about the next step to reach their creative aim of communicating the theme of violence to their audience. While recapitulating on the preceding creative stages, Dawn Stoppiello announces the group's new challenge:

*Through the first try-outs we got a clear idea of what we want to express in the piece and we found intriguing movement material. Now it's all about finding a way to use the loops in the choreography to communicate a disturbing experience to the audience. And we want it to be poignant.*¹⁰⁹

The artists' new program of action thus consists in developing a choreographic structure that conveys the notion of oppression in an impactful manner. In short, Stoppiello and Coniglio search for a choreographic format that corresponds to their creative goal. In the subsequent working periods which comprise different residencies in New York, Berlin and Lincoln the artistic directors, together with the dancers, elaborate choreographies which contain specific solo loop episodes. This means that the dancers perform pieces in which they only occasionally, and individually, execute brief looped sequences. During these try-outs Stoppiello and Coniglio realize that presenting the looped movements in this format bears a rather playful character, which does not correspond to their creative goal. In order to emphasize the repressive aspects of the loops, the artists subsequently decide to make all dancers perform the same loop structure during an extended period of time. While viewing the result of this experiment, Troika Ranch's directors have the impression to be "on the right way", as

*The dancers seemed to be trapped in the looped movements because they were [executing the looped gestures] for a long time. And if they do this for a long time, it becomes hard for you to watch, as a spectator. So we decided that the whole choreography needed to be looped because this would transport the oppressive atmosphere that we were feeling the most.*¹¹⁰

¹⁰⁹ Interview with Dawn Stoppiello, 08.10.2009.

¹¹⁰ Ibid.

For the artists around Troika Ranch, making all six dancers 'loop' simultaneously and over a longer period of time presents an interesting format: in their eyes, it allows them to come closer to the artistic goal of creating a violent piece. In the same time, the collective starts exchanging ideas with light designer David Tirosh about possible illumination strategies for the staging of *loopdiver*. These activities lead the artists to what Stoppiello names a "break-through moment"¹¹¹:

*While thinking about the whole piece and discussing with [light designer] David, we suddenly had this epiphany of looping everything together: the video footage, the music, and the lights. Because this would allow us to create a whole environment that reflects the loop structure, so that we could flesh out the image of the dancers being trapped in those painful loops even more.*¹¹²

Through their association with light designer Tirosh, Troika Ranch's directors refine their concept for a 'disturbing' performance: they design a framework in which the dancers are placed in an entirely looped environment that consists of manipulated lights and music. This idea leads Stoppiello and Coniglio to produce a specific setup for the realization of their artistic concept. Together with the dancers, Stoppiello elaborates a five-minute long, set choreography consisting of pedestrian movements which is accompanied by a sound score designed by Coniglio. The resulting videotape is subsequently manipulated with the help of a long and complex looping structure that extends the recorded choreography and its sound to a duration of approximately 45 minutes. The looped recording thus now presents a long series of technologically edited movements that the dancers are supposed to learn and perform with their bodies.¹¹³

This section illustrates that the process of collective creation becomes increasingly intricate because *loopdiver's* network continuously evolves and generates new actors and associations (cf. Latour, 1999). It furthermore shows that its evolution renders the creative web increasingly complex: the dancers' problems of associating with the looping tool's script in the previous phase have further consequences for *loopdiver's* creative network, as the conflict is taken up by the actors Stoppiello and Coniglio. Through their stimulation to specify *loopdiver's* artistic theme, the network takes a more concrete shape and expands anew through the association with the light designer, the music score and the theatre lights. *Isadora's* looping tool thus continues to co-shape *loopdiver's* further aesthetic development as the conflict between its script and the

¹¹¹ Ibid.

¹¹² Ibid.

¹¹³ For a description and postphenomenologically informed discussion of the performers' efforts to physically perform the looped movements displayed by the manipulated video, see chpt 5.

dancers impacts on, or mediates, Stoppiello's and Coniglio's intentions concerning *loopdiver's* theme and choreographic structure, and the device translates the artists' criteria concerning an efficient movement vocabulary.

In the ensuing rehearsal phase, the dancers learn the looped choreography by pursuing the adaptation of their rehearsal practices and the development of new strategies to perform the digitally manipulated gestures displayed by the video. In 3.1.2 we have already seen that the work with the looping tool translates the performers' rehearsal activities. Its impact however goes even further as it not only shapes the acts but also the role of choreographer Stoppiello within *loopdiver's* network.

3.1.4 The distribution of choreographic and aesthetic responsibilities

During the production of the looped videotape and the subsequent rehearsal phase in which the dancers learn to perform the entirely looped choreography, choreographer Stoppiello notices that she cannot execute her usual rehearsal practices anymore, as her range of tasks changes.

In the beginning of loopdiver ... the dancers and I did a lot of improvisation and playing to come up with useful [movement] material. That's also how we worked in previous pieces: I was trying things together with the dancers. In our earlier works this process would last from the beginning until the end. We would continuously improvise to find interesting movements, and I would decide whether that movement would be part of the performance, or whether we needed to change it or throw it out. So in the end, I, together with the dancers, was responsible for the choreography. But once we decided that the entire choreography was going to be looped, we were locked into this precision of the [loop] structure, which closed down my choreographic options. Because the rule was to copy [the movement displayed on] the video, so there was no point for me to create any new steps for example.¹¹⁴

Stoppiello realizes that once the group has decided on *loopdiver's* shape, her choreographic activities are limited. In addition to this, the creation of its movements involves more participants than only herself and the dancers. 3.1.3 has already shown that the looping tool influences the choreographer's and the dancers' choices concerning

¹¹⁴ Interview with Dawn Stoppiello, 08.10.2009.

the gestural vocabulary. Also Stoppiello herself takes note of this dynamic, but her experience is even more far-reaching, as she also notices that the tool's involvement grants a certain choreographic impact to her artistic partner Coniglio:

First of all, when we were thinking about the body language [in loopdiver's choreography] and we developed this pedestrian movement style, it felt as if we were not only creating the movements according to our own idea of how to express this notion of violence in the dancers' bodies. We rather felt that we were also developing a choreography for the loops. So, [working with] the looping patch clearly directed our decisions, my decisions ... but there was also something else ... Mark had created the loop structure, so in a way he had also decided on the movements because his loop composition gave shape to [the choreography], because he had made the structure that the dancers were supposed to follow.¹¹⁵

Stoppiello's description suggests that the work with the looping device not only affects her artistic choices concerning the aesthetics of the movement material, as it also impacts on her role as choreographer. This point becomes clear through the fact that the programming activities by Coniglio, who had hitherto been excluded from the choreographic developments, equally shapes the performance by composing the loop score. Through this dynamic, Coniglio turns into "a kind of choreographer" in Stoppiello's eyes, as also his choices (in the loop structure) shape *loopdiver's* performance. This situation shows that from now on, Stoppiello not only shares her choreographic responsibilities with the dancers as parts of them are also distributed to programmer Coniglio. Stoppiello's story thus illustrates that not only the choreographer and the dancers but also programmer Coniglio and the looping tool itself participate in the creation of the piece's choreography. The gestures presented in *loopdiver's* performance are thus resulting from the intervention of the different human and non-human actors. During the artists' work with the looped video, *loopdiver's* network increasingly solidifies, as its respective participants do not work in clearly defined, compartmentalized ways anymore: Stoppiello's tasks blur and her identity is redefined in the process of association (cf. Akrich, 1997; Latour, 1999). In this context, *Isadora's* looping feature again takes in a different role in *loopdiver's* creative procedure because it functions as a gateway to programmer Coniglio because he influences the choreographic process. In an ANT-informed logic, the shift of an actor's identity can equally affect the actant's programs of action (Latour, 1999). In this sense, the finding that Stoppiello's choreographic responsibilities are distributed to more actants through the work with the looping patch

¹¹⁵ Ibid.

leads me to investigate whether this change also has consequences on the choreographer's programs of action and consequentially on her concrete rehearsal activities.

While the performers learn to imitate the entirely looped choreography from the digitally manipulated videotape, Stoppiello realizes that her working practices shift. Instead of elaborating movements with the dancers, she takes in a rather monitoring function which she describes as follows:

I'm not choreographer in the sense that I'm making up a new step. I'm interpreting a video moment into real time and space, that's how I'm the choreographer ... I'm making the decisions about how to make the decisions ... I'm constantly working the system.¹¹⁶

The specific application of *Isadora's* looping tool, namely working with the entirely looped choreography, has translated Stoppiello's program of action. The new undertaking of monitoring the performers' decisions furthermore requires different rehearsal practices, as the choreographer explains:

I started looking at how the dancers were dealing with the loops ... and by doing that I noticed that they were not always trying to be as close to the video as possible. For example, it has happened a million times that one of them was convinced that she couldn't do a certain part [as precisely as indicated in the video], and then I came and said, 'you mean you can't do this', and I did it. Then they [told themselves] 'if Dawn can do it, then I can do it as well', rather than giving up on it because it's hard ... I think this helped them rise to that precision in the movement.¹¹⁷

Stoppiello's activity thus has changed from producing new movement material to observing the dancers' creative negotiations with the looped gestures and ensuring the precision in the dancers' movements. In this situation, Stoppiello takes in a mediating function between the looped videotape and the performers. In this respect, she also pays specific attention to the artistic quality of the group's performance:

I was scanning the group all the time, making sure [the dancers] are in sync, that they come together as a group and make the right choices ... when they got stuck

¹¹⁶ Ibid.

¹¹⁷ Ibid.

in one of these moments [of negotiation] I told them how they could get out of it, that they could for example diminish the movement, or needed to make it slower, do fewer movements or skip a bit ... there's these little techniques that we used when facing the impossible. That was kind of my role as a choreographer then, making sure the right choices are made by the dancers.¹¹⁸

Stoppiello's story shows that once Coniglio and the looping device are engaged in the choreography's development, this specific collaboration shapes the rehearsal dynamics as the choreographer needs to adapt her rehearsal practices. While on a general level, the activities of observing and monitoring dancers' decisions might not present any genuinely new rehearsal practice, the translation of Stoppiello's activities is of interest to this analysis because the particular rhythm and form of her tasks is emerging during the work with the looping tool. Thus, once again, the technological device co-forms the dynamics of the piece's making.

So far, we have seen that *loopdiver* increasingly gains shape through the network's multiple dynamics which are brought forward through the different actors' interactions, among others with the looping device. To further concretize the piece's form, Troika Ranch ask light designer David Tirosh to integrate the theatre lights by looping them: a further actant, the theatre illumination, joins *loopdiver's* network. The theatre lights are supposed to contribute to *loopdiver's* violent impact by endowing the piece's performance with specific visual looping effects. It thus seems that the lights' role within the creative network is clearly defined. However, in this section we have already seen that through his association with the looping tool, Coniglio got involved in the creation of *loopdiver's* concrete choreography and therewith expanded the reach of his role as a programmer, which furthermore had aesthetic consequences on *loopdiver's* form. I suggest to follow the lights' integration into the creative web to find out whether also their association with the looping tool affects the piece's shape any further.

3.1.5 A new role for the looped theatre lights

During Troika Ranch's last artistic residency before *loopdiver's* premiere, light designer David Tirosh starts integrating the theatre lights in the piece. To support Stoppiello and Coniglio during the realization of their goal and reinforce *loopdiver's* violent impact (see 3.1.3), Tirosh programs the theatre lights in line with Coniglio's loop score. Without going into further detail, it is notable that also Tirosh's and the lights' associations with the

¹¹⁸ Ibid.

looping tool require several changes in the respective actors' programs of action and working procedures. During the process of association, the looping tool itself is equipped with further technical material to enable the communication with the light boards, and the light designer alters his working objectives and practices and therewith develops programming strategies which he "never used before".¹¹⁹ Also the light bulbs' characteristics are adapted in order to fit the artistic goal of presenting an abrupt and violent atmosphere. After this elaborate process of negotiation between the different participants, the lighting boards reflect the loop structure in a way that corresponds to the artistic intentions. Interestingly, the association between light designer Tirosh and the theatre lights with the looping tool brings forward an unexpected alliance during the further rehearsals. The looped lighting plot not only serves to support *loopdiver's* dramatic atmosphere, as it also turns into an important aid for the performers. Because the manipulated theatre lights reflect the loop score visually and with extreme precision, the performers start using them as points of reference while learning the looped movements. The lights' accuracy more precisely helps the dancers to find their bearings in the choreography and the dance space, as performer Morgan Cloud explains:

[The lights] are rendering the loop structure so well that you can actually rely on them ... for example, there's this one moment when I have to walk across the floor ... there's a very specific place I have to be in, and I can kind of judge how long I actually have to take to get there, because the light comes up just as I get to the spot. And so I know exactly how long I need to take to roll up and start walking backwards because I just start walking backwards as the light disappears, that gives me a lot more ability to be as precise as possible, in my movements and in my timing.

In figure 3.5 we see performer Cloud in a situation in which the theatre lights provide orientation for his performance: as the square's illumination fades and re-intensifies in the rhythm of the loops, Cloud learned to adapt the pace of his movements according to the pulse of the square's lighting.

¹¹⁹ Quote by David Tirosh. All quotes by Tirosh stem from an interview held in Lincoln on October 11, 2009.

Using the lights as means for orientation presents a new learning strategy for the dancers, because “never before have [we] used lights as an indicator of how much time [we] have to do a bit of material”.¹²⁰ This way, the performers engage in a new relation with the



Fig. 3.5: To dancer Morgan Cloud, the looped theatre lights provide orientation in the looped movements' pace

theatre illumination and hence develop new working practices; this finally allows the dancers to enhance the accuracy of their movements. This situation shows that through the theatre lights' engagement with the looping tool, their identity for the dancers transforms: instead of functioning as a mere decorum, the light bulbs

have turned into useful learning aids. This new association between the theatre lights and the performers contributes to the quality of the dancers' movements and therewith materializes in the aesthetics of *loopdiver's* performance. Here, the light bulbs, together with *Isadora's* looping tool, present unexpected allies to the performers as they allow the dancers to work towards precision. The example of the theatre lights' integration into the artistic network also demonstrates that *Isadora's* loop feature can also indirectly co-shape *loopdiver's* network on an aesthetic level, as the transformations through its association with the lighting plot and the dancers have consequences for *loopdiver's* final form.

In the following rehearsal period, the performers and choreographer Dawn fine-tune their newly acquired working practices. The actors thus engage in the stabilization of *loopdiver's* techno-choreographic network up until the piece's premiere.

3.1.6 Intermediate conclusion

The preceding sections have shown that considering *loopdiver's* creation as a process of collective creation and through the lenses of specific ANT-related concepts allows us to observe the concrete activities with which the different creative participants engage with

¹²⁰ Interview with Morgan Cloud, 12.10.2009.

each other. The piece's development can be characterized as a procedure of complex and multiple dynamics in which every actant finds itself in transformation. We could furthermore closely study the ways in which the digital looping tool became involved in *loopdiver's* network. In this context, my ANT-informed perspective has shown that *Isadora's* looping feature can be identified as a participant in the process of collective creation. It presents a technological (non-human) actor which is involved in *loopdiver's* network on different levels because it co-shapes the rhythm of *loopdiver's* development and its final form in various ways. While associating with the other actors engaged in *loopdiver's* web, the technological device notably co-caused negotiations in Stoppiello's and Coniglio's artistic goals and activities, presented a problematic script to the dancers, functioned as a gateway that granted choreographic responsibility to programmer Coniglio and co-defined the theatre lights' role as an orientation aid for the performers. Through these processes, also the looping tool itself is transformed, as its script alters, its shape is adapted to the dancers' didactic needs and its identity differs according to the actors it is engaged with. We could observe that these activities generated unexpected dynamics which impacted on the artistic decisions and working strategies. These developments finally materialized in *loopdiver's* concrete shape as they brought forward the piece's theme as well as its choreographic vocabulary and structure. Through these processes the looping tool unfolded its creative agency. In this line, the analysis of these concrete rehearsal dynamics furthermore allows us to understand that in the respective situations, the looping tool co-shapes *loopdiver's* form in direct ways, for example by impacting on the artists' choice of a convenient movement style, but it also co-forms the piece (and therewith its artistic web) in more indirect manners, for instance by causing a friction in presenting anti-programs to the dancers' working style which is taken up and subsequently transformed into *loopdiver's* creative theme by Stoppiello and Coniglio. Another example for the tool's indirect creative agency is its function as a gateway for programmer Coniglio or the theatre lights, as the shifts in the respective actors' roles have consequences on the shape and quality of the dancers' movements. The ANT-informed framework has furthermore helped to characterize the dynamics of *loopdiver's* evolution as a continuous redefinition of Troika Ranch's artistic goals.

The subchapter has equally shown that Troika Ranch adjusted their initial ideas about dance-technology relations during the creative process. During the making of *loopdiver*, the artists changed their conception that the human body infiltrates the employed media technology to its opposite as they have the idea to submit themselves to the video loops' rigorous dictate, to the point that not only the dancers' movements but also the accompanying musical score and the theatre lights are looped. However, in my analysis I have demonstrated that not only the artists adjust themselves to the looping tool during different phases of negotiation because the technology itself is equally altered during the rehearsal process. It is adapted to fit with the artists' needs and interests and

changes its status within *loopdiver's* network several times. My ANT-inspired framework thus allows me to show that despite the artists' biased conceptions of dance-technology relations, the making of *loopdiver* is a process in which both the involved artists but also the employed technological device are constantly transforming. Nevertheless, we could also observe that Troika Ranch demonstrate a willingly open approach concerning the creative process' development, as the piece takes shape throughout *loopdiver's* rehearsals. In this context, another digital dance production, *Habitat*, is of specific interest. Here, technology is not accorded such a directive role but is instead supposed to serve as a mere tool. In this case study, the artists' starting point can be considered as rather opposite from Troika Ranch's, as right from *Habitat's* early creation, the members of the collective LaborGras have a relatively specific idea of the piece's shape. As a consequence, the artists attempt to define the technology's role within the choreographic artwork in a very early stage. *Habitat's* creative process is thus characterized by the artists' efforts to realize their predefined idea, or artistic goal. This approach suggests that the employed technological tools function according to the artists' prescriptions. In line with my ANT-informed conceptual approach, I do however argue that also in the case of *Habitat*, the involved technologies are also co-accountable for the dynamics that shape the piece, whether in direct or indirect, in planned but also in unexpected ways. In the next subchapter we will therefore study *Habitat's* rehearsal process in the light of the artists' interaction with their digital devices.

3.2 *Habitat*: digital technology as a bridge for dance and sculpture

In 2007, LaborGras' directors Renate Graziadei and Arthur Stäldi discover a group of seven oak wood sculptures that have been designed by their common friend and sculptor Volker Schnüttgen. Graziadei explains that the wooden objects reinforce her and her artistic partner's interest to collaborate with the befriended artist. Figures 3.6 and 3.7 present two of these massive wooden objects that inspired LaborGras to work with Schnüttgen:

We knew Volker for a long time already, and we wanted to work with him for many years. And when we saw the sculptures, we were mainly intrigued by the following question: how to combine these objects with dance? I could have simply danced around the sculptures, but we didn't find this satisfying enough, as an artistic concept. But then the notion of spatial dimensions came up, because we had the

idea to place the sculptures in the dance space, and their presence obviously does something to [such a space]¹²¹¹²².



Fig. 3.6, 3.7: The photographs show examples of the wooden sculptures that inspired LaborGras during the initial creative phase of *Habitat*.

Graziadei and Stäldi have an artistic aim: they want to create a project with their friend Schnüttgen and his sculptures in an artistically interesting way. In ANT parlance, LaborGras' artists intend to integrate Schnüttgen and his sculptural works in their creative network. To realize their goal, they however mean to collaborate and thus associate with the sculptor and his wooden creations in a "satisfying" manner that allows them to explore the notion of spatiality. Through the sculptor, the group develops the idea to engage with digital tools to reach their creative aim. Stäldi explains:

While we were thinking about a possible collaboration, Volker participated in a workshop on the design of three-dimensional [virtual] spaces. This inspired us to install screens in the oak wood sculptures, so that Volker could create some virtual environments for these screens. In addition to that we had worked with the interactive software Kalypto earlier, and we thought that the program could help us connect Renate's dance with Volker's three-dimensional spaces within the sculptures ... Our idea was that Renate would then create different choreographic pieces for the seven different sculptures [and their virtual spaces]¹²³.

¹²¹ Unless stated otherwise, the presented quotations relating to *Habitat*'s creation have been collected during my field research in LaborGras' studio and at the dance and theatre venue Radialsystem in Berlin during the period of September until December 2010. English translation by the author.

¹²² Renate Graziadei, 10.12. 2010.

¹²³ Arthur Stäldi, 19.11. 2010.

Figures 3.9 and 3.10 illustrate LaborGras' idea to integrate screens with Graziadei's video image in Schnüttgen's sculptures. Stäldi's account shows that the artists mobilize further (technical) actors, as a software program for the generation of three-dimensional virtual spaces and the real-time programming environment *Kalypso* enter the artistic web. Stäldi thus describes an initial phase of collective performance making as a heterogeneous artistic network takes shape.



Fig. 3.9: LaborGras plan to integrate screens in the wooden sculptures that display virtual spaces and dancer Graziadei's live video image as shown in this picture.

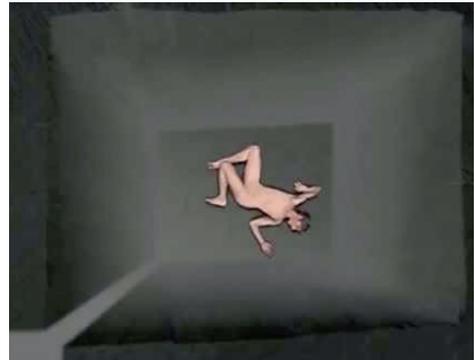


Fig. 3.10: This photograph presents one example of the virtual spaces created for *Habitat*.

This first glimpse into *Habitat's* initial creative phase demonstrates that the artists employ digital technology to solve an artistic problem: the software programs present their 'bridges', or allies, to combine sculptor Schnüttgen's sculptures with dancer Graziadei's performance. This way *Habitat's* beginning draws parallels to the emergence of *loopdiver*: in both cases, digital tools are enrolled in the respective networks to allow different actors to associate and realize a creative goal. However, in the following we will see that the two cases also considerably differ as the rhythms of their creation vary. This divergence is mainly related to the fact that the two artistic groups approach the creative process, and with it the technology's role in it, differently. While *loopdiver's* artists let the piece take shape in the course of their experimentation with the looping tool and so took time to develop *loopdiver's* concept and structure, we will see that LaborGras attempt to define *Habitat's* general form even before they associate with the technologies in question. In 3.2.1 I will therefore start my analysis by describing LaborGras' first undertakings to stabilize the piece's network.

3.2.1 Shaping *Habitat* through dualistic conceptions of dance-technology relations

In 3.2 we have seen that two technological actors, namely the virtual spaces and the programming environment *Kalypso*, enter the artistic network around *Habitat*. Through the presence of these digital tools, LaborGras' artistic directors further specify their creative goal. These undertakings also help the artists to concretize their ideas concerning *Habitat*'s shape. Stäldi reports:

*We had already worked with Kalypso for another piece [entitled] I, myself and me again. In that project, we used [Kalypso] to make the dancers interact with one or several video images of themselves. We could also make these [doubled images] appear with different temporal delays. So we knew how the software worked ... for Habitat we wanted to work in a similar way: we had the idea that Renate's image should be projected in Volker's virtual spaces, and we then wanted to multiply and delay it with Kalypso. Because one can create several clones and vary the delay times [with Kalypso], there's a vast amount of possibilities. We knew that our time together was limited, so we had the idea that Volker would first program individual settings for each of [the virtual] spaces. Our plan was to watch [those spaces], get inspired by them so that Renate could work out some choreographic material, and we'd then decide on the visual [Kalypso] effects that we wanted to use.*¹²⁴

LaborGras' directors now have a clear idea of how to proceed to realize their goal to combine Graziadei's dance with sculptor Schnüttgen's works, and they ask Schnüttgen to develop the different digital rooms that are going to be projected into the wooden sculptures. The two artists plan to watch the different virtual spaces once they are created to "get familiar with their distinct shapes" and to decide which of *Kalypso*'s video effects to employ in the respective rooms. In parallel, the artists want these visual outcomes to stimulate and serve Renate during the elaboration of choreographic material.

This phase of *Habitat*'s creation shows that contrary to the previous case study *loopdiver* in which the artists took time to develop the piece's shape, LaborGras rather quickly work out a distinct idea of *Habitat*'s general structure. Here, the artists intend to decide on the tools' functions before associating with them. These artistic choices interestingly reflect LaborGras' general attitude concerning the status of (digital) technology in dance art. The artists are of the opinion that "technologies should serve as

¹²⁴ Arthur Stäldi, 03.12.2010.

artistic or expressive aids and extensions to the art of dance, they should not impose themselves on the creative work".¹²⁵ For LaborGras, the fascination concerning technological features can quickly turn into a "danger", as the desire to demonstrate "technical magic"¹²⁶ can easily gain the upper hand and therewith reduce dance and the dancing body to mere demonstrators of technology's extraordinary effects. In LaborGras' perspective, it is thus preferable to control the technological devices before being dominated by the tools themselves. This view on technology's role in dance production might primarily account for LaborGras' choice to predetermine the roles of the software programs employed in *Habitat* and therewith turning them into assisting devices. In his report Stäldi nevertheless also explains that the group's "time ... was limited"¹²⁷, which means that the artists consider their rehearsal schedule as rather short. And indeed, the period in which LaborGras can collaborate together with their artistic partners is limited to a total of three weeks. Because "there was no time for surprises"¹²⁸, the restricted time at disposal equally reinforces the artists' desire to have a clear idea of *Habitat's* format and also of the digital effects in it before the actual rehearsals start. In this respect, the restricted time schedule presents an actor that co-shapes the relation between the artists and their tools, as it strengthens LaborGras' intention to predefine and dominate the technologies' role within *Habitat's* performance instead of leaving time for more experimentation. Stäldi's report furthermore shows that the artists especially tend to predesign the way in which they want to use the programming environment *Kalypso*, as they plan to decide on its specific effects before concretely working with it. This attitude results from the fact that Graziadei and Stäldi have already worked, or associated, with *Kalypso* during an earlier production and therefore consider themselves familiar with the software's possibilities and function.

In this early rehearsal phase for *Habitat*, Graziadei's and Stäldi's goal appears much more concrete than Troika Ranch's intentions at the beginning of the first case study *loopdiver*, where the artists' interests were less specific with regard to the technology's performance in the creative process. It almost seems as if LaborGras merely need to put their current goal into practice in order to create *Habitat*. Like we have already seen, an ANT-inspired perspective however suggests that the group of artists cannot entirely control the course of action during *Habitat's* making, and that the production process is structured through the redefinition of artistic goals. In this context, the Actor-Network-informed perspective directs my attention to the artists themselves in order to find out whether they are also influenced by the tools' integration in *Habitat's* network. Here, the

¹²⁵ Interview with Renate Graziadei, 17.08.2009.

¹²⁶ Ibid.

¹²⁷ Interview with Arthur Stäldi, 17.08.2009.

¹²⁸ Ibid.

notion of 'goal translation' allows to understand that while the artists desire to specify and direct the creative procedure and therewith also the technological devices, they are equally already affected by the software programs' presence: Stäldi's account describes that through the engagement with the digital spaces and with *Kalypso*, LaborGras' creative ideas have been transformed, or translated, from 'collaborating with Volker' to 'creating a dance piece with virtual spaces and real-time video image modification'. The technological tools' entering into the creative web thus has affected and further specified LaborGras' artistic intentions. We will see in the next sections that this translation has further consequences on the rehearsal process.

3.2.2 Attempts to put instrumental ideas into practice

Once Graziadei and Stäldi receive the first layouts of Schnüttgen's virtual spaces, the dynamics of collective creation gain pace because the artists start concretely realizing their previously developed ideas concerning *Habitat's* structure and production. While working with the digital rooms, they reflect on how to combine the virtual spaces with the movements of dancer Graziadei's filmic image and with *Kalypso's* effects of live video manipulation. In this rehearsal phase, Graziadei is mainly occupied with the elaboration of choreographic material. Her plan is to develop distinct choreographic vocabularies that she wants her video image to perform in the respective virtual spaces. Graziadei has thus defined a new creative goal. LaborGras' concrete undertakings to put their creative concept into practice illustrate in how far the artists, as has already been mentioned in the previous section, approach the two technological actors in different ways. Stäldi describes the artistic procedure as follows:

We began by projecting Renate's live video image into the different virtual spaces that Volker had created, and spent much time watching what happened when Renate was moving ... we mainly tried to get inspired through [the spaces'] individual characteristics ... and Renate would work out some choreographic material for them, which helped us find out which video effects we wanted to use. We had already worked with [Kalypso], so we had some ideas of the [software's] possibilities. And then, once we knew what we were after, we asked [Kalypso's designer] Frieder to join us ... so that he could implement our ideas and realize the

[Kalypso] effects we wanted, because we're not familiar with programming issues.¹²⁹

Stäldi explains in more detail how he and Renate proceeded:

For example, there's one [space] that has a frontal perspective, and it's very low. That's why we call it the 'drift'. Because the camera setting in that space is so low, we noticed during the first try-outs that Renate would have to constantly move on the floor to be captured [by the video camera], because only then her entire image would be visible on the screen. So it was not possible for her to get up when working in that space, she was either sitting or kneeling, or moving on all fours. So we knew that [Renate] would be mostly performing in a low position, and because the [virtual] space appeared rather broad, we had the idea that her [video] image would double at one moment during her performance. We wanted to mirror and delay [the image with Kalypso], so that she could play with both her live image and her delayed, inverted double. We proceeded in a similar way with the other [virtual] spaces, they are all quite different.¹³⁰

Stäldi's account depicts that on the one hand, he and dancer Graziadei take time to explore the digital rooms created by sculptor Schnüttgen, while the artists on the other hand tend to fix *Kalypso's* visual effects without, or rather before, concretely working with the software program. During this rehearsal phase, the artists let the virtual spaces co-shape Graziadei's choreographic vocabulary: formulated in ANT-related terms, the example of the 'drift' space shows that the dancer's program of action is mediated through the work with the virtual room from 'performing in the drift space' to 'performing in the drift space in a low position'. Throughout the rehearsals, Graziadei encounters further situations that impact on her aims in similar ways. This has consequences on her gestural language. The camera perspective of another digital room for instance requires that Graziadei moves in an outstretched position on the floor because she is filmed from above. In other moments, the respective compositions of the digital rooms furthermore inspire the performer on the level of her movement style, as she develops gestures with specific characteristics through the work with the particular spaces. The virtual socket in one of the digital rooms for example inspires Graziadei to develop choreographic material that contains climbing and jumping gestures, as she intends to let her video image move up and down this spatial element. In this sense, the

¹²⁹ Interview with Arthur Stäldi, 17.8.2009.

¹³⁰ Ibid.

first rehearsal phase is marked by multiple situations in which the dancer's programs of action are translated through her work with the distinct features of the virtual spaces. These dynamics consequently mediate Graziadei's postures and movement style in individual manners. Thus, similar to the looping device in *loopdiver*, the virtual rooms impact on *Habitat's* shape by transforming the performer's programs of action, albeit in different ways. In the same time however, LaborGras do not seem to grant this form of creative agency to the other digital actor comprised in *Habitat's* network, namely the software *Kalypso*. Having explored the software during the work for an earlier production, the artists determine the technology's effects before associating with it.

In the context of LaborGras' earlier statement that technologies should be directed throughout the creative process, it might seem surprising and even contradictory that the virtual spaces are granted a certain agency as the artists accept, and seemingly desire, that the digital rooms interfere with Graziadei's movement language. This idea appears to stand in contrast with the artists' way of dealing with *Kalypso*, because here the program's features are directly fixed to avoid any changes, or processes of translation, in the rehearsal process. LaborGras thus tend to work more openly with the virtual rooms as they did not yet associate with them before. For this reason, the artists still need to negotiate with the respective software. As they already associated with *Kalypso* during an earlier production, LaborGras have the impression that they can 'handle', and thus instruct and control the familiar tool. However, the story on *Habitat's* making so far indicates that also the work with *Kalypso* does not leave the network unaffected: in order to make *Kalypso* execute their ideas, LaborGras need to collaborate with the software's designer Frieder Weiss. This signifies that Graziadei and Stäldi need to associate with a supplementary (human) actor to work with the software in the desired way. Thus, similar to the case of *loopdiver*, *Habitat's* network complexifies around a technological device through the mobilization of further actants. In this context, the case of *loopdiver* has furthermore shown that the technological tool's functions and roles changed in the course of the creative network's development. While LaborGras wish to direct the rehearsal procedure and its final outcome according to their plans, this observation casts doubts on the idea that *Kalypso's* functioning can be prescribed during *Habitat's* making even before the software has concretely entered LaborGras' network. If, as *loopdiver* has shown, a (technological) actor already changes its functioning and identity during the evolution of one and the same network, it is highly questionable that *Kalypso* will function in *Habitat's* creative web in the same way as it did in the network of another production. This aspect is especially relevant because by entering *Habitat's* web *Kalypso* is integrating with different artistic interests and new actors which did not figure in LaborGras' earlier creations, for instance the virtual spaces. In this line of reasoning, it is thus very probable that *Kalypso* will equally adopt a different identity and work in ways that do not entirely correspond to its earlier functioning during the previous production.

Following the technologies' further integration into *Habitat's* network will therefore allow me to examine whether and how the tools' functions change, and whether the artists themselves are affected by the work with the respective devices. In the next subsection I will trace *Habitat's* development by focusing on LaborGras' collaboration with *Kalypso* and its designer Frieder Weiss.

3.2.3 Frictions through (the desire to) control

In the previous subsection we have seen that LaborGras determine *Kalypso's* functions before concretely working with the software. Lacking the necessary programming skills to operate the program, the artists mobilize a further ally, namely multimedia engineer Frieder Weiss, to realize their ideas. Stäldi explains:

*We told Frieder what we wanted. It was important for us to tell him our ideas once they were really clear so that we could tell him which effects to program for us.*¹³¹

LaborGras expect Weiss to make the technology function according to their inspiration and hence involve the programmer in *Habitat's* collective creation. The artists intend to define the ways in which they want *Kalypso* to engage in *Habitat's* network. However, Graziadei and Stäldi soon realize that they cannot simply predefine the ways in which *Kalypso* is supposed to perform. Despite their previous experience with the software, the first technical rehearsals with Weiss reveal that several of their ideas cannot be immediately implemented: first frictions emerge.

When we made the first try-outs with Frieder, some of our plans could not be directly realized ... for example, for some sculptures we wanted to clone Renate's video image. But [during the rehearsals] we found out that the number of filmic doubles was rather limited. We had planned to work with several clones in the 'socket' sculpture, but Frieder told us that it was not possible ... we wanted to work with eight clones or even more, but at that moment the maximum was five.

