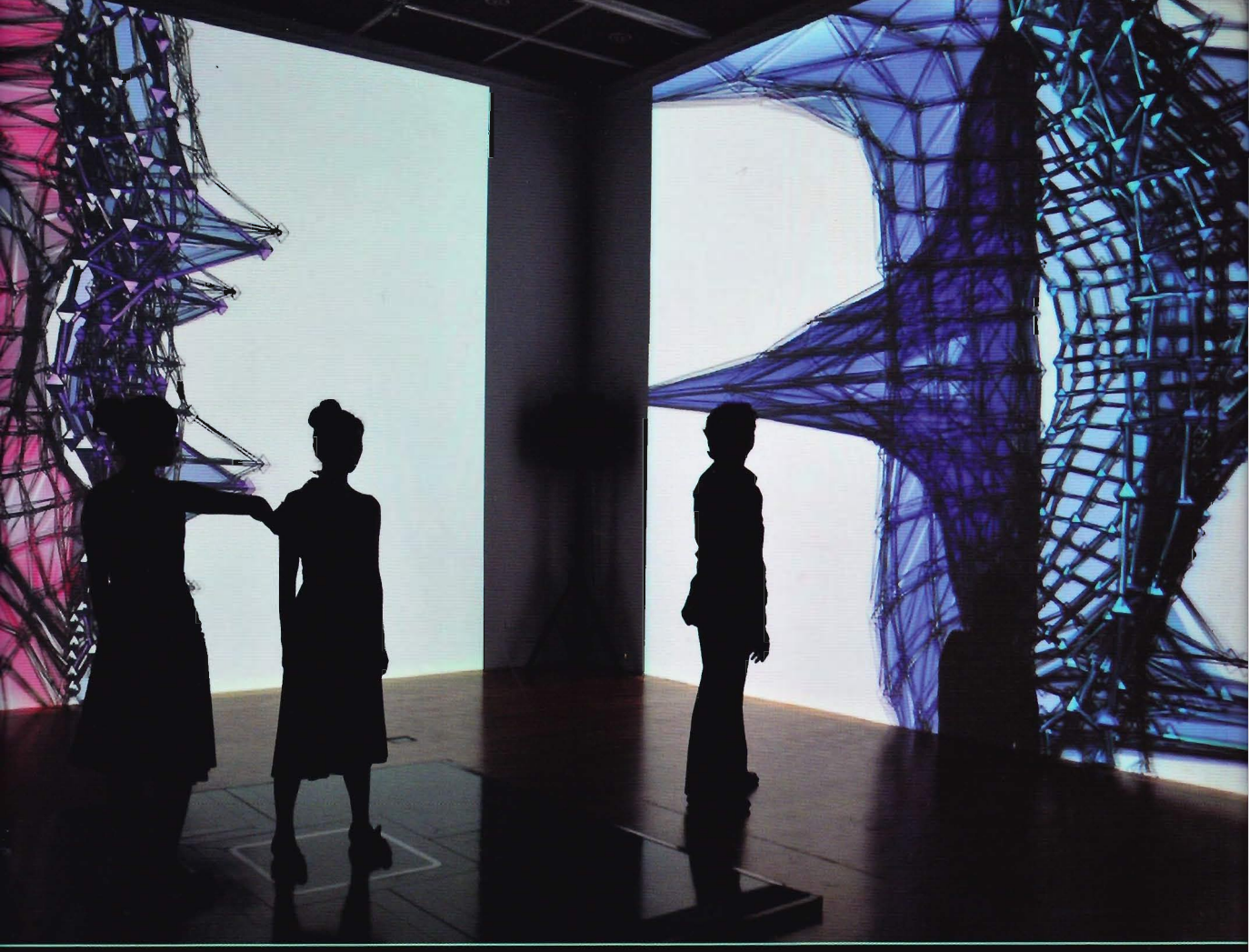

Aesthetics of Interaction in Digital Art

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4 The Aesthetics of Interaction in Digital Art

In the previous chapters, I discussed both strategies used in processual art and theoretical perspectives on associated qualities of aesthetic experience. In addition, comparisons with play have helped to identify basic parameters of non-purposeful activities. I will now turn to the main objective of the book, which is to develop a theory that can be used to analyze interactive art and determine its distinctive aesthetic potential.

The first step in an academic analysis of an artwork is usually to identify the object of study and the genre to which it belongs. Is the work we are dealing with an image, a sculpture, or an installation? Is it a text, a piece of music, or a play? Even such a basic classification as this is anything but simple with respect to the artworks under discussion here, however. As was pointed out in chapter 2, interactive artworks often do not manifest themselves in self-contained, material form, but as structures or systems. They may have been produced in different versions and have a large number of (sometimes variable) components, or they may run on different media. Above all, however, they are consciously conceived with a view to being realized by recipients in a multitude of ways.

As early as the 1960s, in reaction to the efforts of the neo-avant-garde to shatter the boundaries of the traditional forms and concepts of the artwork, various new classifications were proposed to replace the established categories. As regards the processual forms of art discussed in this study, these included (in addition to Umberto Eco's analysis of the "open work") an approach proposed by Stroud Cornock and Ernest Edmonds, who suggested differentiating between static and dynamic art systems,[1] and one proposed by Roy Ascott, who distinguished between deterministic and behavioral works.[2] However, dualistic distinctions of this kind were quickly displaced by more variegated spectrums. Eco had already introduced the subcategory of the "work in movement" to denote another stage of variability within the category of open works. Cornock und Edmonds further subdivided dynamic works into dynamic, reciprocal, participatory, and interactive systems.[3] Both proposals are thus based on the idea of a ranking scale reflecting the degree of activation of the recipient. However, such an approach can be problematic, especially when it comes to analyzing artistic projects.

A more complex proposal was developed by the Variable Media Network between 2001 and 2004. That North American research network created a model that takes into account specific characteristics of ephemeral, time-based, and media-supported projects, and can be used to describe artistic works without assigning them to any particular genre. Artworks are differentiated on the basis of process-related qualities (behaviors), which may also appear in different combinations. The model distinguishes between contained, installed, performed, interactive, reproduced, duplicated, encoded, and networked behaviors. Different criteria can then be applied so as to achieve a more precise description of each of these behaviors. The majority of works in the traditional visual arts (paintings and sculptures, for example) are meaningfully described as contained by their own materiality and as having clear physical boundaries. Consequently, the options for describing this type of work are based on standard characteristics related to matter, such as the type of surface and the support material. Installed artworks, by contrast, are characterized in terms of their location, their boundaries, and the associated lighting directions and sound elements, whereas in the case of performed works information about props, stages, costumes, performers, and time frames is collected. The options for describing code-based works include the recommended screen resolution and the data sources and fonts used. Interactivity is characterized by defining the input options and the interaction partners.[4] This kind of approach makes it practicable to compile a classificatory description of artistic activities (including media art)—while taking into account close intermeshing of material and processual characteristics.

In this chapter I will deal first with the main actors and parameters found in interactive media art. I will then analyze the spatial and temporal structures within with the actors stage and realize the processes of interaction. Only on this basis will it be possible to describe the processes of interaction themselves and discuss their aesthetic potential in terms of gestalt, aesthetic distance, and epistemic potential. Toward the end of the chapter, I will return to the question as to whether and to what extent it is possible to define the ontological status of interactive art.

Actors

A meaningful description of interactive art must begin with the active entities involved. Human actors are addressed here as individual subjects—as opposed to mere operators of the interaction system—because an aesthetics of interaction must give priority to individual perceptions and interpretations. Perceptions and interpretations arise subjectively and cannot be generalized.

The creator(s) of a work must be addressed as the first actor(s), if only because they are the first, chronologically speaking, to be involved in the project. In most cases,

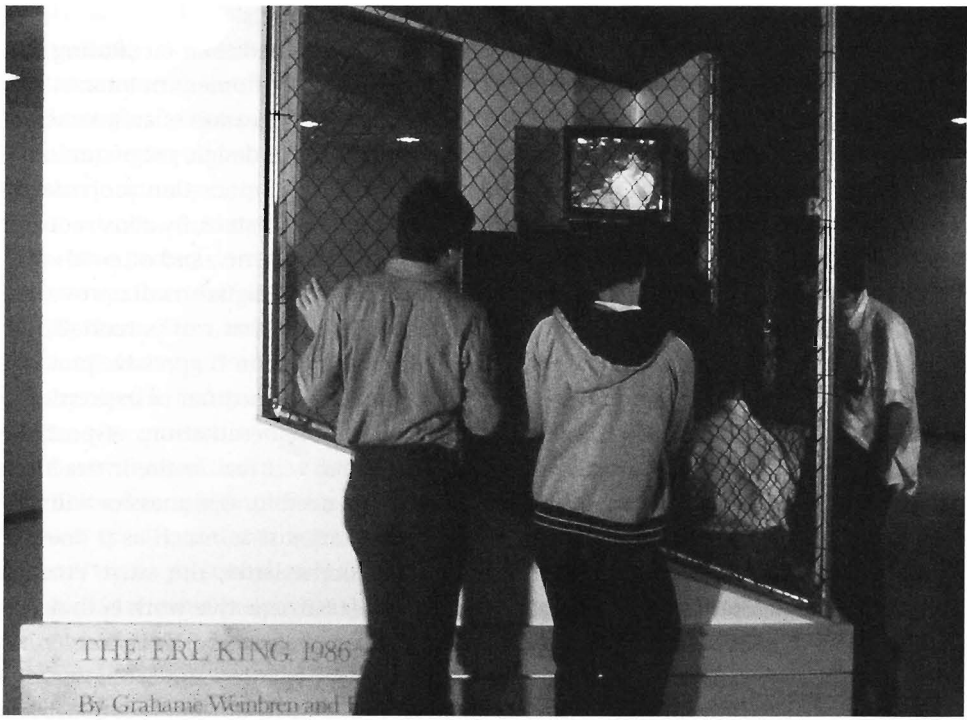

Figure 4.1
Actors of interactive art. Roberta Friedman and Grahame Weinbren, *The Erl King* (1983–1986/2004), installation view, Los Angeles Museum of Contemporary Art, 1986.

the creators still maintain their authorial role (in the sense that they have a significant influence on the aesthetics of the work in question), even if this role changes substantially as a result of the recipients' opportunities to take action. In the following discussion, the actors who initiate the project and who construct the interaction system will be referred to as "the artist(s)" regardless of whether these actors consider themselves to be artists, authors, or producers of a project. In the performing arts, these actors are flanked by interpreters and/or performers. Both in the performing arts and in the visual arts, the public traditionally has the task of contemplative or cognitive reception. Whereas in the traditional arts it is unusual for recipients to play a physically active role, that is the rule in interactive art.[5] The artist conceives of a process that awaits realization by a recipient, for only through the action of the latter can the processual presence of the work take shape. Nonetheless, both the construction of the work's interactivity and its realization depend on technical systems, which are thus also regarded as actors in this study.

The artist

The activity of the artist generally consists in conceiving of and then facilitating the interaction process, and therefore takes place before the actual moment of interaction. Several different people may be involved in the conception and creation of an interactive work, especially when different skills—e.g., sound design, interface design, programming—are required. As author of the work, the artist(s) create(s) the interaction proposition by designing, programming, or implementing the underlying system, by constructing, selecting, or assembling its digital assets and material components, and often also by selecting or configuring the required setting. In this context, digital media provide a means for structuring interactivity, in the sense of processes that can potentially be activated. The games researcher Noah Wardrip-Fruin uses the term "expressive processing" to highlight the creative potential of programming as a medium of expression.[6]

The production process is guided by visions or mental representations of possible interactions, or by assumptions about how the recipient will realize the interaction proposition. Many artists, however, also emphasize the need for openness or willingness to relinquish total control. This applies to media art just as much as it does to participatory works outside media art. In reference to the latter, the artist Yvonne Dröge Wendel has stated that "the beautiful thing about interactive work is that the moment you let go the unthinkable occurs and unknown situations arise beyond your own pre-conceptions. . . . I have to suppress my tendency to intervene or impose my intentions as to how the work is used or experienced."[7] Such declarations illustrate once again how the interest in random processes that informed art in the years after World War II is related to the strategy of open works, in which indeterminability was achieved through the active involvement of the recipient. However, Dröge Wendel is referring to circumstances where the artist himself may well be present in order to propose a situation within which recipients can act, so that the outcome results from a joint elaboration of the initial situation and the main focus is on a collaborative aesthetics of production. Such open invitations to collaborate are also found in the media arts, especially in Internet art. However, in this book I am not focusing on collaborative works. I am interested specifically in the aesthetics of projects within which the reactions of the systems to the decisions of the recipients are defined in advance. Nevertheless, the processes of realization can still occasionally surprise the artist. For example, as was mentioned above, Rafael Lozano-Hemmer experienced surprise in relation to his work *Body Movies* when the recipients were so fascinated by playing with their own shadows that they lost interest in using them to reveal the portraits the artist had projected onto a building facade. Likewise, Agnes Hegedüs is unlikely to have imagined that a recipient attempting to assemble the interactive *Fruit Machine* puzzle—which is designed to inspire cooperative behavior—would take over the work and manage to operate all three control stations on his own. David Rokeby, who cites Myron Krueger as sharing this view, sees the possibility of the artist being surprised

by his own works as an important feature of interactive art. In his view, the evident contradiction between the desire for surprise and the desire for control is a characteristic of interactive art.[8]

Although the absence of the artist from the interaction process has been identified as an important characteristic of interactive art, this criterion should be qualified here because it actually only applies to his role as author. The artist can certainly be present in other roles, for example as recipient, observer, mediator, or fellow player. Most interactive projects are developed in an iterative process in which the artist tests the possibilities for interaction he has envisaged in order to verify them and perhaps modify them. Thus, the artist is often the first recipient of his own work. The potential problems deriving from this practice are illustrated by an episode recounted by David Rokeby. At the first public presentation of *Very Nervous System*, he was astonished to see the system reacting only weakly to the actions of the recipients. Seeking to understand why, he realized that he had only ever tested the system himself—that he had internalized certain sequences of movements and then configured the system to react to these specific actions.[9] In order to avoid such pitfalls, most creators of interaction systems try to present their project as soon as is possible to the public or to a small group of interested people, so that they can observe how others engage with it.[10] But artists can also act as mediators of their own work by encouraging potential recipients to interact or by describing the way the system might potentially behave. The boundaries are fluid here—mediation will often follow observation, and the artist might take on the role of ideal recipient and perform possible interactions in order to encourage the public to follow suit. Thus, many artists exhibiting at the Ars Electronica Festival can be found in the close proximity to their works, ensuring that they are functioning properly, making themselves available for conversation, observing the public, providing suggestions, and perhaps interacting with the work themselves so as to present it or break the ice. The media artist Teri Rueb jokingly called this activity "babysitting a work."[11]

In a project that requires several human interaction partners, an artist may take on the role of a participant, and so may make contact with other recipients. Nonetheless, the artist is always in a special situation—even if he is subject to the same rules as the other recipients—because of his familiarity with the possibilities offered by the interaction proposition. Thus, when an artist assumes the role of co-participant (and whether or not he acts noticeably differently than the other recipients), he should be designated as a performer, because his primary intention is not to behave in the interest of his own experience, but rather to enrich the interactions of the other recipients. However, it would be wrong to draw too fixed a boundary here, for some of the other recipients may have figured out the system and its possibilities, perhaps because they already know the work or because they are familiar with similar projects. Thus, a recipient, too, can function as a mediating actor.

The assistant

Artists occasionally appoint third parties to assist in the presentation of interactive works. Such assistants may act as performers, as in Sonia Cillari's *Se Mi Sei Vicino*, which involves a female performer as a permanent interaction partner. Assistants also often play a mediating role when the input required of the recipient must be explained, supported, or supervised, and may be asked to distribute equipment. However, it is difficult to make a clear distinction between assisting functions that are a constituent element of the realization of the work and those that belong to the external setting. Matt Adams of the group Blast Theory, for example, sees the briefing phase in *Rider Spoke*—in which recipients must borrow a bicycle from a supply point—as extremely important for the success of the subsequent activity phase. According to Adams, the interaction is immediately preceded by a "particularly rich moment for us because people are thinking 'this hasn't started yet,' and so they are still relaxed and . . . our ability then to stage the experience and give them subtle cues is very strong."[12] Thus, overlapping roles are possible in this case, too: assistants can simultaneously be performers, and performers can act as or be perceived as recipients.

The recipient

The task of the recipient in interactive art is to realize the artwork. This means that the recipient actively responds to the interaction proposition (although not in the sense of "correctly" executing a prescribed concept, for recipients' behavior will not necessarily always correspond to the artist's expectations).[13] The scope for action offered by different works varies considerably, starting with the question as to precisely how the possible or expected actions are communicated. Written or verbal instructions may be provided, but most works are constructed and configured in such a way that the possibilities for action can be deduced from the installation itself. In many cases, one of the central components of the interaction is the recipient's exploration of the actual possibilities for interaction offered by the work.

As was mentioned in chapter 2, the recipient's activity depends to a large extent on his experience with similar works, his resulting expectations, and his willingness to take action. This is also confirmed by the results of the research projects carried out in the context of this study. For example, a recipient of Tmema's *Manual Input Workstation* recounted that his behavior was shaped by the fact that, as a teacher, he was accustomed to operating the kind of overhead projector presented in the work.[14] A recipient of *Rider Spoke* explained that the project went too far for her sometimes because she was not the kind of person who was inclined to speak openly about her feelings.[15] In order to counteract such contextualizations, David Rokeby sought specifically in *Very Nervous System* to ensure that recipients would not be able to draw on similar experiences in their interactions: "[I]t doesn't automatically register something that's familiar."[16] In addition to depending on the possibility (or impossibility) of

drawing on familiar behavioral patterns, the recipient's actions also depend on his interests—for example, in the type of technology used, or in its aesthetic effects. Likewise, the recipient's willingness to engage with the possible interpretability or intentionality of a work will vary.

Recipients may limit their activity to observing others interacting with a project, thereby taking a distanced position relative to the work. However, sensual or cognitive comprehension can still take place in these cases. Golan Levin defines such situations as "vicarious interaction"—a term, borrowed from educational science, that denotes a cognitive comprehension of others' interactions.[17] If an observer can understand the interaction taking place, he can also see relations between action and effect, even if he is not actively involved. Although the passive bystander doesn't have the same experience as an active recipient, he may be able to observe and understand interaction processes that he would not have carried out. As a result, the designs of many interactive installations reserve space for vicarious interaction. For instance, Grahame Weinbren often presented his early onscreen interactive narratives in cage-like constructions that contained a protected seating area for the interacting recipients. But he also built—either outside the cage or behind a metal construction—an area for spectators, which sometimes was even equipped with a monitor that replayed the screen recording of the active user for the onlookers.

Jeffrey Shaw also sees the advantages of vicarious interaction: "For the non-active spectator who only observes this interactive artwork being manipulated by a user, there is the unique experience of seeing it being illuminated through the eyes of another—his manifestation is a performance."[18] A recipient of *The Manual Input Workstation* recounted in the follow-up interview that observing other recipients was like witnessing an intimate act that revealed something about the person in question.[19] Observation may also be the first step toward active participation in that it gives the onlooker an initial glimpse of the system processes and reactions and also reduces inhibition. Observation often substantially influences the observer's own actions, for previously observed behavior is often followed by imitation or by deliberate modification.

The foregoing discussion leads us once again to the possibility of an interaction proposition being activated by the artist himself. In addition to explanatory demonstrations as an ideal recipient, it is also common for artists to stage performances using the systems they have created. Golan Levin and Zachary Lieberman invite the public to their own stage performances of their audiovisual systems.[20] Masaki Fujihata's *Small Fish* (1998–1999) and Toshio Iwai's *Piano—As Image Media* (1995) have been presented in public performances.[21] Levin regards his performances with *The Manual Input Workstation* as potential catalysts for vicarious interaction. In these performances, changes in the program mode are controlled by placing cardboard numbers on an overhead projector. This is clearly understandable for the public and takes place according to

the same principle as the subsequent interaction with the different modes themselves. For Levin this is an ideal way to demonstrate the functionality of the system to spectators.

The concept of vicarious interaction once again addresses the question of aesthetic distance. Is it really essential that the recipient be active in order to enjoy the aesthetic experience of an interactive artwork, or do forms of experience such as vicarious interaction actually create the distance to the object of experience often required by theories of aesthetics?

Robert Pfaller has been acclaimed for coining the term "interpassivity," which he uses to question the ostensible omnipotence of interactive media.[22] Pfaller suggests "denoting those media that already provide the process of their reception and consumption in ready-made form as interpassive media." The example he uses for such media is the video recorder, which, Pfaller claims, watches the films in place of the observer, so that the recording of films replaces their consumption. Pfaller explains the use of the prefix "inter" in terms of the transfer of roles that occurs: "[J]ust as interactive media transfer the activity to the observers, interpassive media transfer the passivity of the observers to the artwork."[23] Although the term "interpassivity" is admirably thought-provoking, it seems fair to ask whether it is really "passivity" that is being transferred in Pfaller's example or, in reality, actual or potential activity. What is certain is that the interaction propositions at the focus of the present study are neither (inter)passive nor vicariously active; rather, they are bearers of a processual potential that can be activated by a third party (the recipient).