The collaboration with Weiss makes LaborGras soon aware of *Kalypso's* technical limits, as the software's actual functions differ from, and prevent the realization of, a part of their creative ideas. The above-mentioned example shows that while the artists desire an elevated number of clones, the software is not able to produce more than five. In a similar

¹³¹ Arthur Stäldi, 09.12.2010.

way, further technical features, such as the duration of the filmic delays, cannot be directly adapted to the artists' ideas. LaborGras thus cannot simply predefine *Kalypso's* role in the rehearsal process. As the artists have the impression to already be familiar with *Kalypso's* characteristics because of an earlier production, this conflict occurs in a rather unexpected way. It thus presents an unplanned friction which hinders Graziadei and Stäldi to pursue the rehearsals according to their plans, and the working process stagnates. The situation shows that the technology's unforeseen reluctance disturbs the rehearsals' dynamics. In other words, *Kalypso's* program of action presents an anti-program to LaborGras' interests, or creative goal. It also becomes clear that the tool's role in *Habitat's* network has changed: while LaborGras originally employed the software to achieve a creative goal, *Kalypso* now presents an obstacle to the realization of the artists' interests.

This situation resembles the first moment of friction during *loopdiver's* rehearsals described in 3.1.2 in the sense that also here the dancers' problems with the loops' characteristics hindered the working process although the tool had initially been employed to help Troika Ranch achieve their first artistic goal. In this context we have seen that Troika Ranch dealt with the situation of conflict by creatively exploring the obstacles occurring between *Isadora's* looping device and the dancers because they turned the performers' experience into the piece's main theme. In the case of *Habitat*, the artists deal with the friction in a very different way. True to their desire to control the rehearsals' course of action, LaborGras consider *Kalypso's* limited capacities and the situation of friction as malfunctions that need to be solved. Consequently, Graziadei and Stäldi are not willing to compromise their creative intuition that quickly, as they try to "push Frieder"¹³²:

*We told him that we really needed more than five clones ... and working with Frieder is really cool, because you can tell him something, then he says 'ok', and when you come back, he often has realized your ideas. And it was the same with the clones: a few days later he had found a way to produce eight of them. He told us that he himself hadn't believed this was possible, but in the end he had managed ... so in that sense one could say that we pushed the technology with our ideas.*¹³³

Through Weiss' intervention, *Kalypso's* processing capacity is improved so that its programs of action finally comply with LaborGras' creative goal. In this phase of the rehearsals, multimedia artist Weiss thus presents LaborGras' gateway to control

¹³² Interview with Renate Graziadei, 17.8.2009.

¹³³ Ibid.

Kalypso's functions and maintain its assisting role in the creative process. However, the technology's adaptation in turn requires that LaborGras dedicate a substantial part of *Habitat's* first rehearsal period to programming activities and the organization of further technical equipment, as Graziadei reports:

When you work with Frieder, you definitely need much time. For example, when you ask him if he can change a certain [effect], he might tell you that it will take him five minutes to do it. But curiously, his five minutes are much longer than mine (laughs). He often makes a coffee when he starts with a certain task, and eventually he will never drink it because it is already cold when he's done with his work ... first I kept waiting for him, but now I know that it usually takes much longer than he told me, and I do something else in the meantime. ¹³⁴

Graziadei's account shows that making *Kalypso* work according to their ideas also demands compromises from the artists' side. More precisely, to "push" the technology LaborGras have to cope with long programming hours and integrate them into their rehearsal plan, and organize and invest in supplementary computer material. LaborGras thus need to dedicate much time to the collaboration with Weiss and his programming work. These activities slow the rehearsal process down and shape its course of action.

This section has demonstrated that despite their ambition to control the rehearsal process, the artists are themselves affected by the work with their digital tools as they need to adapt their working rhythm if they want the technology *Kalypso* to comply with their creative ideas. LaborGras and the digital tools are thus comprised in dynamics of translation: although Graziadei and Stäldi do not grant much agency to their technological devices, their interaction with the tools nevertheless impacts on the dynamics of the rehearsal procedure and *Habitat's* final shape.

In the course of the creative process, the work with the virtual spaces and *Kalypso* affects the artists on a further level, as they desire more visual realism in the digital video imagery and effect. In short, a new artistic goal emerges: LaborGras' intentions are thus mediated by the digital tools.

¹³⁴ Ibid.

3.2.4 Mediated rehearsal practices through unplanned anti-programs

After a few days of working in *Habitat's* setup, LaborGras notice that they are not yet satisfied with the appearance of the virtual spaces designed by sculptor Schnüttgen. More precisely, Graziadei and Stäldi are interested in a more realistic presentation of the virtual rooms: through their association with the technological tools, the artists' next goal emerges.

*While we were watching my video image in the digital spaces, we found that the rooms still appeared rather flat and inanimate to us. We wanted them to be more voluminous and defined because Volker's wooden sculptures possess this spatial presence. We didn't want to let my video image dance in front of those flat virtual spaces.*¹³⁵

To put LaborGras' creative intuition into action, sculptor Schnüttgen and software engineer Weiss start manipulating the respective digital devices. Schnüttgen more specifically creates effects of virtual walls that can be animated for particular digital rooms while Weiss introduces a so-called 'z-buffer' in the *Kalypso* software. This particular algorithm ensures that the size of Graziadei's filmic clones decreases with time, and that the virtual walls can 'mask' her image. *Habitat's* network thus continues growing. Thanks to these additional features, the virtual rooms gain in visual depth and therewith respond to LaborGras' desire for spatial realism. Both the virtual spaces and *Kalypso* have thus been expanded, and therewith transformed, through further technological assets: similar to the earlier rehearsal phase described in 3.2.1, the technological tools are modified to comply with Graziadei's and Stäldi's ideas. However, as the mentioned section has already shown (and as ANT suggests), it is very likely that these modifications also have consequences for the artists, as together with *Habitat's* network they need to associate with these new, or transformed, actors. And indeed, the new visual assets require significantly more processing power. This presents a considerable downside for LaborGras because the computer equipment frequently stops working during the rehearsals. The situation is problematic for the artists, as Graziadei reports:

¹³⁵ Renate Graziadei, 19.11.2010.

Although we were satisfied with the new [visual] depth in the virtual spaces, the rehearsals became really difficult because the computer was crashing more and more often ... and to me this was extremely unnerving. Because in this piece I can't work without the technology, I need to see myself in those virtual spaces to develop the choreography. And quite often it happened that I was just in the middle of something when the image froze, or it wasn't even possible to get the whole thing started ... then the screens stayed black or only showed some green and red pixels. That was really annoying because it disturbed the [rehearsal] process, again and again ... so we decided that we needed more technical material to continue working, because the interruptions wouldn't stop.¹³⁶

Graziadei's account shows that while the technological actors have been adapted to LaborGras' interests, the tools' need for more processing power presents an anti-program to her rehearsal plans. In short, another friction emerges that the artists need to solve if they do not want to compromise their artistic idea. Hence, to enhance the computer system's capacity, LaborGras decide to install further technical equipment in their rehearsal space. To function in the desired way, the modified software programs thus require the mobilization of even more actants in *Habitat's* network. During the following days, additional computers, screens, wires and a supplementary camera therefore find their ways into LaborGras' studio. This acquisition considerably changes the workspace's appearance: while the computer equipment previously occupied one single table, it is now taking in a substantial part of the dance place. Figures 2.11 and 2.12 show that the additional computers, processors and screens are placed on further tables and a bench. Various cables furthermore snake along the windowsill, and two cameras are hanging from the ceiling above the dance floor, which is now equipped with three instead of two screens. "The space has turned into a tech-lab", Stäldi jokingly remarks once the new supplies have found their place.¹³⁷ And indeed, the artistic group needs some time to experiment and reorganize itself to be able to work with, or between, the considerable amount of new technical devices. During this phase, the artistic network is even further expanded as the new computer equipment and the software's supplementary functions require intensive maintenance.

¹³⁶ Interview with Renate Graziadei, 17.12.2010.

¹³⁷ Arthur Stäldi, 03.11.2010.

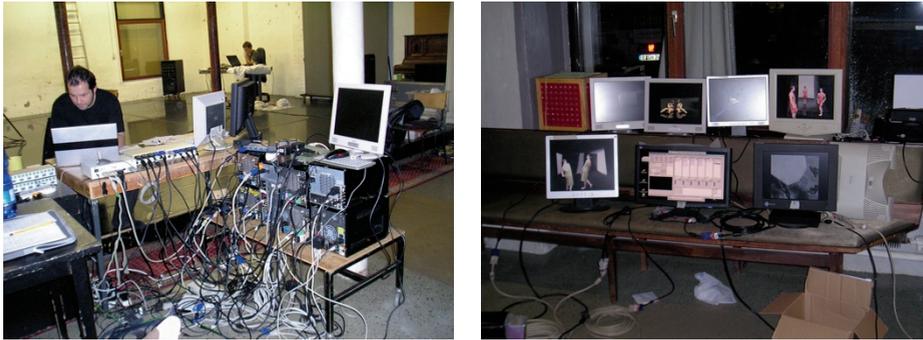


Fig. 3.11, 3.12: The technological equipment necessary for *Habitat's* production increasingly occupies LaborGras' rehearsal space.

As software designer Weiss can only sporadically attend the rehearsal process, the artists engage a further programmer, Martin Bellardi, who is supposed to assist LaborGras in their daily work by operating and caring for the IT material. *Habitat's* creative web thus develops again. For some team members, dealing with this new situation merely signifies the creation of new working space because the computer equipment is dispersed over the studio; they rather easily associate with the new working material and Bellardi. For dancer Graziadei and the freshly introduced computer specialist, the situation however has further consequences, as the new computers require programming activities which interfere with Renate's working rhythm. Bellardi explains:

My task was to make the new computer material operable ... so I was involved in much programming work. Every virtual space was operated by one single computer, and Kalypso's settings needed to be adapted to each room's characteristics. This meant long sessions of calculation, and in addition to that the cameras on the ceiling had to be calibrated for each virtual space. For [the calibration procedure] the dance floor either needed to be empty, or Renate had to position herself at specific points in the [dance] space ... she was not very pleased with the situation, as I constantly had to tell her either to leave the dance floor, or to move to a certain place and stay there for a few minutes.¹³⁸

Bellardi describes that a new moment of conflict emerges, as his individual goal, or program of action, is to render the computer equipment operable. In the same time, performer Graziadei's aim is to create choreographic material with *Kalypso* and the virtual spaces. In this situation, Bellardi's programming activities interfere with

¹³⁸ Interview with Martin Bellardi, 07.12.2010.

Graziadei's rehearsal practices, as she cannot work in the dance space in the foreseen way. To her, the problems resulting from Bellardi's programming work concretely present themselves as follows:

It was hard for me to continue working during the programming period because our discussions mainly turned around the computer equipment, the realization of programming tasks and timing issues, and Martin would quite often spontaneously interrupt me. It happened quite often that I was busy [developing] one of the choreographies, and suddenly [Martin] would claim that the dance floor be empty, and two minutes later he'd ask: 'I need a moving body, could you please walk from the right side [of the dance floor] to the left?' And because it was necessary, I helped him out. But for my own [choreographic work] those activities were quite distracting. Especially because it also meant a lot of waiting ... Martin would for example tell me that everything would be over in a few moments, but sometimes I had to wait for more than an hour until I could get back to the [dance] floor, and that was extremely annoying because I couldn't do much else in the meantime. I need to be warmed up and mentally focused to do my work, and this was just not possible with all those interruptions and hours of waiting.¹³⁹

The long programming sessions signify a heavy disturbance for Graziadei who has the impression to lose much working time. Programmer Bellardi in turn feels under pressure when seeing Graziadei impatiently "tapping with her feet".¹⁴⁰ After a few days, both artists experience the situation as increasingly uncomfortable as they are constantly getting in each other's way. Neither Graziadei nor Bellardi can follow their particular activities, and this conflict puts the rehearsal process on hold again. In other words, through Graziadei's and the technological equipment's requirements, Graziadei's and Bellardi's individual goals present anti-programs to their respective programs of action. This problematic situation causes the performer and the programmer to revise their working rhythms and needs and to search for a more suitable arrangement.

We realized something had to change ... so one day I decided to inform Martin every morning about the amount of time I would need to spend with the equipment in the dance space. He then told me in turn when he planned to work on the software, and how much time he would roughly need for this. From then on we tried to organize the day so that each of us would be able to work with the

¹³⁹ Interview with Renate Graziadei, 17.12.2010.

¹⁴⁰ Martin Bellardi, 03.12.2010.

*computers and the dance floor at some point, without being disturbed. So in a way we negotiated a kind of individual schedule for every single day.*¹⁴¹

To avoid the frictions between their working modes and generate more efficiency during the rehearsals, the artists develop a time plan that structures their respective working periods. The daily schedule allows both artists to concentrate on their working activities during a defined time frame and therewith presents an alternative and common program of action for both parties. While this procedure of translation “[makes] things clearer”, it still requires much tolerance and concessions from both dancer and programmer.

*It wasn't easy to stick to our respective time slots. I know that Martin really tried to make things work within his share of the day, but often that didn't work out, because the computer crashed again, or simply because things took longer than expected. In those cases I would postpone my working hours, or Martin would get back to his stuff after I was finished ... which sometimes meant that he worked at night. And I was depending on his progress, because when things weren't [readily programmed], it could mean that the [virtual] space or effect I had planned to work with wasn't available ... plus I noticed that it can be very difficult to be creative within a clearly defined timeslot, especially when it only lasts for a short time, like one or two hours. Those brief moments didn't really allow me to develop anything new or interesting. So I mainly used those hours to simply rehearse material I was already familiar with.*¹⁴²

Graziadei's report demonstrates that the association between herself, programmer Bellardi, the modified software programs and the new computer equipment demands a considerable investment from the artists' side, as Graziadei and Bellardi spend much time arranging their working methods to operate the technological tools in the desired way. To make the technological devices perform according to their ideas, the (human) actors comprised in *Habitat's* network also need to adapt and organize themselves around the technologies' requirements.

In this section we have seen that LaborGras' desire for further visual effects has unanticipated consequences for the rehearsals' course of action: while the technological tools in *Habitat's* network continue to be adapted to LaborGras' artistic interests, they

¹⁴¹ Interview with Renate Graziadei, 17.12.2010.

¹⁴² Ibid.

also exert further agency on the rehearsal process by unexpectedly mobilizing more actants like computer equipment and a programming specialist. We found out that the association with these new participants created several situations of conflict between performer Graziadei and programmer Bellardi. Their ensuing negotiations shape the rehearsal practices and the tempo of the creative process, as a huge part of the actors' discussions and actions is organized around the technologies. These observations describe how *Habitat's* technological devices influence the course of action during the piece's making because they necessitate considerable engagements from several (human) actors in the artistic web. The technological tools subsequently indirectly mediate the rehearsals' rhythm by impacting on Graziadei's and Bellardi's working activities. This shows that LaborGras cannot exclusively control the technologies' modes of operation because they are again comprised in dynamics of translation. While this section has demonstrated how the transformation of *Habitat's* digital media further impacts on the level of the artists' rehearsal practices and rhythms, we will see in 3.2.5 that Graziadei's work with the tools also affects the piece's shape on an aesthetic level, notably by presenting an altered script.

3.2.5 Unexpected translations through a modified script

Once the virtual spaces' new visual features are updated and rendered operable by programmer Martin Bellardi, dancer Renate Graziadei starts rehearsing with the augmented digital rooms that are now equipped with animated and opaque elements. This means that specific parts of the virtual spaces such as walls or sockets can now be displaced and cover the dancer's video image. At first, LaborGras appreciate these new features because they provide the desired visual depth to the digital rooms, but also because they supply new creative options to Graziadei as her filmic image can 'play' with the different graphic effects. However, during the first try-outs the group's enthusiasm soon fades as the extended spaces present yet another obstacle: the virtual walls turn out to be very unstable. Graziadei explains:

In the beginning I was quite excited by the masking effect, because the opaque walls indeed provide a more three-dimensional character to my virtual stages ... and I could play with the animated elements, which meant new choreographic possibilities. But when I started rehearsing more intensely with the augmented spaces, I soon noticed that the walls weren't always working like they should. In fact, they didn't always remain opaque when they were supposed to ... sometimes

they would simply stay transparent, another time they would start flickering or jumping, so they were suddenly turning transparent while they had been covering me before ... this disturbed the rooms' [realistic] appearance and my performance of course. Because I just couldn't anticipate at which moment these disturbances would actually occur, which made me feel confused. At first we didn't know what the problem was, but after some time Martin found out that the [computer] system had become very light sensitive. This made the walls so extremely unreliable ... it was a real mess because I couldn't work properly.¹⁴³

According to Bellardi, the walls' unstable function is due to alterations in the computer system and equipment:

Now we work with the z-buffer and we've installed a new infrared camera that captures light differently than the older model. So the system's features have been changed, and the equipment's capacities [have been] ameliorated ... through these changes the system processes light differently, which in our case unfortunately means that it can be easily irritated and therefore doesn't track Renate that properly anymore.¹⁴⁴

Bellardi furthermore describes how the situation concretely impacts on Graziadei's work:

In general, to be tracked Renate needs to move in a clearly defined area on the dance floor, where the camera can register her position and movements so that her image can be projected in the virtual spaces. But now that we have the virtual walls, there's also the masking effect [which turns the virtual walls opaque] ... and because the walls are located at specific points in the virtual rooms, the masking effect is only activated at specific places in space. For Renate this concretely means that the walls only turn opaque when she moves in a very distinct area on the dance floor. Only when the camera locates her in this specific section the mask is activated, and the walls turn opaque ... but if the camera doesn't properly detect Renate's position in space because of the light sensitivity, it might happen that the walls stay transparent or start to flicker although Renate finds herself in the defined 'opaque' area. This can mean that if you watch Renate move in a virtual

¹⁴³ Interview with Renate Graziadei, 17.12.2010.

¹⁴⁴ Martin Bellardi, 18.11.2020.

*room on screen, her video image stays visible although she just walked behind a wall.*¹⁴⁵

The dancer's and the programmer's accounts show that a new moment of friction has emerged: the expansion of *Habitat's* network through further technical actors, notably the z-buffer and the new infrared camera, has generated an unexpected side-program in the shape of the virtual walls' flickering effect. More precisely, the engagement, or association, with the new technical actors has modified, or translated, the computer system's functioning as it has become increasingly light sensitive. This concretely signifies that for instance light reflections on the freshly cleaned dance floor or changes in the studio lights' positions can disturb the tracking process, and the new infrared camera does not always correctly locate Graziadei's body in space. As a result, the camera sends improper data to the processing *Kalypso* software, which causes disruptions in the virtual walls' masking effect.

The resulting digital walls' instable functioning presents a new challenge to the artistic collective because it annihilates the recently gained visual realism of the virtual spaces. It therefore presents an obstacle to LaborGras' new creative interests. Furthermore, performer Graziadei feels disoriented through the walls' unforeseeable reactions, which hinders the development of further choreographic material. In short, while *Kalypso's* expansion through the z-buffer and its association with the new infrared camera has initially helped LaborGras to realize their artistic aim, it has also brought forward anti-programs to the artists' individual goals because the flickering virtual walls prevent both LaborGras' and Graziadei's pursuits of their programs of action. Again, the tools' role in *Habitat's* creation has changed: the technologies have transformed from gateways to the realization of the artists' interests to obstacles for the fulfillment of the very same creative goals. This situation shows that while the tools have been adapted to the artistic aims, they also repeatedly intervene in the creative process by producing an unplanned problem to the artists. As LaborGras experience the walls' flickering as a phenomenon that needs to be avoided, they wish to 'tame', or control, the undesired effect: a new artistic aim emerges. This dynamic bears concrete consequences on the artistic collective's activities, as from now on LaborGras' members adapt certain working habits in the studio as they try to reduce the computer system's light sensitivity by maintaining the dance floor's surface as dull as possible, for instance through cleaning it with a broom instead of sweeping it with a mop, and by preventing changes in the studio lights' positions. However, the system's light sensitivity impacts even further on the artists' activities, as it causes changes in the script of *Kalypso's* tracking mechanism. In

¹⁴⁵ Ibid.

the following it becomes visible that as a result this situation influences Graziadei's choreographic language, and it therewith affects *Habitat's* performance on an aesthetic level.

As we have seen in Bellardi's explanation, the virtual walls in *Habitat's* digital rooms only turn opaque when Graziadei moves within a clearly defined area, and this masking effect is disturbed through the computer's light sensitivity. However, during her further work in *Habitat's* setup, the performer realizes that instead of being entirely instable, the masking effect rather has adopted a different kind of regularity. While moving in the 'masking area', she makes the following observation:

I noticed that the [virtual walls'] flickering was most critical when I was moving at the edges of the opaque area. Sometimes the system would get really crazy then ... so I decided to position myself more clearly in the masking zone, and this finally meant that I had to move a lot at the back of the dance floor. That was not my initial plan because if the [video] camera captures you from the front, it's less interesting to work with the depth of the space ... but here I had to do it, because I wanted to work with the masking walls, and moving in the back seemed the only way to keep the walls under control. I also noticed that the flickering was less intense when I decelerated the pace of my movements ... so I ended up working at the back, and moved slower than I finally intended, but that way the walls became more reliable.¹⁴⁶

Graziadei describes that instead of rendering the tracking procedure completely unreliable, the computer's light sensitivity has rather altered the size and characteristics of the masking area. In other words, the introduction of the new infrared camera and the z-buffer in *Habitat's* network has altered *Kalypso's* tracking script. To assure the tracking of her body and its movements, the performer hitherto needed to move within a clearly defined, relatively large area on the dance floor. This situation changes when she wants to make her video image perform behind opaque walls, as for the specific masking effect *Kalypso* only tracks Graziadei when she moves in a more restricted area, which is furthermore located at the back of the space, and at decelerated speed. Here, *Kalypso's* script has thus changed: it now requires that Graziadei adapts her individual program of action and orients herself towards the new masking area if she wants to assure a clean tracking procedure and control the masking effect. The dancer thus translates her program of action from 'moving in the masking area' to 'moving at the back of the masking area at decelerated speed'. Through the translation of (a part of) her movements'

¹⁴⁶ Interview with Renate Graziadei, 17.12.2010.

characteristics, the performer can realize her goal of rendering the virtual walls' masking effect more reliable. In this sense, by adapting her gestural language Graziadei presents LaborGras' gateway to the achievement of their artistic aim, which is to eliminate the walls' flickering reaction. As a result, Graziadei's negotiations with *Kalypso's* modified script mediate the performer's choreographic activities and choices, as they affect the orientation and intensity of her movements. This way, the software thus impacts on the aesthetics of *Habitat's* final performance. Through its modified script, *Kalypso*, together with the z-buffer, the new infrared camera as well as performer Graziadei and LaborGras' artistic aim, thus gives shape to *Habitat's* final choreography.

The preceding sections have shown how the technological tools exert creative agency by directly and indirectly co-forming the rehearsals' rhythm and the creative course of action. We have seen that these dynamics required a considerable amount of efforts from the involved artists and transformed their creative goals. In the following, we will see that yet another friction emerges when the group installs the technological setup in the theatre venue where *Habitat* is going to be premiered.

3.2.6 Introducing playful approaches to "flickering walls" through a mask activity indicator

Five days before *Habitat's* premiere, LaborGras move the technical setup to the theatre venue in which the piece is going to be performed. Together with the theatre staff, software engineer Frieder Weiss and programmer Martin Bellardi install the computer equipment in the performance hall. Once the setup is reassembled, performer Renate Graziadei starts moving in the digital environment to 'test' whether it functions according to plan. To their surprise, during the performer's try-outs the artists notice that *Kalypso* does not work in the foreseen way, as an already familiar problem has returned: the virtual walls are flickering again. According to Bellardi, the situation is due to the fact that the computer system has been moved to another place with different characteristics than the studio space. More specifically, some of the theatre hall's features irritate the tracking procedure anew.

When we moved to the theatre ... the new space changed things again. The theatre lights were different from those in our studio [and] so was the floor's surface. This disturbed the tracking [process], and the virtual walls became unreliable again. We tried to fix the problem through some programming, and Renate tried to find

*out whether she could avoid the flickering through moving in specific parts of the space. But none of that worked, so we couldn't help it.*¹⁴⁷

Through the relocation to the theatre venue, *Habitat's* network has again transformed, as certain actors that belong to the studio space such as the lighting system and the floor have been replaced by the equipment of the theatre hall. Similar to the situation described in 3.2.5, these new actors are consequently causing the undesired side-program of the virtual walls' flickering reaction. Just like in the preceding rehearsal phase, LaborGras still desire a realistic functioning of the virtual walls, and performer Graziadei feels the need for a "reliable"¹⁴⁸ tracking function. *Kalypso's* association with the theatre's lights and floor has thus brought forward anti-programs to both the artistic collective's desire for visual realism and performer Graziadei's need for a stable tracking procedure. To realize their creative goal anew, LaborGras' artists invest efforts by exerting various strategies to 'tame' the masking effect's instability. As reported in Bellardi's account, he and multimedia artist Weiss try to solve the problem through particular programming activities, and dance Graziadei reverts to the already familiar strategy of trying to render the masking effect more stable through moving at the back of the space. However, this time neither the dancer nor the two programming specialists can solve the issue: despite the artists' different undertakings, the virtual walls continue flickering. Contrary to the previous rehearsal situation described in 3.2.4, LaborGras thus cannot eliminate the undesired jittering effect. As *Habitat's* premiere is approaching, the situation causes a considerable problem to LaborGras, as the rehearsal process stagnates. Graziadei explains:

*It was just not possible to work properly in the theatre space because I would never know whether the [virtual] walls would cover [my video image] or not ... to me this unreliability was extremely distracting, it made me feel insecure again. And it was a huge issue for the group because the [virtual] spaces would just not look realistic anymore when [my image] was running into those transparent walls. So we really needed to fix this because we needed the time for rehearsal, and there was not much time left ... and then Frieder came up with this new tool that really helped us out.*¹⁴⁹

¹⁴⁷ Martin Bellardi, 16.12.2010.

¹⁴⁸ Renate Graziadei, 15.12.2010.

¹⁴⁹ Interview with Renate Graziadei, 17 December 2010.

Graziadei's account shows that because the time available is limited, the group is urged to find a solution to the virtual walls' problematic functioning as neither the dancer nor LaborGras' other artists are willing to compromise their creative aims. With *Habitat's* premiere lying only a few days ahead, the artists however decide not to spend further time searching to correct the deficient tracking procedure. Instead, programmer Weiss develops a new tool which is supposed to solve the current problem in another way: he adds a 'mask activity indicator' to *Kalypso*. This new feature demonstrates at which moment the virtual walls' masking effect is activated and when it is not. It takes the shape of a black bar which appears on the computer screen shortly before the masking effect is functioning, and it remains invisible when the virtual walls do not turn opaque. With the help of this means, the dancer can thus know whether and at which moment the virtual walls are able to cover her video image already before she moves in the respective tracking space. This way, performer Graziadei can avoid that her video image walks into the virtual spaces' walls when the masking effect does not function. And indeed, the new tool helps the artists and especially dancer Graziadei to cope with the situation, as the performer reports:

The bar gives me some security in my performance. When I see it appearing, I know that I can make my [video] image move behind the [virtual] walls because they will hide [my image]. And when the indicator doesn't appear, which means that the walls won't cover my image in that specific situation, I simply move to other places in the space ... this way I can make sure that I only move in the walls' tracking zone when I see the bar, so it means less risk to me. [The indicator] prevents me from running into a transparent wall. And that also means that the virtual spaces appear realistic again, because they hide [my image].¹⁵⁰

So again, shortly before *Habitat's* premiere, a technical actor in the piece's network undergoes further changes: the artists' desire to control the walls' irregular functioning, the dancer's need for more reliability in the masking effect and the extreme time pressure bring the modification of *Kalypso* forward. In this phase, the technology is again adapted to solve an artistic problem, as the new indicator tool alleviates Graziadei from feelings of insecurity. Through this freshly developed device, the software program *Kalypso* is altered to meet the performer's needs. This way, *Kalypso's* expanded version furthermore bears the potential to help LaborGras achieve their creative interest, because if Graziadei only moves behind the virtual walls when they turn opaque, the digital spaces regain their realistic appearance. Once again, the technology is modified in order to comply with the

¹⁵⁰ Ibid.

artists' creative interests. This leads me to ask whether the changes in *Kalypso* also reverberate in other parts of *Habitat's* network. And indeed, when the dancer starts working with the new feature, she interestingly rather quickly notices that her perception of the walls' irregular opacity changes. Thanks to the mask activity indicator's signal, the flickering effect loses its "unreliability" in Graziadei's eyes as it turns into a predictable reaction for the dancer. In this sense, the new indicator shapes the relation between Graziadei and *Kalypso's* tracking mechanism (cf. Akrich, 1997:216). As the recent feature is introduced quickly before *Habitat's* public performance, the performer intensely rehearses with it during the following days to get used to working, and thus to associate, with *Kalypso's* mask indicator. This phase interestingly explicates that the interaction with the new tool has concrete consequences for Graziadei and her work. The performer notices that dancing with the mask activity indicator adds a spontaneous and even playful character to her performance, which she describes as follows:

Once the indicator was there, I suddenly found it quite exciting not to know whether the mask would work properly or not. Because I couldn't foresee when the bar would pop up I really had to be in the moment ... so I always had to take the mask's [indicator's] status into account. For example, if I wanted to involve the [opaque] wall in my performance but the indicator would tell me that the mask was inactive, I had to react really quickly and change my ideas ... I needed to react on the spot ... so at one point I felt like I was playing with the mask's instability.¹⁵¹

Graziadei's story shows that her association with the indication bar has changed her programs of action, as her activities do not circulate around the aim of 'moving in the tracking area' anymore but are instead focusing on following whether the mask indicator's black bar appears on the computer screen. Through this new program of action, the performer spontaneously decides in which direction to move on the dance floor. In this sense, the dancer's interaction with the mask indicator structures part of her choreography. Because of this dynamic, Graziadei considers her movement sequences as more improvisational than before as the indicator's black bar signals her "on the spot" whether she can occupy the masking area or not. The mask indicator turns into an improvisational element for Graziadei. This development marks a considerable change in her approach towards the role of technological tools in (digital) dance performance, as instead of trying to control the device's function and activities as has hitherto been the case, the dancer lets the rhythm and structure of her performance guide by her work with *Kalypso's* new mask activity indicator. This unexpected development shows that again,

¹⁵¹ Ibid.

the artists' interaction with the digital tool *Kalypso* shape *Habitat's* structure and therewith its final form. Two days later, *Habitat* is premiered.

3.3 Conclusion

In this chapter I have proposed to explore the creative processes of two concrete digital dance productions as procedures of collective performance making. I have followed the creations of *loopdiver* and *Habitat* through the conceptual lenses of the ANT-informed theoretical framework developed in 2.3. I have argued that considering digital dance performances as actor-networks makes possible to articulate the complexity inherent in procedures of (digital) dance making as it allows to follow the individual actors' activities within those creative webs, and by this means to trace the dynamics that make these networks evolve. In line with this research project's interest in digital technology's status in rehearsal processes, I have focused on the ways in which specific digital media integrated, co-constituted and -shaped the creative networks of the two case studies. By comparing these two examples I could furthermore show that the involved artistic participants adhered to contrasting stances in which technology was either invited to impose itself on the artistic process (*loopdiver*), or in which it was supposed to be controlled by the creative actants (*Habitat*). I have suggested that both conceptions, which are generally very present in the field of digital dance as chapter 2 has shown, can be challenged by the examination of the pieces' respective creative processes with the help of concepts such as goal translation, program of action and mediation. In this sense I have argued that describing the concrete rhythms and activities in which digital media engage in and co-shape creative processes in digital dance allows to formulate technology's creative agency, which I suggest as an alternative to conceptions of dance-technology relations in which technology is seen as a non- or anti-artistic element.

This chapter's analysis has shown that my ANT-related conceptual framework allows to understand digital dance artworks as dynamic constellations between various interconnected human and non-human participants. I have demonstrated that *loopdiver* and *Habitat* took shape during collective dynamics, that is diverse interactions between human participants such as the artistic directors, a choreographer, performers and multimedia programmers but also with non-human actors like programming environments, light bulbs, rehearsal schedules, infrared cameras and reflective theatre floors. In this context, I could identify the digital software programs *Isadora* as well as *Kalypso* and the programming environment for virtual spaces which are respectively employed in *loopdiver* and *Habitat* as non-human contributors to the creative networks. In this light, the mentioned objects as well as the technological devices present

participants in the collective dynamics of digital dance making. The creative processes of *loopdiver* and *Habitat* appeared as non-linear, intricate procedures with unexpected turns in which not only artistic decisions but also mundane issues such as a computer program's light sensitivity and a reflecting dance floor impacted on aesthetic aspects of a choreographic artwork.

Troika Ranch's work with the looping tool and LaborGras' involvement with both the software program *Kalypso* and the virtual spaces has revealed that while the technological tools entered the creative networks in order to make the realization of specific artistic goals possible, the devices subsequently co-generated diverse dynamics by engaging with the various actors of the respective creative webs. During the creative procedures, *Isadora* and *Kalypso* for instance affected the goals of the artistic directors and the performers' or programmers' individual objectives. These changes partly occurred through the artists' mere interaction with the technological tools, but the software programs also created situations of friction by requiring negotiations that brought forward new activities of use or the mobilization of further technical actors. I have shown that these different interactions shaped the rehearsal procedures by influencing their pace, the course of action and the artists' rehearsal practices. The technologies' various entanglements moreover formed *loopdiver's* and *Habitat's* performances on the level of their choreographic structures, materials, aesthetics and, in the case of *loopdiver*, their artistic theme. Here I found out that the tools co-shaped the creative procedures in ways that I categorized as direct and indirect. In both *loopdiver* and *Habitat*, the tools for instance directly co-formed the creative processes by making the artists change their intentions, or by creating unexpected conflicts through altered scripts, as was the case for *loopdiver's* and *Habitat's* dancers who consequentially adapted their working practices and choreographic language. However, the software programs *Isadora* and *Kalypso* also indirectly co-shaped the creative procedures and results, for example by presenting gateways to other actors such as *loopdiver's* multimedia specialist Coniglio whose loop score significantly formed the performance's choreographic structure, or to the looped light bulbs through which *loopdiver's* performers were able to increase the accuracy of their movements. *Habitat's* software program *Kalypso* indirectly formed the creative course of action as it caused negotiations between programmer Bellardi and dancer Graziadei, and it mobilized further technical equipment like a new infrared camera which in turn affected the artistic team's creative goals.

While I could observe the different ways in which digital technologies influenced the creative process and results, my conceptual toolkit also allowed me to discover that the technological tools themselves were equally transformed during their participation in the respective networks. *Isadora* and *Kalypso* were for instance adapted to artistic interests as they were equipped with supplementary features such as the looping tool

(*Isadora*) or the z-buffer (*Kalypso*) through which the technological effects complied with the artistic directors' creative visions. *Isadora's* and *Kalypso's* video displays were furthermore completed with didactic indications for the performers. These extensions in turn induced changes in the tools' characteristics and scripts. I could moreover observe that in the course of the rehearsals, the software programs' roles altered, as they turned from problem-solving participants for the realization of one artistic goal to an obstacle in the next situation while presenting gateways for influencing the creative result for yet other actors. The tools were thus differently handled and perceived by the various participants.

The preceding paragraphs make clear that following and describing the collective dynamics emerging in *loopdiver's* and *Habitat's* respective networks with my ANT-inspired framework has allowed me to articulate how the employed digital technologies unfolded their creative agencies in two specific cases of digital dance making. I could show that the devices participated in and co-shaped the complex dynamics of two creative webs in which the different actors instigated transformations in each other in various manners. Interestingly, these findings contrast with the involved artists' own perceptions of technologies' roles in dance creation which, as I have already mentioned, show dualistic tendencies. While the artistic group around *loopdiver* invited the digital looping tool to dominate the creative activities, we have seen that the device itself was adapted on different levels throughout the rehearsal process. My analysis of *Habitat's* production has shown that despite the creative directors' desire to control the tools' functioning, also the human participants needed to invest and transform their practices and artistic ideas to be able to work with the technologies in question. In this regard, my analysis of the two case studies discloses an alternative perspective to techno-instrumentalist and deterministic viewpoints because it indicates that the rehearsal and creative procedures rather resembled moments of negotiation and continuous transformation in which neither of the participating actors remained the same. As we have seen, instead of entirely determining the course of action or being exclusively directed by human actors, the technologies in *loopdiver* and *Habitat* engaged in the pieces' makings by allowing specific developments, for instance through the roles as gateways and problem-solving entities, and preventing others, for example by presenting obstacles to the achievement of specific artistic goals. (Digital) technologies thus rather present mediating participants in the creative processes of digital dance instead of directive or neutral instruments.

On another level, analyzing the two rehearsal processes as collective undertakings with concepts inspired by ANT suggests that the evolution of a virtual performance production is not finished with a piece's premiere. While it is a common practice that choreographic artworks are adapted on different levels after their first presentation, for instance on the level of the choreographic material and transitions or

the stage setting including light and music, the two case studies indicate that the replacement of specific actors can transform the performance in further, unexpected ways. In *Habitat* we have for instance seen that a change in location, notably the move from the dance studio to the theatre venue, and the consequent substitutions of particular equipment has induced alterations in the performance's choreographic concept and shape. This situation may recur when *Habitat* is presented in yet another theatre hall. Also *loopdiver's* performance might alter, for instance when one dancer needs to be replaced by another performer, as this person would be asked to imitate the videotaped and looped movements of her predecessor because the substitute might not move in exactly the same way as the person recorded on video. Also, the group might have difficulties to recall the highly intricate details of the looped choreography in the near future. Therefore, the performers might decide to omit certain steps or movements in order to present a coherent piece. In this ANT-inspired perspective, the performance of a dance piece appears as but one moment among many in the life of the dynamic networks that constitute a choreographic artwork. This underlines the importance of a thorough understanding of rehearsal processes even further.

4 Exploring the relations between dancing bodies and digital technologies

As a dancer I inherently understand the realm of the body. I had no idea that technology would enter into that understanding until I chose to entwine myself with the machine. I was altered, and so was my body as it expanded to include sound, light and image.

(Stoppiello & Coniglio, 2003:450)

One day after *Glow's* presentation, I met performer Sara Black for an interview. During our conversation about her physical work with new media devices she told me the following:

When we started working on Glow, I got in touch with digital dance technology for the first time ... and it was only then that I understood how complex performing with this medium was. I mean, when you see the piece now, the way I dance with the technology, I guess it looks all flowing and intuitive, but it was not like that in the beginning ... I first needed to get intimate with that media world.

Sara provided some details about her experience:

First of all, I'm performing in the dark, and I only have these visual animations around me, which felt really strange in the beginning. For instance, I had the impression that the floor would move while I was performing on it, so I got quite easily lost ... also, the projections are reacting to my movements, but at first I couldn't figure out how they would respond to what I did. So when I started dancing, some effects would for example be very slow, which would irritate me when I was moving fast. Other [effects] then would have lots of speed, which felt quite disorienting after working with the slow projections. It just didn't feel natural at first ... I was losing my usual bearings in space ... for me it did alter things because I had to [find out how to] deal with these restrictions ... it really took some time and practicing until I was able to move with the technology.

During the rehearsals I learned that when you have these barriers, you have to explore them and shift your [bodily] habits ... that might be hard sometimes ... but depending on how you work with these restrictions they really force you to try something new ... that changed the way I make and feel the movement. And then,

at some point the technology is just a part of you and a part of this duet you are going to perform. Once I had reached that moment it became a real freedom to dance with the technology.

Sara's story intrigued me because according to the dancer, the fluid and balanced interplay between her body and *Glow's* live imagery that I had witnessed during the piece's performance turned out to be the result of an intense training procedure. In her report Sara described her bodily work with new media as a complex undertaking that generated moments of disorientation, or "restrictions" with regard to her physical routines. These "barriers" in turn had challenged and transformed Sara's spatial orientation and the rhythm of her movements. However, the dancer also explained that adapting to *Glow's* lighting imagery allowed for new physical possibilities and experiences.

These observations struck me because they defy different theoretical conceptions of body-technology relations in dance art. Since the beginning of the 20th century, a dualistic understanding of dancing bodies and technological devices was and still is very present among dance scholars and practitioners. These perspectives tend to either testify to an essentialist notion of the (performing) body or conceive of technological tools in either deterministic or instrumentalist terms. According to these views, dancing bodies are incompatible with technological tools, or they are either taken over by machines or use them at their proper service. Significant for these approaches is that they consider human-technology constellations to stand in relations of domination. The example of *Glow* however shows that neither of these viewpoints holds, as Sara neither entirely adapted to the lighting effects' demands, nor did the reactive video imagery allow her to freely execute movements at her will. In her report, the dancer describes that the work with the digitally controlled projections had altered and expanded her physical experience through her active bodily engagement. Sara's descriptions thus suggest that she found herself in a more intricate and relational connection with the technology employed.

Sara's experience seems to be reflected by another, more recent view on body-technology constellations in dance. In order to avoid the tensions inherent in the dualistic perspectives, different scholars in the field of digital performance suggest that dancing bodies and computer technologies are comprised in processes of "relational dynamics" (Schiller, 2006). The contributors to this discourse propose that in digital dance practice the dancer's bodily experience is reconfigured instead of abandoned or superseded. In their view, the dancing body finds itself in a fluctuating mode in which digital technologies interfere with the performer's physical perceptions and movement sensations. This perspective so far comes closer to Sara's descriptions as her bodily

experience was gradually transformed and affected on different levels through her interaction with the digital video imagery. However, the contributors to the relational approach use a vocabulary of fluidity when referring to the suggested changes in the dancer's physical sensations. Sara's story nevertheless shows that her intuitive relation with *Glow's* video projections only developed after a series of intense bodily negotiations which themselves were generated by considerable frictions that destabilised her physical habits. Yet, those situations of (bodily) irritation are only marginally treated by the different authors contributing to a relational understanding of body-technology constellations in digital dance. Focusing on perception-oriented and aesthetic analyses of staged performances, they do not study the complex procedures and practices through which the propagated fluid bodily state comes about, nor do they investigate the role played by digital media in these processes. Sara's example however suggests that a closer examination of the dancers' physical negotiations during the rehearsal procedures could allow for a more differentiated understanding of the ways in which virtual media integrate bodily experience in digital dance. It could provide answers to the question of how physical perception is constituted in digital performance. How can the 'relational dynamics' between dancing bodies and digital media be qualified? And which status do new media have in these procedures? In order to apprehend the relational dynamics in digital dance, an appropriate conceptual framework could pave the way towards a more comprehensive understanding of bodily processes in virtual performance. In this chapter I will therefore contribute to the approach of 'relational dynamics' in digital dance by developing a theoretical vocabulary that allows researching the emergence and nature of the relations between dancing bodies and new media.

In the previous chapters, I have designed and applied an ANT-informed approach to answer my research questions relating to technologies' role in the collective creation of digital dance artworks. Those concepts were very helpful for a description of how the artists' actions, their intentions but also the technological tools themselves were continuously mediated during the rehearsals. As already explained, the present focal point however concentrates on the dynamics in which digital media integrate the performers' bodily experience. As the mediation of (physical) experience cannot be articulated with an ANT-inspired framework because the latter's scope is centred on the mediation of action and intention, I need a new theoretical approach to answer the research questions raised in this chapter. For this reason, I will construct another conceptual toolkit that makes possible to examine the relational bodily processes in digital dance. First of all I suggest to revert to theory from dance studies that deals with the development of performers' bodily experience. Especially Susan Foster's theory of dancing bodies describes the different layers of embodiment involved in the gradual construction of a performer's body. Second, I also refer to postphenomenological approaches to human-technology relations. Because the field of postphenomenology

deals with the ways in which (digital) technology can be entangled in human perception and bodily experience, it provides useful concepts for the present research endeavour. In this context, the works of two postphenomenological theorists appear especially appropriate: Don Ihde's categorisation of human-technology relations and Mark Hansen's concepts on transformations of bodily experience through and with digital media will allow me to articulate how technologies are involved in the making and sensations of (performing) bodies.

Based on dancer Sara's experience in *Glow*, the framework will be constructed on the following criteria: it will provide concepts that suggest a processual approach to physical learning and allow to conceive of bodily perception from an experiential perspective. The theoretical toolkit will furthermore include concepts that help to understand situations of friction and fluidity in bodily experience and provide tools to apprehend the role of new media in body-technology constellations. In this context, I will pay specific attention to the ways in which (digital) technology can be entangled in physical perception and processes.

The current research undertaking also leads me to specify the idea of physical experience with the notion of embodiment. While this term is differently defined according to various scientific disciplines¹⁵², it broadly refers to our physical perception and presence in our environment, and our bodily interaction with the world around us (Gallagher, 2005). Following the phenomenologically and psychologically inspired approach by philosopher Shaun Gallagher (ibid.), I understand embodiment as the processes through which we are in the world and perceive it through our bodies, but also through which our environment can act on our bodies and our physical consciousness (ibid.).¹⁵³ This notion describing bodily experience, I argue, is especially pertinent in this research context as it links physical perception to humans' relations with their surroundings. Talking about dancer Sara's embodied experience in *Glow's* digitally equipped setting thus not only comprises her actual physical sensations but also refers to the fact that the latter are resulting from her bodily presence in and interaction with the reactive environment. In the course of this chapter, we will furthermore see that this notion of embodiment can be further specified with postphenomenological theories of body-technology relations, which underlines its relevance in this research context even further.

In the first part of this chapter I will present the discourses that have accompanied artistic experiments exploring the relations between dancing bodies and

¹⁵² Embodiment is a term frequently used in the scientific domains of philosophy, sociology, cognitive science and psychology (Gallagher, 2005).

¹⁵³ In his work, Gallagher provides a more detailed definition of the multiple components of embodiment, which I nevertheless do not consider as relevant in the context of this chapter.

technologies, and which partly persist today. Currently, written contributions on human-technology interaction in digital performance still adhere to these legacies of thought with dualistic tendencies. I will discuss these approaches by showing that their conceptions of either bodies or technologies reveal as problematic for a differentiated appreciation of bodily experience within digital dance. This part will show the necessity to escape the dualistic dilemma in digital dance theory and construct alternative, more relational perspectives that allow apprehending the intricate nature of body-technology constellations in performance art.

As an appropriate alternative I will present the approach of 'relational dynamics' which postulates a fluctuating mode of embodiment. To render this view more operable, especially in the context of rehearsal practices, I will suggest specific conceptual tools that can help towards a more detailed understanding of relational embodiment in (digital) dance. As explained above, the framework I am going to propose more particularly builds on theoretical approaches deriving from the fields of dance studies and postphenomenology. The resulting conceptual toolbox presents the theoretical backdrop for my subsequent description and analysis of the dancers' embodied experiences in the rehearsals for *loopdiver* and *Habitat* in chapter 5.

4.1 Dualistic understandings of body-technology relations in dance art

Before delving into the construction of a conceptual framework for a relational understanding of human-technology constellations in digital dance, I will in this subchapter present different perspectives on choreographic practices with technologies that derive from earlier developments in the art of physical movement. These viewpoints are of interest to this study because they present dualistic legacies of thought that are still prominent in a considerable number of contributions dealing with the issue of embodiment in digital dance. This subchapter thus provides an introduction and historical background to the origin of current tendencies in the discourse on digital performance and discusses the relevance of these approaches for an evaluation of present virtual dance activities. I will show that choreographic practices at the beginning of the 20th century reflect that the artistic community of this epoch was already torn between a fundamental fascination for mechanical aesthetics and deep-seated fears of disembodiment through mechanization. Similar thoughts emerged again at the end of that century during the advent of digital media in the arts scene. It will become clear that these developments reflect one-sided notions of both the body and technology that are

problematic for a nuanced understanding of the complex nature of choreo-technical entanglements.

4.1.1 Binary conceptions of dancing bodies and technology in the age of mechanization

In the early 20th century, dance artists adhering to progressive art developments such as Russian Constructivism, Italian Futurism and the Bauhaus movement¹⁵⁴ started presenting and reflecting the socio-cultural impact of daily life's increasing industrialization in their staged productions. Considering the interaction between man and machine as a subject for artistic exploration, these dance makers specifically created mechanical aesthetics by situating the performing body into geometric stage sets, equipping it with mechanic costumes or by submitting the dancers to machine-like movement styles. With this staging of human-machine interaction, the avant-gardist dance makers meant to express their faith in technological progress, celebrating "the machine as liberator, not as enslaver", as in their eyes the mechanic rhythms symbolized the human future (Kisselgoff, 1985). This way, the choreographers chimed with the *zeitgeist* of their epoch, as the idea of technology's reign over man was very prominent (Gündüz, 2012).

Nikolai Foregger's 'mechanical dances' for instance displayed performers who imitated industrial machines and electric processes like transmission chains (Gordon, 1975). The Russian ballet master furthermore developed a new system of physical training termed *tafiatrenage*, in which he conceived "the body of the dancer as a machine and the muscles of volition as the machinist" (quoted in Goldberg, 2006:39). In a similar vein, Russian theatre maker Vsevolod Meyerhold's Taylorism-inspired 'bio-mechanical exercises' trained and disciplined performers of all kinds in executing movements in extreme precision through scientifically informed methods (*ibid.*). Also geometrical costumes which restricted and shaped the dancers' movements became increasingly present on theatre stages. Among the most prominent examples figure the *Triadic Ballet* by stage designer and Bauhaus member Oskar Schlemmer. In this production, the performers were equipped with elaborate suits that transformed the human outline into

¹⁵⁴ These avantgardist art movements emerged at different places at the beginning of the 20th century. Inspired by social upheavals, their adhering artists aimed at breaking with aesthetic traditions by creating art forms that reflected the characteristics of the technicised and dynamised modern life. In this context, specific focus was directed towards abstraction and movement.

abstract, geometrically arranged shapes. Through their setup, these costumes converted traditional dance movements into monotonous and automated motion sequences and thus turned the performers into puppet-like figures moving in mechanical accuracy (Droste, 1991:102; Goldberg, 107) (see figure 4.1). The avant-gardist enthusiasm for the machine as aesthetic element even reached a point at which stage designers such as Enrico Prampolini and Edward Gordon Craig heralded the human actor's replacement by automatic apparatuses (Prampolini) or a mechanically driven *Übermarionette* (Craig) (Rood, 1986; Goldberg, 2005).

In these examples of machine-oriented choreographic practices, mechanical principles are employed as powerful means to alter the human form. Here, the performing body is presented as subject to machinic laws of motion and seemingly passively adopting the logic of the apparatus. While the idea of the body's domination by the machine was enthusiastically received in avant-gardist circles, it was understood as a compelling danger by other performance artists. The latter's fear of alienation influenced alternative reactions and developments, for example the evolution of modern dance.

Refuting the industrial spirit of their times, several dance makers considered the increasing mechanization and concomitant objectification of the human (dancing) body as a threat to their art form. Countering the artificiality and rigorous technicity of classical ballet and the avant-gardist staccato-like movement aesthetics, choreographers such as Isadora Duncan established modern dance forms that stressed the authentic character of physical gestures. Orienting the performer's motions towards the rhythm of breathing and gravity, the dance makers' new movement style emphasized the body's organic qualities. In Duncan's work, this aspect was furthermore underlined by loose-fitting costumes and bare feet which reflected the 'natural' flow of simple gestures. For the choreographer, the harmonic and inner movement experience primed over any aesthetic conventions; therefore she claimed her dance style to be free and authentic (Au, 1988).

Through its emphasis on the performing body's naturalness, the artistic movement of modern dance presents the human corpus as an organic refuge from the mechanizing and alienating effects of body techniques and machines. Conceived as "the natural relict in an alienated society" (Klein, 2000:8), the body is thus described as authentic, which



Fig. 4.1: The photograph presents the replica of a costume designed by Oskar Schlemmer for his *Triadic Ballet*.

stands in stark contrast with the industrialized world and its technologies.¹⁵⁵ The development of modern dance therewith depicts an image in which the performing body is seemingly untouched by any techn(olog)ical intervention and in which organic and mechanical worlds remain incompatible. Here, mechanization presents a threat to the seemingly 'given' performing body, as any machinic intervention would harm its authentic status.

The early 20th century witnesses two different and contradictory notions of body-technology interaction in dance art: on the one hand, the human figure operates according to the dictate of machines, and on the other, the (dancing) corpus presents an organic site of salvation from the relentlessly industrializing world. In both cases, technology is understood as a determining force. These approaches outline situations in which the dancing body is either subject to mechanical logic or refuting technological heteronomy altogether, and therewith present very one-sided and mutually exclusive perspectives on the performance with technologies. The dance world also experienced dualistic ideas of body-technology relations in a later stage, namely during the advent of digital dance at the end of the 20th century.

4.1.2 Digital dance opposing disembodiment in the 1990s

While choreographic practices were extended through mathematically generated procedures and dancing bodies connected with wearable objects and prostheses since the 1960s¹⁵⁶, these (rather marginal) avant-gardist experiments received only little attention in the dance field. The fast-growing use of computer-assisted technologies in dance at the end of the 20th century however provoked all the heftier reactions. Because the increasing digitalization inspired dance makers to integrate various computer devices in their works, the dancing body was progressively put into contact with motion sensing devices, 3D modeling software, motion data analysis techniques and placed in interactive, motion capturing software environments (Salter, 2010). Through its intimate connection with digital devices, the dancing body found itself at the threshold to virtual

¹⁵⁵ The modern insistence on the dancing body's authenticity however seems to omit that instead of being a given and unmarked entity, the performing corpus is already highly shaped through a long and intense training procedure (see subchpt. 4.2). Furthermore, the question remains whether artists such as Isadora Duncan are aware of the fact that their ideals of a 'natural' movement style simply presented yet another aesthetic direction according to which the dancing body was shaped and staged (cf. Evert, 2003).

¹⁵⁶ In 1.1 I have provided an overview of the development of technologies' use in dance art.

realms. Through the performers' confrontation with virtual spheres, concerns of technology's compelling power re-emerged.

The dance-tech experiments at the end of the 20th century evolved at a time in which media artists, influenced by the postmodern notion of the body's obsolescence, celebrated disembodiment as liberating because it allowed access to virtual realms. In this light, the physical art form of dance seemed to reflect the stakes of corporeality and embodiment in the information age *par excellence*.¹⁵⁷ In this context, the notion of disembodiment turned into a polarizing issue in (digital) dance practice and discourse. The idea of placing the performing body at the threshold to virtual spheres was not always enthusiastically received because it provoked fears of technology's alienating character. Especially motion capture techniques inspired certain dance practitioners to consider the respective tools as means to extract movement from the performer's body, or even as "theft of spirit" (Kozel, 2007:236). Their fear of separating the dancer from her dance led artists and theorists to draw 'doom scenarios' announcing the total disappearance of the dancing body and its replacement with digital or robotic mechanisms (cf. Dixon, 2007; Kozel, 1994; Salter, 2010). These anxieties concerning the body's subjugation and loss through its encounter with virtual tools persist to the present date (cf. Francksen, 2013; Kozel, 2007).

In the course of the 1990s, these concerns were countered by other digital performance practitioners who developed a new discourse by stressing the performer's sensory experience when working with digital media (ibid.). In order to do away with the preponderant deterministic stances in body-technology debates, they claimed that digital technology presents an opportunity for the body, not a danger (Ramsey, 1996) by appealing to the origin of perception in the physical body. Considering (mostly interactive) digital environments as involving the participation of the entire body, these artists and researchers argued that interactive computer systems allowed the body to unfold into its technological surroundings (cf. Evert, 2002; Klein, 2000). In this phenomenologically inspired perspective, digital media are understood as extensions of the physical dancing body, as "expansions of the kinesphere" (Evert, 2002:44) which make an enhanced dance experience possible; it is thus "*through flesh and not in spite of it that we gain access to the virtual*" (Kozel, 1994; original emphasis). Here, primary agency is granted to the dancing body while technologies rather appear to be at its service. It becomes clear that this phenomenologically based view bears essentialist and instrumentalist traits as it acknowledges digital tools a merely prosthetic function. In this

¹⁵⁷ For instance, in the mid-1990s two subsequent issues of the German art journal *Kunstforum international* dealt with the question how artists aesthetically explore their work and the human body's role at the intersection with virtual media (Rötzer, 1995; 1996). It is striking that a considerable amount of the published articles deal with the topic of dance and digital technologies.

view, computer technologies appear as neutral instruments for physical expansion. While this approach succeeded in avoiding deterministic views on the interaction between the human body and digital media, it still does not allow to describe the complex interactions between organic bodies and technological tools. In the case of *Glow*, this perspective might for example explain in how far reactive media reflected or extended Sara's movements, but it does not allow to analyse how and on which levels the dancer's bodily experience was altered through her work with the virtual devices.

This subchapter has shown that the artistic experiments combining performance and technologies in the past century are marked by dualistic stances which grant determining power to either the tools employed or to the dancing body. In this context it is noteworthy that digital dance artists and researchers currently search for a different angle that allows to appreciate the complex nature of body-technology connections in performance. They specifically propose a perspective which conceives of both performers and technological tools as comprised in dynamic procedures. In the following, I will therefore present an approach to which I refer to as 'relational dynamics', and which preents the starting point for my construction of a viable conceptual framework for investigating embodied processes in digital dance. Chapters 4.3 and 4.4 will then be dedicated to the construction of a conceptual framework that renders the approach of relational dynamics operable.

4.2 Fluid transformations: current notions of embodiment in digital dance

Suspecting that "this feigned, supposedly modern tension between the humanistic body and the dehumanized machine that has so occupied us may be ... a fabulous construction drawing a false line between poles that are always in the process of being blurred" (Salter, 2010:276), certain digital dance adherents currently strive for alternative perspectives on performance practices occurring at the threshold to or within virtual realms. Similar to their phenomenology-inspired precursors, they argue that digital technology does not stand for the body's abandonment or subjugation but that digital tools present means to discover yet unexplored physical possibilities and experiences (Portanova, 2005). However, instead of claiming that these new physical prospects unfold through the dancing body's simple extension (as has been argued from a phenomenological angle), contributors to the current discourse suggest technology's potential to affect and transform embodied experience (Broadhurst, 2007:187; Haffner, 2001). Key to this perspective is the conception that the dancing body is reconfigured through its contact

with new media (Broadhurst, 2007; Broadhurst & Machon, 2006; Birringer, 2008; Brown, 2006; Kozel, 2007; Schiller, 2006). In their works, the respective authors describe the dancing human corpus as in a state of “flux” (Broadhurst & Machon, 2009:2 oscillating between various conditions in which the physical and virtual are interwoven (Brown, 2006:98). In their view, it is notably in this fluctuating mode that “the embodied self is extended, hybridized and delimited through technologies” within digital performance (Vanhoutte, 2010:45-46). Digital dance scholar Isabel Valverde for example sketches the notion of “cyborg performers” in which the dancers appear as “perpetually mutable subjectivities” which are open to be affected through their interaction with diverse technological tools (Valverde, 2004:26-28). In a similar vein, digital performance artist and researcher Gretchen Schiller declares technologies to be “entangled in the manner in which we come to experience, understand and perceive movement” (Schiller, 2006:109). She therefore proposes to consider digital performance as events in which the dancing body and new media are comprised in “the fluid surprises of relational dynamics” (ibid.). Also digital dance philosopher Stamatia Portanova puts forward the idea of a “cyber-dancing body” which is continually in material passage and “altered, affecting and affected, rhythmically moving across its different states” (Portanova, 2005). The authors thus depict scenarios in which the performing body’s sensorial experience is transformed instead of being lost (Biringner, 2008:109); the body appears as a transitory construct which is shaped through its interplay with diverse technologies.

Contrary to the techno-determinist and -instrumentalist perspectives presented in 4.1, the approach of relational dynamics avoids dualistic stances. In this perspective, neither technology nor the body are presented as passive recipients, as both the dancing corpus and virtual tools seem to find themselves in a transformative relationship. In opposition to the deterministic idea, here technologies are involved in the rhythms of alteration, which implies that they do not always control the course of action. In the same time, the perspective of relational dynamics also avoids an instrumentalist view because it shows that the dancing body is undergoing changes through its interaction with digital tools. The authors thus escape dualistic positions by proposing a transformative understanding of the (dancing) body. They put forward an alternative notion of embodiment which renders the prevailing idea of the performing human corpus as a given entity obsolete. So far, this perspective promises a more differentiated view on the combination between dancing bodies and new media in digital performance because it puts emphasis on the relational nature of choreo-technical constellations.

Striking here is that the presented depictions of the performing body’s experiential reconfiguration are articulated in a vocabulary of fluidity: in the different scenarios, the human body finds itself in continuous transformation through its interaction with multimedia devices. *Glow*’s example however has shown that the fluid relation between dancer Sara and the reactive projections was the result of frictions and

moments of bodily irritations that needed to be negotiated. Although certain contributions to the discourse of 'relational dynamics' mention that similar moments of resistance occur during the production of digital dance works, this aspect is not dealt with in depth. This might be due to the fact that the current publications mainly consist in aesthetic apprehensions of the body's role in staged digital performances and therewith do not take into account the concrete processes through which the proclaimed bodily shifts occur. In digital dance literature, only a few authors mention that the fluidity in dance-technology constellations is preceded by experiences of resistance that cause moments of bodily irritation in the dancers.

In the foreword to their anthology on the combination of dance and media, scholars Martina Leeker and Söke Dinkla (2002) remark that dancers experience physical disorientation during their initial experiments in digital setups. In her study of the relation between dance and digital technologies in the 1990s, Kerstin Evert (2003) discusses the body's staging in performances employing motion capture. Referring to the example of Troika Ranch's production *In Plane*, she explains that the performer gains new possibilities because the 'mocap' system allows her to control video and sound effects onstage. In the same time however the dancer's range of movement is also limited as it needs to adapt to the material requirements of the motion capture suit, which turn out to be quite restrictive with regard to the performer's movement range. The motion capture tool thus both enlarges and restricts the dancing body's capacities, and the performer needs to undergo a long and intense learning procedure to deal with the new situation which can appear as overwhelming and complex (Evert, 2003:184). Evert explicates that this adaptation process causes shifts in a dancer's mentally and physically acquired movement vocabulary, and therewith expands the choreographic material. Also digital dance practitioner and scholar Susan Kozel (1994; 2007) reports on her work with motion capture and telepresence environments. She describes the initial experiments with the respective systems as situations in which the tools produced "a loss of control over the direction and momentum of movement" (Kozel, 2007:111) and caused "frenetic" situations of physical disequilibrium (ibid., 243). Kozel subsequently explains that she managed to overcome these moments of physical disorientation through negotiating with the technology's characteristics, and that this process led her to "[develop] a new relationship with my body" (ibid.). In her study of various types of interfaces in digital dance, also artist-researcher Isabel Valverde (2004) explains that the initial work with interactive digital systems can cause "temporary overwhelming and disorienting sensations" (57) in the dancers, to the point that they develop the feeling of "becoming foreigners to their own bodies" (80). This state of friction, Valverde explains, can only be surpassed by the performers through repetition and "skilled attention" to their bodies (80). During this process, the performers learn to adapt to the tools, which can require a considerable amount of work (406). This way the dancers can acquire new specialized

perceptual dimensions “in ways otherwise impossible” (57). According to Valverde, the state of being overwhelmed is accompanied by “an awareness of a new world within the body” (406). The previously mentioned authors describe that the situations of resistance between dancing bodies and new media are overcome through negotiations in which the dancer’s body adapts to the technological means, albeit without going into further detail.

At this point, dancer Nik Haffner (2001) becomes more specific when reporting on his personal experience with digital media by comparing his first encounters with virtual imagery with the wearing of pointe shoes. He explains that in the beginning, the shoes feel like a “drag” (295) that limits the habitual movement repertoire and causes physical pain. In line with Valverde, Haffner describes that with time the dancer’s body adapts to the footwear, for instance by developing callus, or by creating movements that make dancing with the shoes possible. However, he interestingly adds that also the shoes themselves become subject to transformation, as ballet performers become very creative to find individual solutions to “tame” their shoes (301). Haffner points out that dancers have developed individual techniques and use specific tools to make the pointe shoes adapt to their bodies. He describes that the shoes are treated with hammers, cutters, pliers or glue until they find themselves in the right condition. Through this process, the pointe shoe turns into an “intimate partner” that enables gestures which were previously impossible (295). Haffner argues that a similar process happens during the integration of media technologies in dance, because after initial problems (physical) possibilities emerge that could not be realized without technology (ibid.). Similar to the earlier mentioned authors, Haffner thus also acknowledges that the balanced relationship between dancers and (digital) media is the result of frictions and an ensuing process of adaptation. However, according to him, not only the dancing body but also technological tools are comprised in a dynamic of mutual transformation. Haffner’s example of the pointe shoe thus indicates that, to a certain degree, dancing bodies and technologies constitute each other.

By referring to moments of friction occurring in digital dance production, the researchers Leeker, Dinkla, Evert, Kozel, Valverde and Haffner enrich the discussion on embodied processes in digital dance as they provide insights into how the relations between dancing bodies and new media come into being. They address a notion that has not yet received much attention in digital performance literature. The authors’ claims that the work with new media is accompanied by situations of physical disorientation meet the story of *Glow* performer Sara Black presented at the beginning of this chapter. In her account, the dancer describes that her balanced physical condition is preceded by challenging moments of bodily confusion: the light projections initially made the performer lose her spatial bearings, and the peculiar speeds of the video effects irritated her personal physical rhythm. Furthermore, just like the digital dance authors suggest that the ensuing recalibration process can demand considerable efforts during a

performer's work and training, Sara reports that she needed to learn to deal with the medium by shifting her bodily habits. Both the written contributions to the idea of frictions and Sara's story thus suggest that it is worthwhile to investigate into the rehearsal phases that precede the staging of the apparently fluid bodily conditions in digital dance productions. In this context, further insight into the possible obstacles and transformations occurring during the choreographic integration of digital media would be helpful to assess the nature of the (bodily) resistances and transformations in the making of digital performance. Here, also the role of digital media deserves attention. While the status of technological tools in the discourse on the dancing body's remapping (relational dynamics) has been widely neglected¹⁵⁸, Nik Haffner (2001) makes an interesting proposal by suggesting that also digital media can be transformed through their interaction with dancers. This implication tends to consider that dancing bodies and virtual technologies are transformed in a symmetrical relationship as they mutually constitute each other.¹⁵⁹

The presented contributions of authors such as Susan Broadhurst, Gretchen Schiller, Isabel Valverde and Stamatia Portanova suggest the idea of what Schiller names 'relational dynamics' to describe the connection unfolding between dancers' bodies and digital technologies. This way, they propose a promising alternative to dualistic understandings of body-technology constellations in digital dance. They more specifically present starting points to assess the complexity of the embodied relations in virtual performance situations. However, this discourse is still missing the conceptual tools to articulate and evaluate these dynamics, especially with regard to the situations of friction happening during digital performance rehearsals. How can the dancing body's oscillating state and the ways new media infiltrate in it be evaluated? How can the moments of friction and resistance occurring between dancing bodies and digital media be qualified? In how far are the technological devices subject to transformation as well? In order to render the approach of relational dynamics more operable, I will in 4.3 develop a conceptual framework that provides the tools to find answers to the preceding questions. This subchapter has shown that this perspective needs a more refined conceptual apparatus if we want to examine processes of bodily learning and to conceive of embodiment from an experiential perspective. A thorough investigation into relational

¹⁵⁸ From the authors contributing to the discourse on digital dance, only Gretchen Schiller (2003) proposes that new media are constituted through the contact with moving bodies, albeit without going into further detail.

¹⁵⁹ In this sense, Haffner's approach comes close to the STS strand of co-production which conceives that both (scientific) knowledge and technology and society bring each other forward and depend on each other (cf. Jasanoff, 2006).

dynamics in digital dance furthermore requires conceptual means to assess situations of friction and fluidity in embodied experience and the ways (digital) technology can be entangled in bodily perception. These aspects will form the criteria on which I will base the analytical framework to examine relational dynamics in digital performance.

4.3 Relational approaches to the dancing body and to body-technology constellations

This subchapter is dedicated to the development of an analytical framework that serves to examine the relational dynamics in digital dance. As this approach is based on a transformative understanding of the dancing body and its relation with digital tools, it directs my research focus towards the dancing body's formation and the role of technology within human-technology connections. In the following I will present theories dealing with these aspects. The introduced concepts deriving both from dance studies and postphenomenology will provide the base from which I will subsequently elaborate the framework for the assessment of the dynamic relations between dancing bodies and digital media in performance art. The resulting research scheme will also refer to the criteria for the study of (technology's role in) embodied processes in virtual performance that have submerged in the previous subchapter: it will provide tools to assess procedures of bodily learning and to adopt an experiential view on these activities. Furthermore, it will present perspectives on situations of resistance between bodies and digital media and the ways in which technologies infiltrate in physical experience. In section 4.3.1 I will introduce the first component of the conceptual grid which offers instruments to describe the formation of dancing bodies as a transformative process.