Although Pfaller's concept of interpassivity thus appears less suitable for analyzing the aesthetic experience of interactive art, the broader context of his ideas certainly deserves consideration, insofar as they are based on a general mistrust of the view that activity is positive on principle and that activating observers is thus always "aesthetically rewarding and politically liberating." As Pfaller argues, many of the emancipation movements since 1968 have presupposed that "active is better than passive, subjective is better than objective, personal is better than other, changeable is better than fixed, immaterial is better than material, constructed is better than elemental, etc."[24] We must therefore ask critically which particular forms of aesthetic experience are specifically enabled by the activity of the recipient, whether a recipient's activity may also potentially prevent aesthetic experience, and to what extent contemplative observation of actions in the form of vicarious interaction should be taken into consideration as a distinct form of aesthetic experience of interactive art. Lars Blunck deals with this question in detail in his discussion of participatory art forms. In his study of (non-electronic) works that invite audience participation (e.g., the action art of the 1960s), Blunck doesn't discuss vicarious interaction so much as the possibility of mental anticipation of interactions. He asks whether actively responding to an invitation to participate is even necessary: "Is the theoretical possibility of participation not enough

to initiate an aesthetic fantasy centered on imagining using the work?"[25] Referring to works by George Brecht, Erwin Wurm, Joseph Beuys, and Franz Erhard Walther, he suggests that a particular form of aesthetic experience may be possible if we experience a situation not by actually experiencing "its sensual presence" but by "imagining it in its absence, imagining it sensually and in such a way as to lead it to its own aesthetic emergence."[26] Blunck argues that aesthetic sensuality is by no means sacrificed in this way to non-sensual reflexivity. He therefore suggests recognizing a range of different means of reception, and viewing sensuality and reflexivity not as alternatives but as components that can have different degrees of influence in determining the process of reception. However, the precondition for such an attitude—denoted by Blunck as reflexive imagination—is the accessibility of the potential actions. In the works on which Blunck's study focuses, the intended interaction is clearly identifiable and the course it may take can be anticipated. This is true both of Brecht's event scores and of Wurm's *One Minute Sculptures*, for example. In interactive media art, by contrast, we are usually dealing with a black box that conceals its own workings. In such cases, processes can be understood only if they are activated. This doesn't necessarily exclude an aesthetic experience through the observation of activation through others, but it does exclude Blunck's reflexive imagination. As my case studies will show, even vicarious interaction is not always possible in interactive media art. In particular, works that operate with mobile devices, works that are staged over large areas, and works that are based on audio files (played to the recipient on headphones) do not allow vicarious interaction.

Nonetheless, the possibility of aesthetic experience through vicarious interaction or reflexive imagination should be kept in mind as a potential mode of receiving interactive art, insofar as it touches on issues that have already been addressed as central to aesthetic experience—the relationship between active realization and distanced observation, and that between action and reflection. In the interaction with an artwork, shifts in the recipient's perspective between engaged realization and distanced (self-)observation are not only possible, but also essential for the epistemic processes at stake in the aesthetic experience of interactive art.[27]

The technical system

The technical system supporting the interaction proposition and the material components of that system must be considered actors in their own right, and not only when the system is configured as a virtual person. On principle, interaction systems not only enable actions; they also have their own processuality, which, although designed or programmed by the artist, acts independently of him. "Actor-network theory," for example, proceeds on the assumption that objects should be considered actors. Objects not only serve as a backdrop for human action; according to Bruno Latour, they can also "authorize, allow, afford, encourage, permit, suggest, influence, block, render

possible, forbid, and so on."[28] The proponents of actor-network theory are not primarily interested in processual entities, however, but in static objects. Donald Norman uses the term "affordance" to describe the action potential of objects. "Affordance" refers to the actual and perceived characteristics of things, especially those that determine how things can be used.[29] In the area of HCI research, especially, the concept of affordance has become established as a means to describe the stimulative nature of computer interfaces.[30] The present study, however, doesn't deal only with the perceived stimulative nature of systems; it also deals with their processuality. Although many interaction systems become active only after an input (in the form of human activity or incoming data from other systems) and otherwise remain in wait mode, some systems run their own processes while waiting for input. Thus, we must ask how processuality is triggered in each individual work, and what actually characterizes the processuality. Is it based on the activation of pre-stored playable assets, or on real-time processing of code? In the following, I will be looking at the processuality of technical systems especially with regard to the temporal structures of interactions and in the context of instrumental and phenomenological perspectives on interactivity.

It is important to note, in this context, that this study seeks to abstract the processuality from the actual technology used in works. In other words, the aim is to describe general qualities of processuality, not specific hardware or software functionalities. Of course, interaction systems are characterized by technology—for example, by the type of software and hardware that is available at the time a work is created or is familiar to the artist. The artist's decision in favor of a particular technology or system architecture may be based on the concept of the work itself, but can just as easily be determined by external factors. These include not only access to technology or the means for funding it, but also the roles played by sponsoring institutions, commissioners of works, and cooperation partners. For example, Ashok Sukumaran reports that the idea for his work *Park View Hotel* (2006) came to him during his stint as an artist-in-residence at Sun Microsystems, where he was required to work with Sun-SPOT technology.[31] Similarly, Matt Adams relates that Blast Theory would unquestionably have used GPS technology for *Rider Spoke* if the group's cooperation partner, the Mixed Reality Lab in Nottingham, had not proposed WiFi fingerprinting.[32] But although the underlying technology influences the aesthetics of a work, the latter is still ultimately based on abstractable procedures and structures. These will be described here not primarily in terms of their technical causality, but with a focus on the effects they enable. First, however, it is necessary to discuss the spatial and temporal structures within which the actors operate.

Regarding the actors, it can be said in summary that interactive media art differs from other forms of participatory art in that the authorial role of the artist is usually restricted to the phase before the actual interaction. At the same time, the interaction process is already embedded in the system as a potential, which leaves the recipient

different degrees of freedom to configure the interaction himself. Thus, the kind of interaction at stake in interactive media art differs substantially from a face-to-face interaction. As Erika Fischer-Lichte explains, in the performing arts, interaction is based on the principle of the "autopoietic feedback loop."[33] As was discussed in chapter 2, this term denotes the joint negotiation of the course of the performance, which can be controlled neither by the performers nor by the public alone. However, according to Fischer-Lichte, the feedback loop requires face-to-face interaction, which is not possible in mediatized performances.[34] In actual fact, the feedback processes in interactive media art are not the same as those that Fischer-Lichte draws on from performance art. Even if some projects also induce interpersonal negotiations, the focus is still on the interaction between a human being and a technical system.

Space

Each and every interaction proposition and act of interaction is tied to particular spatial situations. This is always true, regardless of whether the activity takes place in a public, institutional, or private space, whether it occurs in a physical place or within a data network, or whether it is based on mobile or stationary devices.

A "place" is understood to be a point, usually on the Earth's surface, that can be located using a system of reference (e.g., geographical coordinates), whereas "space" refers to an area with boundaries that can either be perceived or imagined. Recent theories of space are particularly interested in imagined boundaries, which are both subjective and variable. The sociologist Martina Löw defines space as a more or less fluid individual or collective construction, which may be material or may exist only in perception, in ideation, or in recall.[35] According to Löw, who sees space as "a relational ordering of living entities and social goods,"[36] the ordering comes about as a result of processes of "spacing" and "synthesis." Löw defines spacing as the placing of things, people, or markings, as in the alignment of items in shops, of groups of people, of architectures, or even of the components of computer networks. By contrast, she defines synthesis as the cognitive part of spatial construction: "[G]oods and people are connected to form spaces through processes of perception, ideation, or recall."[37] In Löw's model, spacing and synthesis should be understood not as consecutive but as mutually conditioning processes.

Löw's interpretation of spatial parameters as including not only materially fixed characteristics but also mutable designations that can be subjectively configured is also crucial for an aesthetics of interaction. However, we must distinguish between two different moments in the construction of space—on the one hand, the selection or staging of spatiality during the configuration of the interaction proposition and, on the other, the realization of spatiality during the moment of interaction. The distinction is not at all the same as that between spacing and synthesis, for the latter

Figure 4.2
Spaces of interaction. Scott Snibbe, *Boundary Functions* (1998), installation view (© Scott Snibbe).

two processes are involved both in the configuration of the system and in its realization. The author of an interactive work not only arranges objects and data (spacing), but also combines them so as to create a real or potential spatial structure (synthesis). In exactly the same way, the recipient not only constructs spatial structures within his own perception (synthesis), but also actively configures them by means of his own movement (spacing). Spacing and synthesis are thus relevant in equal measure for the configuration of the interaction proposition and for its realization.

The configuration of interaction spaces

The spaces that accommodate interactive works can be either man-made constructions or natural environments. Fischer-Lichte uses the term "performative spaces" to denote the spaces used for staging artistic performances. She writes that these spaces are intentionally created or selected in order to organize and structure the relationship between the actors and spectators and to enable specific forms of movement and

perception. Accordingly, performative spaces can be configured by the artist or they can build on the possibilities offered by pre-existing spaces (chosen by the artist).[38]

In interactive art, spaces of interaction are often subject to different premises than the performative spaces described above. Despite its hybrid status between visual and performing art, interactive art is mostly presented in exhibition situations, whether during festivals or as classical museum exhibits. This institutional context establishes certain spatial parameters. Because an exhibition usually runs for at least several days, interactive projects are rarely housed in architectonic spaces normally used for other purposes—unless the institutional situation is similar to an exhibition in that it is open to public access and is constantly supervised, such as the foyer of a trade show or an airport terminal.[39] Occasionally, an exhibition will display only one large-scale work, or a group of interrelated works by one artist that may be conceived as a single spatial arrangement. Two examples are the exhibition *Es, das Wesen der Maschine* held in Osnabrück in 2002, which featured robotic installations by Louis-Philippe Demers and Bill Vorn,[40] and the exhibition of works by Rafael Lozano-Hemmer that represented Mexico at the 2007 Venice Biennale.[41] Both of those exhibitions were held in historic locations, the former in Osnabrück's Dominikanerkirche and the latter in Venice's Palazzo Soranzo van Axel. Indeed, curators often make use of vacant historic buildings that still evoke a special atmosphere associated with their original function or their age. Among the other media-art shows that have benefited from exposition spaces with an interesting atmosphere are the exhibitions held by the Hartware MedienKunstVerein in Dortmund's Phönix Halle (part of a former steel mill), the presentation of the ZKM's exhibitions in a former weapons and ammunitions factory, and the guest appearance by Ars Electronica 2010 in the former Tabakfabrik (tobacco factory) in Linz.

Often however, exhibitions are held in neutral venues where the artist is assigned a site, or a white or black cube, for his installation. Unlike the theatrical stage, which is designed so as to accommodate a constant succession of new and individual productions, the spaces allotted to special exhibitions in exhibition venues often are neutral containers that offer only limited possibilities for modification. An interactive work must then be adapted to the space provided, be it by simply placing the necessary hardware in view, by assembling a sculptural installation, or by mounting hidden technical devices, sensors, or effectors.[42]

Whereas interactive media art of the 1990s often eschewed physical space in favor of simulations of virtual reality, active configuration of the actual spatial situation became more common over time. In the 1990s, the hardware used in media art was often seen as no more than a necessary interface to a projected artificial world. Myron Krueger called explicitly for the real-world space to be as neutral as is possible so that recipients could close their eyes to its materiality: "The empty rectangle has the advantage of being so familiar that physical space is eliminated as a concern and response

is the only focus."[43] This statement is consistent with Krueger's vision of an artificial reality that should be considered distinct to the spatiality of the here and now. The focus of Krueger's *Videoplace*, which he produced in the 1970s and the 1980s, is clearly on the effect of the computer-generated graphic feedback conveyed by the projection, whereas the real interaction space is darkened. However, the spatiality of Krueger's computer graphics is not particularly complex, either. Though his intention may have been to allow the recipient to concentrate entirely on the actual interaction, the technical possibilities available at the time the work was created limited the scope for complex graphical solutions from the outset. The 1990s saw the production of various projects that staged computer-generated graphic feedback as a visually illusionary virtual reality. Examples range from Jeffrey Shaw's *Legible City* (1998–1991), which sought to create the illusion of a bicycle ride through a city,[44] to Peter Kogler and Franz Pomassl's 1999 *Cave* (produced for the Linz Ars Electronica Center's CAVE environment[45]), which invited the recipient to immerse himself in a labyrinth of graphically patterned tubes, pipes, and passageways.

In more recent installations, by contrast, physical space is understood by many artists to be a fundamental component of the work and is configured accordingly. This may take the form of complex sculptural settings, such as *Web of Life* (2002) by Jeffrey Shaw and collaborators. Visitors to this installation must traverse an artificially curved floor and pass through a web of taut wires before arriving in an inner space that houses the interaction system. However, space may also be structured simply by means of a coordinated interplay between dimensions and lighting.[46] Spatial structures can also interconnect different components of a project. For example, Sonia Cillari's *Se Mi Sei Vicino* stages the spatial relationship between interface and visual feedback by means of multiple projections onto the walls surrounding a clearly marked touch-sensitive area of floor in the center of the room. David Rokeby's installation *n-Cha(n)t* (2001) features several monitor towers that communicate both with one another and with the recipient, inviting him to wander around the space delineated by the work. In other cases, spatial structures may be used to clarify the possible roles of the actors. As has already been mentioned, Grahame Weinbren, in his interactive installations, constructed one area for the active realization of the work and another for the observers of the interaction. In this case, action and observation—two possible functions of the recipient as actor—are presented as spatially separated roles. At the same time, they are distinguished from another possible actor function—that of the passer-by who is involved neither in the active realization nor in the observation. Thus, this artist uses material means to suggest different possible forms of reception. The spatial arrangement illustrates that the interaction is part of the work but is also a possible object of observation and reflection.

Visual art has always (also) been a spatial art, and twentieth-century installation art placed the spotlight on spatial configuration. I have already mentioned the action

art of Allan Kaprow, the Groupe de Recherche d'Art Visuel, and Claude Parent, the experiential environments of Bruce Nauman and Rebecca Horn, and the live stages of Rirkrit Tiravanija, all of which are based on spatial organization. But interactive media art offers much wider scope for spatial configuration. As was discussed in chapter 3 in relation to the self-contained nature of play, in interactive media art both the materially configured space and the interaction space are important, and these two spaces will not necessarily always coincide. A project's potential radius of interaction is usually determined by technical factors, be it simply the length of a mouse cord or the need for proximity to a monitor used as a touch screen, the angle of a camera observing the recipient, or the range of a sensor. However, the radius of interaction is often not visible from the outset—especially in works that operate with wireless sensor technology. In various manifestations of her installation *Untitled 5* (2004), Camille Utterback used a panel, lighting, or simple markings to indicate the margins of the touch-sensitive floor area. David Rokeby has recounted that every time he installs *Very Nervous System*, he asks himself whether and how he should specify the work's radius of interaction. In some versions he has used ropes to define the interaction space, in others lighting. However, often he has decided not to mark out the radius of interaction at all, so that it can be experienced only through interaction.[47]

As has already been pointed out, the spatial staging also concerns the space surrounding the immediate area of interaction. Does the artist leave room for vicarious participation or does he exclude potential observers? And if he includes them, does he allot them a specific place? Besides Grahame Weinbren's configuration of different areas for different types of reception, the Austrian artist group Time's Up's *Sensory Circus* deserves mention in this regard. This environment, installed numerous times in 2004–2006, offered various possibilities for individual and collaborative physical activity, including a recreation area that functioned as a transitional zone between the interaction space and everyday space.

Locative art has its own possibilities for spatial configuration. The use of portable devices (cell phones, GPS navigators, laptop computers) as interfaces enables the spatial extension of art projects across entire cities or landscapes and at the same time allows for a potentially infinite spatial dynamic of actions. This is all the more true when the project can be realized on everyday devices. Often these are not even provided by the artists and the recipients are expected to use their own, which means that the spatial (and temporal) confines of the project are ultimately determined in technical terms only by the mobility of the recipients.[48] However, having to rent out devices at supply stations is not necessarily a disadvantage, for it necessitates an institutional starting point. The significance of a related briefing phase has already been discussed in reference to Blast Theory's *Rider Spoke*. Furthermore, because the supply station will be both the starting point and the final destination of the recipients' activity, the spatial structure of the project usually takes its location into account;

levels of representation (e.g., fictional texts) refer to it, and its historical, social, or atmospheric implications are taken into consideration in the staging of the work. Also generally, locative artworks are characterized by a close nexus between their spatial structure and the public space, because GPS technology or some other location-tracking technique can be used to directly link information to specific coordination points.

The realization of spatiality

The recipient has the task of realizing spatiality within the structures provided by the system. When such a realization takes on manifest, physical form, it immediately acquires the quality of a performance. This was pointed out as early as 1980 by Michel de Certeau. When de Certeau observed that spaces are realized by walking through them, he was drawing clear parallels to performative acts. He believed that, owing to a "triple enunciative function," the act of walking was to the urban system what the speech act was to language. First, it served as a "process of appropriation of the topographical system on the part of the pedestrian"; second, it served as "a spatial acting-out of the place"; third, it implied "relations among differentiated positions, that is, among pragmatic 'contracts' in the form of movements." Walking, for de Certeau, was thus a "space of enunciation."[49] It was not just a question of subjective construction and perception of space, but also a perceptible performing. De Certeau was interested in physical and cognitive perception, in the active utilization of the environment, in the activation of certain places by means of presence, and in the construction of relationships between places and spaces through one's own movement.

In the performing arts, such active realizations of spatiality are primarily reserved for the performers (who may be following stage directions), whereas the recipient's contribution is mainly cognitive in nature.[50] In interactive art, by contrast, the recipient may be assigned an active role, or even the main role, in the material realization and manifestation of spatiality. Observations of recipients interacting with Rokeby's *Very Nervous System*, as well as interviews with them afterward, showed that many recipients first explored the motion-sensitive area and generally perceived their movements as an acting-out of space or as a way of finding the spatial boundaries of the work. In Cillari's *Se Mi Sei Vicino*, the material configuration of space functions as a foil for the negotiation of the spatial relations between the actors, especially with respect to the recipient's distance from or proximity to the performer. In these cases, then, we can concur with Martina Löw that spatiality can also characterize a relationship between people. In fact, the presentation of space as interpersonal relationship is a central theme of Scott Snibbe's *Boundary Functions* (1998). As soon as more than one visitor enters a demarcated area, lines are projected onto the floor so as to partition the area in such a way that each recipient is assigned a section of equal size. As the recipients move, the partitioning lines shift to adapt to the new situation.[51]

The realization of spatiality on the part of the recipient can, therefore, be manifested through self-positioning with respect to certain spatial constructs (as in Rokeby's work) or through a spatial acting-out of social relations (as in Cillari's and Snibbe's works). The realization of space tends to be on a much larger scale in locative art projects, which also require positioning with respect to everyday public space. In Schemat's *Wasser* and Rueb's *Drift*, the location and the boundaries of the works were determined by the artists, but each recipient created a version of the project that was unique in terms of its (internal) spatial structure. In both of these projects, everyday space acquires a metaphorical or atmospheric function and becomes a central element of the work's interpretability. In Blast Theory's *Rider Spoke*, by contrast, the participants have complete liberty to define their own radius of action. They can cycle in any direction they please, and their radius of movement is subject only to a time limit equal to the maximum duration of interaction allowed by the system. What all of these projects have in common, however, is the significance of personal movement for the construction or realization of the spatiality of the interactive work. This may take the form of physical activity or positioning, inclusion or exclusion of others, or even extensive locomotion. The gestalt of the work is realized in the course of these individual activities. Such gestalts are often fleeting and processual and ultimately endure only in the perception or memory of each individual recipient.

Digital and virtual spaces

In interactive media art physical space and digital data space can enter into complex interrelations. On the one hand, space can be simulated in the digital medium; on the other, digital information flows and networks create their own forms of spatiality.

When space is simulated by means of digital media, this simulation is not restricted to creating the visual illusion of space behind the picture plane or of interpreting an image as a window (as has been practiced in painting since the invention of central perspective). Digitally simulated space can be presented as both processual and modifiable, which opens up various possibilities of action for the recipient.[52] The simulation may present an enclosed space, like the cube in Perry Hoberman's *Bar Code Hotel* (1994), which is constructed from a central perspective and within which objects either move or can be moved. Space might also be presented as an infinite space into which the recipient can gaze, as if through a large window, or within which he is invited to move virtually, as in Shaw's *Legible City*. Hegedüs' *Fruit Machine* has such a dark background that the interactive object the recipients must assemble seems to float within the actual exhibition space, or at least this is the intended impression.[53] The same impression is even more effective in the CAVE, in which virtual objects are projected directly into physical space so as to create the illusion that the recipient finds himself in a virtual world. *Home of the Brain* (1992), by Monika Fleischmann and Wolfgang Strauss, was explicitly designed to feature an overlap between virtual and

physical space. Recipients were given head-mounted displays and were invited to move around the foyer of Berlin's Neue Nationalgalerie so as to explore a virtual space whose boundaries and dimensions corresponded to those of the actual foyer. Within this space, the virtual homes of famous philosophers could be visited.