4.3.1 Culturally constituted bodies in dance studies

In her study on dance and new technologies (2003), Kerstin Evert refers to Marcel Mauss' socio-anthropological theory to explain that the dancing body is shaped by specific body techniques.¹⁶⁰ A closer look at the relational dynamics between performing bodies and

¹⁶⁰ In his work on 'Techniques of the Body', Marcel Mauss suggests that the human body itself can be considered as a technical object because it has learned to incorporate particular forms of movement which depend on and express specific cultural knowledge and beliefs. The body thus presents a means to transmit distinct methods of cultural transfer (Mauss, 1973).

virtual media nevertheless requires conceptual means to understand how the dancing body comes into being and is remapped and reconfigured when learning to perform with digital media. Therefore I will enlarge my focus and refer to studies in the general dance field which deal with processes of the performing body's formation. While they do not explicitly offer perspectives on the role technologies can play in the dancing body's remapping, these works present relevant starting points as they provide concepts that allow to consider the performing body as a processual, socio-cultural construct. While on a general level, the dance field still witnesses the tendency to consider the performing human body as self-contained and unchanging (cf. Evert, 2002)¹⁶¹, the works of dance scholars Jaana Parviainen and Susan Foster provide viable perspectives on the dynamics in which the dancing body comes into being and continuously evolves.

In her research on the human body in dance (1998), performance scholar Jaana Parviainen refers to the notion of 'body techniques' to advocate that the human body is in a constant process of condition and change. She explains that "physical education and other bodily disciplines, including dance education, mould the body ... for instance [by] reiterating a certain movement in a certain manner for a definite period in order to produce a certain result" (Parviainen, 1998:59). Parviainen furthermore explains that these body techniques also generate changes in the body-subject on an experiential level, even if they are not intended (59). She concludes that "the consequences of body techniques are more fundamental than aesthetic [as] they also project existence" (ibid.). Parviainen moreover adds that these physical and experiential transformations are occurring in the training process (128). In her work Parviainen thus suggests that the dancing body does not exist in itself but that it rather presents a socially and culturally constructed entity which is continuously shaped in the process of learning. Dance training here appears as an active process that generates the performing subject instead of presenting a mere bodily inscription of skills and ideas. However, for further research into the transformations of embodied experience in digital performance, more detailed and conceptual insights into the ways in which these bodily alterations occur are needed. More precise information on the dancing body's construction can also clarify whether this learning process is accompanied by any frictions or resistances. In this context, dance scholar Susan Foster (1992) provides conceptual tools that can help to articulate the dynamics in which the dancing body continuously evolves. She designs central categories from which bodily learning in dance can be examined (Hardt & Stern, 2014), and which refer to the different dimensions that bring the dancing body forward.

¹⁶¹ Although several scholars have recently developed arguments against this fairly essentialist body model by emphasising the dancing body's culturally impregnated and semiotic status (cf. Foellmer, 2009), their approaches do not allow to conceive of the performing human corpus in a relational, technology-inclusive perspective.

In her article on *Dancing Bodies* (1992), Susan Foster describes the performer's corpus as an ideological construct which is shaped by cultural discourses and practices. She therefore refers to it as "body-of-ideas" (ibid.:480). Foster explains that the performing body¹⁶² is particularly moulded through the year-long process of dance training. This procedure, in which the dancer and her body are instructed according to a specific technique, produces two different kinds of bodies: the 'perceived' and the 'ideal' body. While the perceived body mainly originates from sensory and kinaesthetic information, the ideal body presents a more abstract aesthetic model inspired by "fantasized visual or kinaesthetic images of a body, images of other dancers' bodies and cinematic or video images of dancing bodies" (ibid., 483). According to Foster, these two kinds of bodies mutually influence and shape each other during the training process as they develop along the performer's formation. As a consequence, "a dancer's daily consciousness of the body ... ranges between her or his perceived body ... and images, both fantasized and real, of other bodies" (485). In Foster's explanation, a dancer's embodied experience is thus constituted by, and fluctuates between, various impressions and images relating to the two types of bodies. This alteration between the physically perceived and the imagined ideal body however does not occur by itself, as the training performer encounters considerable difficulties because her material, perceiving body will regularly resist her attempts to adapt to an abstract and imaginary model. This struggle with the physical body results in a constant experience of failure and feelings of loss, in which the perceived body is sensed to be "horribly deficient" (484).¹⁶³ To nevertheless create the dancing body, the training process is accompanied by much repetition and drilling, as through these procedures "the images used to describe the body and its actions *become* the body" (ibid.). In this phase, the dancer also becomes aware of a third body that Foster refers to as the 'demonstrative' body, which can be understood as a didactic vector, or as "the bodily instantiation of desired or undesired, correct or incorrect, values" (ibid.). The demonstrative body can manifest itself in the own mirror image or the bodies and mirror reflections of the teacher and other students. Over years of training, the dancer's embodied experience is changed because "the training process repeatedly reconfigures the body" (ibid.): the performer discovers body parts and movements that were formerly unknown, and which enable her to approach the ideal standard. This procedure then generates a mutation of both the perceived and the ideal body. In her work, Foster explains that one means to form the perceived body according to an ideal presents the invention and use of particular terms, or metaphors.

¹⁶² Foster explicitly refers to the body-of-ideas in Western theatrical dance (1992:482).

¹⁶³ Building on Foster's argumentation, Dutch sociologist Anna Aalten shows in her study of the classical ballet world that the frictions between ideal and perceived bodies can appear in multiple forms and manifest themselves in bodily risks like constant physical pain, injuries or eating disorders (Aalten, 2007).

She explains that a dancer's training is characterised by the work with particular literal or metaphoric nomenclatures that relate to individual dance techniques (ibid.). Here, Foster provides the example of the idea that one lifts the leg forward using the back thigh muscles. Although the employed notions might initially not appear as physically applicable, they gain in bodily concreteness, as through the training process "the images used to describe the body and its actions *become* the body ... through their persistent association with a given movement" (ibid.:484). Foster underlines that over time, the continuous effort to realize a specific movement with the relating image in mind allows the performer to execute the desired gesture. Moreover, the author claims that this experience also affects the dancer's inner bodily perception, as she starts feeling the metaphor's attributes in her body (ibid.). According to Foster, "each [dance] technique creates a body that is unique in how it looks and what it can do" (485).

With her categorisation of the ideal, the perceived and the demonstrative body, Susan Foster explicates the different dimensions involved in the dancing body's formation and provides tools to consider the performing body as a relational composite of different bodies, images and actions. The concept of the ideal body furthermore introduces a virtual dimension to the notion of embodiment, as also abstract (aesthetic) ideas can affect and interlace with concrete physical experience. In the context of this research, Foster's distinction between different layers of embodiment is especially interesting because it makes possible to consider the dancing body's formation as a process which is accompanied by unavoidable tensions between the (material) perceived and the (immaterial) ideal body, and that this situation can lead to painful frictions which require negotiation. These moments of conflict can in turn generate bodily shifts. Foster's theory thus provides fruitful means to understand and analyse how performers deal with situations of bodily resistance. It presents tools to examine the particular strategies dancers develop to overcome moments of friction, and to point out which levels of bodily experience are both involved and affected through this process. In this light, her approach seems especially relevant with regard to the situations of friction occurring in digital dance rehearsal because it could allow to closely follow the ways and dynamics in which performers realign their bodily experience after the moments of disruption with digital media. In the case of *Glow*, it might for example enable us to examine how the dancer managed to regain spatial orientation after experiencing the disorienting effect of the video projections. For a thorough analysis of these processes, it is however necessary to examine which roles (technological) artefacts can play in the procedures of bodily formation. A differentiated assessment of body-technology relations in digital dance therefore requires tools that point out on which levels (digital) media can infiltrate bodily experience during the performers' learning procedures. For this reason, I propose to enrich Susan Foster's theory with selected concepts from the field of

postphenomenology, a discipline invested in studying how technologies are involved in the constitution of embodied experience.

4.3.2 Postphenomenology: technology's co-constitutive role in relational embodiment

Postphenomenology builds on phenomenological conceptions of body-technology constellations. In earlier parts of this chapter, I have explained that the relation between dancing bodies and digital media in dance art has often been explained from a phenomenologically informed angle.¹⁶⁴ I have shown that this approach turns out as problematic because of its techno-instrumentalist tendencies. In the context of *Glow* performer Sara's experience, a phenomenological perspective would allow to explain that the digitally controlled light projections function as extensions of the dancer's body. It would however not permit to trace (and consequentially analyse) the effects the work with the projected images has on her spatial orientation or the rhythm of her movements, which, as she reports, have changed. Neither would a phenomenological approach enable us to understand how the technology's function as a bodily extension came into being. It could thus not clarify how Sara learned to perform in *Glow's* technical setup. As a consequence, the notion of friction cannot be explored with this view either because a phenomenological perspective does not explain how bodies learn to deal with resisting technologies. The field of postphenomenology however deals with these issues, as it examines the ways in which technologies mediate how humans perceive reality and themselves. In the following, I will therefore provide a brief introduction to the main objectives within postphenomenological studies. Subsequently I will present theories by the postphenomenological thinkers Don Ihde and Mark Hansen which will complement my conceptual toolbox for the study of relational dynamics in digital performance. Their concepts will allow us to shed a closer light at the specific relations dancers and technologies are engaged in (Ihde), and the ways in which digital media can alter bodily experience through frictions (Hansen).

¹⁶⁴ See chpt 4.1

Introducing postphenomenology

“Humans and the world they experience are the products of technological mediation”, explains Dutch philosopher of technology Peter-Paul Verbeek, one of the most prominent scholars in postphenomenology (2005:163), a discipline positioned at the thresholds to the fields of Science and Technology Studies and philosophy of technology. To bypass attitudes of technological instrumentalism and determinism¹⁶⁵, postphenomenological approaches extend phenomenological perspectives on human-technology relations into the realm of philosophy of technology, a field in which technology frequently used to be described in deterministic terms. In 1.3 I have already explained that according to postphenomenological perspectives, technology takes in a mediating role between humans and world, and therewith co-shapes humans’ experience of their surroundings. Here, technological artifacts not only play a role on a heuristic level in human existence in forming humans’ interpretative frameworks, as they furthermore mediate peoples’ concrete activities in daily life, and therewith also intervene on an existential level (ibid.). In more concrete terms, the use of eyeglasses for instance not only shapes the way their wearer discerns her environment, but also how she experiences herself, as she might for example become more independent of the help of others. The postphenomenological view therewith ascribes technology a fundamental role in human perceptions.

In the context of this chapter’s focus on a differentiated conception of body-technology interaction, the postphenomenological approach appears as a promising perspective through its emphasis of technology’s co-constitutive character in human-world relations and its interest in the concreteness of technological artifacts. Contrary to the classical phenomenological view according to which perception and experience are located in the human subject, the postphenomenological perspective understands embodiment as an intertwined process that can be mediated by technologies. In a postphenomenological perspective, the extended body is not only the body that acts through a technical mediation, but also a body that perceives itself through that mediation. Embodiment, therefore, is not located in the perceptive human alone but is conceived as a relational phenomenon because it can be mediated. This conception of human-technology relations meets Sara’s story on the making of *Glow*, as the digital projections not only followed her movements but the work with them also affected the dancer’s sense of orientation and the way she experienced producing her physical gestures. Sara’s example illustrates that bodily experience in digital dance is shaped by the performer’s interactions with technology. I have shown that this mediating effect

¹⁶⁵ As explained earlier in this thesis, in an instrumentalist perspective technologies are conceived as neutral tools while they are considered as alienating forces in deterministic views (Verbeek, 2005).

between humans, their world and technologies is also the main object of interest in postphenomenological research. To deepen these insights in relational dynamics in digital performance, I will in the following delve further into postphenomenological theory. I will in particular turn towards the works of philosopher of technology Don Ihde and new media theorist Mark Hansen. These two thinkers propose specific concepts that allow to further explore the dimensions and ways in which technology constitutes bodily perception. Ihde's theory allows to examine the concrete relations humans and technologies find themselves in, and how these particular constellations can affect human experience. Hansen moreover provides means to articulate situations of friction between human bodies and digital devices, and the ways in which these impact on bodily sensations and capacities. Hence, these postphenomenological works promise to enrich our understanding of relational dynamics occurring in digital dance rehearsals.

Human-technology relations according to Don Ihde

The work of one of postphenomenology's leading thinkers Don Ihde provides further tools that help towards a more differentiated understanding of (the transformations of) embodiment in digital performance. In particular his categorization of embodied, hermeneutic, background and alterity relations suggests a vocabulary to describe the ways in which dancers and technologies can engage.

In his work, Don Ihde analyzes technological mediations of humans' perceptions of the world. To develop his own perspective on human-technology relations, he builds on the works of the phenomenologists Heidegger, Husserl and Merleau-Ponty. According to Ihde, technologies intervene in human perception on a micro- and a macro level. While microperception refers to immediate bodily and sensory impressions, macroperception points to a hermeneutic level which encapsulates sociological, cultural and political dimensions. These two levels, Ihde claims, are interrelated as our perceptions on a macro-level can influence our "microperceptions", thus our physical engagement with objects. He furthermore considers human-technology relations as ambiguous in nature, which he explains with the notion of technology's 'multistability': in Ihde's view, technologies have no essence in themselves as their functions differ from their concrete contexts of use. This means that one and the same technological artefact can have varying identities in different situations and hence provoke diverse activities. In this perspective, technology does not appear as essentially fixed but is defined through its relations with humans and thus the way it is employed. It is therefore necessary, Ihde argues, to examine the role of technological artifacts in their concrete moments of use if one wants to draw

a differentiated picture of technology.¹⁶⁶ However, as already indicated, technologies are not simply used by humans, as human perception is equally influenced by technological artefacts. Ihde develops on this aspect by providing the categories of embodiment, hermeneutic, alterity and background relations. These refer to the ways in which technologies play an active mediating role in the relationship between humans and their world.

According to Ihde, people often relate to their surroundings in mediation relations (Ihde, 1990: 72). When humans perceive the world through technical devices, certain artefacts can be so well integrated into daily activities that they turn “transparent”. For example, when we perceive the world through glasses, we do not explicitly experience the glasses themselves; while they allow us to perceive our surroundings, we mostly do not take them into account as part of our environment. In Ihde’s terms, human and technology find themselves here in embodiment relations (Ihde, 1990:72): the technology is taken into a person’s own bodily self-experience. To perceive through a tool in an embodied way, it is however necessary to adjust to it through learning. This requires that technologies also need to lend themselves to embodiment relations by allowing people to learn to integrate them into their bodily experience. In this context Ihde underlines that technologies are never entirely transparent, as their materiality enhances and in the same time reduces perception. While eyeglasses for example allow for an improved view of my surroundings, they only do so in a certain frame, which is defined by the size of the glasses, and the glasses themselves for instance might filter specific light rays so that colours might be perceived in shades that vary from the nuances experienced in non-mediated situations. In this way, tools enhance and in the same time reduce perception (ibid.: 79). Other devices can however afford a different kind of mediated relation, as tools such as a thermometer invite what Ihde refers to as hermeneutical relations (ibid.:80). These technologies provide a representation of an aspect of the world that cannot be simply perceived but that requires interpretation. We know for example that it is cold outside by reading the thermometer’s scale instead of feeling the cold air on our skin.

Devices can also be experienced as quasi-autonomous, for instance when they function in unexpected ways, or when they do not work at all. In these situations, Ihde describes the human-technology relations as alterity relations, because the technology is experienced as a quasi-other (ibid., 98). It attracts our attention and therewith impedes

¹⁶⁶ In line with Ihde’s concept of technology’s multistability, Verbeek names the “postphenomenological turn toward things” which emphasises the tendency to study the concrete use of technological artifacts instead of considering technology in what Verbeek terms its ‘conditions of possibility’ (2005:30).

the generation or maintenance of embodiment relations. Ihde explains that while humans tend to anthropomorphise technologies, the latter can never be present as a genuinely other living being. A broken-down vehicle for example does not resist with the same autonomy that a reluctant animal or a recalcitrant person could possess. Therefore we can experience technologies only as 'quasi-others' (100). In alterity relations, we perceive our surroundings to a lesser degree while the resisting device and our relation to it attract most of our attention. Here, our perception rather relates to the tool itself.

In the last human-technology relation Ihde identifies, technologies play a role at the background of human experience and thus create a context for our perceptions. These kinds of background relations emerge for example through the lighting or heating in a room, the ventilation sounds of a computer or the automatic switching on and off of the refrigerator.

Ihde furthermore states that peoples' relations to specific devices may vary. He illustrates this with the example of a spinning top: when the top is set to spinning through a stick or a string, "what was imparted through an embodiment relation now exceeds it" (100), because the animated top seems to take on a life on its own, and therewith an alterity relation emerges.

In the context of this chapter's focus on a non-dualistic conception of embodied experience in digital dance, Don Ihde's work is of particular interest because it provides a vocabulary to describe the nature of the constellations in which dancers and technologies can engage. His categorization of human-technology relations has the potential to contribute to a differentiated understanding of the relational dynamics in which performers and technologies are invested. In the case of *Glow* for instance, Ihde's theory allows to characterize the change in Sara's relation with the digital projections during the rehearsal procedure. The performer describes that she initially did not yet know how to attune her proper movements with the video effects. In Ihde's words, Sara found herself in an alterity relation with the digital projections. Only through bodily learning was Sara able to turn this engagement into an embodiment relation, as she now feels the technology to be "part of [her]". Just like Ihde suggests when mentioning the transformative effect of embodiment relations, Sara explains that her physical abilities changed because the technology both restricted and enhanced them. Ihde's theory thus makes possible to define the nature of the relations in which performers and digital media are engaged, and it allows to trace whether and in how far these relations alter over time. The notion of embodiment relations furthermore permits to explain the transformative character of body-technology constellations, as it suggests that human bodies need to adapt in order to entertain this kind of connection with technologies.

While Ihde provides categories that allow for a more nuanced apprehension of body-technology relations and their dynamics in digital dance, his work opens up the question how humans (and thus also dancers) can learn to adjust to digital media and

incorporate them in their embodied experience. As the example of *Glow* and several contributions to digital dance discourse show¹⁶⁷, these procedures can be preceded by situations of bodily resistance and frictions. How can these moments of friction be described in the context of body-technology constellations? In which ways do dancers adjust to the technologies they are working with, and (how) can this affect their bodily experience? Mark Hansen's study of digital media's co-constitutive role in human embodiment provides tools to answer these questions.

Mark Hansen: embodiment in 'mixed reality'

In this chapter's research objective to develop a conceptual framework for the articulation and analysis of relational dynamics in digital dance, I have so far proposed the works of two different theorists. They allow to assess specific aspects relating to human-technology interaction in virtual performance. Susan Foster's theory enables us to consider the dynamics of the dancing body's formation. Don Ihde's work makes possible to characterise the relations humans, and thus also dancers, can entertain with technological tools. Specifically the notion of embodiment relation allows to explain that certain human-technology constellations can affect transformations in bodily experience. The question remains how digital media engage in the moments of friction in the rehearsal process as described by *Glow* performer Sara and further contributors to digital dance discourse, and how and with which consequences the performers solve these situations. In this context, I propose to shed a closer look on Mark Hansen's postphenomenological theory of *Bodies in Code* because it provides conceptual tools to trace the dynamics of frictions in human-technology interactions.

In his work, Mark Hansen analyzes and develops theories on the correlation between new media and embodiment (2004; 2006). Central to his research is the refutation of new media's perception as disembodied and abstract information. Hansen stresses the positive engagement of the body with technology by arguing that technology co-constitutes and extends human capability. In this context, he emphasises technology's materiality which detaches it from abstract discursive and representational levels. In his book *Bodies in Code* (2006), Hansen focuses on the processes through which embodiment is actively produced in conjunction with new media artifacts. For Hansen, embodiment does not present any given experience but it rather is a development of bodily performance that includes a technical dimension. The new media philosopher considers embodied experience as evolutionarily acquired, and he stresses that it has developed along with the use of various tools. He therefore also speaks of "the originary technicity

¹⁶⁷ See 4.2.

of the human" (2006:ix). In line with this reasoning, Hansen argues that human embodiment also involves (digital) information, and suggests exploring the mechanisms in which digital media co-constitute bodily experience. By advocating that digital media "are literally virtualizing the physical" (ibid.) instead of submerging it, he argues against a deterministic conception of digital media's role in human embodiment.

Hansen strives to avoid dualistic perspectives on the relations between humans and digital technologies by suggesting that physical and virtual spheres cannot be considered as separate. Rather, he argues, humans live in a "fluid interpenetration of realms" (2) in which physical and virtual spheres blend. Hansen describes this condition as "mixed reality".¹⁶⁸ He illustrates this idea with exemplary 'mixed reality situations' which are part of many people's daily lives. Hansen refers to typical activities we encounter in professional situations, such as retrieving information from a digital database during a meeting, or enriching drawn sketches by matching them with digital computer visualizations. In these cases, we execute activities in the physical world by simultaneously accessing virtual realms and digital artefacts. According to Hansen, these passages from one realm to another occur in "seamless" and "unnoticeable" ways (8). The theorist stresses that humans are able to disclose virtual realms through their motoric capacities, which allow them to move between different spheres. In this perspective, virtual and physical realms are not separated from each other but they are instead interlinked through human movement and perceptuomotor activity. In line with this definition, also performer Sara finds herself in a mixed reality situation when performing *Glow* onstage: while moving on the physical dance floor, she also fluidly accesses and interacts with the computer program *Kalypso* through the digitally controlled light projections. Hansen explains this passing between physical and virtual spheres with the concept of a "body-in-code". Building on Merleau-Ponty's idea that human embodiment is characterized by a fundamental 'écart', by being "distributed into non-overlapping sensory interfaces with the world", and that this écart entails a fundamental relation to technics (ix), the term 'body-in-code' designates "embodiment as it is necessarily distributed beyond the skin in the context of contemporary technics" (x). In other words, this term refers to the idea of a body that is "subject to *and constituted by* an unavoidable and empowering technical deterritorialization – a body whose embodiment is realized, *and can only be realized*, in conjunction with technics" (20). According to Hansen, our bodies, or bodies-in-code, can adapt to their environments and thus also to mixed reality situations through a constant state of deterritorialization. He explains that this condition is latent and we are usually unaware of it (ibid.:30).

¹⁶⁸ The expression 'mixed reality' has originally been coined by artists Monika Fleischmann and Wolfgang Strauss (Hansen, 2006).

In the context of digital dance, the notion of ‘mixed reality’ helps to describe the situation digital performers find themselves in when dancing in technically equipped environments, as they are able to navigate both physical and virtual realms while performing. However, this concept rather seems to apply for situations of staged performances: Sara’s case shows that the dancer’s fluid access to *Glow*’s digital spheres was not initially given because it first needed to be negotiated. Sara’s experience of ‘mixed reality’ was preceded by situations of friction between her bodily sensations and the technology that needed to be dealt with during the rehearsals. Sara could thus not perform in ‘mixed reality’ directly when stepping into *Glow*’s setup. Mark Hansen takes this aspect up by explaining that when trying to access virtual realms, humans can experience a form of physical disorientation that is caused by resistances between people’s physical capacities and sensations and the technology’s characteristics. This condition, the theorist explains, results from the fact that digital media possess the capacity to create situations of conflict that make us aware of our bodies’ state of deterritorialization.

To illustrate this idea, the author describes visitors’ experiences of perceptual disorientation in particular digital art installations. He furthermore explains how and with which consequences these moments of friction are overcome. One of his examples is *Rigid Waves*, an artwork by Monika Fleischmann and Wolfgang Strauss¹⁶⁹ in which the viewer is confronted with alienated reflections of herself. In the digital media installation *Rigid Waves*, the visitor stands in front of a frame that is fixed on a wall. Inside the frame, the viewer can perceive her reflection which closely resembles a mirror image. However, as soon as she starts moving, she will notice that the motions performed by her reflection differ from her own movements. The reflection contorts the visitor’s physical activities in different ways, for example by slowing down or freezing for short moments. If the viewer approaches her image and attempts to touch it, it ultimately shatters into many fragments that slowly dissolve.¹⁷⁰ According to Hansen, in this moment the artwork’s viewer is confused because she becomes aware of her body-in-code and its state of deterritorialization. The theorist develops on this argument by suggesting that *Rigid Waves* generates a situation of conflict in the spectator because it creates a disconnection between the external visual image and the internal motoric sensations of the viewer’s body. To further explain this idea, he refers to Maurice Merleau-Ponty’s phenomenological concepts of the body image and the body schema.

¹⁶⁹ A video illustration of *Rigid Waves* can be viewed on <https://www.youtube.com/watch?v=3bJZFILCLug>, retrieved May 11, 2016.

¹⁷⁰ On a technical level, the reflection’s effects in the installation are generated through algorithmic processing, as the viewer’s movements are converted into digital data which are subsequently altered and transformed into a mutated mirror image.

In his phenomenology of embodiment, Merleau-Ponty distinguishes between two dimensions that are part of our physical experience.¹⁷¹ On the one hand, the body can be understood as an object that is part of the world, and which is conceived through conscious concepts, attitudes and visual appearances. Merleau-Ponty names this aspect the 'body image'. On the other, we also experience our bodies in a more subjective manner as we relate to our environment through bodily action and preconscious perceptuomotor capacities and thus an intraspective perception of our movement in space (Gallagher, 2005). While the body image refers to external and deliberate views on the body, the body schema mostly operates on a prereflective level (Slatman, 2014). In the case of *Rigid*



Fig. 4.2: *Rigid Waves*, an interactive art installation by Monika Fleischmann and Wolfgang Strauss

Waves, the body image for example refers to the viewer's visual reflection in the frame, while the body schema designs the visitor's (mostly subconscious) motoric experience of her posture and the way she is moving in space. In the case of dance, a performer's body image might be represented by her mirror image, and her body schema for example could relate to the way in which she orients and feels herself moving in a particular rehearsal space or on the dance floor. In his theory on the body schema, Merleau-Ponty adds that to manage different situations or goals, we also recur to physical tools. These tools can be integrated into our body schema and therewith modify and extend it (ibid.). This also means that the body schema's boundaries do not correspond to the organism's confines, but that they might be constituted for example by the end of a hammer or the outline of a car (ibid.). The body schema thus can be expanded through the accommodation of technical devices. In the context of dance, the example of the pointe shoe illustrates that performers are able to integrate the footwear into their bodily consciousness to the point that they do not constantly have to reflect on the fact that they are wearing those specific shoes: the 'pointes' are included in the dancers' body schemas.

Mark Hansen develops on this aspect by claiming that also digital technologies can mediate the body schema, albeit in a different way than physical tools. He explains that digital media can cause a disconnection between the body image and the body schema, which subsequently allows for the body schema's expansion. This effect of

¹⁷¹ To elucidate the concept of the body schema and its importance for Hansen's approach, I will in the following refer to further sources from the field of phenomenology that deal with Merleau-Ponty's theory.

separation, Hansen claims, can exclusively be produced by digital media.¹⁷² According to the theorist, this dissociation between inner and outer bodily experience renders our state of deterritorialization manifest (38). In this context it is worth noting that for Hansen, the body image does not necessarily need to represent the body's external appearance, as also animated graphics can produce an effect of disjunction between body image and body schema. Here it is however important that the animations stand in one way or the other in connection with the body's movements. The disjunction does for example arise in the case of *Rigid Waves* when the viewer experiences that her reflection does echo her movements in unexpected ways. Because the reflection appears distorted, it presents the viewer with body images she is still unfamiliar with: her inner perception of how she moves does not correspond to the image displayed in the frame in front of her anymore. This situation produces a physical disorientation in the viewer. Hansen however explains that the viewer can realign her body schema with her body image through moving: by following and studying the distorted body image's reactions, she can with time accommodate the characteristics of her technologically altered body image in her body schema. In the case of *Rigid Waves* this could for instance mean that the visitor does not experience the modified body image as alien anymore, and that she can intuitively move with her altered reflection without feeling disoriented. Also *Glow* dancer Sara seems to undergo a situation of disjunction when noticing that the speed of the digitally generated light projections does not correspond to the pace of her own movements. As we have seen, Sara managed to overcome these initial irritations through learning and was finally able to move intuitively with the light effects. In line with Hansen's thoughts, Sara seemingly managed to realign the digital projections with her body schema. According to Hansen, the readjustment with a distorted body image causes a reframing and reorientation of the corporeal schema in its motor and its perceptual dimensions (44). In the case of Sara this could for example mean that her body's adaptation to the projections' speed altered her experience of moving specific body parts, or that she might need to develop particular physical skills in order to move at a specific pace.

With regard to this chapter's focus on a relational approach to human-technology constellations in digital dance, Mark Hansen's theory provides viable concepts for the articulation of embodied processes with virtual technologies. His concept of 'mixed reality' allows to describe the situation digital performers find themselves in when working in digitally equipped environments. Hansen's concept of the 'body-in-code' furthermore enables us to trace the dynamics between dancers' bodies

¹⁷² It is however debatable whether the disconnection between body image and schema can only be induced by digital media, as similar effects are occurring through physical objects such as distorting mirrors or one's reflection on a water surface.

and new media during digital dance rehearsals. Here, the dislocation of body schema and body image occurring through the bodily interaction with digital technology helps to articulate the experience of disorientation many performers undergo when rehearsing with new media devices. In this context, the phenomenological concepts of the body image and the body schema allow to understand that the disorientation results from a disruption between inner motoric and outer visual bodily perceptions. The two notions thus present useful tools for a more detailed and specified analysis of embodied dynamics in relation with digital media. However, while the concepts of the body image and the body schema might be pertinent tools to describe the bodily processes in digital art installations as discussed by Hansen, they do not render justice to the complexity in the work of dancing bodies. The phenomenological concepts especially do not allow to apprehend the aesthetic dimension of bodily learning, which as we have seen in the work of Susan Foster is an integral part during the training of dancing bodies. In the case of *Glow*, this could mean that performer Sara might have specific ideas or instructions in mind concerning the overall look of the piece's presentation. While this aspect might be less important during a visitor's short-time stay in a digital installation (as described by Hansen), it is of vital priority during a dancer's work. As we have previously seen, this dimension is taken up by Foster's notion of the ideal body. Just like the concepts of body image and body schema, the ideal, the demonstrative and the perceived body allow to distinguish between inner and outer bodily perceptions, albeit in a way that is more tailored to a dancer's situation because it considers the aesthetic and didactic levels of embodiment. Foster's concepts therefore provide a more pertinent vocabulary to describe the specific bodily experience of dancers. Therefore I propose to adopt Hansen's idea that the experience of disorientation is caused by the technologically generated contrast between an external visual perception of the body (which Hansen refers to as the body image) and inner motoric sensations (the body schema in Hansen's terms) and replace the notions of body image and body schema with Susan Foster's categories of the perceived, ideal and demonstrative body. In this sense, I suggest that digital technologies can potentially intervene in a dancer's external perceptions of the ideal and demonstrative body, which in turn can generate changes in the internal perceived body. On a further note, while Hansen proposes that the friction occurring during the dislocation of the inner and outer bodily perceptions can be overcome through the realignment of body image and schema, his writing misses concrete suggestions concerning how this adjustment process can occur. For a thorough understanding of technology's involvement in dancers' embodied procedures, it is nevertheless worthwhile to understand how performers accommodate external, technologically altered (body) images in their internal bodily experience. Sara's case for example shows that the dancer's readjustment with the video imagery's speed required an intense physical learning process. Here again, Foster's theory can be of use, as her categorisation

allows to understand the dynamics in which dancers' bodies develop and realign themselves after situations of friction.

I therefore propose that a combination of Hansen's approach with Foster's body concepts allows a deeper investigation into the ways in which digital technologies can intervene in the mediation of bodily dynamics. In the following, I will recapitulate on the concepts that I have presented so far in this chapter by developing a framework for the assessment of relational dynamics in digital dance that will guide the analysis of the two case studies *Habitat* and *loopdiver* in chapter 5.

4.4 Developing a conceptual framework for the analysis of body-technology constellations in digital dance

In the following paragraphs I will present in how far the selected concepts from the fields of performance studies and postphenomenology that I have presented in this chapter help to grasp the complex reality of the relational dynamics occurring between dancing bodies and new media. The works by dance Scholar Susan Foster and the philosophers Don Ihde and Mark Hansen respectively provide insights that help to elucidate specific aspects of bodily learning (Foster), to describe human-technology relations (Ihde) and the ways in which new media can affect bodily experience (Hansen).

In the discourse on relational dynamics, the contributing authors describe the dancing body to be in a fluctuating mode when in contact with digital media. Performer Sara's account on her work with the digital projections in *Glow* has shown that this conception of a fluid bodily state especially fits those situations in which performers present already rehearsed digital dance productions on stage. Here, Mark Hansen's term of 'mixed reality' helps to articulate how performers experience this moment, as it explains that the dancers appear to move within, and seem to connect, both physical and virtual spheres through their bodily activities in a flow-like way. Considering the performance of digital dance pieces as moments of 'mixed reality' thus allows to formulate the dancers' experience of fluidly accessing and navigating within physical and virtual spheres. However, various empirical accounts in this chapter have shown that it is not possible to immediately perform in mixed reality, as the performers first have to learn to deal with the employed media when stepping in a digitally equipped setup for the first time. It thus becomes clear that the fluid dance in 'mixed reality' is only possible under particular conditions which need to be previously negotiated. These observations raise questions concerning the nature and the implications of the relation between

dancers and digital media in a 'mixed reality' situation. In this context, Don Ihde's category of 'embodiment relation' helps to depict the constellation in which dancers and media need to be involved to realize a fluid performance: to permit an intuitive navigation within virtual and physical realms, the dancer needs to integrate the technology in question in her bodily experience. Ihde's perspective helps to understand that independently from their initial relation with the technological device, digital dancers need to develop an embodiment relation with the tool they are working with to allow for a fluid digital performance. Ihde's approach furthermore suggests that the performers need to learn to physically work with digital tools to embody them, and that this process affects the dancers' bodily perceptions. Ihde's categorization also implies that the relations between performers and their digital tools may transform, as they can for instance change from an alienation relation, in which the dancer experiences the technology as a foreign element, into an embodiment connection. Here, Ihde's categories help to trace whether and how these relations alter during the rehearsal process. A transformation in the form of human-technology relationship furthermore allows to detect whether also the technology is affected by the process of adaptation, as its status in the relation might change.

So far, the postphenomenological concepts of 'mixed reality' by Mark Hansen and Don Ihde's categorization of 'mediation relations' help us to understand the conditions digital dancers strive for to be able to perform with new media in a fluid relationship. This insight opens up the question of how this flux-like bodily state is generated, especially because this chapter has shown that the performance with digital media requires a considerable amount of bodily learning during the rehearsals. We have seen that according to different digital dance practitioners, this process involves situations of friction between the dancing body and the technological tools that provoke sensations of physical disorientation. Certain artists and theorists contributing to the approach of relational dynamics furthermore suggest that to overcome these moments of resistance, the performers but possibly also the technological device need to undergo procedures of adaptation. These observations lead to the question of how the situations of friction and the subsequent learning processes can be articulated, specifically with regard to embodied dynamics. Here, Mark Hansen's concept of the 'body-in-code' and Susan Foster's categorization of the ideal, the perceived and the demonstrative body present viable tools to investigate how performers encounter and subsequently overcome situations of friction in digital performance rehearsals. Hansen's approach allows to describe how the resistances between dancing bodies and new media are generated. He presents those frictions as moments in which digital technologies intervene in performers' bodily experience. Hansen's theory notably permits to show that the performer undergoes physical irritations because she is confronted with a digitally modified external appearance of herself that does not match the inner motoric sensations

of her own movements. In other words, the dancer's inner and external physical perceptions are brought into disequilibrium through digital intervention on an external level. To clarify how new media can infiltrate in the external dimensions of bodily experience, Susan Foster's notions of the ideal and the demonstrative body can be of help. Both categories refer to the external dimensions of a dancer's embodied sensations. In this sense, Foster's categorization permits to show that digital technologies can potentially intervene in a performer's bodily experience by modifying her ideal or demonstrative body. The dance scholar's theory also provides a useful lens to explain the dancer's subsequent attempts to overcome those moments of irritation, as it suggests that she will try to reinstall the balance between the inner and outer dimensions of her bodily sensations. Foster's theory allows to show that the performer trains herself to realign her ideal and demonstrative body with her inner, perceived body through diverse practices such as imitation, repetition and metaphorisation. This learning process can consequentially generate transformations in the dancer's perceived body. Through these training procedures, the 'relational dynamics' are realized. In chapter 5 I will employ the presented conceptual grid to analyse how embodiment is constituted with new media in the rehearsal processes for the digital dance productions *Habitat* and *loopdiver*.

5 The relational dynamics between dancing bodies and digital media in *Habitat* and *loopdiver*

In this chapter my principal aim is to analyse the concrete processes through which embodiment is constituted in digital dance practice. I will do so by specifying the relational dynamics between dancing bodies and digital media. The investigative framework allows me to focus on situations of friction occurring between dancing bodies and virtual technologies. In chapter 4 I have explained that these moments of resistance present significant instances in digital dance rehearsals as they destabilise the performers' physical habits and subsequently generate processes of bodily negotiation with digital tools. These learning procedures shape the dancers' physical experience. In this way, the occurring frictions in digital dance rehearsals present important focal points.

By studying the rehearsal processes for *Habitat* and *loopdiver* with the help of the conceptual grid, I will be able to describe the concrete situations that generate those resistances between performing bodies and digital media. The analytical framework will furthermore allow me to specify the particular strategies through which *Habitat's* and *loopdiver's* dancers overcome the moments of friction, and to interrogate how these activities impact on the performers' bodily experience and the employed technological tools. These insights will help me to describe the complexity of the relational dynamics and how they are concretely shaped in two particular digital performance productions. In this context, we will see that *Habitat* and *loopdiver* present two particular case studies that illustrate different ways in which digital technologies can integrate bodily learning processes.¹⁷³

In both cases the performers undergo experiences of physical disorientation while being confronted with digitally manipulated video reflections of their bodies. However, while *Habitat* dancer Renate is working with live and reactive live video images, *loopdiver's* performers are exposed to a non-reactive videotape. Following the respective rehearsal processes will show that these technological characteristics

¹⁷³ While I have mentioned the digital tools used in the two case studies by their names *Kalypso* (*Habitat*) and *Isadora* (*loopdiver*), I will in the following rather speak of the performers' digital images and reflections. I wish to clarify that this change in vocabulary is due to the fact that my current analytical perspective is focused on the dancers' experience, whose contact with the digital tools is primarily established through (inter)actions with the digital images. I argue however that because of their tight enmeshment with the digital tools, the images can be considered as parts of the software through which they have been generated.

considerably influence the dancers' strategies to realign, or establish bodily connections, with their distorted reflections. Studying the performers' experiences in these two works thus also makes possible to see how technology itself affects the ways in which dancers negotiate with it. These concrete insights furthermore underline the individual character of the processes that shape embodied experience in the making of digital dance productions.

In subchapter 5.1, I will study dancer Renate's experience of realigning her physical sensations with her digitally mediated body image. 5.2 is dedicated to the analysis of the ways in which *loopdiver's* performers overcome the friction between their bodily capacities and the movements of their manipulated video reflections.

5.1 *Habitat*: performing 'mixed reality'

Dancer Renate Graziadei gets in contact with *Habitat's* technological setup for the first time during LaborGras' residency in Portugal in the beginning of 2008. In the piece, the performer is supposed to move on the dance floor while her live video image is projected into virtual spaces and digitally modified.¹⁷⁴ For the realization of *Habitat*, the dance floor in the Portuguese venue is equipped with various technical devices. Graziadei's live video image is generated by two video cameras that are respectively placed on the side and above the dance floor so that the performer can be recorded from a lateral and an upper perspective. Her movement data are then processed by the software program *Kalypso*, which allows to project Graziadei's video image into the virtual rooms and to introduce different real-time manipulations of the video. To be able to check how her live image appears in *Habitat's* virtual rooms, the dancer develops the choreographic material while directly working in the setup. To support her orientation, three computer screens are furthermore placed on the dance floor's sides. Displaying Graziadei's video image within *Habitat's* virtual spaces, they serve as 'windows' to the digital rooms and thus present visual supports to the performer. The dancer plans to monitor her performance both on *Habitat's* physical and virtual stages with the help of the screens: when moving on the dance floor, she can observe and direct her live video image while simultaneously performing in one of *Habitat's* digital spaces. Figures 5.1 and 5.2 present *Habitat's* digital setup in LaborGras' rehearsal space.

¹⁷⁴ See chapter 3.



Fig. 5.1, 5.2: *Habitat's* technical setup in the rehearsal studio: performer Renate Graziadei moves in a space equipped with cameras on the sides and above the dance area, two screens are placed on the dance floor.



Fig. 5.2

This description shows that the setup presents Graziadei with both material and digital stages. In other words, *Habitat* places her in an environment that requires the experience of what Mark Hansen names 'mixed reality': to realize the piece's concept, the performer needs to be able to access and move within *Habitat's* virtual spaces while in the same time moving on the studio dance floor. The piece's setup supposes that the dancer can variously switch between real and virtual realms through her bodily performance. Here, the concept of 'mixed reality' allows us to understand that the performance of *Habitat* is

about the coming together of two realities, namely the physical realm Graziadei is moving in and the digitally equipped video setup. This way, Hansen's notion directs our attention to the dancer's physical experience of this situation: considering her initial rehearsals in *Habitat's* setup through the lens of 'mixed reality' allows us to ask whether dealing with the two different kinds of realities has consequences on her bodily sensations.

Interestingly, the performer soon notices that navigating in 'mixed reality' cannot be easily realized. Graziadei recognizes that she "[can't] simply step into the setup and continue working on [her] choreographic material"¹⁷⁵, as she quickly feels lost in the digitally equipped environment. She feels physically disoriented because her video images behave in unfamiliar ways. Hansen's concept thus helps us understand that the dancer not simply starts rehearsing in *Habitat's* digital environment, but that she encounters difficulties to cope with the setup's physical and virtual spheres. In the following section, I will therefore examine Graziadei's feelings of bodily disorientation more closely. Subsequently I will trace the performer's different undertakings to realize a mixed reality experience in *Habitat's* technological setup.

5.1.1 Confusing video images

The preceding paragraph has described that *Habitat's* setup requires that performer Graziadei is able to fluidly combine the physical space of the stage and the piece's virtual rooms while moving. In chapter 4.4, we have seen that performing in mixed reality supposes that the performer finds herself in an 'embodiment relation' with the digital tools employed (cf. Ihde, 1990). In Graziadei's situation, this suggests that the dancer has integrated the digital video imagery in her bodily perception. This is however not the case. On the contrary, the performer experiences the first working phases as extremely irritating. The dancer describes her initial feelings in the piece's technological environment as follows:

When I started moving in the setup, I felt bewildered at first ... because I saw myself, that is, my live [video] image moving on the screens, and although [the image] made the same movements as I did, it confused me ... because [the video image] shows my frontal reflection, it walks into opposite directions. For example, when I make a step to the right on the dance floor, the [video] image will move to the left ... it looks like a mirror image, but it doesn't act like one, and that felt quite disorienting. Plus I had no feeling yet for the relations between my position on the

¹⁷⁵ Renate Graziadei, 17.11.2010.

dance floor and my image's situation in the [virtual] rooms ... if I wanted my image to appear on a specific spot in one of the digital spaces I didn't know where I had to position myself to be captured the right way ... so it happened that [on the video] I would run into virtual walls, or even walk out of the video frame. It felt quite strange. I felt like 'cut off' from the image, because I couldn't steer it in the ways I wanted ... [the image] seemed to have a life on its own ... it acted so differently from what I wanted it to be.¹⁷⁶

As the frontal video image mirrors the dancer's movements in unaccustomed ways, Graziadei has difficulties to link it to her motoric activities. This situation causes feelings of estrangement in the dancer. She even perceives the video image as an entity that is uncoupled from her physical activities: to Graziadei, her digital reflection seems to lead "a life on its own". The performer finds herself in an 'alterity relation' with her digital video image because she experiences it as a 'quasi-other' (Ihde, 1990). This situation is problematic insofar as it does not allow Graziadei to intuitively move in *Habitat's* setup and thus achieve the experience of acting in 'mixed reality'. It even generates more confusion, as the video image's unfamiliar reactions mark a first situation of friction in the rehearsal process. Through the video reflection's unusual behaviour, the dancer cannot recur to her habitual movement and orientation strategies. Similar to the participants in the digital installation *Rigid Waves* described by Mark Hansen in chapter 4.3, Graziadei's inner physical sensation is confused through her confrontation with an alienated and mediated reflection of her body. Graziadei thus undergoes a conflict in her bodily experience that has been generated through the technological modification of her body's external image. The dancer is in a situation which Hansen describes as a digitally generated disconnection between the external image and the internal sensations of her body. In this context, Susan Foster's theory allows us to understand where Graziadei's irritation specifically stems from. In her account, the dancer explains that she feels confused because her live video image's reactions considerably diverge from what she "wanted it to be". This indicates that she has developed an 'ideal body' for her performance in *Habitat*: through observing the virtual spaces, talking with her creative peers and following her live video image's reactions, Graziadei has developed visions of how her digital reflection should behave. She wants it to move effortless in the virtual rooms and play with their specifics such as the opaque and mobile digital walls. In this context it is interesting to note that the dancer's ideal body is shaped by the characteristics of *Habitat's* video technology. Graziadei for example notices that her imagined ideal reflection rather moves in sideways-oriented directions instead of

¹⁷⁶ Interview with Renate Graziadei, 17.12.2010.

dancing between the front and the back of the virtual spaces. This feature results from the dancer's impression that the digital spaces' depth, and with it the forward and backward movements of her live video image, appear "flat" on the computer screens. Graziadei therefore imagines her digital reflection to move more often to the virtual spaces' sides, as her steps become more visible this way. In this sense, the performer's activities and intentions, together with the technology's characteristics and possibilities, have brought forward a bodily ideal that the performer now intends to achieve. The dancer however realizes a discrepancy between her ideal and her perceived body, as she notes a disjunction between her idea of how her digital reflection should perform, and her actual performance as it is reflected by her live video image. This observation interestingly shows that Graziadei's live video body adopts the function of a demonstrative body: it shows the dancer that her actual performance differs from her imagined ideal body. This disconnection creates Graziadei's experience of physical estrangement.

While the feeling of disorientation might at present appear as utterly irritating and restrictive to the performer, Mark Hansen's concept of the body-in-code suggests that albeit its initial effect of confusion, this situation bears the potential for bodily development. As we have seen in chapter 4.3, Hansen's theory proposes that the experience of physical disorientation can be overcome through the readjustment with a technologically distorted body image. In Graziadei's case this could mean that she learns to accommodate her video image's unfamiliar reactions in her movements. This process, Hansen argues, allows a reframing and reorientation of the body on the level of its motor and perceptual dimensions, which can result in the expansion of the physical capacities and sensations (2006:44). In the context of *Habitat's* rehearsals, this idea signifies that learning to adapt to her modified video image can offer Graziadei the opportunity to discover and develop new ways of executing and feeling her movements. Hansen's concept of the 'body-in-code' thus allows us to understand that the performer's situation is not desperate: despite her experience of physical disorientation, she can overcome this first moment of friction through realigning her kinaesthetic capacities with the setup's unfamiliar video images. Here, Susan Foster's theory helps us to comprehend that Graziadei can do so more specifically by approaching her perceived and her ideal body. Adjusting to the digitally generated imagery could even allow the performer to explore new bodily possibilities. By means of this realignment process, the performer also works towards an embodiment relation with her digital video projections. To gain further and more concrete insights into the bodily dynamics occurring during *Habitat's* rehearsals, I therefore suggest following whether and how Graziadei attempts to overcome the situation of friction between her performing body and the digital video projection tool. Accordingly, the next section will provide a more profound description of the dancer's

strategy to bring her internal bodily sensations and her digitally modified external reflection in a balanced relation.

5.1.2 Strategy of realignment: developing a demonstrative body

In the previous subchapter we have seen that to pursue her choreographic activities, Graziadei needs to enter an embodiment relation with *Habitat's* manipulated video imagery. In order to move more intuitively in the digital environment, the dancer strives to overcome the sensation of physical disorientation that she experiences when working with her modified video reflection. She describes her attempts to realign with her digital image as follows:

I tried to get a feeling for the [video] image ... so I started to observe what exactly happened on the screens when I moved. I tried to figure out how the [video] image reacted to my activities ... I for example asked myself, 'if I go one step to the left, where does this make me stand in the virtual space?' I would follow my image and try to understand what was happening ... so you can picture me moving around, always staring at one of the screens to check my position on the video ... it was all about gaining a sense of the virtual spaces and the video [image]'s reactions, and the bodily awareness that this implies ... and because my live [video] image would show me exactly how I performed, I could check if I came close to what I wanted [my dance] to look like ... I learned how to make the image function with my body, according to my ideas ... I moved and watched, over and over again, for hours ... that's basically how I proceeded ... it took quite some time.¹⁷⁷

Graziadei explores her video image in order to get familiar with its peculiar reactions (figure 5.3). Her aim is to steer her live reflection in order to make it correspond to her choreographic visions. This will allow her to enter into an embodiment relation with *Habitat's* digital imagery and consequentially to create the desired situation of mixed reality. To realize this aim, Graziadei intends to make her live video image correspond to her imagined ideal body by controlling it through the movements of her actual perceived body. In this context, Susan Foster's theory permits to understand that during this rehearsal phase, Graziadei actively turns her video image into a demonstrative body as it takes in a didactic function: the performer intensely studies her digital reflection because

¹⁷⁷ Interview with Renate Graziadei, 17.12.2010.

it demonstrates in how far her current bodily performance differs from her imagined ideal. Graziadei thus uses her video image to check which of her movements need to be adapted if she wants her video reflection to meet her ideal body. In the same time, her digital image allows the performer to test whether the changes in her gestures generate



Fig. 5.3: Moving in *Habitat's* setup, performer Graziadei studies her live video image as it is displayed on the screens placed next to the dance floor. This practice allows her to realign with her live video image.

the desired effect. This way, Graziadei spends much rehearsal time orienting herself in *Habitat's* setup through the means of her demonstrative (live) video image. In this manner, turning her digital reflection into a demonstrative body becomes her strategy to realign her physical activities with *Habitat's* modified video imagery.

So far, we can observe that digital media are interfering in Graziadei's bodily experience on an external level, as her ideal and her demonstrative body are shaped by *Habitat's* digital video technology: the ideal (video) body is influenced by the video's and digital spaces' characteristics, while the demonstrative body itself is a numerical live video image. However, as we have seen, Mark Hansen suggests that through their involvement on the body's external dimension, digital media can also affect bodily experience on an internal level. According to Hansen, this happens during the process in which the concerned viewer tries to accommodate digitally modified imagery in her physical activities. This perspective thus directs us to further follow Graziadei's rehearsals and investigate whether, and if so, how the interaction with her mediated ideal and demonstrative bodies impacts on her perceived body.

After intensely studying and trying to guide her video image through her movements Graziadei makes an interesting observation. The dancer first of all notices that through her orientation towards her imagined performance, her movement style has changed. She for example discerns that she is executing more gestures that are oriented towards the dance floor's sides than she had previously intended. The performer's perceived body has thus adapted to the ideal body on the level of her movements.

Graziadei furthermore notes that the training process has engendered transformations on the level of how dancing with her live video image feels. She explains:

At some point I noticed that ... the [video] image's reactions didn't feel that strange to me anymore. In a way I got used to them, and I could foresee them, so that I could sort of steer the [video] image according to what I wanted [it to do] ... I [also] started to get a feeling for where the different rooms would end, and for how much [maneuvering] space they would leave me on the actual dance floor. I somehow felt where I needed to be [on the dance floor] if I wanted my video image to stand in front of a virtual wall for example, or where I should direct myself to if I wanted it to walk into a specific direction ... my movements were kind of adapting the [virtual] rooms' structures ... and the video [image]'s specificities.¹⁷⁸

Through the performer's intense efforts to make her live video image comply with her ideal conception of *Habitat's* performance, her kinaesthetic sensations and skills have changed: she can now anticipate and control her image's reactions and "feel" the dimensions of *Habitat's* virtual rooms in her motion. Thus, Graziadei's experience of moving in *Habitat's* setup has shifted. This shows that during the realignment process, the dancer's perceived body has undergone transformations. As a result of these changes, she is now able to "steer" her video image and make it act according to her intentions through her gestures. By adjusting her perceived body to her digitally influenced external physical reflection, Graziadei thus enters into an embodiment relation with the numerical imagery of *Habitat's* technologically equipped environment. Interestingly, she now also has the impression that her work in the setup has become "very smooth": her bodily transformations allow the dancer to finally move in mixed reality. Her freshly acquired skills make it possible for Graziadei to fluidly navigate the physical and virtual realms comprised in *Habitat's* setup.

Now that the obstacle of the dancer's physical disorientation is solved, it seems that she can continue her work and create *Habitat's* choreography without any additional disturbances. However, a closer look at Susan Foster's theory reveals that the training process bears the potential for further situations of friction. Foster more precisely suggests that during the training procedure, neither the perceived nor the ideal body remain stable as their definitions are changed and further developed (1992:484). The scholar for instance argues that the perceived and the ideal body mutually influence each other. In the case of dancer Graziadei, this could mean that her new physical (perceived) capacities can in turn also impact on the performer's vision of what her (ideal) reflection

¹⁷⁸ Interview with Renate Graziadei, 17.12.2010.

should look like. This situation might generate new differences between Graziadei's kinaesthetic abilities and her imagined performance, which would then require new processes of bodily learning. In line with Foster's reasoning, this chapter's focus on embodied processes with digital technologies raises the question whether the employed media also play a role in this ongoing process of transformation involving the dancer's perceived and ideal body. Guided by Mark Hansen's theory, we have already seen in this subchapter that digital media can affect the performer's kinaesthetic sensations by shaping her ideal body. Therefore I suggest that changes in the media's functioning, for example through the use of additional technological features, can again transform the performer's vision of her ideal performance. New possibilities to present Graziadei's video reflection could for instance impact on the dancer's ideas of how her video image should perform. These evolutions bear the potential for new moments of resistance between her ideal and her perceived body. In this light, it seems worthwhile to further follow Graziadei's work in *Habitat's* digitally equipped setup and investigate whether possible changes in the technology's functioning affect the dancer's idea of her video image's performance. This closer look can allow us a more precise idea of the rhythms of *Habitat's* relational dynamics.

5.1.3 New frictions through technological augmentations

In the course of *Habitat's* second rehearsal phase in 2010, the piece's setup is completed with further technological assets: a new algorithm in the software *Kalypso* allows to multiply Graziadei's video image, and the feature of the z-buffer provides an opaque masking effect to the walls and movable elements in *Habitat's* virtual spaces.¹⁷⁹ In the preceding subchapter I have suggested by referring to Susan Foster's and Mark Hansen's theories that changes in the technology involved in digital performance can cause further moments of friction in the dancer's bodily experience. Following Graziadei's rehearsals after the introduction of the new technological features indeed shows that working in the enhanced digital setup presents new challenges to the dancer. While she has previously learned to accommodate the digital spaces' characteristics in her bodily experience, the effects of image doubling and the covering walls perturb her physical sensations anew. Graziadei describes her work with her duplicated video image as follows:

¹⁷⁹ These technical features have been described in 3.2.

Dealing with Habitat's [setup] got complicated again when I was supposed to work with my [video] clones. There's one sculpture in which I perform with my live video image and a delayed, mirrored version of it. And in others, there are two or even up to seven lagged doubles of my live [video] image which reproduce my movements at different moments ... so I got new ideas, I for example wanted the clones to communicate. They should approach each other, go apart again, touch each other. But because the clones are either mirrored [and/or] delayed, they behave differently than my live image ... and in the beginning I felt as if I had no control over them, they were moving around in the virtual spaces and my live image was constantly running into one of the [image doubles]. It was strange, because my movements produced them, but I felt quite disconnected from them. I even felt [my live image being] kind of chased at some point ... that felt quite awkward.¹⁸⁰

To the performer, also working with the non-transparent walls turns into a confusing experience:

The z-buffer renders the virtual walls in the digital rooms opaque ... which meant new choreographic possibilities. I for example wanted my video clones to hide behind a wall from time to time. But it turned out that activating that masking effect was not that easy, because I need to stand at specific points on the dance floor and the system is very light sensitive.¹⁸¹ In the beginning, I had difficulties to figure out the correct positions ... I would walk around on the [dance] floor without knowing where exactly I needed to go to make the mask appear ... that felt really strange ... it made me feel lost again.¹⁸²

Graziadei's account shows that *Kalypso's* new features stimulate further choreographic ideas in the performer: she wants her video image to interact with its digital doubles and the opaque walls in *Habitat's* virtual spaces. Through the supplementary technological assets, the dancer's ideal body transforms. However, when working in *Habitat's* augmented setup, she notices that also her live video image has changed as it behaves in a different way.

Graziadei cannot directly perform her choreographic ideas because she has lost her physical orientation in the digital environment through her digital reflection's

¹⁸⁰ Interview with Renate Graziadei, 17.12.2010.

¹⁸¹ See also 3.2.

¹⁸² Interview with Renate Graziadei, 17.12.2010.

unfamiliar reactions. Hence, a further situation of friction emerges: the introduction of the new video effects has engendered a process in which Graziadei re-experiences a mismatch between her kinaesthetic capacities and her live video image. Again, the performer's internal, perceived bodily sensations are in conflict with her external body image. Through her video image's new reactions, the dancer again feels disconnected from her digital reflection. The performer has thus turned back to an alterity relation with her video image (Ihde, 1990).

Susan Foster's theory concerning the continuous transformation of the ideal and perceived body and Mark Hansen's suggestion that digital imagery can separate external bodily sensations from inner physical perception allow us to identify the moments of technological changes in *Habitat's* setup as key situations during the rehearsal process because they can engender new moments of friction in Graziadei's bodily experience. Through the supplementary video tools, the performer undergoes a further phase of physical disorientation that she needs to solve if she wants to continue her choreographic work: the new situation thus requires a new phase of negotiation between Graziadei's dancing body and the digital video device. In this context, Don Ihde's categorisation of mediation relations helps us to understand that like in *Habitat's* first rehearsal phase, Graziadei needs to incorporate the digital video image in her bodily experience and thus to enter an embodiment relation with it if she wants to realize her new creative ideas and move fluidly in the augmented setup (cf. Ihde, 1990). This subchapter thus shows that technological changes or adaptations bear the potential to considerably shape the rhythms of relational dynamics in digital dance. Through the z-buffer's and the video clones' additions Graziadei's rehearsals for *Habitat* take in a circular structure that is characterised by the dancer's repetitive experience of physical confusion and her subsequent attempts to overcome them.

In 5.1.2 we have already seen that Graziadei can solve the moments of resistance between her embodied sensations and the augmented video device by realigning her perceived and her ideal body. Tracing her attempts to re-establish an embodiment relation with *Habitat's* transformed video imagery can allow us to find out if Graziadei can simply revert to the realignment strategy of using her digital image as a demonstrative body, or whether the new technological characteristics require further plans of adaptation. This way we can gain a more profound idea of the manner in which (new) situations of friction can be overcome in *Habitat's* rehearsals. In the next subchapter we will therefore study the performer's undertakings to bring her new ideal and her perceived body back into balance.

5.1.4 Further challenges and strategies of realignment

The previous subchapter has shown that the technological augmentations in *Habitat's* setup cause new feelings of bodily confusion and disorientation in performer Graziadei. To regain her orientation in the virtual spaces and continue her work on the piece's choreography, the dancer needs to re-enter an embodiment relation with *Habitat's* video imagery. She therefore returns to the realignment strategy that she developed during an earlier rehearsal phase: while moving in the digital setup, Graziadei studies her live video image in order to understand how to change her movements so that her digital reflection corresponds to her choreographic ideas. In other words, the dancer again turns her video image into a demonstrative body. Just like in the preceding rehearsal phase, in many situations this procedure allows Graziadei to gradually re-inhabit *Habitat's* virtual imagery. However, the performer notices that her strategy is not suitable to every moment of *Habitat's* choreography, as her problems of bodily confusion remain when she works with specific video effects or characteristics in the digital spaces. In those cases, Graziadei needs to develop further strategies of realignment to incorporate *Habitat's* video images. In the following, I will describe Graziadei's different plans to achieve her aim of elaborating an embodied connection with the digital video technology she is working with.

Recording the demonstrative body

While rehearsing with *Kalypso's* video doubling effect, performer Graziadei soon notices that the work with the delayed clones of her live digital image shapes her aesthetic ideas. The dancer explains:

*With the [video doubles], the dynamics in the space are completely different. Depending on how often the video image is multiplied, you can fill the space with lots of clones ... that reminded me of some kind of vermin, and I wanted to reflect this idea in my movements as well. [The movements] became very abrupt and short, also for reasons of space.*¹⁸³

Graziadei describes that the possibility to multiply her video image influences her idea of how her video reflection should move in *Habitat's* virtual spaces: through the video's new

¹⁸³ Renate Graziadei, 10.11.2010.

affordances, the performer's ideal body develops further as it adopts a specific movement style. In the same time, the dancer also notices that the digital doubles create rhythms that she finds difficult to adapt to. Graziadei narrates:

Dealing with the clones turned out to be quite tricky ... usually, when you perform in a dance piece, as soon as you make a gesture it's already gone. But with the delayed clones, the movement comes back ... so if I wanted the video doubles to interact with my live image, I needed to be really accurate. I had to anticipate my movements to the point that I would know when and where a certain step that I'd made would be performed by a video double. So, if my live [video] image appeared in the middle of the space and I would walk to the right, I'd know that a few seconds later a clone would stand at that same place and move to the right side as well. And the doubles have different delay times, which can vary from two to fifteen seconds. They create particular rhythms, and for me it was really hard to keep up with that. I had to know the paces of the doubles to make them act according to what I wanted them to do, but that was incredibly difficult because that requires lots of accuracy. And when I studied my live video image while moving in the setup, things went really fast because of the [video] doubles' proper pace. It was almost impossible to perform and catch up with the clones in the same time ... I needed more time to get familiar with their specific rhythms.¹⁸⁴

Dancer Graziadei desires an intricate interplay between her live video image and its copies. Through the short and abrupt movement style and the multiplied video reflections, this new version of her ideal body however demands concise knowledge of the rhythms created by the doubles' delays. In this situation, Graziadei realizes that the simple study of her live video image does not allow her to get physically acquainted with the pace of the delayed clones. She needs a learning method that gives her more time to watch her cloned video reflections in depth. The dancer therefore adapts her approach of using her live video image as a demonstrative body to her new needs: she starts recording her performance in *Habitat's* video environment after a so-called rehearsal 'run'. These recordings are then saved on an USB stick so that Graziadei can repeatedly watch the resulting videos in the dance studio or at home (see figure 5.4).

I would watch the videos directly after a run, but also in the evenings and whenever it was possible. It was very intense. I would mostly imitate what my live image was doing on the video, and observe the reactions of the clones. And if there were

¹⁸⁴ Interview with Renate Graziadei, 17.12.2010.

*difficult moments, like situations in which my [live] image and a clone would overlap, I would watch this moment over and over again, put the tape on hold, rewind and watch it again, until I got a feeling for how to make it better.*¹⁸⁵

Dancer Graziadei thus completes her strategy of observing her live video image during the rehearsals with the viewing of the recorded runs. She imitates the movements of her recorded live image and follows the ensuing delayed repetitions of her performance by the digital doubles. While altering between the practice of rehearsing in the setup and closely examining the resulting recording, Graziadei notices that she can gradually anticipate the clones' reactions through her movements. Similar to *Habitat's* first rehearsal phase, the performer realizes after some time that she increasingly manages to direct the video image with her gestures, so that her live video reflection starts interacting with its delayed doubles. Through the process of studying her live and recorded demonstrative body, Graziadei manages to generate kinaesthetic sensitivities for the clones' respective dynamics. The performer has thus again created an embodiment relation with *Habitat's* digital imagery. Thanks to this learning process, Graziadei can now make her live video image interact with its multiplied reflections and thus approach her perceived and ideal body. Interestingly, this specific training procedure also affects the performer's experience of how it feels to move in space. The dancer explains that although she knows that "in real space" she is walking on an empty dance floor, she senses the clones' fast and tight rhythm in her body. Through



Fig. 5.4: Renate Graziadei intensely watches the recordings of her rehearsal 'runs'. In the front, multimedia specialist Martin Bellardi is working on the settings of the software *Kalypso*.

the interaction with her digital video image and its multiplied reflections, she reports to "feel like being amidst a crawling crowd".¹⁸⁶ This experience occasionally even gains a tactile dimension, as Graziadei observes that she sometimes feels startled when her live image unintentionally collides with one of its doubles: in those situations, she has the

the interaction with her digital video image and its multiplied reflections, she reports to "feel like being amidst a crawling crowd".¹⁸⁶ This experience occasionally even gains a tactile dimension, as Graziadei observes that she sometimes feels startled when her live image unintentionally collides with one of its doubles: in those situations, she has the

¹⁸⁵ Ibid.

¹⁸⁶ Renate Graziadei, 10.11.2010.

impression to “run into the clone [her]self”.¹⁸⁷ The negotiation with her digital video images thus has allowed Graziadei to discover and develop further movement qualities in *Habitat*'s setup.

Using 'physical' markers

While Graziadei mostly gains a physical understanding for the virtual rooms' characteristics through the strategy of intensely watching her digital reflection, she also notices that some of the spaces' details and dimensions are more difficult to assimilate. She explains:

*Although I got better at [orienting myself in the environment], there were moments in which I would always get lost. This happened for example in the 'well' sculpture, whose area is extremely limited. In that space I am recorded from above, and I move within an area of around 1,5 x 2 metres, which is really narrow, especially because I am mostly stretched out on the floor to make my body visible on the screen. That sculpture has huge walls, and when they turned opaque [through the z-buffer], they generated a claustrophobic atmosphere, and I wanted this to be reflected in my movements. So in the well I slide a lot along the walls and touch them. But that turned out to be quite difficult, because each time I tried to work out some material I would sooner or later transgress the space's borders, just by stretching my arm out a bit, or because I had turned a few centimetres too far to one side. That means that once the walls were not transparent anymore, my arm or another body part would be 'swallowed' by one of those walls, and that was really irritating ... it was really difficult to find my bearings in that narrow space, and we didn't have much time left ... so we decided to put some black adhesive tape on the floor, which helped me find my way within the sculpture. So in the 'well', I watch both the screens and the markers.*¹⁸⁸

In her account, Graziadei describes that her choreographic ideas are again affected by the new technological effect. The recent opacity of the well sculpture's walls inspires her to express a claustrophobic atmosphere in her movements. Furthermore, she does not want her video image to disappear behind those virtual walls: the dancer's ideal body thus evolves further. In the same time, the dancer's video image is transformed through the opaque effect, as her body parts are not displayed on the screen anymore once they

¹⁸⁷ Ibid.

¹⁸⁸ Interview with Renate Graziadei, 17.12.2010.

transgress the space of the non-transparent virtual walls. This effect, combined with the 'well's narrow measures, has a disorienting impact on Graziadei. In order to facilitate her orientation in the virtual space, the dancer and her colleagues place visual markers on the dance floor. Placed on key points in the performing area, the adhesive tape indicates the well's borders in physical space. It thus shows Graziadei where she can move on the dance floor without her video image being covered by the virtual walls. From now on, the performer not only refers to her demonstrative video image, but she also watches the markers on the dance floor to learn how to move in the particular virtual room. This way, watching the adhesive tape turns into a supportive realignment strategy for Graziadei as it allows her to work with her digital reflection in a more precise manner. These activities permit the dancer to approach her actual physical performance to her imagined ideal of moving her video image tightly along the opaque, virtual walls without the reflection being "swallowed" by them. Here, Graziadei's negotiation practice thus further illustrates Hansen's notion of 'mixed reality', as during her performance, she switches between the markers in physical space and the digital spaces' virtual architecture. Interestingly, after some time of repeatedly looking at the physical markers while moving in the rehearsal space, Graziadei notices that she has "gained a feeling" for the sculpture's narrow dimensions. She now knows "in her body" which points in physical space correspond to the virtual room's limits. As a consequence, she does not feel the need to refer as intensely to the adhesive tape as in the beginning of her work with the live video image. Referring to the physical markers has allowed the performer to gain more sensitivity for the interaction with her digital reflection and with the 'well' sculpture's spatial dimensions. Through this procedure, Graziadei is increasingly able to steer her video image in the sculpture's virtual room without transgressing its virtual borders. Using the adhesive tape as a means for spatial orientation has thus helped Graziadei as a supplementary strategy to develop an embodiment relation with her digital image in the 'well' sculpture. During this process, also her perceived body has again transformed.