In addition to using forms of visual illusion, artworks may represent social structures by means of spatial metaphors. For example, the original interface of the early network platform *De Digitale Stad* was a mixture of a city map and a subway plan, whereas a more recent and more abstract version showed a web-like structure. In this work, urban space was seen as a network of social, societal, and political institutions and relationships, and was staged as an online communication space. Ingo Günther went even further with his project *refugee republic* (1995), which presented a republic without a location in the real world and characterized by independence from all existing political and geographical systems.[54] These last projects address yet another form of digital spatiality, for they not only represent a place but also instrumentalize a digital communication network. Local and global data and communication networks are also spatially structured, manifesting themselves as such by means of access points, information flows, and entry requirements. Manuel Castells coined the term "space of flows" to describe this feature. As a counterpart to the "space of places," it denotes global economic, social, and political communication flows and relationships organized around various nodal points.[55] Anthony Dunne and Fiona Raby use the term "Hertzian space" to describe the immaterial spatiality of information carried by electromagnetic waves.[56]

Internet art is never located primarily in physical space; rather, it is based on HTML code stored on a server whose location usually seems to be of no relevance for the recipient. When the appropriate address is accessed, the code is temporarily transmitted via an Internet connection and can be displayed on any computer. Nonetheless, these works involve spatiality both in the staging and in the realization. The realization is shaped significantly by the location of the reception—the public or private space in which the project is activated. It makes a great difference whether I interact with an Internet artwork alone or in company, and whether I am positioned directly in front of a large screen or am incidentally clicking through a work on a laptop computer. The staging, by contrast, concerns the technical location of the work in digital data space. If the work in question consists of Web pages that the recipient is simply invited to explore, where the work is stored usually isn't relevant. One exception is Olia Lialina's *Agatha Appears*, which is not just stored on but also narrated across multiple servers spread around the world. The network nodes also acquire substantial importance when a work links up different recipients, whether synchronically or asynchronically, as is the case in *refugee republic*. But then again, it is not so much the location of the server as that of the recipients that determines the individual spatial construction of the work. Even if I am not exactly aware of where my interaction partners are, I still create the idea of a communication network, which is shaped by

my mental image of the interconnected space of the World Wide Web. This imagined spatiality may have parallels in the actual technical paths of transmission, but need not coincide with them.

Again, the most complex form of superimposition between data space and real space happens in public space. This is clearly illustrated by *Blinkenlights*, a project presented by the Chaos Computer Club in 2001. The Berlin-based hackers' club transformed the facade of Berlin's Haus des Lehrers into a computer screen, using the windows as pixels. Recipients were invited to send their self-designed graphics to a server, and these were reproduced in large scale from the illuminated windows of the high-rise building. Moreover, it was also possible to play the computer game Pong on the facade.[57] Phoning a number that had been publicized in advance turned the recipient's cell phone into a joystick that he could use to control the Pong paddle depicted on the facade. The action became especially exciting when a second player joined in, for then the recipient was not playing against a computer but against another person whom he knew must have been somewhere within sight of the playing field (the facade of the building). Now the recipient's perception of the space around the high-rise building changed, for somewhere in the immediate area there had to be a person with a cell phone controlling the second Pong paddle. So the recipient tried literally to trace the incoming radio waves back to their transmitter. The path of the Pong ball and the path of the transmission became mixed in the recipient's perception, even if, technically speaking, the information did not follow a direct path from the player to the playing field. Now space was suddenly defined in terms of information flows, and a network of connections was superimposed on the physical urban location—a network of mobile transmitters and receivers, visible pixels, and invisible information flows. Such close linking of real space and data space is typical of many interactive artworks. It may, as in *Blinkenlights* and *Se Mi Sei Vicino*, be supported by appropriate visualizations, or, as in *Wasser* and *Drift*, be based on linking real space and acoustic information space.

In the locative projects chosen for the case studies presented in this volume, the artists selected specific locations for the works to be realized. Other projects, by contrast, leave the actual location of their realization completely open. The location then corresponds to the action radius of the recipient, for the work is delivered to the recipient, wherever he is, by cell phone. In *FLIRT* (1998), Anthony Dunne and Fiona Raby sent a virtual cat into the network to dart across the cell phones of the recipients. In *Operation CNTRCPY™* (2003/2004), the Viennese artist group CNTRCPY™ organized a game that used text messages to yank recipients out of their daily life at all hours of the day and night—they were obliged to respond immediately if they wanted to win a virtual race to Mars. In these cases, spatiality is no longer determined by the consistency of physical spaces, but by blending these with imagined worlds and, in Martina Löw's words, with the "non-continuous and only intermittently connected moving realms of cyberspace."[58]

Regardless of whether the conjunction of real space and data space is staged in the public space or is a theme of a Internet artwork, and regardless of whether the artist designates locations within these spaces or simply initiates locative processes, the realization of such hybrid spatial constructs is central to the aesthetic experience of interactive art. Often it is in these mutually overlapping spatial layers that the boundary between interaction space and everyday space is challenged. The resulting irritation of the recipients is explicitly desired. In addition to a constant questioning of aesthetic distance, here a challenging of the boundary between the artwork and everyday life (addressed by Gadamer as "aesthetic differentiation") is also particularly evident. When real space and data space, and interaction space and everyday space, overlap to varying degrees, does it still make sense to refer to an artwork as a self-contained entity?

Presence

The observations made above about individual and ephemeral constructions of spatiality indicate that spatial phenomena are increasingly viewed in processual terms. Spatiality thus acquires relevance not so much as an objective condition as in terms of a perceived situation. If, on the one hand, interactive art relies on the absence of the artist during the process of interaction, on the other hand it requires not only the existence of a system and a recipient, but also the readiness of these to become active—in other words, their "presence." The *Oxford English Dictionary* defines "presence" as "the state of being before, in front of, or in the same place with a person or thing," and specifies that "being present" is also used to denote non-human phenomena, such as things that are ready at hand, immediately accessible, or available. This last meaning of the term is also applied to traditional artworks, which are ascribed the quality of presence on the basis of their material effect or impression on the observer. This spatial impact of art—criticized by Michael Fried as amounting to theatricality—has gradually become a significant issue in art since the middle of the twentieth century.[59]

Dieter Mersch relates his concept of presence to non-human entities, describing their active qualities as "ekstasis" and "positing."[60] Even Erika Fischer-Lichte, who considers presence to be the defining characteristic of the performative ("an aesthetics of the performative is . . . an aesthetics of presence"),[61] recognizes the active qualities of objects, although she would prefer to reserve the concept of presence for the physical presence of human beings. Fischer-Lichte proposes a ranking scale of concepts of presence ranging from weak to strong to radical—from pure physical presence, to presence that dominates space and seizes attention, to the self-experience of recipients as "embodied minds" kept in a state of constant flux by the circulating energy.[62] Fischer-Lichte believes that the third type of presence is the exclusive prerogative of human beings, whereas the first two can also apply to objects. Nonetheless, for objects she prefers to use Gernot Böhme's notion of the "ecstasy of things."[63]

Thus, media studies and performance theory emphasize physical being there and active qualities as criteria of presence. They use the word "presence" in a way that is related, but not identical, to the concept of affordance, which generally entails an invitation to take action. In 1992, Thomas Sheridan introduced the concept of presence to HCI research, specifically in relation to behavior in media-based environments. Sheridan differentiates between telepresence as a sense of presence in another, physical place, and virtual presence as a sense of presence in a simulated place. What is important to note is that he defines presence as a subjective feeling. Thus, according to Sheridan, one can only perceive one's own presence. This is determined, on the one hand, by the degree of sensory information that can be obtained and, on the other, by the potential of the individual to modify his environment.[64] Matthew Lombard and Theresa Ditton illustrate succinctly how in information technology the concept of presence is based on illusion and mediatization when they define presence as "an illusion that a mediated experience is not mediated."[65] The conception of "presence" as an illusion is, of course, diametrically opposed to a definition of presence as actual "being there." Fischer-Lichte, especially, defends her conviction that presence can be simulated, but not generated, by media. In her view, presence requires actual (co-) presence in one place, because otherwise the autopoietic feedback loop—the ongoing negotiation of the relationship between actor and public—cannot take place.[66]

However, these divergent definitions of presence—in performance studies and in HCI research—can be used to create a productive concept of presence for this study. If presence can be applied both to objects (including technical systems) and to people, then although the quality of presence can only be ascribed to an entity that can be activated in the here and now, this entity need not be human. Presence can thus be understood as potentiality for action which is specific to a particular location. When such potentiality results in a factual activity, however, usually the word "liveness" is used instead of "presence."

Time

The processuality of interactive art is not limited to a linear, preconfigured, and structured duration; rather, it is the result of interrelations between different levels of time. As John Dewey emphasizes, time is relevant to all forms of art: "[T]here is the same compression from accumulation in time" in the visual arts and architecture, and also in music, literature, and theater.[67] Nonetheless, the different conditions of reception as well as the structure of the works offered for reception in the different genres have a significant influence on the temporal course of the works.

Whereas a performance is usually defined by a temporally fixed beginning and end, and thus by a fixed duration, in interactive art questions of duration are equally relevant, although (in most cases) they are not determined in advance. Interactive projects are comparable to visual artworks in that they generally are presented in the

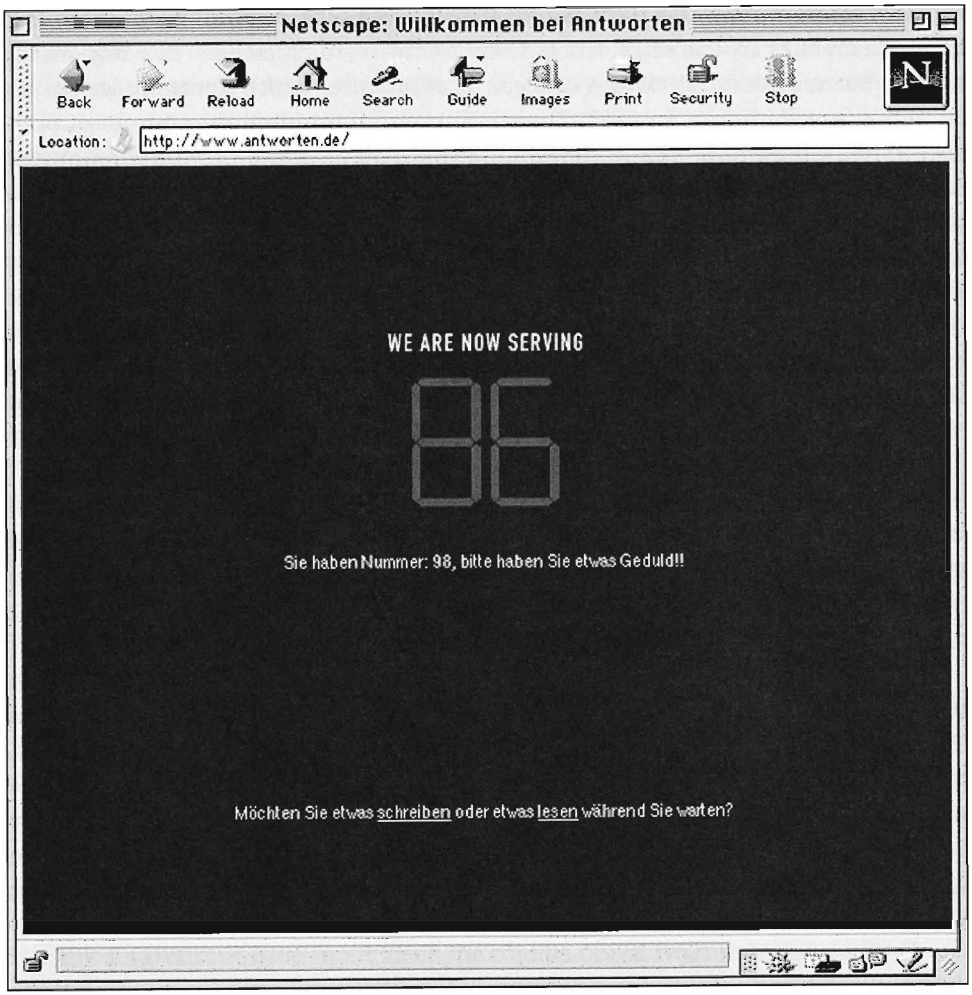

Figure 4.3
Interaction time. Holger Friese and Max Kossatz, *antworten.de* (1997), screenshot.

context of an exhibition and can be accessed at any given time (during the venue's opening hours) and for any given duration. This also applies to Internet artworks (which are not subject to opening hours) and to projects presented in public spaces (where the opening hours of distribution points for devices may have to be respected).

Interactive art and visual art may have the same degree of openness regarding the moment and duration of a reception, but this doesn't hold for the structural presettings of the reception itself. Visual artworks impose no conditions in this respect either, whereas in interactive media art the temporal structures of the realization phase are designed in the form of potential processes. This potentiality, rendered possible by the use of electronic media, is seen by modern philosophers of time as a fundamental revolution with respect to our experience of time.[68] In fact, electronic media are increasingly calling into question our model of a linear progression of time. In 1766, using the examples of painting and poetry, Gotthold Ephraim Lessing noted that the principal difference between visual and time-based art was that "signs arranged side by side can represent only objects existing side by side," whereas "consecutive signs can express only objects which succeed each other."[69] This, Lessing argued, was why bodies were the objects of painting and actions were the objects of poetry. Friedrich Kittler still basically agrees with Lessing when he points out that "on the time axis, however, manipulating the notions of ordering and analyzing seems to be different and more complex than in space," because time is from the outset a "successor relation."[70] Kittler argues that it is only thanks to the tools that electronic media provide for storing information as a time flow that such information can be arbitrarily organized, played faster or slower, or processed in what is regarded as real time.[71] Paul Virilio also observes that the traditional tenses of past, presence, and future have been replaced by two tenses: real time and delayed time. Virilio uses the term "real time" to refer to the natural flow of time, and "delayed time" to refer to represented or potential (virtual) events that can be accessed or realized at any time through a medium.[72] Thus, by making temporal structures available for activation, electronic media, and with them interactive media art, create a new potentiality for time. The issue here is not the representation of a course of events, as in literature, but the potential activation of concrete units of time and of programmed processes.

The technical possibilities for structuring time are not the only aspect that informs the time structures of interactive media art, however. These also rely on the perception and contextualization of such structures, which are based on collective agreements and symbolic attributions.[73] Mike Sandbothe argues that the socially informed concepts of past, present, and future represent a "dimensioned time" that differs from the time model of "earlier, simultaneously, and later."[74] However, both models are characterized by a linear understanding of time, which (like the idea of continuous space) is a modern construct. In fact, the anthropologist Edward T. Hall labels this conception of time characteristically Northern European. From this point of view, Hall writes,

actions are primarily perceived and organized as succeeding one another, whereas other cultures live according to the polychronic model of time, in which there is a stronger focus on the simultaneity of different chains of action.[75] Also Hall observes, however, that the information society is inducing a general trend toward polychronic models of time, and that cultural differences are being gradually broken down by the new potentiality of time engendered by electronic media.

Different concepts are used to describe this new potentiality. Paul Virilio uses the term "simulation time," whereas Helga Nowotny examines "laboratory time." Following the ideas of Karin Knorr Cetina, Nowotny sees the laboratory as an interactional environment—a "temporally structured environment capable of acceleration."[76] She argues that laboratory time is characterized by the "continuous presence" and the constant "temporal availability" of technical objects, which allows temporal sequences to be controlled and programmed. Moreover, it is possible both to accelerate processes and to slow them down under laboratory conditions, and events can be repeated several times—with variations, if so desired.[77] This brings us back to a topic we already encountered in the context of play: the inner infinitude of processes that can be repeatedly activated and replicated within a set framework or rule system. In interactive media art, the repetition of actions is not only possible, it is often specifically desired. Examples are the invitation to play further rounds in Berkenheger's *Bubble Bath* and recipients' tendency to repeat sequences of physical movements, either with the aim of exploring the reactions of the system in more detail or simply of enjoying the processes in question, in Rokeby's *Very Nervous System* and in Cillari's *Se Mi Sei Vicino*.

Interaction time

The time required for an interaction with artistic systems can also be described as laboratory time in the sense that the point in dimensioned time at which short-term interactions take place is not particularly important.[78] We do not contextualize such interactions as temporally relevant segments of the life course. In the configured temporal structures on which this study focuses, the interactions are usually integrated into societal time structures only at the level of representation—that is, they may represent past or future events. The interaction itself, however, can only take place in the present, but the context is generally not that of everyday life. The exceptions are works aimed specifically at calling into question the boundary between the artwork and the everyday, such as *Operation CNTRCPY™*, which, as mentioned above, involves the recipient for a number of weeks in a virtual race to Mars. In this work, the recipients' contact with their virtual spaceship is created via cell phone, so that they can be alerted at any time of the day or night that they must intervene immediately, via an Internet connection, to prevent imminent danger (collisions, attacks by enemies, fuel shortages). Owing to the lengthy duration of this project and the instrumentalization of the participants' personal appliances, the interactions with

the system interfere with the recipients' everyday lives, so that the time spent interacting with the artistic project becomes intermingled with the time spent in social reality. In most projects, however, the duration of the interaction is separated, via its artistic contextualization, from the everyday sense of time. Although it cannot be entirely detached from the conventions of social time management—a recipient will devote less time to a work if he is in a hurry, for example—other time structures still dominate.

Narration time and narrated time

Literary, film, and art scholars have primarily been interested in the relationship between narration time and narrated time.[79] In other words, their consideration of temporal structures relies on the basic assumption that works have a representational function. Research is dedicated to the historical context of the situation or activity being represented and to the relationship between the course of the narrated time and the duration of its representation or reception. Literature operates with flashbacks and previews to structure the representation of time, and film may use slow motion and fast motion, in addition. Represented time can even play a role in the visual arts, for example when a sculpture evokes a sequence of movements or a single painting combines different scenes that succeed one another chronologically.

But of course the arts don't always represent something, let alone something that could be contextualized in temporal terms. Richard Schechner points out that action art is not based on the representation of symbolic time, and Erika Fischer-Lichte's analysis of performance art likewise doesn't place the focus on represented time. The performances Fischer-Lichte examines are not primarily geared toward representation, but emphasize reality and thus the actual time of action. In interactive art, too, the main focus is on the actual moment of interaction. Nonetheless, the category of represented time is by no means irrelevant here. For example, when a project uses assets that have been stored in advance, actions or processes performed in the past are replayed. Although the chronological order of the actions represented in alinear narratives may be variable, the process of reception nonetheless produces a chronological progression that orders the different fragments of represented time. Such works often create the illusion that the represented actions are happening in the real time of the individual realization—for example, when the recipient is addressed directly, as in *Rider Spoke*, *Wasser*, and *Room of One's Own*. In such cases, the storage of data gives a potential to communication that is aptly described by Paul Virilio's concept of delayed time. Of course, this doesn't exclude the possibility that actions stored on media may also be presented as past actions. Both *Wasser* and *Rider Spoke* thematize memories and past events, whereas in *Room of One's Own* we find references to past episodes in the life of the protagonist (for example, she greets a fictitious telephone caller with the words "Finally, it's about time you called. It's been two weeks . . . ").

In interactive art, narration time corresponds to the duration of the interaction. In a game, a conclusion is usually reached either after a certain amount of time has elapsed or after a certain result has been achieved.[80] Because of the open-ended nature of interactive art, such predefined conclusions are rarely imposed; most projects allow interactions of different durations.[81] Nonetheless, the duration of interaction is largely determined by the pre-established structure of the project. In this context, the difference between projects based primarily on stored assets and projects that focus on the processing of code becomes relevant again. In order to differentiate between these two features, Chris Crawford introduced the concepts of "data intensity" and "process intensity."[82] Crawford writes that data-intensive projects are based primarily on prerecorded sound and/or image sequences, or on static texts or images that are selected or arranged during the interaction. In these cases, processuality serves mainly to structure, select, or compose the assets. In data-intensive projects, a time length may be computed by adding up the duration of all the included assets, although this calculation by no means determines the duration of each individual realization. In such projects, recipients may seek to activate all the available assets. Just as we are used to watching a movie from beginning to end, we are inclined to want to experience the "whole" of a work—that is, all available assets. If a work has mainly been programmed in a process-intensive manner, then the sound and image data we can experience will be generated in real time according to algorithms that are activated and influenced by the input of the recipient. In these cases, the duration of the interaction may be determined by the desire to exhaust the underlying algorithms and the possibilities for interaction offered.

The important point in both cases is, however, that the interaction will not necessarily end when all the assets have been accessed or when the workings of the system have been understood. If the interaction process is in itself aesthetically appealing, exciting, or pleasurable, the recipient will seek to reactivate specific assets, repeat individual processes, or try out alternative patterns of interaction. On the one hand, the desire to fully realize or comprehend a project may thus replace the pursuit of a goal in a rule-based game—that is, the recipient will define a conclusion that can be justified within the framework of the interactive work. On the other hand, the recipient might just as easily—as Scheuerl and Gadamer pointed out—find pleasure in the repetition and the inner infinitude of the movement of play.