Adapting the demonstrative body

While Graziadei mostly refers to the strategy of adapting her kinaesthetic abilities to her imagined ideal performance through orienting herself along her video image, she realizes that this procedure is not possible in every rehearsal situation. She notices that the work with certain digital clones exceeds her memorizing capacities. Although she desires to perform with long-delayed doubles of her live video image, the dancer has considerable difficulties to keep up with them. For instance, virtual clones with a reaction of at least thirty seconds challenge the performer's mnemonic abilities to the point that they render the work in *Habitat's* environment impossible. Graziadei thus realizes that her perceived

body cannot approach the desired ideal because she is not able to develop an embodiment relation with her (demonstrative) video image, or rather its delayed clones. Therefore Graziadei and her creative partners decide to solve the problem in a way that differs from the usual learning procedure. The dancer explains:

*The longer the delays became, the more complicated it was to remember the steps that I'd made, and that made it difficult to get the interaction between the [live] image and the clones going. That's why I asked [programmer] Martin to change the problematic delays to a shorter rhythm because that felt better for me to work with.*¹⁸⁹

To facilitate Graziadei's work with the video doubles, the duration of the 'problematic' video clones is shortened. This action is particularly interesting because while Graziadei hitherto used her video image as a reference point to train her bodily abilities in order to reach her ideal performance, at this particular moment the dancer decides that her demonstrative, digital reflection itself be transformed. This happens through the adaptation of the delays', and thus the technological, settings. In this situation, Graziadei's demonstrative body is changed according to the capacities of the dancer's perceived body. As the digital clones now react in a quicker way, this procedure causes changes in Graziadei's idea of how *Habitat's* performance will look like: through the technical adaptation, the dancer's ideal body evolves in accordance with her memorization abilities. Graziadei is now able to memorize the video doubles' shortened delays, she can work towards an embodiment relation with the video image's digital clones. She does so by reverting to her main realignment strategy, which consists in readjusting her motoric and sensory abilities to the new ideal body.

5.1.5 Intermediate conclusion

Following Graziadei's activities to incorporate digital video technology in her embodied experience allows us concrete insights into the procedures that generate the relational dynamics between dancing bodies and new media during the rehearsals for *Habitat*. Here, the concepts of the analytical grid developed in chapter 4 help to understand the specificity and complexity of the processes that make these dynamics possible. The theoretical lenses permit to identify and name the key moments in which the dancer negotiates her bodily experience with *Habitat's* video technology. A perspective informed

¹⁸⁹ Interview with Renate Graziadei, 17.12.2010.

by the theoretical framework shows that Graziadei's dancing body is neither merely shaped in a one-way, causal process by *Habitat's* video tool, as would be the case in a techno-deterministic view, nor does the technology function as a mere physical extension, as would be argued from a techno-instrumentalist or phenomenological standpoint. Rather, the technology and the performer's body are involved in a procedure of multiple negotiations that affect both Graziadei's embodied experience and the digital device. In this context, I have identified the situations of friction occurring during *Habitat's* rehearsals as crucial moments in the constitution of the dancing body because they bring Graziadei to develop different bodily strategies to (re)constitute a physical relation with the digital video device. I have shown that in the light of the theoretical framework, those moments of resistance reveal as situations in which the dancer's work with digital technology, in this case *Habitat's* video imagery, generates conflicts in her physical experience. The technological modification of Graziadei's video image causes a discrepancy between the dancer's inner physical sensations and her external body image, which has a disorienting effect on the performer. In order to bring her bodily experience back into balance, Graziadei subsequently works out a method that involves the technology's characteristics on an imaginative, a didactic and a perceptive-kinaesthetic bodily level. We have seen that through this process, she experiences shifts on the imaginative and sensory dimensions of her body. The empirical observations have shown that while the dancer adapts to the technological tool's specific features during these dynamics, she also expands her choreographic and sensory capacities. Graziadei for instance extends her sense of space as she is able to steer her live video image in the virtual rooms through her movements. By directing our attention towards Graziadei's bodily experience, the theoretical framework allows us to understand that *Habitat's* digital video technology presents an important part in the formation of the dancer's body. Furthermore, through the analytical lenses situations of technological changes emerged as key moments during the rehearsal process because they shape the rhythm in which the performing body is trained. Graziadei's account has shown that shifts in the device's performance bear the potential to cause new situations of friction in the performer. This has brought the dancer to adapt her strategy of bodily assimilation by completing it with different supportive activities according to the technological characteristics. We have seen that these individual negotiation strategies shape Graziadei's (perceived) body in various ways on the level of her movements and her kinaesthetic sensitivities. We furthermore observed that during these procedures, also the technological device undergoes changes to make the dancer's physical realignment process possible, in particular through the adaptation of the tool's settings. These findings demonstrate that *Habitat's* rehearsals present an ensemble of distinct and intricate negotiation processes in which neither the dancing body nor the technological device remain static as both change over time, albeit to different extents.

The example of *Habitat* has shown that dancer Graziadei was able to overcome the different situations of the technologically induced frictions by orienting herself with the help of her reactive live video image. The latter took in an essential role as it adopted the didactic function of a demonstrative body that allowed Graziadei to realign her physical sensations with her mediated ideal. We will see that the dancers in the next case study *loopdiver* are presented with a fundamentally different technical situation: here the performers are supposed to work with a looped videotape that displays an ideal body which they can never reach. Furthermore, unlike *Habitat*'s performer, *loopdiver*'s dancers cannot make use of their video images as live demonstrative bodies because their video reflections are non-reactive. However, also Troika Ranch's dancers feel the need for didactic elements that help them to find out how to approach their ideal bodies. In the course of *loopdiver*'s rehearsals, they will develop various strategies to imitate the movements displayed on the looped videotape. This early glimpse into the situation of *loopdiver*'s performers shows that here, the relational dynamics between the dancing bodies and the digital video images need to be created in ways that differ from those presented in the case of *Habitat*. Following the performers of the second case study *loopdiver* will thus allow us to discover further forms of relational dynamics and routes which dancers can take to meet their mediated ideals. This moreover indicates that the characteristics of the technologies employed in digital dance rehearsals affect the strategies in which dancers proceed to train their bodies. It also permits us to identify further manners in which digital media can infiltrate in dancers' embodied experience, and to describe the quality of the resulting bodily changes.

5.2 *Loopdiver*: performing an impossible choreography

In the summer of 2009, during a residency in Berlin, Troika Ranch produce the video from which the dancers are supposed to learn *loopdiver*'s choreography. For this, the group rehearses a five-minute long dance piece which is subsequently recorded and extended with the looping structure in the programming environment *Isadora*. More precisely, Troika Ranch record the choreographic base material with several cameras from different angles. This way the group intends to ensure that each of the six performers will be visible on the resulting videotape at least once in every moment.¹⁹⁰ Composer and

¹⁹⁰ Because the dancers constantly move and change places during the choreography, their bodies will eventually cover each other when exclusively seen from a single perspective.

multimedia specialist Mark Coniglio then adds the music score that he created for *loopdiver* to the video recording. In the following, Coniglio introduces a loop structure to the videotape, with the result that the 'looped' recording, and with it the displayed choreography, is stretched from five to approximately 45 minutes. The composer finally selects three perspectives from the different camera angles and converts them, with the result that the three angles appear in one and the same video clip (figure 5.5). This multi-angled, looped footage presents the base of *loopdiver*'s choreography and serves as model to the dancers. The performers' task subsequently consists in physically copying the 45 minutes of modified choreographic material. Each performer is thus asked to imitate the looped steps of her personal digital video reflection.



Fig. 5.5: This screenshot presents the video from which the performers are supposed to learn *loopdiver*'s choreography.

This case description already shows that *loopdiver*'s performers find themselves in a considerably different situation than *Habitat*'s dancer. As the looped videotape is not reactive, the performers are not working in a setup that requires any mixed reality experience. Like we have seen, their task consists in physically copying the manipulated video recording. Thus, instead of being asked to fluently move between physical and virtual spheres like Renate Graziadei, the performers are supposed to embody the digitally transformed choreography.

So far, this task appears as an ordinary assignment to the performers because learning dance steps from a videotape presents a current training practice for dancers¹⁹¹. Performer Morgan Cloud confirms this by explaining that "usually, you watch the recording and then try to imitate what you see on screen". In this context, Susan Foster's theory helps to elucidate the role that video recordings can play in choreographic learning processes. Cloud's remark on the use of videotapes in habitual rehearsal situations shows that the video illustrates how a certain sequence of steps should be

¹⁹¹ Since several decades, choreographic works have been recorded on video for purposes of documentation and transmission.

executed and physically imitated. The video recording thus displays what Foster describes an ideal body. Foster's notion hence shows us that the dancers intend to assimilate *loopdiver's* choreography by employing the manipulated videotape as a standard that needs to be achieved.¹⁹² Intriguingly, the dancers soon realize that they cannot simply imitate what they watch on the looped video recording. The performers notice that the looping procedure has transformed most of the displayed movements to a point that they are hard to memorize and impossible to execute by physical bodies. As a consequence, the dancers feel irritated, because "even though we could see ourselves [performing the looped movements] on the video, we could not do it in real life".¹⁹³ The performers are confused because they cannot work with the video images like they are used to. Their irritation is reinforced by the fact that they see their very own bodies performing on the digital images without being able to reproduce the looped actions. This experience marks a moment of friction in *loopdiver's* rehearsals. This situation directs our attention to the dancers' learning process and hence to how they attempt to imitate the videotaped and looped choreography. In the next section I will therefore follow the dancers' approaches to incorporate the looped movements. This will also lead me to examine the performers' irritation with regard to their modified video reflections more closely.

5.2.1 Irritating video loops

In the preceding paragraph, we have seen that video recordings of dance sequences can be used as choreographic models in dance training and rehearsal, and are thus accorded the function of ideal bodies. Troika Ranch's performers plan to employ the looped video recording of their choreography in this manner: during the first days of *loopdiver's* rehearsals the dancers bring their laptops to the dance studio in order to view and study the looped videotape. However, like already mentioned, once the performers try to physically execute the movements of the video recording, they notice that they cannot merely imitate what they see on their computer screens. The dancers realize that the looped movement sequences have been modified in a way that they cannot be performed by human bodies. This confuses the performers. Performer Cloud reports:

¹⁹² In this context it is worth mentioning that while the video recordings of performances can take in the role of choreographic ideals, they can also adopt the status of didactic tools in training situations. Similar to mirror images, the recordings of a rehearsal session allow performers to observe and evaluate their personal performance and to define those aspects that still need improvement. Speaking in Foster's terms, in that case the video images rather function as demonstrative bodies.

¹⁹³ Interview with Morgan Cloud, 12.10.2009.

The loops had cut our short choreography into several thousand little movements ... that's extremely difficult to remember, and it's extremely fast. And we can't do all of the moves we see on the video. [On the looped video] I'd see myself do a step and then change direction for example in the middle of a weight shift, and I thought, well I did it on the video, so I should be able to do it on the dance floor as well. But ... you can't simply rewind [the movement of] falling to the ground. Or you can't be on one side of the stage [in] one second, and stand on the other [in] the next moment, it's impossible. It was such a strange experience, because even though you could see yourself doing that on the video, you couldn't do it in real life. That was really irritating.¹⁹⁴

Cloud's description shows that the looping procedure has transformed *loopdiver's* original movement material into a choreography that challenges the dancers' mnemonic and physical capacities. In this sense, *loopdiver's* transformed video imagery explicates an aspect which is more or less present in any situation involving the encounter between organic and virtual bodies because it amplifies the discrepancy between digital and physical entities. The editing-like looping procedure with its rapid changes in dynamics and abrupt weight shifts does not present any challenge to the digital video body. To the dancers, the task of performing the extremely segmented footage however turns into a considerable obstacle because the abrupt alterations in the video bodies' movements defy the performers' momentum and their attraction to gravity. In his account, Cloud explains that the dancers feel confused during their attempts to imitate their video reflections because their own digital images behave in unfamiliar ways. Not being able to hold up with the pace of their digital reflections, the dancers feel like "being in a different world"¹⁹⁵ and even experience the video technology as an "unforgiving enemy"¹⁹⁶ because their habitual tempo and physical coordination abilities seem to be suspended in the looped choreography. The performers thus find themselves in an alterity relation with their looped video images (cf. Ihde, 1990). The dancers moreover report that although they learned and performed *loopdiver's* base choreographic material, they feel "lost"¹⁹⁷ in their bodies when trying to copy their modified video reflections:

We tried to move like we did on the video, but we couldn't figure it out in our bodies ... that makes you feel quite helpless. I mean, we're all trained dancers, but we were

¹⁹⁴ Ibid.

¹⁹⁵ Interview with Travis Sisk, 13.10.2009.

¹⁹⁶ Interview with Johanna Levy, 14.10.2009.

¹⁹⁷ Ibid.

*unable to do what we saw ourselves doing on those [computer] screens ... it felt quite weird and frustrating.*¹⁹⁸

Similar to *Habitat* dancer Graziadei, *loopdiver's* performers experience feelings of physical confusion and irritation when confronted with their digital video images. Also here, Mark Hansen's theory helps to understand the performers' bewilderment. Like in *Habitat's* case, the dancers' inner physical sensations are confused through the mediated reflections of their bodies. Troika Ranch's performers thus also experience a digitally generated disconnection between their external images and the internal sensations of their bodies. Interestingly, although Hansen's approach refers to digitally generated bodily conflicts in the context of reactive digital images, it is also relevant in *loopdiver's* case. This situation is due to the fact that just like in the installation *Rigid Waves* described by Hansen, *loopdiver's* performers see their very own reflections executing distorted movements that their physical bodies cannot imitate. In this sense, *loopdiver's* imagery has the same disorienting effect on the performers like the transformed, reactive live imagery described by Hansen. Although the situation of Troika Ranch's performers shows parallels to *Habitat's* dancer Graziadei, it also bears a significant difference. While Graziadei is working with reactive video images, *loopdiver's* performers are confronted with non-reactive reflections of their bodies. This discrepancy is important insofar as, like we have seen in 5.1.2, Graziadei is able to correct the mismatch between her inner physical sensations and her external body presentation through realigning herself with the help of her video image's reactions. Like chapter 4.3 shows, interacting with one's mediated, digital presentation is also the procedure Hansen himself proposes for solving this situation of bodily conflict. In the case of *loopdiver*, this realignment strategy is however not possible because the dancers cannot enter in interaction with their non-reactive video reflections. The situation creates a considerable amount of frustration among the performers: they realize that they are unable to fulfil their task and copy the looped movements.¹⁹⁹

While the performers do not yet know how to pursue their assignment, Susan Foster's theory helps to understand that the performers are not as helpless as they might feel during this first rehearsal phase. As explained in 4.3.1, Foster describes the ideal body as an abstract model that can also be fantasized (1992:483). This allows us to comprehend that the looping procedure has brought forth a mediated ideal body that the dancers cannot always achieve: rather than displaying a physically workable dance, the videotape at times presents a more abstract choreographic ideal. The looped ideal body

¹⁹⁸ Interview with Jennifer Kovacevich, 09.10.2009.

¹⁹⁹ For further documentation of the performers' bodily confusion see 3.1.2.

thus rather serves as a guideline, or reference, for the performers' choreographic aspirations. Here it is interesting to note that contrary to the case of *Habitat* where the ideal body resulted from Graziadei's experiments with the employed technology, the ideal body in *loopdiver* presents a digitally generated norm that is imposed on the dancers. This observation shows that ideal bodies can be mediated in different ways.

After some time also the performers understand that the video's technological transformation has turned the recording into an impossible ideal. Dancer Sisk narrates:

At some point I realized that my image on the video is a projected me. It's not something I can accomplish. It's my 'super me' in the video, and I am my 'real me'. And my 'real me' will never be my 'super me'.²⁰⁰

Knowing that they are confronted with movements that are partly unrealizable, choreographer Dawn Stoppiello and the dancers change their perspective on the work with the modified recording because they decide that "you have to make a choice about how to deal with the video".²⁰¹ This means that while they are still supposed to stay as closely as possible to the looped videotape, the dancers intend to find ways to 'translate' the challenging and partly unattainable loops into physical language. Or, as dancer Johanna formulates:

Performing some loops is impossible, but there must be some way to make them look like they're possible [to execute].²⁰²

From now on, the dancers' new aim is to incorporate the modified movement sequences in a physically conceivable way. This way, the dancers strive to come close to their ideal bodies. Thus, as we have seen in the case of *Habitat* dancer Graziadei, Troika Ranch's performers try to realign with their digitally modified video images, albeit in a different way: instead of learning to interact with their reflections (as was Graziadei's case), *loopdiver's* dancers aim at incorporating their images' modified movement sequences in a physically possible manner. However, the performers do not yet know how to realize this aim. As we have already seen in 4.3, Susan Foster suggests that dancers attempt to reach their specific ideal bodies during the training procedure. Throughout this learning process, the performers revert to and develop different strategies that allow them to approach their perceived and their ideal body. Therefore I suggest following whether and

²⁰⁰ Interview with Travis Sisk, 13.10.2009.

²⁰¹ Interview with Dawn Stoppiello, 10.03.2010.

²⁰² Interview with Johanna Levy, 14.10.2009.

how Troika Ranch's performers train their bodies to execute the looped video material. This will allow us to find out how *loopdiver's* dancing bodies are concretely trained, and in how far *loopdiver's* digital video imagery is involved in the dancers' physical learning process.

5.2.2 General strategies of realignment

The following two subchapters trace the different methods that Troika Ranch's dancers employ to approach their perceived and their mediated ideal bodies. We will learn that in a first attempt, the dancers will apply particular practices to generally assimilate the looped choreography. These will be presented in this subchapter. In a next phase, the dancers will create further realignment strategies that are closely linked to the loops' particular technical characteristics. These will be discussed in chapter 5.2.3.

Adapting the video interface

With the new goal to render the looped choreography physically executable, the dancers return to the modified video in order to study it in more detail. During this process the performers notice that they have difficulties to orient themselves in *loopdiver's* intricate choreography. As explained in 5.2.1, the looping structure has dissociated the choreographic base material to a point that it is hard to memorize. Dancer Levy explains:

It felt so strange because we knew the [original] choreography by heart. And the base material, as we call it, was quite simple. But once it was looped, it became really dense, it turned into something completely different ... because the loops had turned the choreography into thousands of little movements which didn't always belong together. There were cuts in the gestures that hadn't been there before, and which just weren't logical, physically ... sometimes we felt really lost because it was just so difficult to remember all those little, separate movements. For example, at some point in the base choreography I move my outstretched arm up in the air. In the looped version, [the arm] moves up for a second, then it moves back down for half a second. After that it's suddenly up in the air, right above, but the next second you see my arm down again, but at a slightly different place than it was before.

*How would you learn a choreography that lasts like that for fifty minutes? It was crazy.*²⁰³

Levy's experience shows that the dancers cannot learn the looped choreography through the simple study of the video recording because they cannot memorize the complex loop structure. In other words, the looped ideal body challenges the performers' perceived bodies. To gain a clearer idea of the looped choreography, the performers therefore start examining the loop score's protocol. This technical document contains details on every modification undertaken in the video recording. For this undertaking, artistic co-director Coniglio turns towards *Isadora's* 'loop editor'. This tool has been developed by Coniglio himself and provides information on the duration and characteristics of each element in the looping score (fig. 5.6). Coniglio extracts the loops' data and inserts them in a word document that is handed out to the dancers (fig. 5.7).

Step	Start Time	Mode	Repeats	Start	Duration	Rate	Start Shift	LR	Dur Shift	Black	End Time	End Dur.	Run Time
1	00:06.350	Loop	24	4.35	2.0	1	0.25	0.0	0.0	0.0	00:12.350	00:02.000	01:30.000
2	00:12.350	Loop	7			1	0.0	-0.25	0.0	0.0	00:12.350	00:00.250	00:17.500
3	00:12.350	Loop	25			1	0.04	0.0	0.0	0.0	00:13.350	00:00.250	00:11.500
4	00:13.350	Loop	20			1	0.0	0.025	0.0	0.0	00:13.350	00:00.750	00:19.500
5	00:13.350	Loop	25			1	0.05	0.01	0.0	0.0	00:14.600	00:01.000	00:42.250
6	00:14.600	Loop	10			1	0.25	0.05	0.0	0.0	00:17.100	00:01.500	00:22.000
7	00:17.100	Loop	10			1	0.5	0.1	0.0	0.0	00:22.100	00:02.500	00:34.000
8	00:22.100	Loop	24		1.0	1	0.0	-0.025	0.0	0.0	00:22.100	00:00.400	00:34.200
9	00:22.100	Loop	15			1	0.02	-0.01	0.0	0.0	00:22.400	00:00.250	00:09.600
10	00:22.400	Loop	15			1	0.01	-0.01	0.0	0.0	00:22.550	00:00.100	00:05.250
11	00:06.350	Play		0.35	6.0	1					00:06.350	00:06.000	00:06.000
12	00:06.350	Jump		Jump Time: 4.35							00:06.350	00:00.000	00:00.000
13	00:06.350	Loop	7		2.0	1	1.0	0.0	0.0	0.0	00:13.350	00:02.000	00:21.000
14	00:13.350	Loop	20		0.2	1	0.05	0.025	0.0	0.0	00:14.350	00:00.700	00:16.500
15	00:14.350	Loop	10			1	0.1	0.05	0.0	0.0	00:15.350	00:01.200	00:17.500
16	00:15.350	Loop	8			1	0.25	0.1	0.0	0.0	00:17.350	00:02.000	00:22.800
17	00:17.350	Loop	7			1	1.0	0.0	0.0	0.0	00:24.350	00:02.000	00:21.000
18	00:24.350	Loop	1			1	1.15	0.0	0.0	0.0	00:25.500	00:02.000	00:02.850
19	00:25.500	Loop	5		0.5	1	0.1	0.1	0.0	0.0	00:26.000	00:01.000	00:06.500
20	00:26.000	Loop	5			1	0.25	0.2	0.0	0.0	00:27.250	00:02.000	00:12.750

Fig. 5.6: Screenshot of the loop structure in *Isadora's* loop editor

Studying the protocol allows the dancers to structure the manipulated choreography, as they divide the technologically modified steps into different loop types and their 'repeats'. Dancer Cloud describes the procedure as follows:

²⁰³ Interview with Johanna Levy, 14.10.2009.

In the piece, we could identify what we call 268 loop steps. And then there are repeats, those refer to how many times each loop step occurs. And each loop step has such a set of repeats, but the number and type of repeats are different for every loop step ... for example, loop step one is a shifting loop, it's a shifting palindrome, which means that it's moving forward and backward again. The loop is two seconds long and it shifts forward in time by half a second ... and it does that 24 times, so it has 24 repeats. And then comes loop step two, which is completely different: there are 20 repeats, and the duration decreases by every 0.3 seconds. That means that loop step two has the same starting point, it doesn't shift, but it gets continuously shorter throughout the 20 times that it's repeated. So loop step two has a completely different set of rules than step one, and so do all the other loop steps.²⁰⁴

9	00:00:22.100	-	0.4	Loop	15X <->	0.02 shf+	-0.01 dur-
10	00:00:22.400	-	0.25	Loop	15X <->	0.01 shf+	-0.01 dur-
11	00:00:00.350	-	6.0	Play	1X	0.0	0.0
13	00:00:06.350	-	2.0	Loop	7X <->	1.0 shf+	0.0
14	00:00:13.350	-	0.2	Loop	20X <->	0.05 shf+	0.025 dur+
15	00:00:14.350	-	0.7	Loop	10X <->	0.1 shf+	0.05 dur+
16	00:00:15.350	-	1.2	Loop	8X <->	0.25 shf+	0.1 dur+

Fig. 5.7: This excerpt from the loop score has been handed out to Troika Ranch's performers in order to provide them a choreographic learning aid.

This systematic approach to the looped video allows the performers to gain more orientation in *loopdiver's* choreography and helps them to provide a frame of reference to the dissociated movements. Performer Jennifer Kovacevich reports:

Knowing the loop score helps to relate all those tiny looped movements to the original steps in the choreographic base material. So it helps to better understand

²⁰⁴ Interview with Morgan Cloud, 12.10.2009.

where a certain snippet of a gesture comes from. It somehow provides a context to the [looped] steps, and that makes us get a better grip on the choreography.²⁰⁵

While the loop structure facilitates the performers' understanding of *loopdiver's* choreography, the dancers still encounter difficulties to memorize the complex score in every detail. Therefore, Troika Ranch decide to augment the video recording with supplementary indicators. In this context, co-director Coniglio explains that “[he] had to add various forms of information to the [video]tape to aid the dancers' learning process”.²⁰⁶ To facilitate the performers' assimilation procedure, two black bars bearing different data are inserted in the looped digital videotape. Placed respectively at the top and the bottom of the video frame, the bars provide numbers that indicate the loop step, its repeat count and information on the loop type and a timeline showing at which moment the movement in question occurs (fig. 5.8). Coniglio furthermore equips the video's looped soundtrack with sound cues that announce the beginning of a new loop step. These different indicators are supposed to support the performers' memorization of and orientation in *loopdiver's* intricate choreographic structure as the dancers can now refer to the different visual and audible aids while watching the looped videotape. Subsequently, the dancers study the loop structure in the rehearsal studio (fig. 5.9). Troika Ranch's activities in this rehearsal phase show that the modified video recording is enhanced to facilitate the performers' learning process. The technology is thus adapted to make the dancers' first steps towards the incorporation of their looped images possible. Considered from a perspective inspired by Susan Foster, this situation shows that the dancers' ideal body is adapted to their perceived body's capacities through changes in the design of the videotape. By adding quantifiable information such as numbers to the video recording, the dancers have thus shifted their imposed norm by attaching a rational dimension to it. The rehearsal process of *loopdiver* thus reveals a new



Fig. 5.8: Screenshot of the modified video: the loop information bar serves as learning aid to the dancers.

²⁰⁵ Interview with Jennifer Kovacevich, 09.10.2009.

²⁰⁶ Interview with Mark Coniglio, 18.8.2009.

strategy of realignment, which is the adaptation of the ideal body through the addition of cognitively accessible information. This practice did not figure among the learning strategies of *Habitat* dancer Graziadei who rather generated her ideal while interacting with her demonstrative live video image. However, in Graziadei's case, the ideal body remained invisible, and it evolved along with her negotiation with her live video image. The ideal body in *loopdiver* however is visible and imposed on the dancers. *Loopdiver's* mediated ideal is furthermore difficult, if not impossible, to reach for the performers. Therefore, the performers' move to adapt the videotape by providing it with a rational and cognitive dimension seems a logical solution to render the looped choreography more accessible. This observation shows that the characteristics of the employed technology can also shape the way in which dancers work and negotiate with their digital tools. The technological augmentations in the videotape thus provide the performers means to interpret and therewith assimilate the looped choreography.

By now, *loopdiver's* performers thus have taken an important step towards the assimilation of the modified choreography by adapting their ideal video body to the needs of their cognitive abilities. However, we have already seen that Susan Foster also suggests that during the training process, both the perceived and the ideal body mutually transform each other. In *loopdiver's* case, this could mean that not only the dancers'



Fig. 5.9: Troika Ranch's dancers study the loop structure in the rehearsal space

memorization capacities influence the appearance of the videotape, but that the changes in the video recording reciprocally also affect the way in which the dancers experience working with the augmented videotape. Therefore, Foster's theory directs our attention to the performers' sensations when trying to memorize *loopdiver's* choreography with the help of the enhanced video recording. And indeed, the dancers notice that the work with the new indicators in the looped video impacts on the performers' physical experience. Dancer Lucia Tong explains:

When we worked with the [enhanced] videotape, we started numbering and counting each tiny movement to learn the choreography. So you can imagine us sitting in front of our laptops, counting all the time ... it really helped to get the loops into our minds ... so the steps were linked to their numbers, and we were

*moving and counting. But the counting was specific to the loop structure, so it was different from the [counting] we usually do ... because here we don't count with the music beats but with the movements, it's not the same. And because we were constantly counting every tiny step, it was quite tedious as well. I sometimes had the impression to turn into a little robot or a computer program myself.*²⁰⁷

Lucia's account shows that reading the loop structure's numbers on the information bars in the video provides the dancers stability in the learning process. For the dancers, this practice makes the digitally altered movements, and with this the ideal body, more accessible on a cognitive level. This achievement however also has consequences on the performers' perceived bodies, as the dancers adapt their way of numbering and counting the dance steps. The new and permanent counting activity in turn creates a mechanical feel to the performers, as they experience themselves as "computer programs"²⁰⁸ during the rehearsals. Working with the augmented video recording thus affects the dancers on the level of their perceived body.

This section has shown that the performers could gain a better grasp of the looped choreography's structure through the adaptation of the video device by adding a quantifiable dimension to it. To the dancers, this procedure has made *loopdiver's* intricate structure more accessible on a cognitive level. The performers nevertheless still need to find out how to perform the complex and physically challenging loops with their bodies. To realize this purpose, the dancers start to slow the looped video down. The next section will describe that they therewith create a demonstrative body that further facilitates the performers' learning process.

Developing a demonstrative body through the video's deceleration

In 5.1, we have seen that *Habitat* dancer Graziadei manages to realign her inner physical sensations with her mediated ideal body by using her live video reflection as a demonstrative body. 5.2.1 has shown that *loopdiver's* performers cannot refer to the same strategy as they do not dispose of any reactive video image that could serve them as means for orientation during the learning process. However, also Troika Ranch's dancers feel the need for didactic elements that help them to find out how to approach their ideal bodies. They therefore create a demonstrative body by slowing the looped videotape down.

²⁰⁷ Interview with Lucia Tong, 10.10.2009.

²⁰⁸ Ibid.

To figure out how to execute the looped choreography that is displayed on their computer screens, the dancers scrutinize the augmented videotape in depth. During this process, they realize that they are especially confused by those looped sequences that appear too fast and complicated to be physically performed.

The [looped] steps are at times extremely short and fragmented, so that you just watch the video like a piece of dense information ... and it goes really fast, too fast ... at times you just have the feeling [that] you don't know what is happening on the video, which makes the whole [movement] sequence look impossible. So, to get a better idea of what was happening on the video, we slowed those sequences down.²⁰⁹

While watching the decelerated video, the dancers notice that the lower pace of the looped images allows them to study the modified movements more closely. This way, they discover that certain looped steps that appeared impossible to perform when viewed at the original speed can indeed be executed. Cloud explains:

Often I thought that I couldn't do a certain movement, for example because it looked extremely complicated when looped. But when the movement was slowed down I could look at all the details, and suddenly I would for example better understand the chronology of a specific step or a weight shift, or I could relate it to the base material ... that would make the loops much more feasible.²¹⁰

With these new insights, the dancers start studying the decelerated loops more intensely on their computer screens. During this process, they realize that the slowed-down videotape has an even more didactic function, as they can start to copy certain video reflections:

Because the [slow video images] were that much clearer and not so fast, we would start to move along with them ... it was much more helpful to work this way because the [decelerated] video showed us how to get the loops right. And even if some [looped movements] were still difficult or impossible, we got a better

²⁰⁹ Interview with Jennifer Kovacevich, 09.10.2009.

²¹⁰ Interview with Morgan Cloud, 12.10.2009.

*understanding of their composition ... so we learned the movement from the slow video and speeded it up to its original pace once we knew how to move.*²¹¹

Through slowing the looped video down, the dancers are now able to access a considerable number of the modified movements that they initially deemed 'impossible'. The performers do so by copying those loops with their bodies. This moment during *loopdiver's* rehearsals shows that the dancers have further modified the ideal looped videotape by changing one of its technological features, its speed, and therewith turned it into a didactic element. By adapting the technology, the dancers thus have transformed their ideal video body into a slowed-down demonstrative body from which they can learn *loopdiver's* digitally manipulated movements. This shows that contrary to dancer Graziadei who made a rather intuitive use of her live video image as didactic vector, *loopdiver's* performers needed to actively transform the videotape in order to generate a demonstrative body. *Loopdiver's* didactic body furthermore differs from Graziadei's demonstrative video image through its non-reactive character.

The decelerated demonstrative body allows Troika Ranch's dancers to further access their looped ideal. It thus seems that with the videotape's slowed down version, the performers can finally proceed to learn the looped movements from a demonstrative recording like they intended at the beginning of *loopdiver's* rehearsals, as has been described in 5.2.1. However, the dancers soon notice that although the digitally modified steps have become physically more accessible through the video's deceleration, imitating some of the looped movements still remains difficult. More precisely, the dancers realize that although many gestures in the looped choreography can be anatomically executed, certain movements cannot be immediately copied by their performing bodies. In some cases, the precision of the technological modifications provides a particular character to the looped gestures that cannot be directly imitated, or in other situations specific parts of the looped movements remain physically impossible. For this reason, the performers need to develop further training strategies to be able to physically translate their looped ideal. In the following, I will therefore present the dancers' next coping practices to realign with their mediated ideal bodies. These strategies depend on the particular characteristics of the employed loops. I will therefore regroup them under the category of loop-specific strategies.

²¹¹ Ibid.

5.2.3 Loop-specific realignment strategies

5.2.2 has shown that Troika Ranch's performers could approach their looped ideal by adding supplementary information to the digitally manipulated videotape and by slowing the recording down. However, as the dancers notice that certain loops remain difficult to imitate, they feel the need to create new strategies of realignment to further incorporate the looped choreography. Like already mentioned, these practices are influenced by specific characteristics of particular loop types. The new realignment procedures can be divided into three activities: in order to reach their looped ideal bodies, the dancers closely inspect the manipulated gestures, develop a technologically inspired metaphor and take the decision to 'fake' impossible movements. I will furthermore examine whether and in how far these strategies generate negotiations on the level of the performers' perceived capacities.

Scrutinizing complex movements

During the next rehearsal phase, the dancers notice that certain looped movements cannot simply be copied because their bodies cannot follow the abrupt interruptions, changes and the very short movement sections that are displayed on the looped video. More concretely, the extreme precision of the computer-generated loops challenges the performers' coordination abilities. This is especially the case when they try to imitate the looped versions of complex movement sequences that involve several body parts, such as walking or shaking hands. Dancer Kovacevich explains:

We're moving in time frames that are very small, some of the loop repeats are just a quarter of a second long, which is just such a short amount of time for our bodies ... and it is very hard to keep up the precision of the computer in these short sections. That's even more difficult with more complicated movements like a handshake for example, because there's so much motion in the body involved ... the video showed me a loop in which I would reproduce tiny sequences of that [handshake], and each time I tried to imitate that I lost track. There was just so much happening in such a little amount of time.²¹²

For Kovacevich and the other dancers, the short and precise loop sections are densely filled with movement material that they find hard to physically reproduce. Kovacevich

²¹² Interview with Jennifer Kovacevich, 09.10.2009.

further describes that this problem results from the dancers' difficulties to coordinate the movement details of complex gestures:

When you're asked to perform just a tiny part of this [handshake], you really have to know which body parts are active at that moment, and what they are doing. And usually, a handshake is a familiar sensation, and you know how to do it without thinking about it, so you aren't necessarily aware of how and when the different body parts participate in this movement. But when it is looped, you need to be aware of simply every tiny motion in that gesture. You have to be conscious of when your hand starts to open, when your elbow passes your body, and when your shoulder moves forward. You need to know this to be able to interrupt this movement at any moment, and to repeat or reverse just parts of it. And it's the same with, say, walking ... there's something about the constant motion and the constant weight shifts in walking that are very, very hard to reproduce in any sort of looped fashion. To maintain the precision of the loops, we needed to find out how each of these movements work, and for that we paid much attention to their physical logic and how the movements unfold, chronologically.²¹³

Kovacevich's report indicates that in order to copy the looped variations of physically intricate gestures, the performers need to deepen their knowledge and awareness of those movements. This also implies that the dancers have to become conscious of the details of gestures which they hitherto executed in quasi automated ways. In other words, performing the loop structure demands a new bodily consciousness from the dancers: in order to reach their ideal body, the dancers need to develop an even deeper perceived bodily knowledge of specific movement details.