The temporal structure given to narrative systems is often closely linked to the storyline. For example, most hypertexts have a starting point that represents the beginning of the story. However, it is rare for such texts to have a defined end, for that would hardly be appropriate for their alinear structure. Nonetheless, every individual reception will, of course, conclude at a particular moment. Michael Joyce wrote the following in relation to his hypertext *Afternoon* (1990): "When the story no longer progresses, or when it cycles, or when you tire of the paths, the experience of reading it [the hypertext] ends."[83] This applies to the experience of Schemat's *Wasser*. By con-

trast, the plot of Lialina's *Agatha Appears*, which has an almost entirely linear structure, has an evident end, even though it leaves the outcome of the story open and thus doesn't provide a conclusion to the arc of suspense. Berkenheger's *Bubble Bath*, by contrast, clearly moves toward a climax, but then loses itself—at least in my experience—in tiresome loops, which are obviously aimed at ultimately provoking the withdrawal of the recipient.

Structure, rhythm, and processed time

Interactions are, by definition, reciprocal actions. Accordingly, the course of time of an interaction cannot be conceived or realized as a seamless continuum; rather, it manifests itself in the form of rhythms or structures.

In both data-intensive and process-intensive projects, the course of the interaction depends on whether all the data can be accessed (on principle) at any time, whether all the processes can be initiated at any time, or whether sequences or actions are available or can be activated only at certain points in time. It is also determined by whether it is mandatory for the recipient to be always active for the process to continue. Jesper Juul introduced a distinction between real-time and turn-based games in the context of play. Whereas in "real-time" games the fictitious gameplay proceeds continuously, turn-based games stagnate in the absence of input from users.[84] And hybrid forms in which such moments of stagnation trigger system-internal processes can often be found. Instead of simply hovering in a waiting state, the system then reverts to a standard procedure that signals that it is waiting for input. Alexander Galloway distinguishes in this regard between "ambience acts," which are activated to bridge pauses determined by the players, and "cinematic interludes," during which input from users is precluded.[85] Interactive media art also operates with different forms of reactivity and autonomy on the part of the system processes. Agnes Hegedüs' *Fruit Machine* remains entirely static when no input is registered. So does David Rokeby's *Very Nervous System*, which is entirely inactive until a recipient enters the room and moves within the work's radius of action. Whenever there is an absence of interaction in Sonia Cillari's *Se Mi Sei Vicino*, the grid reverts to a gentle billowing movement as it registers the variations in voltage that are latently present in the room. By contrast, Lynn Hershman's *Room of One's Own* emits singing and laughter when no recipient is interacting with it, as if the interactive sculpture were involved with itself. At the See This Sound exhibition, *The Manual Input Workstation* indicated its readiness for action by means of the request "Please Interact," which was projected onto the otherwise empty screen. In this work, the audiovisual formations, once generated and activated by the recipient, can also run independently as loops before they gradually fade.

The technical processes underlying such effects are not primarily based on time in the sense of a progression which is perceived, remembered, or anticipated, but on frequencies and pulses that structure a sequence of predefined units and steps—determined to different extents by external input. Even though the feedback processes

of the technically mediated interaction are ultimately always based on a chronological succession, "real-time interaction" is said to take place when feedback is made possible within the normal limits of human reaction time.

Often the transition between sequences follows a conscious design. For example, Grahame Weinbren was particularly proud of having developed a system for his early work *The Erl King* (1983–1986) in which the cinematic assets could be interactively selected and varied, whereas the sound remained unchanged and thus suggested a continuity that Weinbren considered an important aesthetic element of his vision of interactive cinema.[86] Lynn Hershman recorded specific film sequences to accompany the transition from one position to the next in *Room of One's Own*. In *Drift*, Teri Rueb used the sound of footsteps to indicate that the recipient was approaching a zone containing text. However, she also left long pauses between these zones in which the recipient received no feedback whatsoever on his movement. These examples show that, in some works of interactive media art, the transition between selectable information units may be deliberately indistinct; in others it may be staged as an evident interruption. Whereas in the past it was often technically impossible to avoid a waiting period before the system reacted, nowadays one can assume that delays have probably been deliberately programmed. An exception from the past, as Jesper Juul recounts, is Space Invaders, an early computer game that halted briefly when a player had hit an opponent so as to allow him time to celebrate his achievement. Juul compares this approach, which takes account of subjective perception of time, to slow-motion sequences in film, which often mark moments of great emotional significance.[87] Interactive art also uses such deliberately staged delays. For example, in *Bar Code Hotel*, Perry Hoberman programmed objects to react after a time lag when they had reached a certain age. During the restoration of *The Erl King*, delays in feedback found in the original system were artificially simulated in order to preserve the experience of the original process speed.[88] The influence of the system's response time on aesthetic experience is also illustrated by the observations of the visitors to Tmema's *Manual Input Workstation*. Whereas one visitor explained his perseverance in waiting for something to happen after he had placed a number on the projector by saying that in interactive projects one must always first learn to appreciate the latency of the system, the recordings of other visitors showed that they didn't wait long enough to allow the system to recognize the numbers placed on the projector. The Internet artwork *antworten.de* (1997) by Holger Friese and Max Kossatz uses irony to disrupt expectations regarding real-time communication in interactive art. Recipients who access this work's Web page are greeted by a friendly message announcing "We are now serving 13. Your number is 97. Please be patient!" This is accompanied by a musical jingle of the kind that typically signals that one is on hold on the telephone. Even though the number is regularly updated, the recipient finds himself in an endless waiting loop; when his turn arrives, his number is skipped.[89]

At the opposite end to technically determined, aesthetically generated, or ironically disrupted real-time interaction are projects that stage asynchronic feedback processes. Such works invite users to store data that other recipients can then access in different forms. Jonah Brucker-Cohen's *BumpList* (2004) is a mailing list that uses particular rule systems to self-referentially question the mechanisms of such communication. Although the list allows users to refer to one another, it prevents meaningful communication by admitting only a limited amount of subscribers. When a new person joins, the first person to subscribe is "bumped"—that is, unsubscribed—from the list. In other works, including *Rider Spoke* and the archive project *The File Room* by Antonio Muntadas, data can be stored for other, anonymous recipients.

Liveness

One of the main characteristics of interactive art is the fact that it can—indeed must—be experienced in the form of actual and individual realization. However, I have already identified a contradiction between this process-based actuality of interaction and the material or informational permanence of the programmed interactivity. Every work was conceived at a particular moment in time and, unless it has since been updated or adapted for exhibition purposes, it is presented on each new occasion with the same original structure. In this subsection, the concept of liveness will be used to examine the relationship between the action potential ("interactivity") of the interaction proposition and the moments of its realization or actualization ("interaction") by a recipient in more detail.

The adjective "live" is documented in the English language since the early modern period and denotes such different states as "alive," "of current relevance," "full of energy," and even—in the terminology of mineralogy—"untreated." With the coming of the Industrial Revolution, "live" also came to be used to describe machine parts that moved, especially when induced to do so by other parts. The noun form "liveness" has been in use since the nineteenth century, both in the literal sense of an organic body's being alive and in the metaphorical sense (for example, denoting an active area of research).[90] Similar to "presence," "liveness" can thus be applied both to living things and to objects.

The word "liveness" was adopted into the context of media in the 1930s, when radio broadcasting had become widespread. Although storage media such as the phonograph record had already allowed aural performances to be recorded and later played back for many years, it was only with the arrival of radio that listeners were no longer able to distinguish between direct broadcasting of a performance and broadcasting of a recording. Consequently, direct broadcasting was now designated as "live broadcasting."[91] Thus, the concept of liveness found its way into the media context the moment it became possible to simulate "here and now" communication using new storage and broadcasting technology. The word "live" was intended to distinguish

a here and now communication from newly emerging methods that called its liveness into question. The concept of liveness can apply to different areas of the communication model, however. "Live recording" places the focus on the production of data, "live broadcasting" emphasizes the process of transmission, and the "live concert" prioritizes the moment of performance and reception. In the context of the present study, I propose defining liveness in terms of actual processuality. Whereas presence is understood to be a potential of objects, systems, and living beings, liveness will be used to denote a processual activity.[92] In the remainder of this book, the concept of liveness will be applied to the analysis of interactive art when the focus is on processes that are currently taking place. These processes may comprise the realization of the interaction proposition on the part of one or more recipients, but they may also be internal system processes. Moreover, drawing on Jesper Juul's distinction between real-time games and turn-based games, we must also distinguish between system-internal liveness and the reactive liveness that develops on the basis of the reciprocal responses of the system and the recipient.

Philip Auslander has pointed out that the meaning of liveness has changed once again as a result of the growing diffusion of interactive media technology. Now, according to Auslander, the ontological status of the performer—which may be either human or non-human—is under discussion.[93] For example, Auslander views chatterbots such as Stelarc's *Prosthetic Head* as processing entities that perform live. Thus, in his view, the most significant challenge to traditional concepts of interaction is now posed by digital entities that autonomously run processes and respond to the input of performers and spectators.[94] Margaret Morse makes a similar argument: "A machine that thus 'interacts' with the user even at a minimal level can produce a feeling of 'liveness' and a sense of the machine's agency."[95] Auslander and Morse discuss systems that imitate face-to-face communication, but in the present study I will not tie liveness to the idea of simulated human communication. On the contrary, I will also characterize as live technical processes occurring in the here and now that do not necessarily follow communication models, thereby applying the original usage of the term. The liveness of a system must be determined by its processuality, not by its similarity to face-to-face communication.

Processing entities can be individual actors, software or hardware components, or complex networked systems. Manuel Castells describes the entire communication space as a "space of flows" characterized by a continuous real-time interaction. Nick Couldry, by contrast, is interested specifically in online communities, which are based on the potential to link up different social groups or entities and thus enable a social co-presence.[96] Membership in such networks, and constant (even if only potential) connection by means of a cell phone, convey a feeling of being present, whether or not an exchange of information is taking place at the moment.[97] Because communication in these networks often takes place asynchronically (e.g., via chat rooms or text messages), the question arises as to when these represent actual processuality and

when they represent only potential processuality. Liveness and presence thus cannot be effectively separated here. In these cases, interconnectedness is a phenomenon that is equally spatial and temporal.

Further, concerning interactive media art, often different levels of liveness must be taken into account. In addition to the technical liveness of a system and the possible liveness of interaction processes between a human being and a system, liveness can be simulated at the representational level.

Interactivity and Interaction

Having examined the various actors and their possible roles, as well as basic spatial and temporal parameters of interactive art, we can now focus on the interaction processes themselves. Here we must distinguish between instrumental characteristics and phenomenological characteristics.

The instrumental perspective

Descriptions of interaction systems often concentrate on the technical parameters and the structural conditions of the feedback processes taking place. Martin Lister and colleagues classify attempts to describe interaction processes in such formal terms as an instrumental view of interactivity.[98] The project Capturing Unstable Media, for example, focuses on the compilation of a formal meta-database for describing recipient interactions (with the explicit caveat that metadata alone are not sufficient for describing the subjective characteristics of interaction processes, for which a detailed documentation of the experience of reception is also required).[99] The authors of that project seek to record—in addition to the temporal and spatial parameters—the role and the minimum and maximum number of users, as well as the sensory modes of each work (visual, auditory, olfactory, tactile, gustatory).[100] The observed interaction processes are differentiated by their degrees of intensity, which range from observation and navigation to participation, co-authoring, and intercommunication. Thus, similar to Cornock and Edmonds' classification, which was outlined at the beginning of this chapter, Capturing Unstable Media uses a ranking scale ranging from weaker to stronger interactions. In her early study on the reception of interactive art, the artist and curator Beryl Graham also took this approach by comparing interactions to different forms of communication. In Graham's study, an exchange that is equivalent to a real conversation guarantees the highest degree of interaction: "a category which is a possibly unobtainable end point but remains as a possible future aim."[101]

The media theorist Lutz Goertz describes interaction propositions in terms of their degree of optional selection, degree of modifiability, number of available selection options and modifications, and degree of (a)linearity. However, Goertz's ultimate aim is a ranking scale of interactivity, too: "The following rule should apply: The greater the quantity or degree of a factor, the greater the interactivity."[102] This tendency to

Figure 4.4
Interactivity and interaction. Lynn Hershman, *Lorna* (1983–1984), installation view (© Lynn Hershman Leeson and Paule Anglim Gallery, San Francisco).

create ranking scales, which is particularly widespread in media and communication studies and often goes hand in hand with a view of face-to-face communication as the ideal form of interaction, is not suitable for studying the aesthetics of interactive art, however,[103] because it encourages an evaluation of the quality of a work on the basis of its level of interactivity. As a result, interactive media art is measured by the criteria that apply in artificial intelligence research, where the more similar an interaction is to face-to-face communication the more successful it is generally considered to be. But this analogy ignores the fact that many artists deliberately choose to work with digital media because they want to scrutinize specifically how mediated interac-

tion deviates from face-to-face communication.[104] An aesthetic theory of interactive media art must help to identify and describe the various interaction processes that artists have conceived and implemented through the technical systems. It must specifically focus on the tension between media-based potentials and limits, on the one hand, and the expectations and interpretations guiding both the design and each individual realization of the work, on the other.[105]

Other approaches that take an instrumental perspective attempt to describe interactions or interaction systems by means of identifying patterns of action or of individual processes. For instance, Katie Salen and Erik Zimmermann use the term "core mechanics" to denote the basic activities that define computer games. Typical core mechanics are movements such as running or jumping, discursive processes such as answering questions, and goal-oriented actions such as shooting or catching.[106] Ian Bogost's concept of "unit operations" describes in a more general way those individual processes of games that represent particular actions and can reappear in different contexts.[107] However, single operations are not the focus of the descriptions of interaction provided in this study. The reason is that it is questionable from an aesthetic point of view to differentiate between clearly referenceable units, especially in the context of artistic configurations of action.

Above all, however, an aesthetic analysis of interactive art must go beyond instrumental categorizations in general. It will become clear in the following that there is no necessarily causal relationship between the experiences and epistemic processes brought about by interactive art and the instrumental characteristics of interactivity. For example, a hyperlink system may present a non-linear narrative, but can just as easily involve the recipient in a question-and-answer game. The storage of a user's input may be perceived as a means of control, but also as an invitation to become co-author. Nonetheless, an instrumental view of interactive art can be helpful when it comes to analyzing the incongruous relationship existing between technical parameters and aesthetic experience. Thus, I will first take an "instrumental" look at interaction processes in digital art, also to identify the limits of such a perspective.

One could view as the technically simplest form of interaction the activation of a work which is organized as a linear succession of assets. An example of this kind of work is Olia Lialina's Internet-based work *Agatha Appears*, in which the recipient must click on the two schematically depicted protagonists in order to make their dialogue—and thus the story—progress. Masaki Fujihata's installation *Beyond Pages* (1995) is also based on simple activation options. In this work, a picture book is projected onto a table. By touching the pages of the virtual book with a light pen, the user can turn the pages and animate the images that appear. The animations include a stone that can be moved, leaves that begin to rustle, and an apple that can be bitten into. In both *Agatha Appears* and *Beyond Pages*, the recipient's task is limited to activating a preprogrammed sequence of data with minimal possibilities for variation. Nonetheless,

the aesthetic experiences of the two works will be very dissimilar. *Agatha Appears* invites the recipient to follow the narrative of a story. Participating requires no more than clicking on the figures. The recipient becomes a kind of puppeteer, even though he has no power whatsoever to influence the development of the plot. Also, the linearity of the chronological evolution of the narrative is felt much more clearly than in *Beyond Pages*. This is because, on the one hand, Fujihata's picture book doesn't present a story, but depicts independent symbols and objects. On the other hand, the fact that the metaphor used is that of a book seems, curiously enough, to counteract the perception of linearity. The reference to a book, usually considered the linear medium par excellence, gives the impression that all the options are available at the same time (even if, technically speaking, the pages must be turned consecutively), whereas in *Agatha Appears* the traditional hyperlink system, whose alinearity usually represents the antithesis to a book, highlights the linearity of the narrative.[108]

Other projects may offer a simultaneous choice of clearly defined options that can be activated in a non-linear process. They may be constructed in a relatively simple manner (concerning instrumentality), offering a range of options that always remains the same; in other words, after each interaction the same options will still be available as previously. This is the case, for example, in Schemat's *Wasser*, in which the recipient activates acoustic texts by moving through the landscape, and in a similar way in Ken Feingold's *JCJ Junkman* (1995), a screen-based work that invites the recipient to "catch" rapidly moving icons with a mouse in order to influence an audio composition.[109] Both of these works are based on simple selection options presented simultaneously by means of their spatial arrangement. Nonetheless, here again the realization and the aesthetic experience of the two works will have very little in common. Whereas *JCJ Junkman* is concerned with reaction speed on a standard interface and can be viewed as an ironic comment on the consumer society, *Wasser* deals with movement in real space, inviting a poetic experience that results from a combination of fiction and personal associations.

There is a higher level of technical complexity in works that feature a tree structure or a network structure, because different selection options are made available at different moments of the interaction process. This applies to many Internet artworks, such as Berkenheger's *Bubble Bath* (a mystery story in which the recipient influences the course of the narrative by activating hyperlinks). Lynn Hershman's early interactive installation *Lorna* is also based on a tree structure that allows recipients to activate pre-recorded film sequences by choosing numbers on a remote control.

Both *Bubble Bath* and *Lorna* create fictitious worlds, but they differ in the media they employ, the required modes of action, and the involvement of the recipient. Activating a film sequence by selecting a number on a remote-control device is very different from clicking directly on a word on the screen, which itself is a syntactical element of a primarily text-based narrative. Whereas *Lorna* involves the recipient in

the story through the installational configuration of the exhibition space as a kind of stage for the film scenes, *Bubble Bath* encourages involvement not only through the complex semantics of the links, but also by assigning a fictitious role to the recipient.

In addition to various forms of selection, interactive works can offer possibilities to modify something. For example, when recipients use a joystick to piece the segments of a virtual object together in Hegedüs' *Fruit Machine*, this is not a simple matter of selection, but implies a free movement of the virtual object in three dimensions, as well as its rotation. Similarly, in Jeffrey Shaw's *Legible City*, riding the bicycle controls not only the direction, but also the speed of movement in virtual space. Although both projects allow recipients to control a graphic animation through free operation of a steering device, once again there is little to compare between the potential interactions and experiences of the recipients. This is not only because *Fruit Machine* invites several recipients to participate at the same time and presents them with a clear goal. The main disparity is that the two works, although they are both based on the control of (virtual) movement in (simulated) space, provide completely different contexts for the recipient's actions. Whereas *Fruit Machine* challenges the motor and cognitive abilities of the recipients, who have to maneuver a virtual object into a precise position, *Legible City* seeks to convince the recipient that he is using his handlebars and pedals to move through virtual space. Moreover, the ultimate aim of the activity is not motor precision, but the act of reading and exploration, which the recipient can experience through direct spatial and bodily involvement.

Another possibility for designing interaction systems is the integration of a recipient's likeness into an interactive installation. In *Room of One's Own* and *America's Finest* (1993–1995), Lynn Hershman uses closed-circuit systems that reflect the real-time image of the recipient back into the installation so as to orchestrate processes of (self-) observation. In other works, the recipient is only reproduced in shadow form, either to encourage him to make performative movements (as in Snibbe's *Deep Walls*) or to enable interaction with graphically generated creatures (Myron Krueger's *Critter*) or objects (Tmema's *Manual Input Workstation*). Other works (for example, Utterback's *Untitled 5*, Cillari's *Se Mi Sei Vicino*, and Rokeby's *Very Nervous System*) may record recipients' body movements without creating a mimetic image; instead they use the movements as a trigger for abstract formations of a visual or acoustic nature.

Some projects not only reproduce the actions of the recipients in real time, but also record them and store them briefly or even permanently. A comparison between Scott Snibbe's *Deep Walls* (2002) and Camille Utterback's *Untitled 5* (2004) shows how such recordings can inform the experience of the interaction in different ways. Utterback creates abstract generative graphics in which the recipient's movements leave traces that evolve and grow as formal compositions, then interact with one another and mutate, then gradually fade. In *Untitled 5*, the recipient becomes a kind of painting implement, although he cannot use his own creative imagination, but rather steers

Figure 4.5
Self-representation of the recipient. Scott Snibbe, *Deep Walls* (2002), installation view.

and activates processes built into the system that recall natural processes of growth and decay. *Deep Walls*, by contrast, records a sequence of movements by a recipient and then plays back a silhouette version of the sequence in just one segment of a wall projection, with other segments containing recordings of previous recipients. The projection is repeated in a loop until all the segments have been filled with new recordings; the oldest recording is then deleted. In one work, therefore, the recordings function as an abstract index and an element of the process of gestalt formation, and in the other they are a means of iconic self-representation on the part of the recipient. Nonetheless, in both works recordings are presented as fleeting traces that fade as the time since the actual interaction passes. The aim is thus not permanent storage, but the staging of a time-limited process that begins with the real-time interaction and ends in dissolution.

Whereas some projects record visual traces of a recipient, others involve the recipient in a dialogue, in which case his input is more likely to be stored on a long-term basis. Discursive interaction can be staged as asynchronic communication (Jonah Brucker-Cohen's *BumpList*), as an anonymous exchange of ideas (Blast Theory's *Rider Spoke*), or as contributions to a meta-data archive (Antonio Muntadas' *File Room*). In all three of the aforementioned projects, the participants provide input in the knowl-

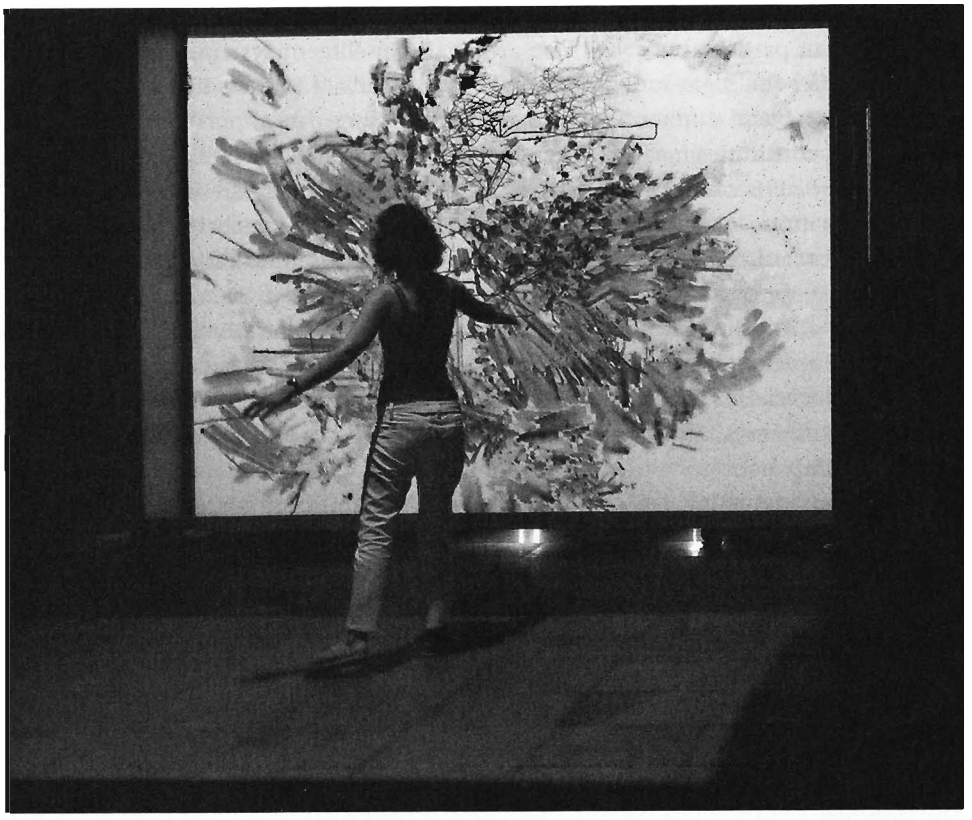

Figure 4.6
Visualizing a recipient's movements. Camille Utterback, *Untitled 5* (2004), from External Measures Series (© Camille Utterback).

edge that it will be recorded and stored. The perception of the communication situation is shaped not only by the specific context, but also by the person or people to whom the statements are addressed. Both *BumpList* and *Rider Spoke* are based on the idea of mutual consent. The recipients must first reveal something about themselves in order to gain access to the contributions of others. Thus, a community is created, but its behavioral norms are challenged in both projects. Muntadas' archive, by contrast, is made available to the public via the Internet. Thus, whereas *BumpList* and *Rider Spoke* have a limited number of participants, making active contributions to Muntadas' archive amounts to publishing something in the mass media. Once again, however, the specific design of the communication is a fundamental component of the work, insofar as *File room* is designed to publicize cases of censorship, which would be incongruously perpetuated if access to the archive were limited in any way.

Projects that encourage discursive communication in real time, whether between several human participants or with an artificially intelligent system, are usually considered to offer the highest degree of technically mediated interaction. Communication between several different participants is often staged in interconnected systems that offer opportunities for input in different locations. The spectrum of these works ranges from Paul Sermon's telepresence installations, which create intimate communication situations, to Blast Theory's mobile game projects, which stage communication in the form of competition.[110] Discursive real-time communication is thus usually ranked at the upper end of the instrumental continuum of interactivity.

Together with other instrumental criteria, such as differentiation between system-internal and reactive liveness and differentiation between process-intensive and data-intensive projects, this continuum offers one possible point of departure for describing interaction processes. However, by comparing and contrasting works with similar instrumentality but very different aesthetic potentials it has been shown that an exclusively instrumental view of interactive art is not sufficient for an aesthetic analysis. The aesthetic experience of interactive art is based on the interplay between instrumental constellations, their processual activation, their material staging, and their contextualization within different possible systems of reference and individual horizons of experience. These aspects will therefore constitute the focus of the observations that follow, beginning with the rule systems of interactive art, which mediate between the processuality and the interpretability of the interaction systems and thus serve as a link between instrumental conditions and their individual perception.

The interplay between constituative and operational rules

As was noted in chapter 3 above, Salen and Zimmerman differentiate between constituative, operational, and implicit rules of play. *Constituative rules* are the formal structures on which games are based—their logical or mathematical principles. They exist independently of the here-and-now action of play as abstract, logical relations that may not necessarily be discernible from the gameplay or from the operational rules. The algorithms on which artistic interaction propositions are based can also be seen as constituative rules. Constituative rules determine the principles according to which the interplay between input and output is organized; they also determine which calculations or transformations take place. For example, when in Cillari's *Se Mi Sei Vicino* the projected grid structure is set into motion by the performer's movements, the constituative rules not only make that happen; they also determine exactly how the grid changes and moves. When in Rokeby's *Very Nervous System* a recipient's movement triggers a sound, the constituative rules define the threshold value at which a movement is interpreted as such; they also define which sounds (or sequences or combinations of sounds) are emitted as a result. The recipient doesn't have to understand exactly how the algorithms work, although many projects—particularly process-

intensive works—emphatically prompt recipients to examine the underlying constitutive rules.

Operational rules are what we normally call the rules of the game—the guidelines or instructions that players need in order to play and to which they are supposed to feel obliged to adhere.[111] The operational rules describe the activities and procedures that may or must be carried out in a game. In interactive media art, however, operational rules are rarely communicated explicitly to the participants, though they may be outlined by assistants or in written information. Whether it is necessary to communicate the rules is determined not only by the nature of the project in question, but also by the context in which it is presented. Tmema's *Manual Input Workstation* illustrates this point particularly well. When the work was presented at the See This Sound exhibition in Linz, Golan Levin decided to spell out the fundamental operational rule underlying all interactive art by means of a projection requesting visitors to "please interact." Because only a few interactive works were being exhibited, Levin felt that visitors could not be expected to know automatically that they were expected to interact with the work. The fact that he called this decision a capitulation demonstrates that instructions to interact are often felt to be inappropriate in interactive art—the recipient is expected to grasp the operational rules intuitively. For example, the structure of Hegedüs' *Fruit Machine* (three seats equipped with joysticks to control the three free-floating parts of the projected puzzle) unequivocally indicates the objective of the installation and the fact that this can ideally be achieved through collaboration between three players. In this work, the operational rules are self-explanatory. On the other hand, explicitly formulated rules need not have a negative connotation. For example, Blast Theory deliberately uses the introductory phase to its interactive projects as an opportunity to emotionally and aesthetically attune the recipients to the work.

When a work represents a fictitious world, the explicit formulation of operational rules can be rendered superfluous by the fact that these rules are presumed to be the usual standards of behavior of the world that has been staged.[112] On the other hand, the representational level also offers the possibility of communicating the rules as part of the narrative. For example, in Schemat's *Wasser*, when the recipient is addressed as a detective during the course of the narrative and is instructed to look for a woman, the operational rules are contextualized within the story. The detailed analysis in the case study on *Wasser* will show, however, that this doesn't mean that the recipient must acknowledge these rules as binding. The relationship between operational rules and constitutive rules must thus be examined separately for each individual case. We must ask if there are any clear instructions regarding behavior, or if the recipient is encouraged to play freely within the framework of the system structured by the constitutive rules. And if operational rules exist, do they help the recipient to understand the system and its constitutive rules, or do they actually impede such

understanding? How is the relationship between openness and control structured by the system of rules?

Play theorists believe that operational and constituative rules are ideally combined when they allow for emergence—that is, for interesting variations to emerge from the rule systems. Play theory sees emergent systems as differing from fixed, constantly self-repeating, or chaotic game structures,[113] on the one hand, and from progressive systems, which are based on the successive presentation of challenges, on the other.[114] Salen and Zimmerman believe that only emergent systems allow intensive and persistently engaging exploration of the relationships between game elements and gaming possibilities. The system's emergence corresponds to the player's "agency"—his personal feeling of empowerment, his scope to exert meaningful, logical, and relevant influence on the way the game is progressing.[115] Janet Murray describes this experience as "aesthetic pleasure." She argues that in games "we have a chance to enact our most basic relationship to the world, our desire to prevail over adversity, to survive our inevitable defeats, to shape our environment, to master complexity, and to make our lives fit together like the pieces of a jigsaw puzzle."[116] However, Murray also points out that adopting a creative role within a constructed system is not the same thing as filling the role of author: "The interactor is not the author of the digital narrative, although the interactor can experience one of the most exciting aspects of artistic creation—the thrill of exerting power over enticing and plastic materials." For Murray, this is not authorship; it is agency.[117] Emergence and agency are thus important factors concerning the player's willingness to take action in the non-purposeful circumstances of play. However, Ian Bogost objects that prioritizing emergence privileges the formal qualities of games over their expressive potential.[118] In order to determine the relevance of the concepts of emergence and agency for an aesthetics of interactive art, we must examine more closely the modes of experience and action that characterize interaction with artistic systems.

Phenomenology of interaction: Modes of experience

The recipient's realization of an interaction proposition usually begins with procedures of *experimental exploration*. The recipient wishes to investigate the system presented to him, both with respect to its constituative rules and with respect to the assets that may be available. He wants to acquire an idea of the actions that are possible within the framework of the interaction system and of the results to which they may lead.[119] David Rokeby closely observed this approach in exhibitions of his installation *Very Nervous System* (see case study 8) describing it as an attempt to verify the predictability of the system. He noted that recipients initially repeated a particular action with a questioning attitude and subsequently (when they believed they knew how the system would respond) repeated the same action with a commanding attitude—which, however, because of the system's sensitivity, led to a different response.

Often the observation of recipients conveys the impression that the reception amounts to no more than an attempt to fully grasp the work, its assets, or its functional principles—an attitude that many artists view very critically. Ken Feingold notes that "the circuit described between the desire to get something from an artwork and the expectations of a return informs the basic drive in the interactive encounter."[120] He reports that many recipients of his *Surprising Spiral* (1991) expressed disappointment that they were unable to achieve their objective: to control the work. In fact, the structure of *The Surprising Spiral* denies the recipient an understanding of the effects his actions elicit. Feingold comes to the conclusion that "interactivity is, in many ways, about affirmation of the human action by a non-human object, a narcissistic 'it sees me.' But beyond that, there is the desire for control, for mastery over the non-human entity."[121] He relates that, in his experience, very few recipients felt comfortable in the role of public participant in an interactive artwork that had no clear goal. Most of them wanted to find out how the work was structured, whether they were approaching it "correctly," whether it responded purely randomly, or how one could achieve a certain outcome.[122] Myron Krueger has also dealt in depth with recipients' efforts to explore interactive works, describing the artist's position as an interactive dilemma. He recounts that the individual artists who co-designed *Glowflow* had very different ideas about which interactions should be made possible. Although feedback was considered conceptually interesting, some of the artists did not believe the recipients should necessarily be made aware of it. They were concerned that the visitors might become entirely absorbed by playing with the evident interdependencies: "This active involvement would conflict with the quieter mood established by the softly glowing walls."[123] Thus, although in *Glowflow* the feedback processes were not rendered explicit, Krueger decided that the design of his own works would place the focus on interactivity, instead of seeking to use interactivity to convey other themes: "Interactive art is a potentially rich medium in its own right. Since it is new, interactivity should be the focus of the work, rather than a peripheral concern."[124] However, Krueger also pointed out that one could consciously foil recipients' expectations, "leading to a startled awareness of previously unquestioned assumptions."[125] Such strategies of disruption thus elicit epistemic processes from the act of exploration. Ultimately, disruptive strategies are at odds with the primacy of agency, for the recipient is deliberately not given a sense of empowerment; instead he is intentionally irritated. The recipient cannot fully control the system and instead is encouraged to grapple with its mediality.

However, the use of such disruptions is not the only way to induce epistemic processes. As Rokeby's example showed, another way to heighten awareness during the process of experimental exploration is to invite the recipient to repeat interaction processes. Repetition not only furthers the exploration of the workings of the system, but also creates distance to one's own actions by contextualizing them as just one of

many possible behaviors. Repetitions may be merely made possible by the structure of a system, or they may be explicitly prescribed. For example, the authors of *Terminal Time* (the interactive film, mentioned in chapter 1, that involved viewers by asking them to vote on the plot) decided to show the film twice to the same audience. They observed that the viewers responded to the questions in a completely different way the second time around: In the second screening, they had a more playful approach, trying out different responses to see how this would influence the plot.[126] Noah Wardrip-Fruin analyzes such forms of gradual understanding in relation to computer games. He cites Will Wright, the author of the game SimCity, who has observed attempts at "reverse engineering" in which players try to infer the constitutive rules by exploring the different processes that can be carried out.[127]

Thus, a recipient may repeat an action in order to achieve a particular objective or to understand something specific about the system, but he may do so also because he is fascinated by the action itself. The latter possibility is addressed by the concept of "inner infinitude" in classical theories of play. The process of experimentally exploring a work's interactivity thus provides opportunities for knowledge, be it in the form of critical reflection or in the form of intensified (self-)experience.

Moreover, the recipient can be encouraged to elicit something new from a system—as soon as he is more familiar with its workings—and thus to become consciously creative himself. For example, Tmema's *Manual Input Workstation* invites the recipient to create and manipulate audiovisual formations. As soon as a recipient has become more familiar with the constitutive rules of a system, he can explicitly use these for *expressive creation*, grasping his own actions as a creative activity. This will be all the more true the more scope for creativity the recipient is given by the system. It seems appropriate to see this as a form of agency, insofar as the recipient can intentionally use the system to achieve a particular result. However, as Murray has emphasized, agency in this sense is not the same thing as co-authorship if the recipient has no influence on the predefined systemic parameters of the interaction. Furthermore, agency need not be based on an emergent system. Thus, for example, *The Manual Input Workstation* allows numerous different types of action without these becoming more complex or leading to more sophisticated processes over the course of the interaction.

When interaction processes are connoted on a representational level, then, in addition to exploring or making creative use of the potentials for interaction, the exploration or configuration of the symbolic level also becomes relevant. I will denote this form of interaction as *constructive comprehension*. Not only can the rule systems of the work be explored; so too can the chosen, configured, or represented elements that contextualize the action in question and give it another level of interpretability. This is already true when the interaction system is spatially configured, either through the representation of spaces that can be explored using a mouse or other input device or

through the direct location of projects in a public space—in both of these cases, the represented or configured space contextualizes the interaction. Often, the representational level is presented to the recipient as a narrative for constructive comprehension, in the sense of arranging or performing the narrative. We can distinguish between such interactions as either diegetic processes (located within the fictional world of the narrative) or extradiegetic processes (located externally to the narrative) that, in different ways, further, control, or comment on the actions that are presented. The recipient may then activate the assets stored in the system, which are connected to one another in some way—usually flexibly, as in a hypermedia structure. The basis may be textual assets (as in Schemat's *Wasser*) or a classical hypertext linked through words (as in Berkenheger's *Bubble Bath*), but the system may also primarily link images or film excerpts (as in Weinbren's *Erl King*).

In commercial media, the reception of hypermedia-based structures is usually contextualized as freedom of choice, because the available links contain clues to what is hidden behind them and thus enable the recipient to consciously decide whether or not to retrieve more information or assets.[128] In many artistic projects, however, the recipient may be offered no information, or only misleading information, about the possible effects of his choices. As George Landow explains, the hierarchical tree-like or rhizomatic structures of hypertext must also be interpreted at the semantic level not only as links but equally as disruptions.[129] Roberto Simanowski explains the many possibilities for intelligent semantization, which is often configured as a "deliberate . . . contradiction between the expectation built up by the link text and what is represented by the node which is linked." It is not just a question of deciding in favor of a particular link, Simanowski writes, but also a question of making of guesses as to whether "link A is A only because, or also because, or despite, or instead of."[130] For example, links may lead to pages that use a different sign system to comment on the linked term or text passage. In the case studies presented in this volume, such references are created in *Agatha Appears* through the use of system-internal error messages as diegetic elements, and in *Bubble Bath* in the numerous passages that first explicitly offer a link and then criticize the recipient for having made the mistake of clicking on it. Such hypermedia systems thus elicit actions that must be decided upon on the basis of hypothetical expectations and interpretive strategies. Not only the actual (technical) potentials for action call for exploration, but also (and even more so) the actions and processes that are represented.

Often the recipient becomes the protagonist in the processes that are portrayed. Assigning a diegetic role to the recipient of a fictitious plot is also common practice in computer games and constitutes the point of departure for Brenda Laurel's theory of interactive drama. Drawing on Aristotle's theory of drama, Laurel describes interaction in technically mediated narrative systems as an interplay between material and formal causes.[131] Elaborating on this theory, Michael Mateas differentiates between the

position of the recipient in classical theater and in interaction systems. He argues that in theater the actual performance is the material cause that the audience uses to draw conclusions about the formal cause—that is, about the intentions of the author. The recipient of an interactive narrative, by contrast, becomes active himself, guided by the material resources and possibilities for variation that are available to him and also by his own desire for the plot to follow a meaningful course. Thus, by using the material resources, the player develops an increasingly concrete idea of the plot and consequently a meaningful version of the story, which can generate a sense of agency.[132] Such theories are based on the premise that—within computer games—the technical system should be as transparent as is possible and the fictional context should be logical. The player should be absorbed by the game and should identify with his diegetic role as fully as is possible.[133]

When the recipient of interactive art is assigned an active role in a narrative, his possibilities for action and the resulting potential for experience are usually significantly different from those found in games. The recipient of interactive art may also be invited to activate the plots that are presented and, if he has been assigned a diegetic role, must adopt a position with respect to it. However, at least in the case studies dealt with here, he is not offered any possibilities for action that will decisively influence the progress of the narrative on the basis of logical inferences. Although plots can be activated or selected, very often the actions of the recipient will be ironically disrupted. Thus, the recipient in *Bubble Bath* is more likely to feel powerless, whereas the recipient in *Agatha Appears* will feel like an uninvolved provider of simple impulses.

Artistic strategies that counteract the seamless absorption of the recipient into a plot find parallels in modern critiques of Aristotelian poetics. Arguing that under the Aristotelian model the recipients' immersion in the stories leads to their losing all critical distance, the game researcher Gonzalo Frasca refers to Bertolt Brecht and Augusto Boal, whose solution was to create strategies of alienation that required a distanced attitude on the part of the actors but at the same time spelled out to the spectators the artificial nature of the performance.[134] Thus, the use of alienation and disruption demands aesthetic distance from the actors and renders aesthetic distance possible for the recipients. The interactive narratives discussed in this study use comparable means to provoke reflection. However, in interactive art the recipient is in the ambivalent situation of having to advance the narrative and at the same time perhaps being involved in it himself, all without stage directions. Theoretically, the recipient can choose among the basic approaches to acting discussed in chapter 3: distancing, projecting himself into the story, and pure self-expression. Although his self-positioning with respect to the interaction proposition will certainly be influenced by provocations or disruptions that are incorporated into the work, nothing can be imposed.

The possibilities for involving the recipient diegetically, as well as the question as to his agency within the context of fictitious roles, lead us to another mode of experience: *communication*. For the purposes of this study, any feedback process that addresses the recipient as a reasoning actor and involves him in an expressed or sensed intercommunion is defined as communication. This applies not only to cases that allow a real-time exchange of information with the system or other actors, but also to asynchronic or asymmetrical forms of communication.[135]

Thus, many interactive artworks present the technical system primarily as an observer, often with reference to or as a critique of modern surveillance technology. They explicitly deny the recipient the possibility of discursive communication, although they address him as a thinking individual whose reaction to this form of one-sided contact is being provoked. Two examples of such projects are Golan Levin's *Double Taker* (2008) and *Opto Isolator* (2007), both of which consist of artificial eyes that appear to observe the recipient. Although these eyes can register no more than the presence and position of a person, their behaviors are associated with living creatures and fascinate their viewers. Several early interactive apparatuses, including Edward Ihnatowicz's *SAM* and *Senster*, were based on this phenomenon. Another example is Simon Penny's amiable robot *Petit Mal* (1993), which approaches observers inquisitively but shrinks back, apparently frightened, if they get too close.[136]

Other projects use closed-circuit systems to address the recipient. In David Rokeby's *Taken* (2002), the recipient is not only filmed and replayed on screen but also classified by the system. In *Border Patrol* (2003), a collaboration between Rokeby and Paul Garrin, visitors are shown their heads in crosshairs and simultaneously hear the sound of machine-gun fire. *Access* (2003), by Marie Sester, takes a different approach by giving Internet users control of a spotlight with which they can follow unsuspecting passers-by. Although none of these works allow discursive real-time communication in the instrumental sense, they are still perceived as establishing moments of contact and as inviting the recipient to engage in the situation. On the other hand, even interactive works that use discursive elements can generate unbalanced communication. For example, in Hershman's *Room of One's Own* the recipient is addressed but is given no possibility to respond. Or recipients may be asked to reply to questions, as in Blast Theory's *Rider Spoke*, but receive no feedback on their answers. Cillari's *Se Mi Sei Vicino* illustrates that even manifest interpersonal communication (non-linguistic in this case) can be based on such an imbalance. The recipient uses body language and touch to enter into contact with the performer, but the performer shows no directly perceptible reactions; instead, the recipient sees a visualization and sonification of the surrounding electromagnetic field.