To gain a more profound physical understanding of the complex gestures, the dancers put themselves to an extensive study of both the movements in their original state and their looped versions. Kovacevich describes this procedure as follows:

The first thing we did is, we went through the original movement: what was it, from beginning to end? We [executed] it repeatedly, so that we knew where the weight shifts were, and when our upper body moved, and the legs for example. And then the next step was that we watched the [looped] video to such disgustingly minute detail ... I for example looked at what I was doing [on the video], how many times I was doing it, how far my hand went for example, where my head went, what my foot did when my hand was doing that ... to have this extensive information ... was

²¹³ Ibid.

*what made it executable ... that way the [looped] movement became clear, down to any detail.*²¹⁴

By studying the original movements in depth, the dancers intend to become conscious of the mechanisms in which their different body parts participate in the respective gestures. The dancers thus revise those complex movements to gain awareness of the gestures' different components. As Kovacevich's account shows, once the dancers have gained a more profound understanding of a movement's details, they turn to the video to learn how to perform its looped version. Also this step requires extensive studying, as the dancer clarifies:

*It was extremely tedious, it took me hours to learn a few seconds of that looped material. We were repeating the little looped movements over and over again and watched the video ... to get the loops right.*²¹⁵

Kovacevich's account shows that in order to reach their looped ideal bodies, the dancers not only refine their bodily consciousness and intensely watch the looped videotape, they also start imitating their digitally manipulated reflections. This activity resembles the learning procedure of *Habitat* dancer Graziadei who intensely studied and repeatedly moved along her demonstrative live video body in order to make it function according to her ideal²¹⁶. In both cases, the performers are extensively repeating specific movements in order to reach their mediated ideal body. Susan Foster refers to the activity of intensely repeating a movement or exercise as "drilling" (Foster, 1992: 484): according to the dance scholar, highly repetitive activities are part of the procedures that generate dancing bodies (ibid.). She explains that through drilling, the body is impregnated with the ideas and actions that shape it to the point that the latter become part of the performing body. This leads me to investigate whether, like performer Renate, *loopdiver's* dancers notice changes on a perceived bodily level after this laborious learning procedure. And indeed, after some time of intensely practicing the performance of looped complex movements, the dancers relate differently to their digital reflections. Kovacevich shares her experience:

Once I've gone through every detail of the movement, and I've learned it until it is really stable in my body, the loop doesn't feel strange anymore, because I'm finally

²¹⁴ Ibid.

²¹⁵ Ibid.

²¹⁶ See subchpt. 5.1.2.

*able to do it.*²¹⁷

Through the intricate training procedure of developing a new (because more detailed) movement consciousness and learning the loop structure by studying and imitating the videotape, the dancers are now able to physically copy the precision of the looped recording and incorporate the manipulated versions of complex movements. They thus do not find themselves in an alterity relation with their images anymore but have accommodated the loops' precision in their perceived bodies (cf. Ihde, 1990). The dancers nevertheless testify that the training process has affected their bodily sensations even further, as they not only manage to copy the gestures displayed on screen, but they also experience new movement qualities while 'looping'. Kovacevich advances the example of her sensations while performing a reversed loop:

*Reversing a movement like it's displayed on the [looped videotape] is difficult because it doesn't just mean that you go backwards in your movement, like you learn in dance class. Reversing means that you have to literally rewind [the movement], and that means that you also rewind its rhythm ... if the original movement is accentuated at the beginning and gets increasingly slower, for the reversed version that would mean that you start slow and accentuate the end. That is very difficult because you really need to know the movement to reproduce it in a reversed loop. It was quite a process to learn how to do it, but now that I know how to reverse a certain step in my body, and I'm doing it, I have a sensation that is similar to listening to reversed music. I can feel this sensation, and I can clearly execute [the reverse loop]. This experience is new to me, and it's one of the most interesting things for me as a dancer.*²¹⁸

Kovacevich's report demonstrates that the laborious learning procedure through which the performers were able to reach their mediated ideal has not only affected the dancers' perceived bodies by enhancing their motoric capacities and consciousness, but it has also provided new physical sensations while executing parts of the looped choreography. Here, *loopdiver's* digital video imagery has intervened in the dancing bodies' formation by making the dancers reorganize their coordination abilities and movement perception.

²¹⁷ Interview with Jennifer Kovacevich, 09.10.2009.

²¹⁸ Ibid.



Fig. 5.10: Troika Ranch's dancers intensely examine the looped videotape.

In the next section we will follow how the performers deal with another challenge, which is the physical translation of one of the loops' aesthetic key characteristics. We will learn that to imitate this visual feature with their bodies, the dancers work with a technologically influenced movement metaphor.

Developing a loop-inspired movement metaphor

While working with the looped videotape, *loopdiver's* dancers encounter a further challenge, as their digital reflections bear an aesthetic property that the performers cannot correctly imitate. The digitally modified recording presents very brief interruptions at the beginning of each looped movement which the dancers cannot execute. Dancer Tong describes this visual effect as follows:

*Our video bodies halt for a short moment when a loop begins. It's a really tiny thing, but it's very specific for these looped moves. At first we couldn't copy these moments the right way, we were emphasizing them too much or not enough.*²¹⁹

The extremely brief pauses displayed by the modified videotape reflect one of the loops' visual key properties. However, no matter how often the dancers study the looped video material and repeatedly try to copy it, they do not manage to appropriately reproduce this visual effect with their bodies. It thus seems that here, the dancers' previous training practice of continuously studying and executing the displayed movement does not bring the desired result of making the dancers perform the specific halting effect. Interestingly, in her theory on the formation of dancing bodies, Susan Foster suggests that there are further means to instruct a performer's corpus. She more precisely explains that the use of particular terms and images presents another action to form the perceived body according to an ideal. According to Foster, a dancer's training is characterised by the work

²¹⁹ Interview with Lucia Tong, 10.10.2009.

with particular literal or metaphoric nomenclatures that relate to individual dance techniques (1992). The dance scholar argues that although the employed notions might initially not appear as physically applicable, they gain in bodily concreteness, as through the training process “the images used to describe the body and its actions *become* the body ... through their persistent association with a given movement” (Foster, *ibid.*: 484). Foster underlines that over time, the continuous effort to realize a particular movement with a specific image in mind allows the performer to execute the desired gesture.

As the dancers’ previous rehearsal methods do not permit them to reach their goal to incorporate the loops’ visual halt effect, Foster’s theory leads me to investigate whether the performers’ bodies are instructed through alternative procedures, for instance through the use of specific nomenclatures, to make their perceived bodies correspond to their mediated ideal. And indeed, once choreographer Dawn Stoppiello realizes that despite the dancers’ efforts to copy the loops’ halting effect the desired result is still lacking, she searches for a new realignment strategy. To help the performers translate the visual characteristic into physical language, Dawn creates a specific term for this loop-specific halting moment and names it the “molecular pause”. In addition she provides her associations on how the visual effect can best be indicated in the dancers’ bodies.

It seems that there is a need to [accentuate] the ... beginnings of each looped movement to create the illusion that one is actually looping. This requires what I call a ‘molecular pause’ ... all body functions stop momentarily ... you stop moving for a tiny but perceivable moment ... to reflect this video quality in your body.²²⁰

By developing the ‘molecular pause’, Stoppiello has created a metaphoric term that refers to the loop-specific movement quality, and she has enriched the term with further instructions by explaining her ideas concerning the specific halting moment. Together the metaphor and Stoppiello’s associations are supposed to allow the performers to reach their ideal looped video body (cf. Foster, 1992). During the following rehearsal days, the dancers try to physically translate the metaphor of the ‘molecular pause’ by developing their personal interpretations of Stoppiello’s indications. Despite Stoppiello’s helpful instructions, performing this specific effect remains a delicate task, as dancer Cloud explains:

[The molecular pause] is difficult to physically articulate. If you do it too much, it looks robotic and funky, wrong. If you don’t do it enough, then you don’t see it. So

²²⁰ Interview with Dawn Stoppiello, 08.10.2009.

*we're always trying to find out how much is the right strength of the molecular pause.*²²¹

Although the performers have received Stoppiello's metaphoric instructions, the performers still feel insecure with regard to the appropriate execution of this loop-specific movement. They therefore start to turn toward their peers to receive additional information. The choreographer describes this procedure as follows:

*We would all take a turn to watch from the outside and we'd start to point out things for individuals that they were unconscious of ... for example, Johanna had the tendency to reverberate in her neck too much. And that wasn't working, it made us not be able to see the molecular pause as clearly in her body. So we made her aware of that ... Lucia and JJ actually both at one point had too much energy in the molecular pause, and it was too much, so we had to pull them back in a little bit ... it's those subtle weird things that happen in your body when you loop that we needed to get rid of.*²²²

By comparing their fellows' interpretations of the metaphor of the 'molecular pause' with the halting moment displayed by the looped video, the performers provide each other feedback that serves as further instruction for their respective performances. Through continuously adapting their physical interpretations of the molecular pause according to their peers' comments, the dancers finally develop the skills to copy the looped video's visual halting effect with their bodies.

So far, this section has shown that employing the particular nomenclature of the 'molecular pause' and their peers' instructions presents the performers' strategy to realign with the specific movement quality of their mediated ideal video body. In this context, Susan Foster claims that metaphors can also shape a dancer's perceived body, as through intense physical exercising the performer starts to feel the metaphor's attributes in her body (1992:484). And indeed, working with the 'molecular pause' not only affects the performers' motoric abilities: while they are now able to physically imitate the looping halt, the dancers also observe that their perceptions have equally evolved. Dancer Kovacevich reports:

After some time of rehearsing, I started to know and to feel this little moment that happens before a new loop step starts. I really feel this halt in my muscles ... now

²²¹ Interview with Morgan Cloud, 12.10.2009.

²²² Interview with Dawn Stoppiello, 08.10.2009.

*[the molecular pause] is part of my movement vocabulary, I can do it almost without thinking about it.*²²³

Kovacevich's experience of performing the 'molecular pause' shows that metaphors, after an intense learning procedure and physical exercising, "become the body" (Foster, 1992:484). The new realignment strategy of building a loop-inspired metaphor has thus allowed the performers to approach their perceived and their mediated ideal bodies. Through this procedure, the characteristic short halt in the looped video recording does not appear as alien to the dancers anymore because they are now capable to incorporate this visual feature. In this sense, the dancers' learning process has shaped their perceived bodies in different ways: on the one hand, the performers' movement capacities have been expanded as the dancers are now able to perform a new visual loop feature, on the other they can now also experience a new movement quality in their inner bodily sensations.

By now, *loopdiver's* dancers have created efficient strategies to imitate the looped video by scrutinizing the manipulated movement sequences and developing the metaphor of the 'molecular pause'. Through these procedures, they are able to loop intricate movement sequences and to imitate the halting effect that characterises the movements of their manipulated digital reflections. However, during the rehearsals they also need to deal with looped gestures that remain (partly) physically unattainable. In those situations, the performers create the practice of 'faking' which I will describe in the following section.

'Faking' impossible loops

The previous sections have shown that Troika Ranch's dancers are able to assimilate a considerable part of *loopdiver's* choreography by developing different training strategies to realign with their looped ideal video reflections. However, the performers also make the experience that despite these various learning techniques, several looped movements remain difficult, if not impossible to physically execute. More specifically, certain steps that are displayed on the digitally manipulated recording are transformed in such a way that they transgress physical or anatomical rules. For example, some gestures are abruptly interrupted so that the dancers cannot keep up with them because of their bodies' momentum, or in other cases the extremely short duration of a looped fragment passes too quickly to be physically articulated by the performers. In other cases, the dancers fear to injure themselves or feel the urge to vomit when trying to execute certain

²²³ Interview with Jennifer Kovacevich, 09.10.2009.

looped movements. As the loops in question require abilities that exceed the performers' anatomical capacities, the above-mentioned procedures of metaphorisation and scrutinizing movement details cannot solve the current situation. For the dancers, the inability to fulfil their task and reproduce the displayed movements with their bodies generates a considerable level of frustration²²⁴. However, in 5.2.1 we have seen that Troika Ranch already encountered a similar moment in which the mediated ideal body exceeded the perceived body's limits. Notably when the intricate loop structure challenged the performers' memorizing capacities, the artists developed a realignment strategy by adding cognitively accessible information to the looped videotape. In that earlier rehearsal situation, the dancers thus adapted their ideal body to their perceived abilities. The dancers' current situation draws parallels to that earlier moment because again, the performers cannot reach their mediated ideal through the adaptation of their perceived bodies. Therefore I will investigate whether, and if so, how the dancers will return to the practice of transforming their ideal body as a possible realignment strategy.

Once the performers realize that certain loops remain anatomically impossible, the dancers develop an alternative approach to the work with their digital video reflections. They decide to copy the manipulated steps as closely as possible while in the same time respecting their bodies' anatomical boundaries. The dancers refer to this procedure as "faking" or "cheating". During the process of "faking", the performers intend to reproduce the impossible looped movement in their bodies in a way that it can be physically executed. They thus attempt to make the looped movements appear in their bodies without actually performing the manipulated gestures exactly as they are displayed by their digital video reflections. Depending on the respective movement, the dancers' negotiations range between slight changes in weight shifts and the discard of specific body parts or the omission of an entire loop step. Choreographer Stoppiello provides an example:

There is one moment in the choreography in which Johanna and Travis hit and reverse several times. And they came pretty close to what the video is. But to be that precise in the loop, they left out some of the feet movements. They're indicating the movement so well in their upper bodies that we don't need the feet. So if adding the feet makes it look worse than the upper body, then let's take away the feet as we can really sense it in the bigger part of the body.²²⁵

²²⁴ Also see 2.1.3

²²⁵ Interview with Dawn Stoppiello, 08.10.2009.

Also dancer Cloud explains how he and his peers proceed during the process of “faking”:

We decided that we're not going to do the loop exactly as is dictated to us by the computer ... we changed the movement in some way, for example we didn't shift our weight, or we shifted it differently, or we would stretch our hands out less than was displayed on the video. Or we would omit a repetition or leave certain steps out. We would decide that case by case ... we did that because only then it was physically possible ... so in a way it was very much about finding a balance between the video's technological possibilities and our physical properties.²²⁶

Stoppiello's and Cloud's accounts indicate that in the case of the physically impossible loops, the performers change their previous approach of adapting their bodily capacities to their transformed digital reflections. Here, the dancers instead strive to move in a way that resembles the looped video, but which is still anatomically feasible. The performers' ideal has thus changed, as they do not orient themselves towards the exact movements displayed by the looped video but they aim at a physically executable version of it. In this sense, the performers shift their mediated ideal by approaching it to their physical capacities. This rehearsal situation therefore marks another strategy to adapt the dancers' ideal body to their perceived abilities.

Through the realignment procedure of “faking”, the performers have developed a way to incorporate the anatomically impossible looped movements in a physically feasible manner. To the dancers, this shift in approaching the videotape creates feelings of accomplishment:

It's the most frustrating thing when a loop seems impossible. But it's also most rewarding and fulfilling when you finally get past that hump and you make it [executable], so that it's not impossible anymore ... I get this funny high of it. It's like I cheated reality. I [managed] to execute it anyway, even if it's not what the pixels were doing.²²⁷

Kovacevich's report once again clarifies that here, the dancers' ideal body has undergone changes that correspond to the dancers' perceived capacities. However, in the course of this chapter we could observe several times that, as Susan Foster claims, the ideal and the perceived body develop along with each other. Furthermore, we already learned in 5.2.1 that the adaptation of the looped videotape affected the dancers on the level of their

²²⁶ Interview with Morgan Cloud, 12.10.2009.

²²⁷ Interview with Jennifer Kovacevich, 09.10.2009.

movement experience. Thus, it also appears worthwhile to investigate in this situation whether the change in the looped ideal body generates transformations on the level of the performers' perceived bodies. And indeed, it seems that the dancers have not merely 'appropriated' their digitally modified ideal by making it comply with their physical abilities, as they also realize that the practice of "faking" affects their perceived bodies on the level of their movement vocabulary. The performers notice that their negotiations with the physically unrealistic looped steps have expanded their movement repertoire. Dancer Levy explains:

*The video forced us to take decisions [that] we wouldn't have taken without it. Even if [certain loops] are impossible, they made something happen with our bodies, something that wouldn't be the same without us attempting to deal with the loops in some way.*²²⁸

The changes in the dancers' ideal body thus have equally engendered transformations on the level of the performers' physical perception.

Equipped with the different realignment strategies, the performers finally manage to incorporate the looped videotape.

5.3 Conclusion

In this chapter I have investigated how dancing bodies and digital media engage with each other during the rehearsal procedures for the two virtual performance productions *loopdiver* and *Habitat*. I have done so by employing selected concepts deriving from dance studies and postphenomenology that I presented in chapter 4.3. I have suggested that tracing how dancers learn to move with digital devices in the light of concepts such as Mark Hansen's 'body in code', Don Ihde's mediation relations or Susan Foster's ideal, perceived and demonstrative body allows to articulate the "relational dynamics" between dancing bodies and digital media. According to my argument, this approach presents a viable alternative, non-binary perspective on body-technology constellations in digital dance theory. In this sense I have observed the dancers' rehearsal activities in *Habitat* and *loopdiver* in the light of my analytical framework with the aim to identify the concrete practices in which the relational dynamics between the performers and their tools are

²²⁸ Interview with Johanna Levy, 14.10.2009.

generated, and to articulate the many layers in which digital media are involved in the bodily experience of dancers in virtual performance.

Mark Hansen's and Don Ihde's theories have allowed me to recognize two distinct phases occurring during the dancers' physical work with their digital media, which I referred to as situations of bodily friction and phases of realignment. In situations of friction, the performers experience moments of bodily disorientation, or 'alterity relations' (Ihde) because their video reflections are moving in unfamiliar ways. I could identify such moments in both *Habitat's* and *loopdiver's* rehearsal processes: while *Habitat's* performer felt perturbed by her live video image's mirrored and delayed reactions, the dancers in *loopdiver* experienced feelings of disturbance when discovering that they were unable to physically copy their very own bodies' looped video recordings. Here, Susan Foster's concepts of the ideal, the demonstrative and the perceived body furthermore helped me understand that the dancers' irritation not only derived from a conflict between the dancers' inner bodily perceptions and the video images' unexpected activities as their experience of disorientation also resulted from a divergence between the video images' actual movements and the dancers' ideas of how their reflections (*Habitat*) or their own bodies (*loopdiver*) should behave. The digital devices thus were not only involved on the performers' moto-kinaesthetic, and thus their 'perceived' bodily level, as they also shaped the dancers' imaginative 'ideal bodies'.

In realignment phases, the dancers develop strategies to overcome the situation of physical disorientation by adjusting their physical activities with their digital images. They therewith intend to establish an 'embodiment relation' (Ihde) in order to (inter)act and move fluidly with their virtual images in a state of 'mixed reality' (Hansen). Also in *Habitat* and *loopdiver* the performers developed different realignment strategies to integrate the logic of their digital representations on a bodily level. These were influenced by the respective video technologies' reactive (*Habitat*) and non-reactive (*loopdiver*) characteristics. *Habitat's* performer observed her live video image's reactions to her movements, and *loopdiver's* dancers added 'loop information bars' to the video footage and studied a decelerated version of it. I discovered that in the course of the rehearsals, these strategies were completed by further practices of adaptation for different reasons. In the case of *Habitat*, the introduction of new technical effects or the move to the theatre space caused further frictions that needed to be overcome, and in *loopdiver* the complexity of the looped movement material required further, loop-specific realignment solutions. In *Habitat*, performer Graziadei for instance repeatedly studied recordings of her video image's reactions, taped markers on the dance floor which indicated the virtual images' dimensions and adapted the video image's delay settings to perform with her virtual reflection. *Loopdiver's* team dissected and examined the details of complex gestures, developed the movement metaphor of the 'molecular pause' and created the method of 'faking' those movements that could not be physically executed.

The preceding paragraph shows that the performers in *Habitat's* and *loopdiver's* rehearsals worked out strategies of realignment in which they either attempted to adapt their movements to the digital images, or they adjusted their virtual reflections to their cognitive and physical capacities. I found out that these realignment procedures generated complex dynamics in which the dancing bodies and the digital devices mutually shaped each other. In this context, Susan Foster's theory allowed me to identify the different levels in which the employed tools integrated the performers' physical experience in the two case studies. I found out that in the course of the realignment procedures, (changes in) the technological characteristics such as the moving opaque wall in *Habitat* or the interruptions in the *loopdiver's* manipulated video footage affected the dancers' ideas about how their virtual and physical bodies should perform. Their subsequent efforts to adapt their movements to these mediated 'ideal bodies' affected their physical performance and sensations on the level of their motoric and their kinaesthetic, 'perceived' capacities. First of all, the dancers developed new movement styles, as *Habitat's* dancer for instance accommodated the video camera's perspective in her gestures as she increasingly moved sideward to be better captured by the camera's lens. *Loopdiver's* performers generated a new movement style by studying and copying the looped gestures displayed on their computers. During the process of incorporating certain video technology's characteristics, the dancers furthermore noticed that their performance with the tools gained sensuous and almost tactile qualities. *Habitat* dancer Graziadei gained proprioceptive consciousness for the video-displayed virtual rooms as she learned to orient herself in the spaces' digitally displayed architecture. She also became able to steer and feel her video image's reactions and developed a bodily sensitivity for the dynamics and paces of her digital doubles to the point that she could make her virtual doppelgangers interact. In *loopdiver*, the performers learned to sense the specific character of rewind movements. However, my description has also mentioned that the dancers' realignment practices had yet another effect, as also the technological tools were transformed during their engagement with the performers. I have already shown that the devices were adjusted to comply with the performers' needs, for instance through the insertion of supplementary information in the video (*loopdiver*) or the deceleration of the videos' pace (both *Habitat* and *loopdiver*). Foster's theory allows understanding that through these practices and transformations, the video images turned into didactic aids as the latter served as 'demonstrative bodies' which helped the dancers achieve their bodily ideals.

Examining the rehearsal processes of my two case studies in the perspective of my analytical framework has allowed me to articulate the relational dynamics between dancers and their digital tools as intricate negotiation procedures in which performing bodies and digital media mutually constitute each other. By describing the dancers' experience and practices during their physical engagement with digital video technology,

I could make the tools' role during these processes visible. I could follow that the tools took in different roles as in both cases the digital video imagery caused frictions in the performers' bodily experience but turned into didactic aids of bodily learning during the subsequent phases of realignment. I have equally shown that during these processes, the tools were involved in the performers' bodily experience on an imaginary and a motokinaesthetic level. I furthermore demonstrated that these practices also transformed the technologies as they were adapted to the performers' ideas and needs. Articulating the interplay between dancing bodies and digital media has thus enabled me to draw a more differentiated picture of dance-technology relations than one-sided and dualistic positions allow for.

My analytical framework has permitted me to render those bodily dynamics visible which usually remain hidden in the final staging of a virtual performance artwork. It has furthermore enabled me to provide a more refined language for the medial impact on the dancing body than it would be possible in a purely aesthetic apprehension of a staged digital dance presentation. For instance, after its premiere, *loopdiver* has been reviewed as an artwork in which the performers seem to be "in a battle"²²⁹ with the technology they are performing with, and that the piece's rhythms are shaped by the performers' resistance towards and at times by a coincidence with the video loops. With the help of my analytical toolkit, I was able to look behind the scenes of the performers' supposed "battle" and to describe how their physical experience of moving with the looped video material concretely looked like. I could show that the process of looping contained further dimensions than mere physical resistance: I was able to describe their concrete sensations of bodily conflict but could equally articulate the strategies that allowed them to change their relation to the digital loops. I could furthermore unveil the dancers' sensations of refining and expanding their bodily knowledge and capacities during these processes.

My research perspective has enabled me to see that changes in the technological functioning impacted on the dancers' physical involvement and working practices and hence affected their movement experience. This also leads me to suggest that in both case studies, the relational dynamics will continue in the course of *Habitat's* and *loopdiver's* careers, as technological equipment might need to be exchanged at some point, or the move to theatre spaces causes further transformations in the technologies' functioning. As we have seen in chapter 3, the move to the theatre venue in *Habitat* for instance induced changes in *Kalypso's* operations which impacted on the rendering of performer Graziadei's video image. Furthermore, following *loopdiver's* career, I also learned that six months after the piece's premiere, *loopdiver* was invited to be staged at another theatre

²²⁹ Smith (2010).

venue. At this new theatre the performers were confronted with the problem of a tight rehearsal schedule which made it impossible to rehearse *loopdiver's* intricate choreography in the habitual detail. This made choreographer Stoppiello decide that "now we have to deal with the video in a different way, as we can't rehearse every little movement anymore ... we have to opt for the bigger image".²³⁰ These observations suggest that it is very likely that in the future, the performers will be confronted with similar situations that require further physical adjustments to engage with digital media. The (physical) performance with digital media thus presents a multilayered process in which bodily knowledge is not acquired 'for good' as it demands multiple and constant negotiations with the technological tools which in turn cause adaptations transformations on various levels of physical experience.

²³⁰ Dawn Stoppiello, Chicago, 04.03.2010.

6 Conclusion

Currently, new developments in the dance scene can be identified, as choreographic and dance artists move towards the encounter with digitally controlled robots and artificial intelligence (AI) programs. For instance, in his latest performance project the Taiwanese choreographer Huang Yi performs an intimate duet with an industrial robot named 'KUKA' which has been programmed to interact with Yi. Also the French Company Cie 111 brings a dancer and a robot together in their creation *Sans Objet* (figure 6.1).²³¹ In the work *Pattern Recognition* by the British dance artist Alexander Whitley, the performers dance with an AI program that reflects the dancers' gestures through the stage lighting. Throughout the performance, the program memorizes and learns the performers' movement patterns to the point that it finally attempts to predict the dancers' upcoming steps.

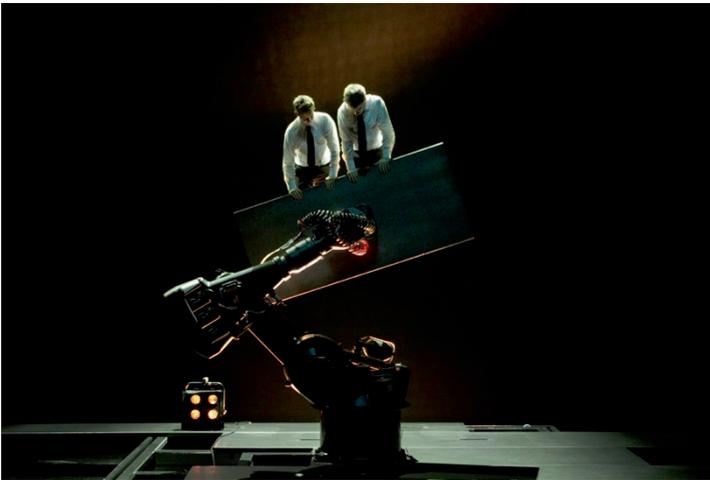


Fig. 6.1: Company Cie 111's creation *Sans Objet* presents an intimate performance between a digitally controlled robot and human dancers.

When informing myself about these artworks by watching videos of the performances online, reading reviews and visiting the dance companies' websites, I came across striking comments written by critics or by the artists themselves. For instance, on their website the members of the French company Cie 111 claim that their production

²³¹ Another example of a dance piece in which a human and a robot are supposed to interact as equal performers is Robin Jonsson's creation *The most human*.

combining a dancer and an industrial robot presents “an impossible encounter”.²³² When reporting on Yi’s robot dance, TIME magazine journalist Raisa Bruner underlines the project’s remarkable character because it “suggests an alternate end game for artificial intelligence: as a friend, not an enemy” (Bruner, 2018). These observations point towards two important aspects in the actual course of choreo-technical experimentation. On the one hand the examples show that dance art continues to explore the most recent advances in digital technology, and that dance artists seek to integrate devices that become increasingly complex and independent such as robots and AI programs to create new dance forms and experiences. On the other, despite the artistic involvement with virtual technologies these avant-gardist ventures are accompanied by discourses that still stick to binary stances in which human performers and digital media are considered as opposing entities and their relation is conceived in terms of control and domination. Describing the encounter between a human and a robot dancer as “impossible”, the artists of Cie 111 refer to the idea that human performers and robot technology find themselves in utterly imbalanced relations. So does TIME’s Raisa Bruner when she suggests that the robot in Yi’s choreography does not present any threat to the performer, as this implies that the technology could indeed present a danger to the dancer.

While conceiving of the tensions between dance art and (digital) technologies in terms of binaries and domination might help to attract the curiosity of a potential audience, in this thesis I have argued that this perspective does not hold in the context of empirical reality. Although the combination of dance and technologies has been and still is considered in binary perspectives that remount to dualistic legacies of thought in which technology is either seen as a determining or instrumental instance, I have demonstrated that choreo-technical constellations are more complex than these traditional positions suggest. This underlines the need for new perspectives that allow to comprehend digital performance a in more differentiated and empirically sensitive way. To understand the relation between virtual media and the art of physical movement in their intricacy, I have therefore proposed an alternative approach. Crucial for this was to move away from an essentialist focus on and an ontological differentiation between digital technology and dance, and instead to turn towards a more relational perspective that conceives of choreo-technical combinations in their interwoven and situative character. Such a point of view, I claimed, also requires an alternative definition of technology. Informed by the interdisciplinary research field of Science and Technology Studies, I have hence suggested considering (digital) technologies not merely as tools but as socio-technical constellations. I have more precisely understood the interactions between dance artists

²³² <https://www.cie111.com/spectacles/sans-objet/>, retrieved on 26 Sept 2018.

and their tools in terms of mediation, which refers to technology's capacity to engage with humans by co-shaping and transforming their actions and experience.

Throughout this thesis, I have dealt with the questions how dance artists and digital media collaborate, and how the dynamics of these processes as well as technology's role in them can be qualified. To find answers, I have developed a research methodology combining theoretical perspectives with extensive empirical material. Starting from concrete situations in digital dance making, I have elaborated interdisciplinary analytical frameworks that were mainly based on selected concepts from theories of mediation as well as bodily learning in dance training. I suggested employing these as analytical lenses to systematically examine the concrete making procedures of my two case studies, the digital dance productions *loopdiver* and *Habitat*. This focus directed me to study those situations in which performance artists used their digital tools, and therewith to examine their specific actions, struggles and experiences with digital media. In this context I intend to emphasize that this study is not set out to abolish the difference between (artistic) humans and digital technologies. This research project should rather be read as a plea to leave aside (ontological) binaries and oppositions when considering choreo-technical constellations because this allows to think these relations more fruitfully. In the following paragraphs I will conclude by presenting my research findings and explaining how my study paves the way towards a more differentiated understanding of technology's role in virtual performance. I will also expound in how far this research project's methodology provides further benefits to (digital) performance studies.

In this thesis, I have examined digital dance making from a relational perspective. In the light of my two theoretical frameworks, the rehearsal procedures of *loopdiver* and *Habitat* appeared as processes of frictions and negotiations in which dance artists and their digital tools shape each other. By studying the concrete situations of conflict and the artists' particular practices to overcome these situations, I was able to make the dynamics that shaped the rhythms of virtual performance production visible and to describe the role of digital media in these processes. Here, my frameworks specifically allowed me to articulate the tools' involvement on the level of collaborative creation and the development of bodily knowledge. This way, I have shown that in my two case studies, the digital tools were intricately involved in the artistic activities and the dancers' bodily experience by respectively exerting creative agency and co-shaping the relational dynamics with the performers' bodies.

Analysing the makings of *loopdiver* and *Habitat* with a perspective inspired by Actor-Network-Theory (developed in chapter 2), I have found out that the employed devices presented non-human contributors to the rehearsal activities by unfolding their creative agencies (chapter 3). Engaging with the dance artists and further non-human participants involved in the artistic procedure, the software programs *Isadora* (used in

loopdiver) and *Kalypso* (employed in *Habitat*) co-generated diverse developments which brought forward changes in the artists' or programmers' ideas, new activities of use or the mobilization of further technical actors. I have discovered that these different interactions and negotiations impacted on the rehearsals' pace, their course of action and the artists' rehearsal practices, and shaped *loopdiver's* and *Habitat's* performances on the level of their choreographic structures, materials and aesthetics. In the same time, the technological tools also transformed during their participation in the rehearsal activities because they were equipped with supplementary features or didactic indications, and their roles in the creative processes changed as they for instance permitted the realization of specific artistic ideas in one rehearsal phase but presented obstacles or gatekeepers for particular actions at yet another state.

Tracing how *Habitat's* and *loopdiver's* dancers learned to move with digital devices with a framework composed by selected concepts deriving from dance studies and postphenomenology (elaborated in chapter 4), I have furthermore examined those processes that constitute the 'relational dynamics' between performing bodies and virtual technologies in digital dance (chapter 5). Here I disclosed that the software tools were involved in situations that caused conflicts in the performers' bodily experience as the dancers felt confused when noticing a rupture between their own movements and those of their digitally manipulated video images. Having co-generated these moments of conflict, the tools interestingly turned into didactic elements during the next rehearsal phase, as the performers subsequently attempted to realign their movements with those of their digital reflections. To incorporate their virtual doubles' logic, the dancers in *Habitat* and *loopdiver* developed different realignment strategies that involved the media and their characteristics on either a moto-kinaesthetic, a cognitive or an imaginative bodily level. During these physical learning procedures, the technologies' features and functioning affected the dancers' ideas about how their virtual and physical bodies could perform and shaped their actual physical capacities and sensations. These developments in turn impacted on the performers' movement vocabularies and styles. I furthermore observed that throughout this learning phase, the digital devices also transformed as they were adjusted to comply with the performers' needs.

My research findings show that focusing on the rehearsal practices for digital dance productions in the light of my theoretical frameworks makes possible to identify, articulate and qualify the distinct levels of technology's involvement in the creative and bodily dynamics of digital dance. Describing the various ways in which virtual tools are integrated in virtual performance making furthermore made me see that digital rehearsal processes present very individual procedures that are shaped by the artists' particular interests and capacities as well as by the technologies' characteristics and functionings. The dynamics occurring in the specific constellations of artists and tools brought forward partly unforeseeable turns at moments that were unplanned by the artists. In *loopdiver*

for instance, the loop structures' introduction to the theatre lights made the dancers use the lights as orientation means for timing issues, and in *Habitat* the move to a theatre venue caused the development of a mask activity indicator which in turn made performer Graziadei develop another approach towards moving in *Habitat's* digital spaces. To deal with these situations in productive ways, the artists reverted to creative solving strategies. When realizing the dancers' extreme conflict with the looped video footage, *loopdiver's* choreographer Stoppiello for instance reverted to a 'rap exercise' to learn about the situation's cause, and *Habitat's* multimedia artist Weiss developed a mask activity indicator to solve the virtual wall's unpredictable actions in one of the virtual spaces. By uncovering these moments of negotiation I was able to name the dynamics that account for the non-linearity of the studied digital dance rehearsals and I could therewith describe the unstable and situative qualities of dance-technology relations.

In the light of my findings, I argue that my research project can provide new understandings and approaches to dance making in the field of digital performance but also to performance studies in general. I have shown that a relational and processual perspective on dance-media combinations presents a valuable contribution to the field of digital dance studies as it makes aspects and dynamics of choreo-technical combinations visible that cannot be uncovered through the traditional aesthetic focus on the artworks' staged presentations. By employing my empirically sensitive analytical frameworks drawing from STS-related theories of mediation and performance studies and combining them with an ethnographic approach, I have proposed a fruitful and innovative methodology for the study of choreo-technical constellations. For the field of digital dance it can be productive in several respects. First of all, reading both *loopdiver's* and *Habitat's* rehearsal procedures through the two distinct lenses of selected ANT concepts on the one hand and postphenomenology and performance studies on the other has allowed me to examine two different but complementary realities of digital performance production. It thus has made possible to render the many-layeredness and intricacy of virtual dance visible. Furthermore, the empirically sensitive theories, combined with my ethnographic perspective have allowed me to let the artists speak. This gathered information from 'insiders' of the rehearsal processes and my ethnographic focus on the concrete situations of the technologies' use has enabled me to discover the artistic practices in their meaningful details. Through the theoretical frameworks it was possible to make these practices legible and provide a vocabulary for the layers of creative and bodily negotiations with digital tools. In my analytical descriptions I have moreover developed a language for articulating and documenting the rehearsal processes in digital performance.

In addition to the contributions that my research project can make to the field of digital dance, I suggest that it can furthermore present fruitful tools beyond this specific academic domain. As it allows articulating the collective dynamics in (virtual)

performance making, I propose that it can also be of benefit for the academic areas of dance, theatre and performance studies in general. As I have explained in this thesis, these academic domains witness an increasing shift away from a purely aesthetic approach and direct their focus on the study of collective processes in performance making to question the notion of authorship, for instance through examining the influence of institutional frames and settings in dance production.²³³ In this thesis, my ANT-informed analytical framework has enabled me to describe the dynamics of artistic collaboration. Because the framework presents useful tools for the identification of different participating human and non-human actors and the study of their various engagements, I suggest it to be of specific relevance for studying the processes that lead to artistic decision-making. Furthermore, in my analyses of *loopdiver's* and *Habitat's* rehearsals I have described in which ways non-material actors such as light bulbs, technical equipment impacted on the production processes and on the shape of the final artworks. In this context, I argue that following the human and non-human participants in concrete rehearsal practices also makes possible to render the impact of larger institutional frameworks on the creative process visible. As we have seen in *Habitat*, the change from the studio place to theatre venue affected the software *Kalypso's* functioning because the camera in the theatre venue had a different light sensitivity. Because the dancer's rehearsal schedule in the theatre space was limited, the artists opted for the creation of the mask activity indicator tool. The use of this tool changed performer Graziadei's approach towards her dance in one of *Habitat's* virtual spaces. This way, taking into account actors such as the choice of technical equipment in theatre spaces or a venue's rehearsal schedules allows to make the institutional impact on dance creation and the specific conditions of choreographic production visible. By allowing to consider institutions as parts of the situative constellations that constitute the processes of dance making, this approach is specifically relevant in the context of the current interest in collective performance creation in the academic fields of dance, theatre and performance studies.

My processual perspective on digital dance making has permitted me to suggest that the situative dynamics of dance creation and bodily learning in *loopdiver* and *Habitat* continue developing even after the pieces' premieres: the choreo-technical constellations and dancing bodies evolve, along with the digital tools, for instance through the move to new theatre venues or the replacement of technical equipment. I have already proposed that the performance of a dance piece appears as but one moment among the life of the dynamic networks that constitute a choreographic artwork. In this perspective, creative processes appear as intimately linked with the staged performances, and not a process

²³³ See 2.1.2.

apart. I have shown that studying these procedures is worthwhile because they can provide deeper insights into the different relations and dynamics in which digital dance artists, performers' bodies and further actors such as virtual media are involved. This research project underlines the necessity of and contributes to a thorough understanding of rehearsal processes in (virtual) performance. In this sense and to conclude, this thesis can also be read as a plea to appreciate dance in the continuity of its making, creating, rehearsing and performing, be it with or without digital tools.

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Summary

In this thesis I study processes of digital dance creation through the lens of technological mediation theory. With this approach I intend to draw an alternative view on choreo-technological constellations that differs from conventional positions in which the relations between dance and digital media are described in terms of opposition and domination. In this sense I follow selected researchers in the digital performance field who propose to avoid one-sided accounts on digital dance with the help of a more relational understanding of technology. The questions that this study ultimately sets out to answer are: How do dance artists and digital media collaborate in the creation of digital dance performances? What is technology's role in these processes? And how can the dynamics of these procedures be qualified? Instead of departing from perspectives of separation and alterity between dance art on the one hand and media on the other, I focus on their interwoven and situative condition. I therefore base my study on a definition of (digital) technology that derives from the field of Science and Technology Studies (STS). In STS, technology is not understood in terms of material artefacts only, but also in terms of socio-technical constellations. This means that scholars in STS consider technology as already being embedded in socio-cultural contexts. In this view, technologies thus cannot be clearly separated from human and social processes. Here, STS-related theories on technology's mediating character lead me to suggest that understanding digital dance making as processes of mediation allows to closely examine the complex dynamics of virtual performance. In this research project I thus propose to relate selected approaches of mediation from the field of STS, such as Actor-Network Theory and postphenomenology, and concepts from performance studies to the current scholarship on digital performance.

This project embraces digital dance's empirical reality by looking at concrete practices in which dance artists and virtual tools enter in contact, negotiate and finally mingle. It focuses on the making of two virtual performance artworks: *loopdiver* (2009) by the American dance group Troika Ranch, and *Habitat* (2010), a production by the German artistic collective LaborGras. By delving into how digital dance artists negotiate the grey zones between dance and new media, this thesis addresses the concrete challenges digital dance makers are confronted with when they develop, rehearse and perform digital performance productions. Moving between the detailed and material processes of the pieces' makings and my interdisciplinary theoretical tools, in this thesis I develop empirically sensitive models to understand technology's role in digital dance production. Guided by the urgency and relevance in both artistic practice and digital dance discourse, I specifically focus on the creative dynamics between dance artists and

digital tools as well as on the formation of the dancers' physical experience in their interaction with digital media. In the context of the first focal point, I formulate the following sub-questions: In which ways can technological tools engage in the artistic dynamics of dance creation? And how precisely can this involvement co-shape artistic intentions and the resulting performances? To explore the second centre of interest, I ask: How do media integrate bodily experience in (digital) dance?

Exploring how dance artists deal with virtual media in virtual performance making, this dissertation takes an empirical approach. I specifically conducted ethnographic research methodologies like interviewing and participant observation in a technographic perspective. This means that I not only followed the human actors such as dance artists, multimedia programmers or technicians but I also examined in which ways the technological tools were relating to the observed activities.

After introducing the field of digital dance and the research design, I will show in chapter 2 that both digital performance practitioners and scholars demonstrate biased stances concerning technology's role in virtual performance creation. These perspectives, I argue, are incompatible with the empirical reality of digital dance making because they do not recognize any creative agency to digital devices. To develop a differentiated conceptual view on how digital media integrate the artistic aspects of digital dance production, I start with the notion of collective dance creation which acknowledges that a choreographic artwork is the result of several contributors instead of one single genius. However, here only humans have hitherto been granted the status of creative co-producers. I therefore propose to enlarge this human-centered scope to material actors with the help of Actor-Network-Theory (ANT). I explain that ANT allows to consider digital dance creation as a process in which human and non-human actors co-determine the course of a choreographic artwork's production by engaging with each other. This leads me to develop an analytical framework by referring to selected ANT-related concepts. The conceptual grid makes possible to trace the ways in which human and non-human participants, and thus also digital media, engage in dance-making procedures and co-shape the evolving dynamics, artistic intentions and results. It therewith permits to describe virtual media's creative agency in digital dance production.

Chapter 3 leads us to the rehearsal spaces of *Habitat* and *loopdiver*. Here I trace the evolution of these two digital dance productions by focusing on the formative role of virtual technologies in the rehearsal procedures. Recurring to the ANT-informed framework developed in chapter 2, I examine the dynamics in which the software programs *Isadora (loopdiver)* and *Kalypso (Habitat)* engage with the other (non-)human participants involved in the respective creative processes. I show that the tools' interactions with the other engaged actors generate diverse unexpected dynamics and frictions that directly and indirectly shape the artworks' development and final form on different levels. I also demonstrate that the technological tools themselves are equally

affected during the creative process in different ways. My analysis therewith discloses an alternative perspective to dualistic viewpoints as it indicates that the rehearsal and creative procedures rather resemble moments of negotiation and continuous transformation in which neither of the participating actors remain the same.

Chapter 4 focuses on the status of new media in the bodily experience of digital dancers. I demonstrate that the relation between dancing bodies and (digital) technologies is often conceived in terms of domination, and that this binary understanding dates back to dualistic legacies of thought that emerged during earlier choreo-technical experiments in the 20th century. Claiming that these one-sided views do not allow to grasp the complexity of digital dancers' concrete physical sensations, I present a current alternative position that understands performing bodies and virtual media as comprised in processes of "relational dynamics". Scholars of this approach consider that contemporary dancing bodies find themselves in a fluctuating mode in which dancers' work with digital tools interferes with and reconfigures the performers' physical perceptions and movement sensations. While this physical condition is presented as a rather fluid procedure, I refer to dancers' reports to add that these "relational dynamics" include series of frictions and physical destabilization that emerge through the dancers' interaction with digital media. I identify these situations as significant because they generate the performers' bodily negotiation with the digital tools, and these learning procedures consequentially shape the dancers' physical experience. To render the notion of "relational dynamics" operable on a theoretical level, I subsequently develop a conceptual framework from theoretical approaches deriving from dance studies and postphenomenology that deal with the formation of dancing bodies, human-technology relations and the ways in which technologies infiltrate in bodily experience. The resulting interdisciplinary analytical toolkit, I argue, allows to describe situations of friction between dancing bodies and new media during digital dance rehearsals, to investigate the dancers' consequent negotiations with digital tools, and to explore how these learning procedures impact on the performers' physical sensations. I claim that articulating these processes makes possible to formulate the "relational dynamics" in digital dance and therewith to define a technology-inclusive understanding of bodily experience in virtual performance.

In chapter 5, we return to *loopdiver's* and *Habitat's* dance studios to examine how the digital performers concretely learn to dance with their digital devices. Here I specifically concentrate on the moments of friction between dancing bodies and virtual media to find out how the performers' physical disorientation is brought about, and on the consequences these situations of conflict have for the dancers' subsequent rehearsal activities and their bodily experiences. In *Habitat* and *loopdiver*, the performers undergo moments of disorientation while being confronted with digitally manipulated video reflections of their own bodies. With the help of the interdisciplinary conceptual toolkit

elaborated in chapter 4, I show that during the subsequent rehearsal phases, the dancers undertake various activities to realign their inner bodily sensations and motoric capacities with their digitally modified video reflections. The two examples illustrate that these realignment strategies are influenced by the technologies' specific characteristics. By presenting and analyzing the performers' particular readjustment activities, I find out that the employed media are involved on an imaginative, a didactic and perceptive-kinaesthetic level in the dancers' bodily work and experience. I furthermore discover that also the tools themselves are adapted to the performers' physical and cognitive needs. Following the impact of these procedures, I notice that the moments of conflict and the ensuing negotiations with the technological devices impact on the performers' physical experience in the sense that they expand the dancers' bodily sensitivity, their movement vocabulary and bring the performers to develop new motoric capacities. Describing the "relational dynamics" in digital dance therewith allows to disclose different ways in which digital technologies can mediate physical experience in virtual performance, which I argue presents an alternative perspective to dualistic viewpoints in which digital media and dancing bodies are considered to dominate each other.

Chapter 6 finally concludes by discussing the findings of this research project and providing a perspective for further investigations in the field of digital dance and performance studies in general.

Samenvatting

In dit proefschrift bestudeer ik digitale danscreatieprocessen door de lens van de technische mediatietheorie. Met deze benadering beoog ik een alternatieve kijk op choreo-technische netwerken te creëren. Deze benadering wijkt af van de meer conventionele stellingnames, waarbij de verhouding tussen dans en digitale media wordt beschreven met begrippen zoals tegenstelling of dominantie. In die zin sluit ik aan bij een aantal onderzoekers van digitale performancekunsten, die een te eenzijdig begrip van digitale dans proberen te voorkomen door een meer relationele benadering van technologie. De vragen die deze studie uiteindelijk beoogt te beantwoorden zijn: Hoe werken dansartiesten en digitale media samen bij de creatie van digitale dansvoorstellingen? Wat is de rol van technologie hierin? En: hoe kan de dynamiek van dergelijke processen worden beschreven?

In plaats van te vertrekken vanuit een perspectief dat onderscheid maakt tussen danskunst enerzijds en media anderzijds, richt ik mij op hun verwevenheid en situatieve conditie. Ik baseer mijn studie op een definitie van (digitale) technologie die werd ontwikkeld in het domein van de wetenschap- en techniekstudies (Science and Technology Studies - STS). In STS wordt technologie niet alleen als materieel artefact, maar ook als socio-technisch netwerk gezien. Dit betekent dat STS-wetenschappers technologie beschouwen als reeds onderdeel uitmakend van socio-culturele contexten. Vanuit dit perspectief kunnen technologieën dan ook niet losgekoppeld worden van menselijke en sociale processen. Dergelijke STS-gerelateerde theorieën suggereren dat het beschouwen van digitale danscreatie als mediatieproces, het mogelijk maakt om de complexe dynamiek van virtuele performance nader te onderzoeken. In dit onderzoek stel ik derhalve voor om bepaalde STS-gerelateerde benaderingen van mediatie, zoals Actor-Netwerk Theorie (ANT) en postfenomenologie, evenals concepten uit de performancestudies te verbinden met recent onderzoek naar digitale performancekunst.

Dit proefschrift beschouwt de empirische realiteit van digitale dans aan de hand van concrete praktijkvoorbeelden. Hier zien wij hoe danskunstenaars en virtuele hulpmiddelen kennismaken, met elkaar in onderhandeling gaan en zich uiteindelijk vermengen. De focus ligt op de productie van twee virtuele danskunstwerken: *loopdiver* (2009) van de Amerikaanse dansgroep Troika Ranch, en *Habitat* (2010) van het Duitse collectief LaborGras. Door zich te verdiepen in de manier waarop digitale danskunstenaars de schemerzone tussen dans en media navigeren, gaat dit proefschrift in op de concrete uitdagingen waarmee digitale dansmakers worden geconfronteerd wanneer zij digitale performancekunst ontwikkelen, repeteren en opvoeren. Laverend tussen de gedetailleerde en materiele creatieprocessen van de uitvoeringen en mijn

interdisciplinaire theoretische kaders, ontwikkel ik empirisch gevoelige modellen om de rol van technologie in digitale dansproductie te kunnen begrijpen. Geleid door de urgentie en relevantie voor zowel de artistieke praktijk als het digitale dansdebat, concentreer ik mij in het bijzonder op de creatieve dynamiek tussen danskunstenaars en digitale hulpmiddelen, alsook op de fysieke ervaring van de dansers tijdens hun interactie met digitale media. In verband met het eerste punt formuleer ik de volgende deelvragen: Op welke manier kunnen technologische hulpmiddelen invloed hebben op de artistieke dynamiek van danscreatie? En op welke manier kan deze betrokkenheid mede vormgeven aan artistieke intenties en de resulterende optredens? Om het tweede punt te onderzoeken vraag ik: Hoe integreren media lichamelijke ervaring in (digitale) dans?

In dit proefschrift is gekozen voor een empirische benadering door te analyseren hoe danskunstenaars omgaan met virtuele media tijdens het creëren van digitale voorstellingen. Ik heb hierbij in het bijzonder gebruik gemaakt van etnografische onderzoeksmethodes zoals interviews en participerende observatie vanuit een technografisch perspectief. Dit betekent dat ik niet alleen de menselijke actoren zoals danskunstenaars, multimediaprogrammeurs of technici gevolgd heb, maar ik heb ook de manieren bestudeerd waarop de technologische hulpmiddelen met die geobserveerde praktijken verbonden zijn.

Na een introductie van het onderzoek en de onderzoeksopzet in hoofdstuk 1, laat ik in hoofdstuk 2 zien dat binnen het werkveld van digitale dans zowel kunstenaars als wetenschappers vooringenomen zijn ten opzichte van de rol van technologie bij virtuele performancecreatie. Ik beargumenteer dat deze perspectieven onverenigbaar zijn met de empirische realiteit van digitale dansproductie omdat ze geen enkele creatieve slagvaardigheid toekennen aan technologische hulpmiddelen. Om een gedifferentieerde conceptuele zienswijze te ontwikkelen voor de manier waarop digitale media de artistieke aspecten van digitale dansproductie integreren, begin ik met de notie van collectieve danscreatie. Volgens dit concept moet een choreografisch kunstwerk gezien worden als het resultaat van meerdere medewerkers, en niet van een enkel genie. Evenwel hebben tot nu toe enkel menselijke deelnemers de status van creatieve coproductanten ontvangen. Mijn voorstel is daarom deze mens-gecentreerde focus met behulp van ANT, de acteur-netwerk theorie, uit te breiden naar materiële acteurs. Ik leg uit dat ANT toestaat om digitale danscreatie als een proces te zien, waarbij menselijke en niet-menselijke acteurs het productieproces van een choreografisch kunstwerk door hun interactie samen weten te bepalen. Hierbij heb ik vervolgens een analytisch kader ontwikkeld van met behulp van bepaalde ANT-gerelateerde concepten. Dit analytisch raamwerk maakt het mogelijk om de wijze te definiëren waarop menselijke en niet-menselijke deelnemers, en daarmee dus ook digitale media, participeren in danscreatie en hoe zij daarbij mede vormgeven aan de veranderende dynamiek, artistieke intenties

en de uiteindelijke resultaten. Hierdoor is het mogelijk om de creatieve slagvaardigheid van virtuele media bij de productie van digitale dans te beschrijven.

Hoofdstuk 3 leidt ons naar de repetitieruimtes van *Habitat* en *loopdiver*. Hier volg ik de ontwikkeling van deze twee digitale dansproducties door mij te richten op de vormgevende rol van virtuele technologieën tijdens de repetitieprocessen. Teruggrijpend naar het ANT-geïnformeerd raamwerk dat ik in hoofdstuk 2 heb ontwikkeld, bestudeer ik het dynamisch proces waarbij de softwareprogramma's *Isadora (loopdiver)* en *Kalypso (Habitat)* omgaan met de andere (niet-)menselijke deelnemers tijdens de verschillende creatieve processen. Ik laat zien dat de interactie tussen de hulpmiddelen en de andere deelnemers onverwachte dynamiek en wrijving genereert. Deze processen modelleren op hun beurt op zowel directe als indirecte wijze de ontwikkeling en uiteindelijke vormgeving van het kunstwerk op verschillende niveaus. Ik laat ook zien hoe de technologische hulpmiddelen zelf op verschillende manieren worden beïnvloed gedurende het creatieve proces. Mijn analyse onthult daarmee een alternatief voor bestaande dualistische gezichtspunten, omdat het laat zien dat de repetitie- en creatieve processen juist op onderhandelings- en transformatiemomenten lijken waarbij geen van de deelnemers hetzelfde blijft.

Hoofdstuk 4 concentreert zich op de rol van nieuwe media in de lichamelijke ervaring van digitale dansers. Ik laat zien dat de relatie tussen dansende lichamen en (digitale) technologieën vaak in termen van dominantie gegoten wordt. Deze binaire zienswijze komt voort uit een dualistisch gedachtengoed dat is ontstaan ten tijde van choreo-technische experimenten in de 20e eeuw. Omdat dit perspectief het onmogelijk maakt om de complexiteit van de fysieke sensaties van digitale dansers te begrijpen, stel ik een nieuwe, alternatieve zienswijze voor. Hierbij worden uitvoerende lichamen en virtuele media opgevat als onderdeel van "relationele dynamiekprocessen". Immers, eigentijdse dansende lichamen bevinden zich in een fluctuerende toestand, waar de interactie met digitale hulpmiddelen de fysieke sensaties van dansers beïnvloedt en herconfigureert. Terwijl deze fysieke toestand hier als een vloeiend proces beschreven wordt, verwijst ik juist naar de ervaringen van dansers om aan te tonen dat deze "relationele dynamiek" ook situaties behelst van wrijving en lichamelijke destabilisatie. Deze situaties ontstaan door de interactie van de dansers met digitale media. Ik merk deze situaties aan als veelbetekenend omdat zij een lichamelijke onderhandeling teweegbrengen tussen de dansers en de digitale hulpmiddelen. Bijgevolg geven deze leerprocessen vorm aan de fysieke ervaring van de dansers. Om het idee van "relationale dynamiek" op een theoretisch niveau operationeel te maken ontwikkel ik een conceptueel raamwerk aan de hand van theorieën uit dansstudies en postfenomenologie. Deze theorieën houden zich bezig met de vorming van dansende lichamen, mens-technologie relaties en de manieren waarop technologieën binnendringen in fysieke ervaringen. Het resulterend interdisciplinair analytisch kader maakt het mogelijk om

situaties van wrijving te beschrijven, die gedurende digitale dansrepetities ontstaan tussen dansende lichamen en nieuwe media. Bovendien staat het toe om de daaropvolgende onderhandelingen tussen de dansers en de digitale hulpmiddelen te bestuderen, en vervolgens te verkennen hoe deze leerprocessen de fysieke sensaties van dansers beïnvloeden. Ik beargumenteer dat het dankzij het beschrijven van dergelijke processen mogelijk wordt om de “relationele dynamiek” in digitale dans te verwoorden, en op die manier een technologie-inclusief begrip van lichamelijke ervaring in virtuele voorstellingen te definiëren.

In hoofdstuk 5 gaan we terug naar de dansstudio's van *loopdiver* en *Habitat* om te onderzoeken hoe dansers op concrete wijze leren om op te treden met hun digitale apparaten. Hier let ik in het bijzonder op de momenten van wrijving tussen de dansende lichamen en de virtuele media om te ontdekken hoe een fysieke desoriëntatie van de dansers ontstaat. Ook kijk ik naar de invloed van deze conflictsituaties voor de daaropvolgende repetitieactiviteiten van de dansers en hoe zij dit lichamenlijk beleven. De dansers in *Habitat* and *loopdiver* raken gedesoriënteerd wanneer zij met digitaal gemanipuleerde videobeelden van hun eigen lichamen geconfronteerd worden. Met behulp van het interdisciplinaire raamwerk uit hoofdstuk 4 laat ik zien hoe de dansers tijdens de volgende repetitiefasen op verschillende manieren proberen om hun innerlijke fysieke sensaties en motorische vaardigheden in balans te brengen met hun digitale projecties. De twee voorbeelden uit de praktijk illustreren hoe deze aanpassingsstrategieën worden beïnvloed door de specifieke eigenschappen van de verschillende technologieën. Door te omschrijven en te analyseren hoe de dansers zich elk op hun eigen wijze weten aan te passen, toon ik aan hoe de gebruikte media een verbintenis aangaan met het lichamenlijk werk en de beleving van de dansers op zowel een fantasierijk, didactisch en perceptief-kinesthetisch niveau. Ik laat ook zien ook dat zelfs de hulpmiddelen zelf worden aangepast aan de fysieke en cognitieve behoeften van de dansers. Uit het volgen van deze processen blijkt dat de conflictmomenten en de daaropvolgende onderhandelingen met de technologische apparaten de fysieke beleving van de dansers beïnvloeden, in die zin dat ze de lichamenlijke sensibiteit en het bewegingsvocabulaire van de dansers uitbreiden en de dansers ertoe aanzetten om nieuwe motorische vaardigheden te ontwikkelen. Het beschrijven van de “relationale dynamiek” in digitale dans maakt het derhalve mogelijk om verschillende manieren bloot te leggen waarop digitale technologieën als bemiddelaar kunnen optreden bij de fysieke ervaring in virtuele performance. Ik betoog dat deze manier van kijken naar digitale dans een alternatief biedt voor bestaande dualistische zienswijzen waar digitale media en dansende lichamen beschouwd worden als onderling dominerend.

Hoofdstuk 6 sluit af met een discussie van de onderzoeksresultaten en biedt perspectief voor verder onderzoek naar digitale dans en performancestudies.

Valorization Addendum

Studying the relation between dance art and digital media, this research project provides insights into the concrete challenges, working strategies and methods that dance artists in two specific case studies encountered when dealing with digital tools. The findings of this thesis are relevant in a societal context as they offer viable knowledge to practitioners involved in the making of digital dance, performance institutions, the games industry and to the field of physical education in formal settings such as schools.

Practitioners involved in the making of (digital) dance

First of all, the knowledge concerning the concrete artistic work with digital media offered by this thesis can be productive for other dance practitioners engaging with virtual technologies, or who intend to do so in the future. Providing awareness of the artists' experiences and practices presented in the empirical accounts on the two case studies *loopdiver* and *Habitat*, the thesis can help dance makers to sensitize to the issues at stake during digital dance production. In this context, this research project's finding concerning the creative potential of the struggles and conflicts between dance artists and their tools during virtual performance making turns out as important knowledge. This thesis has shown that these moments of friction can emerge throughout the creative process and during the performers' physical interaction with the tools, and that they are often encountered by dance makers as situations that need to be avoided. My research however illustrates that the creative capability however lies in the negotiations between the different involved participants such as dance artists, programmers and (technological) materials. Learning about the innovative potential of these frictions, dance practitioners might become more aware of the creative and bodily possibilities that these moments contain, and deal with them with an explorative attitude. The significance of these moments of negotiation for performance creation procedures could be disseminated to dance makers in the form of articles or filmic documentary features in professional art or dance magazines that describe the concrete rehearsal processes for digital dance productions. Also workshop formats in which digital dance artists report on their experiences when engaging with digital media and an explorative phase during which the participants can effectuate try-outs in digital settings could ensure transfer of the knowledge gained in this thesis. These settings could also allow programmers and multimedia artists to prepare for the challenges that can emerge during the collaboration with dance artists.

On a more general level, this thesis also provides knowledge about the collective and continuous character of rehearsal procedures by underlining the unforeseeable dynamics emerging between different participants and the creative possibilities opened up by seemingly mundane materials and situations. Also here, contributions such as articles, documentaries and workshop formats reporting on the two case studies discussed in this thesis could sensitize dance makers to the rhythms, obstacles and creative solutions inherent to the rehearsal procedures and direct their attention to the creative potential of the less obvious participants in their own dance making practice. Sharing their rehearsal experiences in the artistic community, for instance by documenting their creative procedures with the help of blog entries, (digital) performance makers could entice discussions with their artistic peers. Thus opening up the hitherto hidden world of rehearsal could provide a deeper understanding of materials' artistic potential in the intricate practice of dance making, which could finally result in rehearsal activities that are more sensitive to the creative dimension of materials in dance making processes.

Dance training and education

Selected findings presented in this thesis can also provide fruitful contributions in the context of professional dance training and education, an area in which dancing bodies are shaped and new ways of movement are developed and learned. As this research project has shown, digital media's potential to generate conflicts in the performers' bodily experience allowed the dancers to creatively generate movements by working out different realignment strategies. These practices resulted in an expansion of the dancers' bodily experience, their movement vocabulary and motoric capacities. Because of their rich physical impact, these digitally induced situations of bodily conflict could also be of interest when it comes to the search for creative movement development, the expansion of physical experience and of motoric capacities, which are important elements in dance training and education. I therefore propose that the knowledge generated on the dynamics of bodily frictions might flow into the design of tools and appliances which can be used in dance training. As this research project has shown, situations of bodily conflict can for instance be introduced through the manipulation of one's own digital photography or video image. A dance educational tool could provide the possibility to alter a performer's picture manually or through a specific algorithm, for instance by placing the recorded body's limbs in in habitual or even impossible postures. Furthermore, procedures of video looping as described in the case study *loopdiver*, or the work with multiplied body images and delayed video sequences as presented in *Habitat*

are viable alternatives. By enticing the dancers' subsequent realignment strategies, these tools could allow for creative physical work and movement research.

Dance institutions and theatres

While following the work of digital dance artists throughout this research project, I have also attended the different pieces' premieres and presentations in theatre spaces. In this context I observed that the spectators showed much interest in the technologies' functioning and their implementation in the choreographic artworks. Their curiosity was often founded in the idea that here, seemingly opposite elements such as dancing bodies and digital imagery were efficiently combined. In line with increasing art mediation formats in theatre houses, theatre venues presenting digital dance productions could offer their public the possibility to discover the activities preceding the pieces' stagings with a clear focus on the artistic negotiation procedures with their digital tools. This could for instance occur through the organization of post-performance artist talks in which the spectators can engage in a dialogue with the artistic team or with selected members, or through a stage visit in which the audience or several participants can enter the digital setup to gain an idea of how it feels to move with the technological equipment. This visit could be accompanied by artists' reports about their challenges while working in the setup and how they managed to solve them. Allowing the spectators to discover the concrete processes of exchange between the artists and their digital tools and the material activities behind the staged performances, these events bear the potential to refine the public's understanding of digital performance by showing its complexity. These mediation events could therewith contribute to the deconstruction of dualistic perceptions and help to a more empirically close understanding of digital dance practice among dance spectators.

Another, yet more implicit, finding of this research project lies in the fact that the artists' familiarization and work with their digital tools present time-consuming procedures. This knowledge about the nature of digital dance rehearsals can be productive when it comes to the development of residency programmes and the design of theatres' rehearsal and supporting policies. Time is an important factor in the free dance scene as rehearsals are kept rather short because they signify financial expenses. In the context of digital dance productions which are mostly developed in the free dance scene, supporting institutions such as theatre houses or performance venues could organise workshops, residencies or exchange formats before the actual beginning of rehearsal periods. Arranged as open 'labs' with no specific outcome, these events could allow dance artists and multimedia programmers to gain first-hand experience on the work with a specific software tool and explore collaborative formats. Here already, the

artists could sensitize themselves for emerging situations of negotiation and their creative investigation to make them fruitful during the concrete rehearsal procedure for a staged production.

Games industry

The findings of this study may also add to current interests and activities in the gaming industry. This thesis' theoretical models for tracing the formation of bodily experience in relation with digital technologies meet the gaming sector's increasing concern with the player's movement, as recent research suggests that the user's movement has strong influence on the player's overall engagement in the game (Bianchi-Berthouze, 2013). The gaming industry is therefore interested in gaining a better understanding of how body movement allows the player to feel connected with the game and its environment (ibid.). In the context of body-gaming tool interaction, also the notion of constraint is of considerable concern in the gaming sector because playing devices such as sensor-based controllers can still work with poor accuracy, and the game setting itself can present restrictions, for instance by demanding that the gamer continuously fixates a display. The knowledge relating to the development of bodily movement and experience generated in this thesis could inform the design of movement-based computer games by offering a model to think the physical interaction with gaming tools. The identification of situations of bodily friction or disorientation in the game setting and the gamers' possible realignment strategies can provide valuable insights into how players' bodies learn, and consequently how the gamers feel linked to the play's surroundings. The description of the concrete realignment processes could provide important information to the designers of gaming tools and setups, and it would allow them to understand how gamers learn to 'inhabit' a game setting over time, for example throughout different phases or levels of a game. Integrating the users' experience in design processes in the gaming industry presents a fruitful contribution to classical entertainment games but also to edutainment and physical rehabilitation games.

Physical education

Finally, this thesis' insights into dancers' bodily work with digital media can also be used in current developments in the physical education of children and adolescents in formal settings such as schools. Because the interaction with digital media presents an important part of young peoples' daily lives, the educational potential of virtual technologies is explored in the context of physical learning. While in sports classes, digital media are still mainly employed as ideal gestural templates, researchers are currently seeking for more

creative ways in which movement can be generated through digital use. This happens for instance through the development of virtual applications that can be installed on smartphones (Zühlke et al., 2019). These 'apps' allow pupils for example to record video sequences and to study and manipulate them in the sports hall. Here, the knowledge on the creative potential of situations of bodily friction through digital media that has been generated in this thesis could feed into the development of such apps and tools. As my thesis has shown, the digital's potential to generate conflicts in the body's experience allowed the performers to creatively generate dance movements by working out different realignment strategies. Employed in an educational virtual application, this effect of friction could equally allow young people to find various movements in a playful manner. In this context, also the artists' concrete practices to generate moments of conflict with their digital body images that have been discussed in this thesis bear educational potential. Such situations of bodily conflict could for instance be introduced through the manipulation of one's own photography or video image. Here, parts of one's own body picture could be altered by putting the arms and legs in inhabitual or even impossible postures. Also procedures of video looping as described in the case study *loopdiver*, or the work with multiplied body images and delayed video sequences as presented in *Habitat* are ludic ways to engage with movement material and evolve it further. In this sense, the knowledge on movement generation with digital media gained throughout this study can provide relevant tools for creative ways into finding gestures in an educational context.

Curriculum Vitae

Verena Anker (1981) holds a French *Maîtrise* degree in Cultural Studies and Communication Science from the University of Nancy (France, 2001-2005) and an MA degree in Media Culture from the University of Maastricht (2006, *cum laude*). She also studied at the Universities of Montpellier (France) and Utrecht. After completing her studies, Verena worked in the press department of an international art publisher in Cologne (Germany). From 2008 to 2012 Verena was employed as a PhD researcher at the University of Maastricht. During her graduate training, she was a member of the Netherlands Graduate Research School of Science, Technology and Modern Culture (WTMC). Verena subsequently worked as a freelancer in the cultural domain where she was responsible for the communication and mediation of diverse music and performing arts projects. Since 2018, Verena is in charge of print and online publications in the public sector.

Digital technologies are increasingly becoming part of dance performances. The expanding artistic practice of digital dance however challenges conventional understandings in which dance art and (digital) technology are conceived in terms of mutual domination. This book offers an alternative view on the role of digital media in performance art as it analyses digital dance from a relational and empirically oriented perspective. Examining two in-depth case studies, the author follows dance artists, multimedia programmers and software tools in the dance studio to describe how digital dance is concretely made. The systematic analysis of these digital performance rehearsals offers original and detailed insights into how digital technologies 'mediate' choreographic activities and thus integrate the resulting artworks.