Thus, communication (including observation) is another relevant mode of experience in addition to experimental exploration, expressive creation, and constructive

comprehension. On no account should these modes of experience be thought to be mutually exclusive. On the contrary, the aesthetic experience of interactive art is based on superimpositions or successions of different modes of experience that may supplement or counteract one another.

As has been shown, these modes of experience only rarely give the recipient a sense of agency. Often they deliberately frustrate his desire for agency. Very often, neither the assumption of a role in diegetic systems or staged communication nor attempts to explore system processes give the recipient the feeling that he is able to consciously exert influence on the further evolution of the interaction process through his own decisions, or that his own input can represent an important stimulus within an emergent system. The aesthetic experience is found to a much greater extent in the course of interaction itself, which may often be shaped by the encounter with artistically configured and symbolic disruptions and irritations.

Expectations and implicit rules

The various potential modes of experiencing interactive art are shaped by individual interpretations and attributions of meaning. The individual expectations of the actors, the explanatory models they have constructed, and the associated strategies of interaction play major roles in the aesthetic experience of interactive art. As was mentioned in chapter 1, communication studies and the social sciences have long emphasized the significance in interactions of the expectations of the interaction partners. Encounters and communications between people are profoundly influenced by their prior knowledge about one another and by their attempts to find out more. Erving Goffman writes that actors interpret the behavior or the appearance of a person they do not know on the basis of their experiences of similar situations, but also on the basis of stereotyped ideas.[137] In interactive art, processes of this kind are relevant for all the actors. The artist may allow assumptions about his audience to inform the configuration of the interaction proposition, and may design the possible reactions of the system in accordance with these ideas. The recipients will develop individual expectations on the basis of previous experiences with interactive art (or with everyday interactions) and shape their behavior accordingly. As was noted in chapter 2, Wolfgang Iser made fruitful use of the recipients' interpretive role in his theory of the blank space. Referring to literature, Iser argued that, in contrast with the contingency of face-to-face communication, art is based on a fundamental asymmetry because it cannot address a single, concrete recipient. As a result, the artist's prior assumptions and the situations he configures, as well as the recipients' individual interpretations of these, become all the more important. At issue here are interpretations at the symbolic level and role expectations, as well as the exploration of technical processes. One of the central claims of actor-network theory is that not only humans but also objects and systems actively shape interaction processes. As the sociologist Ingo Schulz-

Schaeffer has pointed out, "the reciprocal attributions of behavior and expectations are . . . exchanged in such a way between human and nonhuman protagonists that it becomes impossible to make a tidy distinction between social and technical factors."[138]

Noah Wardrip-Fruin analyzes more closely how these overlaps function. He examines the extent to which technically mediated interaction requires, enables, or facilitates insight into system processes. To this end, he differentiates three effects: the "Eliza effect," the "Tale-Spin effect," and the "SimCity effect." "The Eliza effect" refers to the program Eliza, created in 1966 by Joseph Weizenbaum, which invites the recipient to engage in a written conversation with a computer. Despite the quite simple constituative rules of the system (often a statement by the user is simply repeated as a question), users extolled the system's apparent intelligence. Thus, Wardrip-Fruin uses the term "Eliza effect" to denote the phenomenon whereby a recipient's high expectations regarding the intelligence or complexity of a system will make the system appear to be much more complex than it actually is at the programming level: "When a system is presented as intelligent and appears to exhibit intelligent behavior, people have a disturbingly strong tendency to regard it as such."[139] Myron Krueger had the same experience with the *Glowflow* environment. Because the publicity had mentioned that the system would respond to visitors, many visitors assumed that any visual or acoustic phenomenon was a reaction to their individual actions, and visitors "would leave convinced that the room had responded to them in ways that it simply had not."[140]

The "Tale-Spin effect" denotes the converse situation. A very complex programming process is reproduced in such a simplified form that the complexity remains concealed from the recipient. Wardrip-Fruin's name for this effect refers to a 1970s story-generating computer program whose highly complex algorithms could not be discerned by the users. Many interactive artworks, among them David Rokeby's *Very Nervous System* and Teri Rueb's *Drift*, are likewise based on constituative rules that will not be understood by many recipients. Rokeby uses the complexity of the algorithms to inhibit conscious control of the system and to engender a state of flow. Rueb explains the principles underlying the system's reactions in an animated diagram that allows interested visitors to understand the constituative rules.

Wardrip-Fruin calls the third effect the "SimCity effect" after the well-known computer game of the same name, using the term to denote systems that allow recipients to acquire a broad and growing understanding of the underlying processes via the interaction itself.[141] Game researchers would see only the SimCity effect as indicative of an emergent system that can convey a sense of agency. This is the only case in which the interplay between constituative and operational rules leads each time to new and logically comprehensible courses for the game. However, those who experimented with the Eliza system also felt empowered, although Eliza only feigned emergence.

Likewise, one could characterize Tale-Spin as structurally emergent, but because this emergence is not perceived by recipients, they do not feel their options for action to be satisfying in the long term. In interactive art, the irritation caused by the gap between the logic of the system and the interpretation of processes is an important element of the aesthetic experience. Just as a sense of agency cannot be considered a decisive factor in aesthetic experience, neither is aesthetic experience usually based on systemic emergence. If there is any emergence at all, it is not manifested in a coherent system that becomes increasingly complex, but in an epistemic process that specifically requires disappointed expectations, irritations, and disruptions in order to arise.

The significance of possible expectations for the experience of interactive art leads us to the last type of rule identified by play theory: implicit rules. Implicit rules are the unwritten laws of everyday (inter)personal behavior and of standard behavior in play. Examples include fair play, avoiding cheating, and the behavioral rules that are normal for the societal and social situations (or reference systems) in which actions are contextualized.

The first reference system for interactive art can be said to be the art system itself. What is contextualized in this framework is usually considered to be non-purposeful and separate from everyday life; appreciation of art is subject to its own criteria, and reception of art is subject to its own behavioral norms. However, as we have already seen, the art system is constantly called into question by artists themselves. And, even more important, it is not the only relevant reference system for interactive art, nor can its implicit rules be applied readily to interactive art. Not only can interactive art also be seen as belonging to other reference systems, such as politics and education, media culture, and interaction design[142]; the fact that interactive art requires action on the part of the recipient fundamentally challenges the standards of the art system.

Marco Evaristti's installation *Helena* (2000) highlighted the instability of interactive art's systems of reference. Evaristti exhibited ten commercially available kitchen blenders, each containing a live goldfish, in Denmark's Trapholt Art Museum. The blenders were in working order, and visitors could see that they were plugged in. Several visitors activated the blenders nonetheless. Two goldfish lost their lives on the opening evening, fourteen the following day. Evaristti responded to the public outcry with the laconic declaration that everybody knows that nothing should ever be touched in a museum, so he had never expected the goldfish to come to any harm. The artist thus invoked the implicit rules of the art system, whereas the visitors either responded to the affordance of the kitchen appliances or identified the work as interactive art and inferred that they were expected to activate it.[143] Evaristti's *Helena* thus explicitly thematizes the instability of the reference systems of interactive art and vividly demonstrates how this very instability significantly shapes the aesthetic experience of this type of art. Myron Krueger reports about a much less dramatic but nonetheless inter-

esting clash between the implicit rules of the art system and those of other systems of reference. The recipients of Krueger's project *Maze* were invited to guide a symbol through a labyrinth using their own movements on a floor space covered with sensor mats. Krueger observed that at first the recipients followed the prescribed paths and thus adhered to the usual game rules pertaining to mazes. After a while, however, they began to investigate what would happen if they ignored the apparent boundaries. In other words, the change in their behavior was justified by the reference system of art, according to which a probing questioning of the exhibit is usually welcome. Because the maze in question was a computer-graphic simulation and the activity took place within this simulation, recipients were able to cross boundaries in a way that a material maze would not have permitted. Rule systems that in a real maze are given solidity by the spatial arrangements were only represented here in a digital model and, moreover, were rendered open to explorative violation by the fact that they could be contextualized within the art system.[144]

Phenomenology of interaction: Frames

Implicit rules are similar to what are known as "frames" in sociology. Drawing on Gregory Bateson, Erving Goffman uses the term "frame" to denote the natural, social, institutional, or individual conditions within which an action is perceived or interpreted.[145] According to Goffman, the perception and interpretation of an action depends on the evaluation of its relationship to reality. Thus, frames, for Goffman, are definitions of situations which are established individually in accordance with "principles of organization which govern events."[146] Goffman is particularly interested in what he calls "keys," that is, "the set of conventions by which a given activity, one already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by the participants to be something quite else."[147] He cites as examples play fights and religious rituals that always refer back to an original model.[148]

Thus, if the possibility of contextualizing interactive art within different reference systems has substantial influence on its aesthetic experience, we must also ask how interactive art relates to systems of social interaction. Does the realization of an artistic interaction proposition imitate interactions in everyday life and draw on the relevant conventions? As already noted, there is little point in measuring artistically staged interactivity against the benchmark of face-to-face communication, because artistic projects often specifically seek to reflect on the mediality of technically mediated interactions. However, this doesn't mean that they do not make reference to interpersonal communications in different ways. Though it is true that in a work that creates a technologically mediated discursive communication situation the recipient's behavior clearly differs from real-time communication with a human partner, the recipient's behavior can nonetheless draw on face-to-face communication, for example through

the use of common communication patterns (question-and-answer exchanges, courtesy phrases, eye contact, and so on). But even if the interactivity is based less on discourse and more on action, the project can still evoke an original model of real actions—for example, by means of the interface, which can refer to familiar patterns of action by inviting the recipient to ride a bicycle or sit on a garden swing. Figurative representations can also refer to everyday situations—for instance, in the form of virtual soap bubbles that must be burst, computer-graphic creatures that flee from the recipient's shadow, or a three-dimensional puzzle that must be compiled. In these cases, the recipient is encouraged to behave in the way that is familiar to him in such situations, even if that behavior may ultimately be counteracted by the interactive work. But whereas these examples imitate or modify actions using different media, frame analysis assumes that keying takes place in the same medium as its original model. The representation of actions or situations in another medium, as is usual in the visual arts and literature, renders the keying evident from the outset. Moreover, different keyings can take effect at different levels of (re)presentation. Therefore, in literature studies narrative theory differentiates between diegetic levels of narration (which are localized within the narrated world) and extradiegetic levels (for example, that of an uninvolved narrator who is nonetheless also described as part of the narration or within the frame of the literary work). In analyzing computer games, Alexander Galloway differentiates between diegetic and non-diegetic actions, both of which can be carried out by the user or by the system. In digital media, Galloway shows, actions and processes can be contextualized both within and outside the fictional world of the game, and both within and outside the medium of representation. For example, the control panels of a computer game can be external devices, but they can also be displayed directly on the screen, as part of the games' visual design.[149]

In interactive media art, actions are framed by media, and plots and actions are represented in other media or are presented as keyed through contextualization in new reference systems. These actions may be staged within the frame of fictitious worlds or narratives, although this is not imperative. In chapter 3 I introduced the term "artificiality" to denote these different means of removal from reality. In the context of this study, this term is preferable to the concept of keying because it doesn't exclude levels of alienation that, as purely abstract formations, do not make any reference to an original model of "real" action.

Interfaces, which mark the transitions between different frames, or the entry into and exit from the interaction, have particular importance in this context. In stage performances, Goffman points out, transcription practices that "render stage interaction systematically different from its real-life model" are used.[150] Here Goffman is referring to the placing of spatial and temporal limits, and to the fact that natural forms of interaction are distorted in order to facilitate perception—for instance, when all the people participating in a dialogue are allowed to express themselves without

interrupting one another, or when significant details are emphasized. Marvin Carlson uses the concept of "marking" to describe these practices. Janet Murray uses the term "threshold markers," which she sees as taking on the role of the fourth wall of the theater.[151]

Marking of this kind is necessary when the keying is not conveyed medially, for otherwise the medium is evidence of the artificiality of the presentation. However, such markings can become relevant in interactive art when the intention is for actions to be distinguished from everyday life.

The frames within which interactions are contextualized are constitutive for the perception—or the questioning—of their artificiality. As explained regarding the spatial configuration of interactions, clear-cut markings are by no means always present. Just as the recipient is often left in the dark about the spatial boundaries of a work, the system of reference that should be applied is often far from clear. Erika Fischer-Lichte calls the conflicts that can arise a "collision of frames." If an action can potentially be ascribed to different framing systems of reference, that represents a challenge to its perception and interpretation.[152] Whereas one feels safe in familiar frames (Goffman speaks of "well-framed realms"), frame collisions lead to irritation. Whether one breaks out of a frame on one's own initiative or a change of frame is brought about by the interaction system, the destabilization leads to a conscious awareness of the reference system and, according to Goffman, to vulnerability: "[The individual] is thrust immediately into his predicament without the usual defenses."[153] Goffman demonstrates this using the example of everyday interpersonal encounters, but such frame collisions are equally important in art. Especially in art, they are consciously provoked; in fact, to a certain extent they are actually expected. When interactive art operates simultaneously in several different reference systems, as it often does, the recipient finds himself confronted with multiple rule systems. Thus, Lino Hellings emphasizes that the potential of interactive art lies in evidencing and challenging its implicit agendas and rule systems: "I look for a process of dismantling rules, of derailing the codes and protocols so those who come into contact with the work become aware of their own rules and structures."[154]

Materiality and Interpretability

Up to this point I have dealt with the different actors, parameters, reference systems, and processes of interaction that are constitutive factors of any aesthetics of interaction. The exploration of the temporal and spatial parameters of interaction has demonstrated clearly that although the gestalt of interactive art is set out by the interaction proposition, it becomes manifest only in individual realizations. The gestalt of a work is not found in a determinable materiality or temporal structure; rather, spatial and temporal structures emerge in the process of interaction. Thus, if the traditional category

Figure 4.7
Materiality and interpretability. Christa Sommerer & Laurent Mignonneau, *Mobile Feelings* (2003), installation view (© 2003 Christa Sommerer & Laurent Mignonneau, supported by France Telekom Studio Créatif, Paris and IAMAS Gifu, Japan).

of form is replaced in interactive art by a processual gestalt, the next task is to determine the latter's relationship to other two basic categories of aesthetics: materiality and interpretability. This also brings us back to the main touchstones of an aesthetics of interaction which have been identified in the opening chapters: the requirement of aesthetic distance as a condition of aesthetic experience, interactive art's specific potential for giving rise to knowledge, and its ontological status or "workliness."

The interplay between form and signification is a guiding principle of the arts. This is reflected—with different focuses in the different artistic genres—in the traditional distinctions between style and iconography (in the visual arts), between form and content (in literature), between text and production (in drama), and between structure and expression (in music). Indeed, as differentiation between the signifier and the signified, it even constitutes the central topic of semiotics. However, the importance of the configurable substance underlying both form and signification was only recognized relatively recently. As Monika Wagner explains, material substance was for a

long time considered to be no more than the medium of form in the visual arts. Since World War II, however, material has acquired an increasingly significant role as a constituent element of meaning. This has led, according to Wagner, to the "need to not only view material as a technical circumstance, but also to value it as an aesthetic category"[155] and to take into account everything from raw materials to processed materials, products, and objects. Similarly, Dieter Mersch points out that signs assert "their own presence . . . chiefly through their materiality, through the sound of language, through the trace left by the material . . . or through its substantiality, as used by the artist."[156] As a media philosopher, Mersch is less interested in materiality or substantiality in the physical sense than in its here-and-now effect, which he denotes as an event that should be given more weight in relation to semiotic theories: "The process of significance cannot be separated from the uniqueness of its manifestation—what we try to single out in two ways as the 'ekstasis of materiality' and the 'intensity of performance.'"[157] Although both Mersch and Wagner call for a rehabilitation of the material within aesthetics, their arguments are based on opposite perspectives. Mersch seeks to reassign materiality to signs and specifically examines their capacity to transcend signification, whereas Wagner is interested in the symbolic potential of material, which she sees not only as a medium awaiting processing, but as something that conveys meaning itself.

Thus, materiality is understood in different ways, depending on the perspective of the researcher, and also depending on the artistic genre in question. Whereas Wagner looks at materiality in the visual arts in terms of substance, Fischer-Lichte analyzes materiality in the performing arts from the perspective of corporeity, focusing on its role in the constitution of reality. In music, sound events can be considered to be material, whereas in literature it is difficult to find any kind of comparable material condition. Interactive art operates with both physical matter and objects, but also with light and sound events and the corporeity of the recipient, all of which are activated through actions and processes. The materiality of interactive art is dynamic and modifiable; it can vary substantially from one version, manifestation, or individual realization of an interaction proposition to the next. Thus, Mersch's view that materiality need not precede form, but may also only manifest itself as a "here-and-now effect" in the moment when the gestalt of a work emerges, must be highlighted. Moreover, as Fischer-Lichte's emphasis on the constitution of reality makes clear, what is at issue here is the active creation of situations in the context of interactions. Nonetheless, the reason the concept of materiality is preferred in the following to that of reality is that the existence of an absolute reality becomes increasingly questionable in the light of the media-based phenomena that are at the focus of this study.

Like materiality, signification can also manifest itself in different ways. In music, expression has always been the primary category of interpretation, whereas literature, drama, and the visual arts have usually required a semiotic reading in the sense of an

iconographic analysis or symbolic interpretation. It is only since the twentieth century that in these genres, too, the potentials of open, associative interpretation have become more evident. While the concept of signification suggests the existence of an unambiguous relationship between the sign and the signified, this fixed relationship has been increasingly called into question since modernism—and not only by what is known as abstract art. Indeed, Mersch argues that art can exist "outside the realms of signification and interpretability."[158] Gernot Böhme has also noted a disintegration of the mimetic and semiotic concept of the image: "We are dealing with images that represent nothing, say nothing, and mean nothing." Nonetheless, Böhme adds, such images can lead to "significant and occasionally dramatic experiences."[159] Mersch also points out elsewhere that he in no way means to deny the possibility of any kind of referential interpretability, rather he wants to emphasize that between the known systems of meaning something else is always happening too, "which perpetually pours out of them."[160]

Arthur Danto used the more general concept of "aboutness" to describe the production of meaning through art. He sees artworks as actually transcending their semiotic nature because, unlike pure representations, they also express something about their own content.[161] He argues that such expressions have a metaphorical character in that they refer to a third, non-identical something, which must be deduced by the recipient. In Danto's view, therefore, what is expressed by an artwork demands a cognitive response and a complex act of understanding that is "wholly different from those basic encounters between simple properties and us."[162] Danto is already alluding here to the importance of reflective processes: on the one hand, in the sense of a self-referentiality of the work which is intended by the artist, and, on the other, as a requirement on the recipient to adopt a reflective attitude. The lack of unequivocal signification should thus not be seen as a loss, but rather as a gain in the complexity of possible epistemic processes whose goal is not conclusive decodification. The more general concept of interpretability will be used in the following to denote this epistemic potential. Any work of art can, in principle, be subject to interpretability. For when instead of signification (in the sense of clear-cut reference systems) the general epistemic potential of the experience of art shifts to center stage, the question is not whether an artwork can be interpreted at all, but to what extent processes of interpretation are facilitated by the artwork or possibly hampered or thwarted by it.[163] This is all the more true in view of the fact that interpretability can be manifested at different levels of the artwork, starting with the material chosen by the artist and proceeding with its configuration or style. In addition, the work may be open to a symbolic reading referring to known sign systems. The term "representation" is used in this study only when the symbolic level becomes relevant and denotes a representative, illustrative, or narrative allusion to a referenceable original archetype. When the term "presentation" is used, by contrast, it refers to all kinds of manifestations conceived

for an audience—configurations which are open to interpretation without requiring explicit referents.

As the following analysis will show, materiality and interpretability should be understood as complementary components of aesthetic experience. The analysis will proceed systematically, beginning with the physical materiality of hardware and objects, then examining the immaterial materiality of images and sounds, and concluding with the atmospheric efficacy of reception processes.

Interface and hardware

Even though interactive art may, of course, use traditional, objectual, sculptural, or installational elements, the materiality of the interaction proposition is primarily manifested in its technical components—especially the user interface. The interface is the direct point of contact between the human being and the system, and comprises both input and output media (keyboard, mouse, microphone, sensors, screen, projection, loudspeaker, and so on). It is part of and connected to the hardware that processes, transmits, and stores data. However, especially when standardized, commercially available devices are used, it is debatable to what extent these belong to the aesthetically relevant materiality of a work. This is especially true when a recipient uses his own laptop computer to access Internet art, or his own cell phone to participate in a locative art project.

Nonetheless, even if the interface is presented as a purely functional medium that makes information perceivable and enables actions, it still must be addressed as a potential bearer of meaning. Even when material components appear to be carrier media that are peripheral to the work (like the frame of a painting), they can still play an important role in the process of aesthetic experience.[164] Media theory differentiates between transparency and opacity, or between the "immediacy" and the "hypermediacy" of a medium—in other words, between media that seek to transport data as inconspicuously as is possible and media that make their mediating function explicit.[165] However, complete media transparency is considered impossible. A medium may be blanked out in individual perception, but it can always come back into play.

As the technical component that mediates between the system and the recipient, the interface is usually expected to manifest its functionality overtly. It should display its usability and even actively encourage interaction—a feature that has been addressed above as affordance. However, the input and output media used in interactive art are by no means always visible. Loudspeakers and projectors may be built into existing walls, and the actions of recipients may be recorded by hidden sensors and cameras instead of keyboards and computer mouses. For instance, the only evidence of the technical system in Rokeby's *Very Nervous System* are a tiny camera and standard-issue loudspeakers in an otherwise empty room, and Rokeby considers this to be crucial for the work itself: "I want you to forget about the technology."[166] The recipient's possibilities

for action cannot be deduced through the materiality of the interface but only through explorative actions. Unlike commercial systems, interactive art doesn't necessarily seek to provide interfaces that are as intuitive as is possible. On the contrary, the exploration of the system's functionality often plays a significant role in the aesthetic experience.

Apart from questions of usability, interfaces may also convey meaning incidentally, or they may be employed explicitly as bearers of meaning. For example, Daniel Dion insists that his video work *The Moment of Truth* (1991) be played on a portable video player, although it is conceived as a museum exhibition piece. Dion considers both the mobility and the size of this device to be means of expression.[167] Standard media configurations (mouse/keyboard and projector/screen), because they are familiar, replaceable, and purely functional elements, are usually not perceived as aesthetically effective components of a work. Nonetheless, they convey a subtext that enters into the overall configuration of the aesthetic experience. Thus, while one visitor may feel intimidated by ultra-modern technology, another may be interested in the particular workings or design of a new device. Whether an artist has used a PC or a Macintosh may lead to conclusions about his disciplinary context. Valuable materials or well-known brands can be testimony to quality requirements and can provide information about the financial background of the project. At the same time, medium opacity of this kind can be either lost or can increase when an artifact ages. Devices that come across as novel and spectacular when a work is first presented become affordable and ordinary over time. Vice versa, aging can draw more attention to a medium when, for example, components that were originally ignored as standard devices are perceived as having historical value after a number of years. In most cases, such interpretability is not explicitly intended by the artist; instead, it develops incidentally or as a consequence of an aging process. Nonetheless, technological characteristics may also be highlighted by curators. For example, in Hershman's *Lorna*, old hardware (a laser disc player) has been exhibited as part of the installation, although technically the work had already been installed on a more modern system.

Like standard devices, individually constructed systems can serve purely functional purposes or can be carefully configured, either to satisfy contemporary design concepts or to make an installation appear amateur, old fashioned, or simple. For instance, Bernie Lubell almost entirely eschews electronics in his large interactive installations, controlling or letting the recipients control all the functions using clearly visible wooden mechanical constructions and pneumatic equipment, so that the focus of the works is their materiality, which then shapes the way they are interpreted. Karl Heinz Jeron, in his project *Will Work for Food* (2007), and Jonah Brucker-Cohen and Katherine Moriwaki, in their *Scrapyard Challenge Workshops* (since 2003), use the simplest of materials to build improvised mini-robots, and this pieced-together functionality also becomes an expression of artistic intentionality. At the opposite end to such "low-tech approaches" are efforts to achieve perfection. For example, the Japanese artist Toshio

Iwai collaborated intensively with the instrument manufacturer Yamaha in creating *Tenori-on* (2007)—an artistic musical instrument—in order to achieve a perfect design and at the same time produce an instrument that could be launched on the commercial market.

Even if individual constructions are more likely to be perceived as aesthetically effective elements than (replaceable) serially produced devices, intentional signification or "only" contextual interpretability is possible in both cases. The boundary between the framing context of a work and its aesthetically effective gestalt is thus negotiable. This applies not only to the hardware, but also to the software, which becomes particularly evident in the case of Internet art. Every Internet browser has its own framing elements and is thus not entirely neutral. Even if some Internet artworks recommend the use of a certain type of browser, many can be accessed using different browsers, so that one is inclined to see them as external to the work. However, when I asked Holger Friese, one of the artists behind *antworten.de*, for permission to publish a screenshot of that Internet artwork, he happily complied, but also asked me to use a screenshot taken in the year the work was created (1997), which showed the work in a version of Netscape in use at that time.[168] Should a request of this nature be understood simply as a wish to contextualize a work historically, or is the browser also given importance as aesthetically relevant part of the work?

As early as 1998, in an essay on the materiality of Internet art, Hans Dieter Huber differentiated between the framing borders (which depend on the operating system), the version of HTML code being used, and the materiality of the browser. He pointed out that although browsers all have a central window, a status bar, and an address bar, the look and feel can vary substantially from one make to another. Huber compared HTML data to a score which is performed or interpreted in whichever browser it is activated.[169] However, in contrast with a performer of music, a browser has no interpretive freedom; it depends on its own algorithms. Rather than an artistic, interpretive performance, it performs a technical execution, which nonetheless can substantially influence the effect of a work. But this can be planned by the artist only to the extent that he can program the code with known browser versions in mind; he cannot know how future browsers will present his work. Susanne Berkenheger comments ironically on the problems presented by this situation: Internet artists are forever in danger of physical collapse "as they constantly revise works that aren't even finished yet."[170] This "power of the browser" results in Internet art often self-referentially exploring its media-based context.

Interactive object art

Even if media art only rarely produces traditional sculptural formations, everyday objects—in the tradition of ready-mades, assemblages, and installation art—are often incorporated or converted into interfaces. In *America's Finest*, Lynn Hershman

alienated a rifle from its intended use, capitalizing on the fact that all firearms are interactive devices. Hershman remodeled the weapon in such a way that when the trigger is pulled, historical war images are superimposed on the real surroundings that appear in the viewfinder. In addition, the recipient periodically sees a picture of himself and is thus staged as his own victim. The presentation of a firearm has two purposes here. First, the visitor confronted with the device can imagine what he is expected to do and how the interface should be operated—he deduces the operational rules of the work from what he knows about weapons. Furthermore, firing a weapon provokes associations that can become aesthetically effective through the very invitation to engage in physical action. The recipient enters into a conflict between perceiving his action as a context-free interaction with an artwork and perceiving it as the active representation of a potentially violent undertaking.

Paul DeMarinis' *Rain Dance* (1998) represents a more harmless form of instrumentalization of everyday objects as bearers of meaning. It invites visitors to take an umbrella and walk under streams of water that are modulated with audio signals so that musical tunes are created every time the water hits the umbrellas. The operational rules of the work can be deduced from the normal, everyday use of umbrellas. However, everyday objects can also be used as bearers of meaning independently of issues regarding their usability. In his installation *The Messenger* (1998), whose theme is early methods of communication, DeMarinis uses old enamel basins as resonance bodies and canning jars as signaling devices. He thus characterizes the technology he presents as historical, but at the same time shows how communication systems can be constructed using simple, everyday objects.[171] In his installation *Giver of Names* (1990), David Rokeby uses children's toys that the visitors can scan and classify with a computer. This system could, in principle, analyze any object at all, but Rokeby uses toys, which are available in many different forms and which tend to evoke associations, emotions, and memories.[172] Christa Sommerer and Laurent Mignonneau use bottle gourds as interaction objects in their project *Mobile Feelings* (2003), which explores new forms of multisensory telecommunication by transmitting smells, gusts of air, and movements. The bottle gourds not only contrast with the technological appeal of commercial cell phones, but also open up an associative radius that ranges from erotic accessory to the feel of toad skin. Whatever the association, however, the objects provoke a strong desire in the users to touch them, which again is to the benefit of their usability.[173]

Immaterial materiality and atmosphere

In addition to components that can be considered material in the physical sense, interactive art is substantially based on "immaterial materiality"—visual or acoustic information transmitted via screens, projections, loudspeakers, or headphones. Such elements are anything but imperceptible—they are simply either visible or audible,

but not tangible. Even if they are immaterial, their form can still be shaped and perceived. However, there is considerable dispute as to whether such kinds of perceivable information can be deemed to have materiality. Dieter Mersch ties his thesis of the "anaesthetics of the digital" to this very issue. He believes that the digital medium not only erases the memory of material but also doesn't bow to "the aisthetic sensoriality of its presence."[174] When Mersch, as discussed above, describes presence as ekstasis, he thus suggests that such ekstasis requires a materially tangible corporeity. But why should the phenomenon of presence be bound to physically concrete materiality? In reality, a luminous surface or a light space (such as in Diana Thater's projections or Olafur Eliasson's environments) or a spatially staged sound (as in Jan-Peter Sonntag or Bernhard Leitner's works) can emanate just as strong a presence. Interactive media art also works with the spatiality of such effects, already denoted by Jean-François Lyotard as "immaterial."[175] Teri Rueb's sound islands not only roam with the tides, but are also broken down into inner areas that contain text and external zones, within which footsteps can be heard. David Rokeby describes the movement-sensitive space of *Very Nervous System* as sculpturally explorable. Thus, in interactive media art, (im)materiality should be understood above all as a perceivable spatial quality of the works, regardless of whether this manifests itself through solid matter or immaterial materiality, through static form or fluid motion. As we have already seen with respect to the spatial qualities of interaction, such (im)materiality is, moreover, often only activated and realized in the moment when the work is received by the recipient, whereas otherwise it only exists as a potential.

We must furthermore distinguish between referenceable forms of (im)materiality, on the one hand, and perceptions or appreciations of atmospheres, on the other. According to Gernot Böhme, the primary object of perception—and thus a central theme of aesthetics—is atmospheres, which Böhme defines as an "indeterminate quality of feeling poured out into space."[176] Böhme believes that what are first perceived are not human beings or objects or their arrangements, but atmospheres "against whose background the analytical view then distinguishes such things as objects, forms, colors, etc."[177] According to Böhme, atmospheres are thus always spatial. He uses the term "spheres of presence" to refer to the presence of things or human beings that radiate a "thereness." He believes that atmospheres are tinged by the ekstasis of the people who are present. His point is that atmospheres contribute both to the ontology of the people present and to the phenomenology of perception.[178]

Atmospheres are central to the aesthetic experience of interactive art. Works presented in the public space partake of the atmosphere of the chosen location, be it the raw climate of the German North Sea coast (as in the cases of *Wasser* and *Drift*) or the tranquil mood of a city at dusk (as in the case of *Rider Spoke*). Atmospheres can also characterize exhibition spaces: Consider the calm, white, empty room of *Very Nervous System* and the mysterious mood of the dark entry area to the *Web of Life*, which is

traversed by wires and has an uneven floor. However, in many other works, moods are created by elements that cannot easily be characterized as spatial. As was discussed in chapter 2, emotions can be evoked by visual and especially acoustic presentations, as Anne Hamker has illustrated with respect to the aesthetic experience of Bill Viola's video installations.[179] The music chosen by Blast Theory for *Rider Spoke* is described by visitors as relaxing, whereas the sonar noises underlying the texts in Schemat's *Wasser* have the purpose of creating suspense. The voice of the female narrator in *Rider Spoke* is intended to exude calm and generate trust; the voice of the female protagonist in Hershman's *Room of One's Own* invokes an erotic mood but also expresses anger. However, moods can also emerge during the course of the interaction. Whereas most of the recipients of Berkenheger's *Bubble Bath* probably quickly slip into a tense and perhaps even slightly aggressive mood, the combination of cycling and recollection in *Rider Spoke* has a relaxing effect on many recipients. Feingold's *JCJ Junkman* can evoke a harried mood. The recipients of Hegedüs' *Fruit Machine* often show signs of annoyance (with other recipients) or impatience. Whether emotional effects are evoked by spatial atmospheres or by interaction processes, Böhme's observation still always applies—that atmospheres (and, we should add, the resulting moods) are not represented mimetically or semiotically, but are actually created by the work.[180] Atmospheres and moods thus represent a hybrid link between materiality and interpretability.

Representations

We have seen that interpretability starts with the usability of the interface and the potential contextualizing interpretation of the technology or material used. In addition, sculptural and objectual elements, as well as the "immaterial materiality" of acoustic and visual presentations, convey atmospheric qualities. But, of course, traditional means of signification can also come into play.[181] A work can evoke associations or create atmospheres through abstract configuration or localization in specific environments, but it can also intimate interpretations through references to traditional sign systems. Objects may be chosen to this end, but items and events can also be represented by means of traditional signifiers in texts or images. Interactive film projects such as Weinbren's *Erl King* and Hershman's *Room of One's Own* use pre-recorded video sequences or film excerpts whose scenic representations can be interpreted as sign systems. The same applies to the use of images, such as the comic-style illustrations on the tablet computer used for *Rider Spoke* or the objects found in the picture book in Masaki Fujihata's *Beyond Pages*. Many projects use language—in the form of superimposed or spoken texts—or clearly identifiable sounds. Language and text make use of discursive sign systems, which, in addition to being a means of narrative representation, may also serve the purpose of directly addressing the recipient with diegetic communications or extradiegetic prompts to take action.

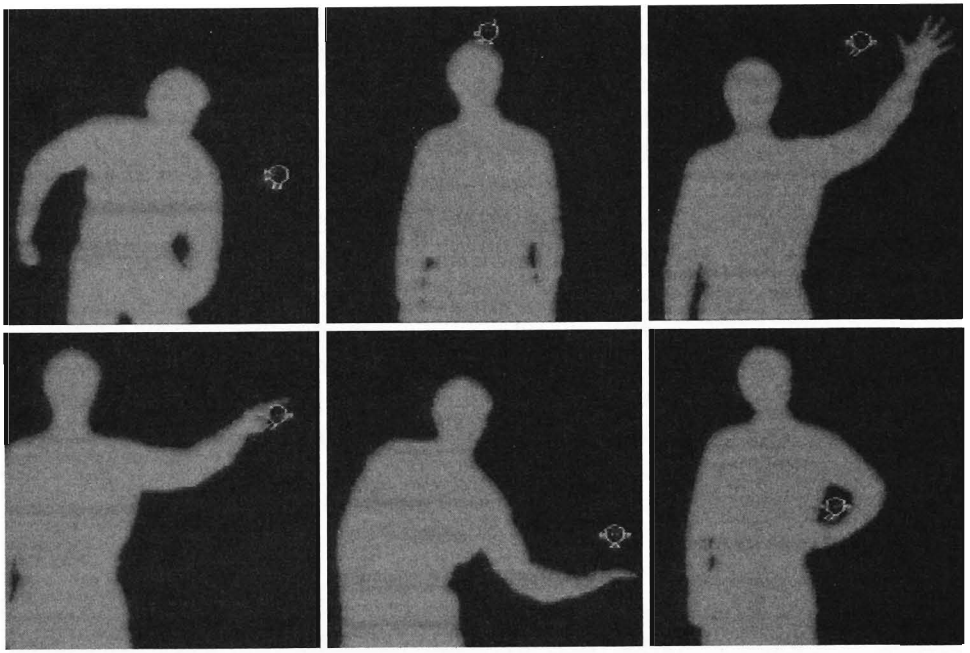

Figure 4.8
Interacting with animations. Myron Krueger, *Videoplace* (1972–1990s), screenshots from 1990 video footage.

However, representative strategies do not necessarily require recourse to prefabricated assets. Myron Krueger's figurative computer animation *Critter* uses programmed modes of behavior to interact in real time with the recipient's shadow; the artificial creatures that interact with one another in Sommerer and Mignonneau's work *A-Volve* (1994) are created anew each time on the basis of the recipients' input. Even when process-based works produce exclusively abstract graphics or sounds, clearly referenceable relationships are not excluded. Tmema's *Manual Input Workstation* enables the creation of simple, abstract forms, which, because they are closely associated with corresponding acoustic data, can be understood as representations of these, albeit in another medium. In Cillari's *Se Mi Sei Vicino*, even though the animated grid structures and metallic sounds that are generated are entirely abstract, they can still be interpreted as a representation of an encounter between the recipient and the performer.

Interactive art thus also operates with traditional relationships between the materiality and interpretability of the artifact or the performance. In contrast with other art forms, however, the purpose of these is usually to activate, motivate, control, or channel action. And the action is characterized, in turn, by its own kinds of materiality and interpretability. The materiality of an action is manifested in movement, be

it the physical movement of the recipients or the dynamics of processes and configurations.[182] However not only physical corporeity and mechanics but also immaterial configurations, animated forms, roaming sound islands, or pulsating light spaces are set in motion.

Traditional means of signification are likewise anything but irrelevant for the interpretability of actions. Discursive communications and narrations are staged over time in interactive art, but visual symbolism also plays a role, for example when the recipient's mimicry or gesturality draw on familiar sign systems or when he acts symbolically in a representative role. Above all, however, the dynamics of the actions also evoke atmospheres and emotions that can substantially influence the aesthetic experience of interactive art. They can trigger both cognitive interpretations and processes of cathartic transformation, and thus they may open up possibilities for a variety of epistemic processes.

Embodied interaction

As Derrick de Kerckhove observed as early as the 1990s, although Western cultures since the Renaissance have replaced proprioception with "self-visualization . . . as the chief point of reference for one's own position within reality," interactive technologies allow us to return from our purely visual relationship to the environment to a tactile and proprioceptive one.[183] This view, which clearly draws on Marshall McLuhan's thesis of the growing significance of the tactile in "acoustic space,"[184] may seem surprising, insofar as in the last decade of the twentieth century most media theorists were still concerned with the trend toward a disembodiment of human beings.[185] However, the visions associated with the buzzwords of cyberspace and virtual reality were not only triggers for theories of disembodiment, but could also be grasped as harbingers of a renaissance of the corporeal—in the form of bodily action in virtual worlds. These expectations were driven forward by artistic projects such as Char Davies' *Osmose* (1995), an immersive environment that allowed recipients to control movement in virtual worlds using their own breathing.

Such involvement of the human body in a simulated spatial experience is only one way of heightening the recipient's awareness of his physicality, however. As early as the 1990s, Myron Krueger highlighted the importance of physical activity in his own vision of interactive art, which he characterized as artificial reality and which, he asserted, "depends on the discovery of new sensations and new insights about how our bodies interact with reality and on the quality of the interactions that are created."[186] Whereas Krueger's approach was to produce a digitally augmented version of the recipient's shadow, David Rokeby believes that the reproduction of a recipient's body on a projection screen is incompatible with its physical perception: "When playing with Myron Krueger's work . . . where you . . . had a visual shadow avatar on the screen, your feeling of being in your body was blasted away by negotiating the

manipulation of an avatar separate from your body."[187] Rokeby himself thus neither depicts nor represents the human body, instead using acoustic feedback to encourage physical movements and enable enhanced self-awareness. Rokeby's aim is "stereoscopic proprioception" on the part of recipients, in the sense of an interference between the internal feedback from the body and the external feedback from the system.[188]

Keith Armstrong took a different approach in *Intimate Transactions* (2005–2008). He created a highly symbolic, telematic installation in which two participants used specially constructed chair-like frames to cooperate, by means of bodily tension and movement, in shaping evolutionary processes, which were displayed on a projection screen.[189] Whereas Armstrong's work interweaves the symbolic level of representation and the proprioceptive level of body perception, Chris Salter focuses exclusively on creating possibilities for intense physical awareness. His installation *Just Noticeable Difference #1: Semblance* (2009–2010) is based on the experience of sounds, pressure pulses, and barely visible light flashes in a pitch-black space. The visual boundaries of the space are thus negated, but not its material limits.[190]

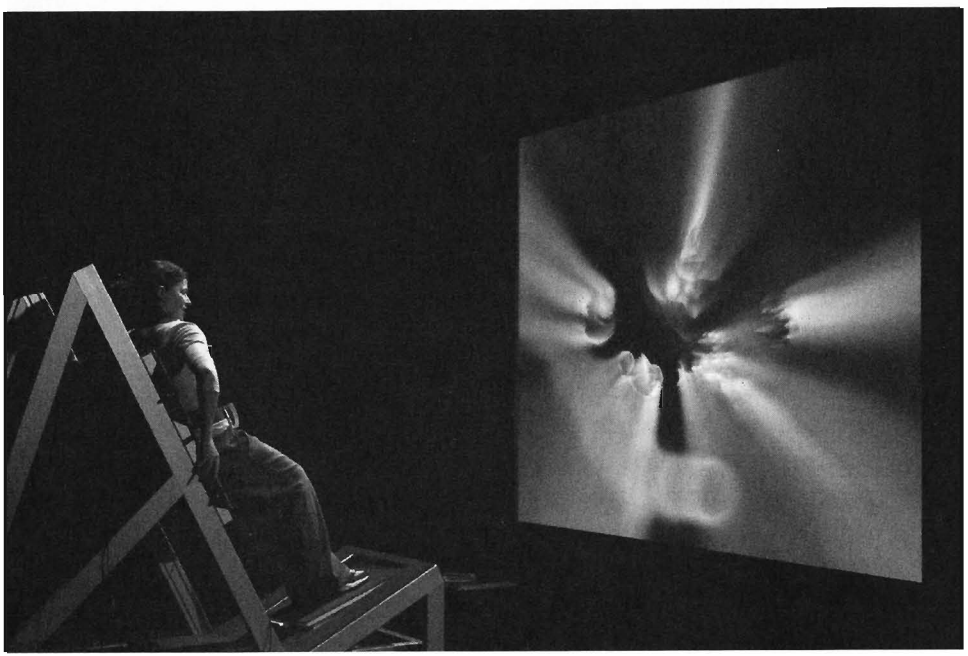

Figure 4.9
Embodied interaction in a telematic installation. The Transmute Collective (directed by Keith Armstrong), *Intimate Transactions* (2005–2008), installation view (photo by David McLeod).

Performance art, not the media arts, must be credited with the return to artistic concern with the human body. As early as the 1960s, performance art shifted the physical presence of the performer to center stage. When media art uses interactive strategies to valorize the human body, however, this takes place under entirely different conditions. Because physical activity in interactive art is not primarily an intentional performance, the recipient's actions correspond to his everyday corporeity. This means that neither special clothing nor ostentatious nudity, both important elements of performance art, can play any role in interactive art. The action is not primarily carried out as a performance for somebody else, but as (unrehearsed) operation or exploration of a system. As a result, body language is also used less consciously than in performance art, where it may have the purpose of symbolic communication, presentation of particular abilities, or explicit manifestation of corporeity. Although such forms of expression may be used in the realization of interaction propositions, they mainly encourage self-awareness. The non-media-based experiential installations of Allan Kaprow and the Groupe de Recherche d'Art Visuel, for example, focused mainly on the latter objective, as did Bruce Nauman's, Richard Serra's, and Rebecca Horn's works of the 1980s and the 1990s. Interactive works based on technical systems do, however, create possibilities for new qualities of self-perception, insofar as media can be used to reflect actions through direct depiction, through alienation, or through abstract visualization or sonification. Media art may use the physical resistance of material interfaces to set bodily self-perception in direct relation to different types of technical feedback. Masaki Fujihata's *Impalpability*, published on CD-ROM in 1998, enabled a form of bodily self-awareness whose technical simplicity rendered it all the more original. *Impalpability* invited the recipient to turn over a standard computer mouse, which in those days was operated by means of a ball attached to its underside. When the recipient rolled the ball with his thumb, a simultaneous movement took place on a ball depicted on the computer monitor. The depicted ball appeared to be made of human skin, so that it seemed to the recipient as if the skin of his own thumb had been transferred to the screen. In this way, a direct link was created between a haptic sensation and the visual perception of a virtual object. The bicycle in Shaw's *Legible City* operates on much the same principle, except that in this case a familiar pattern of action is invoked in order to make the link between physical action and portrayed movement in virtual space more plausible.

In interactive art, corporeity is either highlighted in terms of its own materiality or thematized by means of visual or acoustic feedback. However, in addition to intensifying the recipient's perception of his own body, or using it as an input medium, interactive art offers the possibility of focusing on the body's relationship to other individuals. The focus of such works is on positioning, or, to borrow Martina Löw's terminology, on spacing and synthesis as superimpositions of spatial and social relations. Such self-positioning is the main theme of Scott Snibbe's project *Boundary Func-*

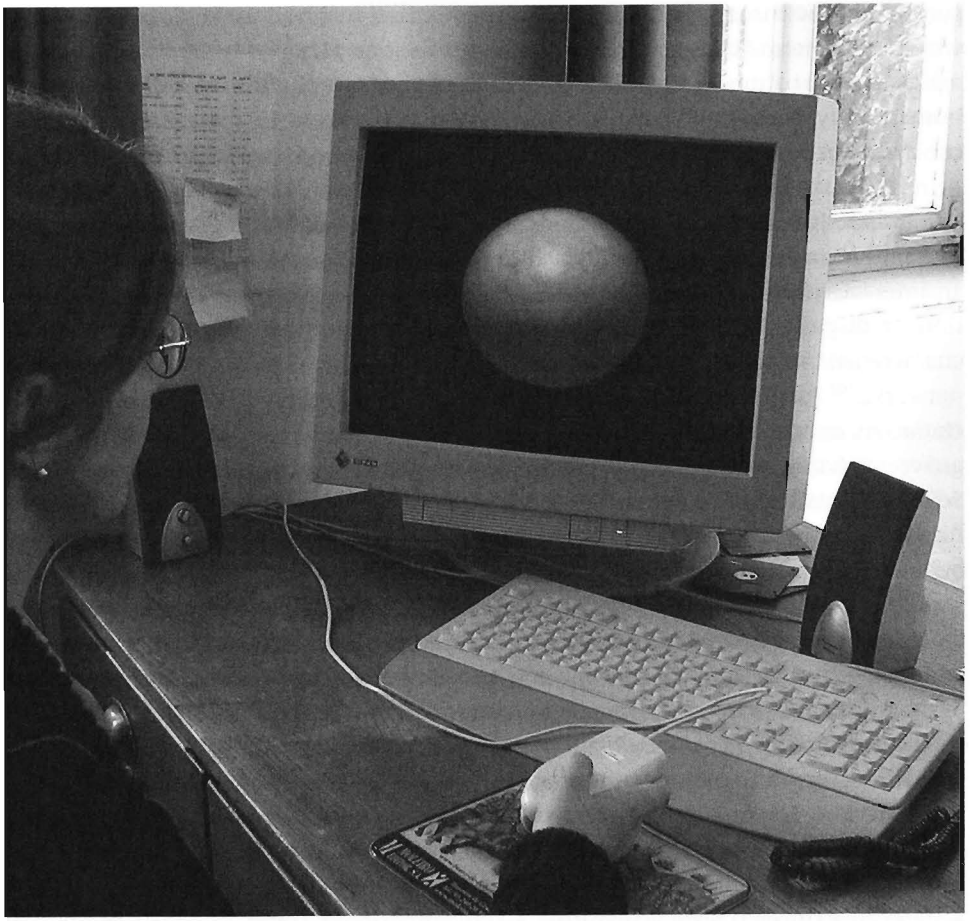

Figure 4.10
Embodied interaction with a standard interface. Masaki Fujihata, *Impalpability* (1998), user interaction (© Masaki Fujihata).

tions, which orchestrates a spatial positioning or segregation of individuals in relation to one another. Cillari's *Se Mi Sei Vicino*, which has also been discussed from this perspective, uses the visualization and sonification of energy fields between individuals to stimulate reflection on the processes involved when we approach or touch other human beings. The overlap between emotional and physical processes illustrated in *Se Mi Sei Vicino*, and the staging of electromagnetic effects as emotional expression, epitomize the transformation of physical and spatial experiences brought about by the information society. Such approaches increasingly call into question not only the boundary between material and immaterial gestalt, but also that between physical

perception and information flows. This trend is also analyzed by Mark B. N. Hansen, who uses the term "body in code" to highlight the new forms of embodied knowledge made possible by modern media. As mentioned in chapter 2, Hansen believes that the human body doesn't (nowadays) end at the boundaries of its own skin, but rather constructs intimate relationships with digital information flows and data spaces.[191]

The interactive work as a stage or mirror

In addition to the forms of bodily self-expression considered above, the recipient of an interactive work may be invited to adopt positions of representational identification or disguise. The possibility for users to adopt multiple roles is an important characteristic of digital media, especially in the domain of modern communication networks.[192] Participants in online communities often present themselves as fictional characters or as members of the opposite sex, or use an imaginative avatar.[193] In interactive media art, such role playing may be explicitly required. For instance, Stefan Schemat casts the recipient as a blind detective, and Susanne Berkenheger declares him to be an intern. Both assignments come with specific expectations regarding the behavior of the recipient, for the ascription of a role provides him with clues about the operational rules underlying the interaction. In addition, both Schemat's work and Berkenheger's draw the recipient more deeply into the fictional storyline by addressing him directly. The recipient is also directly addressed in Hershman's *Room of One's Own*. However, Hershman's recipient is not assigned a fictional role; instead, the theme of the work is his actual function as a recipient of art.[194] The more the focus shifts from the fictionality of the representation to issues of self-portrayal, the more fluid are the boundaries between incidental self-expression and intentional self-representation.[195] Bruno Cohen's early interactive environment *Camera Virtuosa* (1996) dispenses with assigning an explicit role to the recipient, who is invited to enter into a stage area through a door featuring a standard "on-air" light. Whereas the virtual actors who join him on stage perform clearly recognizable roles (cleaning lady, ballet dancer), it is up to the recipient whether he adopts a fictional role or simply acts out his own personality or corporeity. Whatever his decision, the reactions of the spectators are concealed from him, for although his actions are shown in real time together with the actions of the virtual actors, this takes place on a monitor located outside the recording room. Cohen's work examines the vicariousness of media-based interactions and explores the different domains of presence that can become relevant within a media-based interactive scenario.

In other works, it is the very possibility of self-observation that determines the recipient's attitude. Many installations that record the actions of the recipient present them to him immediately, albeit often distorted through mediation. As was suggested in chapter 1, such works may be regarded as digital closed-circuit installations.[196] One example is Scott Snibbe's installation *Deep Walls*. In this work, too, the recipient is

free to decide whether to stage a fictitious scene, record a particular gesture, or simply portray his own corporeity. We have already seen that in other works body movements trigger visual or acoustic effects that go substantially beyond simple mirroring. The recipient of such works may concentrate on staging his own corporeity and movement, but he also may seek to control the audiovisual effects. As has already been discussed in relation to the possible modes of experience of interactive art, the transition from processes of experimental exploration to processes of expressive creation is generally fluid. The recipient may first grasp the interaction system as an instrument of knowledge that mirrors and distorts his actions, then, a moment later, use it as a tool to create images.

Intentionality

As we have already seen, interpretability can be either a matter of artistic intention or arise unintentionally. Dieter Mersch distinguishes between intentionality as "showing something" (meaning) and non-intentionality as "showing oneself" (event).[197] The latter is the cornerstone of Mersch's interpretation of performativity as "positing." Mersch argues that even gestures or movements that are intended symbolically are by no means consumed by their own symbolism, but also manifest other aspects that cannot be interpreted as signs.[198] As was outlined in chapter 3, theories of the performative describe situations in which traditional production of signs is neglected in favor of a focus on the materiality of the action. According to Mersch, performances create their own realities, "in which all manner of things can happen that may not necessarily be related to any kind of signification or meaning . . . and whose characteristics primarily emerge in the performative, which can be simply described as the process of an event taking place."[199]

Nonetheless, there is still scope for interpretation here. Even semiotic theories allow that a sign need not be an unequivocal proxy for the particular object or topic that it references, but that it may also be an interpretable expression linked to ideas, meanings, and contexts.[200] Recipients may arrive at the understanding intended by the artist, but they may also arrive at associations or interpretations that were not explicitly anticipated. As was discussed in chapter 1, the non-intentional generation of aesthetic configurations, for example through the incorporation of random operators, may complement such open invitations to interpretation.

Like the interaction proposition, which may intentionally or non-intentionally create opportunities for interpretation, the realization of the work on the part of the recipient may alternate between intentional and non-intentional processes. As we have seen, the recipient of interactive art is initially not primarily interested in presenting something, but in accepting the proposition to interact, in realizing the work, and in exploring the system. But because these goals can be achieved only through his own action, the recipient, either deliberately or unwittingly, produces signs (images,

language, or movement). Thus, his action may be an intentional delivery, as in an ostentatious presentation for spectators or for a feedback medium. Alternatively, however, he may be mainly preoccupied with activating the system or creating feedback loops, so that the generation of a gestalt or of interpretable formations may not come about intentionally. This is all the more true insofar as his actions are channeled through the system and thus often take the form of reactivity. The recipient's actions are guided by the rule systems imposed by the artist and are responses to the feedback received from the technical system.

The attitude adopted in the recipient's individual experience depends on the particular artwork, on the exhibition situation, and on the recipient's personality. In Snibbe's *Deep Walls*, for example, the recipient is required to perform for a twofold purpose. He is invited to execute a clearly visible and expressive physical movement, but he also is aware that an abiding documentation of this action will be made, for a video recording of his silhouette will be repeatedly played back as a loop on the projection screen.[201] In Cillari's *Se Mi Sei Vicino*, it is not the action of the recipient that is visualized, but its effect. Moreover, the bodily co-presence of a performer may affect the perception of the interaction primarily as an encounter with the performer, not as a presentation. In the case of longer-lasting interactions with the work, however, the recipient may become more interested in creating visual and auditory effects. His attention becomes divided between watching for potential physical feedback from the performer and the audiovisual feedback of the technical system. The action thus oscillates between the intention of generating an image and the desire to establish interpersonal contact.

The recipient's potential attitudes toward the interactive work bring us back to the question of aesthetic distance, which I will examine now in more detail, starting with a critical consideration of the immersive potential of interactive art.

Illusion, immersion, flow, and artificiality

When a designated object is imitated so well that the recipient comes to believe he is looking at the object itself, the phenomenon is usually called an illusion. Illusion thus relies on the recipient's negation of his own awareness of artificiality (the abstraction of the aesthetic experience from everyday reality). In a study dealing with digital media, what first comes to mind in relation to the concept of illusion is the illusionism of virtual reality. Virtual reality is usually defined as a computer-generated environment which the recipient feels part of or surrounded by and which opens up possibilities of interaction.[202] However, the simulation of spatial situations is by no means the only type of illusion that can be created using digital systems. In addition to visually illusionistic effects, simulations that regard the interaction itself are also possible, for example when a recipient is supposed to perceive an interaction with a technical system as communication with a cogitative partner. This was the case when

Joseph Weizenbaum's computer program Eliza imitated communication with a psychotherapist and fooled many recipients. However, as we have seen, most media artworks dealing with communication situations clearly stage the virtual interlocutor as a machine in order to critically examine ideas about artificial intelligence. In fact, the visions conjured up by the terms "virtual reality" and "artificial intelligence" continue to founder on the impossibility of creating enduring multisensory illusion or convincing simulations of human intelligence and on the fact that our concept of reality itself is becoming less and less solid. The more our everyday existence is shaped through media, the more questionable any attempt to draw a clear boundary between actual and virtual reality becomes. If art can be said to reflect and comment on our lives, then it is clear that media art, especially, doesn't primarily deal with our physically tangible environment, but with the reality of a world that is shaped and structured by media. In our highly mediatized environment, artists are interested not only in dealing with what is physically or socially real, but also in dealing with what has already been simulated. Margaret Morse asserts that the growing dominance of media is leading to the construction of a cyberculture that defines both our subjective perception of the world and our place within it. Morse argues that even socially constructed reality is shaped by "virtualities"—"fictions of presence" that have no clear boundary with everyday life. In the new "virtually shared worlds," we interact in physical space with a world of auditory, visual, and kinesthetic images and event spaces.[203]

As early as 1974, Erving Goffman wrote in *Frame Analysis* that the idea of a singular reality that could be imitated or portrayed was questionable. In his view, the concept of reality denotes only a difference or a flexible frame of reference: "So everyday life, real enough in itself, often seems to be a laminated adumbration of a pattern or model that is itself a typification of quite uncertain realm status."[204] Goffman envisages a multiple layering of experience by means of keyings of the primary framework. "[T]he deepest layering can be expected to occur in scripted presentation of a novelistic, theatrical, or cinematic kind."[205] Interactive art is also based on interplays between the physically real and the artificial, portrayed, or fictitious. For example, Jeffrey Shaw, in his spatially illusionistic 360-degree panoramas, shows film stills from documentary news shows that appear to float freely in space. In *Drift*, Teri Rueb overlays the natural sounds of the seaside with the sound of footsteps (which creates the illusion that real people are present) and with literary citations (which are fragments of other fictitious representations). Schemat's *Wasser* stages a detective story in real space, but Schemat links it to memories of past events; the recipient has no way of knowing whether those even actually happened or whether they are fabrications. In *Bubble Bath*, Susanne Berkenheger feigns the presence of a virus controlling the computer, thus creating an illusion that simulates algorithmic processes.

It is left to the recipient to find his own place within these layers of realities and fictions, for his position is by no means preordained. It is possible, at least in theory,

that the recipient doesn't recognize keyings for what they are, but rather takes the representation for what is being represented. Traditional artists attempted effects of this nature, but ultimately the notion of total illusion (which can be traced back as far as Pliny's legend of Zeuxis) can only—if at all—take the form of a short-term illusion that eventually strives for denouement and is thus primarily significant as a topos of art theory.[206] Regarding the domain of computer games, Salen and Zimmerman use the term "immersive fallacy" to denote the still widespread misbelief in this sector that illusions should be as realistic as is possible. They argue that an intensely pleasurable play experience by no means requires the illusion that one is actually part of an imaginary world.[207]

In most cases, whether in traditional or digital art, the recipient will see through the illusionism of the artwork. However, this doesn't mean that he will necessarily reflect on it critically. In the early nineteenth century, Samuel Taylor Coleridge coined the term "willing suspension of disbelief" in order to explain how recipients readily repress their doubts about the logic of a portrayed or described situation in order to remain engrossed in the plot.[208] Thus, in a way, the recipient may voluntarily adopt the role of naive recipient. According to Myron Krueger, this allows the artist to abstract from certain aspects of reality, to reinforce other aspects, or to circumvent restrictions on reality.[209] Goffman also observes that spectators allow themselves to be captivated by a transcription "that departs radically and systematically from an imaginable original. An automatic and systematic correction is involved, and it seems to be made without its makers' consciously appreciating the transformation conventions they have employed."[210]

This form of reception is quite common in the history of art. It can also be applied to media artworks in which the recipient explores the possibilities offered by the interaction system and allows himself to be induced to participate in an unreflective interaction. Such unreflective absorption in an activity is often called immersion. That term was initially used to describe illusionistic participation in virtual worlds.[211] However, as doubts increased that such a state could actually be achieved, the concept was gradually applied to general phenomena of immersion in any activity—in other words, to a not necessarily visual but rather a primarily cognitive engagement that did not perforce depend on illusionistic deception.[212]

The concept of "flow," mentioned in chapter 3, focuses even more specifically on this phenomenon of cognitive immersion. Mihály Csíkszentmihályi defines flow as a state in which "action follows upon action according to an internal logic which seems to need no conscious intervention on our part. We experience it as a unified flowing from one moment to the next, in which we feel in control of our actions, and in which there is little distinction between self and environment; between stimulus and response; or between past, present, and future."[213] Thus, the focus is exclusively on

the emotional and cognitive intensity of the experience. According to Csíkszentmihályi, intensity of this kind can be achieved in different ways. His examples are as varied as playing music, rock climbing, and performing surgery. But flow is also seen as an important aspect of a satisfying play experience. In this regard, Katie Salen and Erik Zimmerman note that play can be an extremely intense, almost overwhelming experience, whether it takes the form of "a cognitive response, an emotional effect, or a physical reaction."[214]

States of flow can also shape the experience of interactive art. Golan Levin describes the ideal reception of his *Manual Input Workstation* as a state of "creative flow"—a kind of rapture. He believes that recipients may become engrossed in the feedback loop in progress and enchanted by the emerging possibilities and relationships becoming apparent between the self and the system, which defy verbalization.[215] In *Very Nervous System*, David Rokeby's aim is that recipients will respond spontaneously to the sounds produced by the work, and Rokeby also strives to bring about a reduction of conscious reflection to the very minimum. Absorption in one's own actions is thus one way in which interactive art can be aesthetically experienced. But how can this conclusion be reconciled with the idea of the epistemic potential of aesthetic experience?

We saw in chapter 3 that game researchers emphasize the make-believe aspect of play. I introduced the term "artificiality" to denote this detachment from everyday life. Artificiality can result from the construction of an illusionistic, make-believe world, but also from the activation of any reference system that differs from that of everyday existence. Unlike the phenomena of illusion, immersion, and flow, awareness of the artificiality of one's own actions (that is, of their difference from everyday life) is considered a possible characteristic of gameplay. Gregory Bateson calls such awareness "meta-communication"[216]; Richard Schechner calls it "double negativity."[217] The experience of play is often informed by the very awareness that one is playing, and that, although actions in a game may have some referent in real life, they still take place somewhere outside of it. This is the experience that Gadamer calls the "to and fro" and Scheuerl calls "ambivalence."

The execution of (inter)actions in a spirit of artificiality—that is, as actions or interplays that are removed from daily life (and often alienated, exaggerated, or decontextualized)—also shapes the aesthetic experience of interactive art. This is true for experimental exploration and expressive creation, for constructive comprehension of narratives, and for operating within communication situations. Even if complete absorption in the activity is possible during the realization of interactive artworks (and even if it is intentionally fostered by some works), most artistic projects explicitly stage interactions as artificial. Many even go further and disrupt the interaction processes and their perception in an ironic or critical manner. In Berkenheger's *Bubble Bath*, for

example, the recipient advancing the story by selecting one of the hyperlinks offered is often rebuked by means of simulated error messages of the browser. The work thus debunks the recipient's readiness to accept his assigned role as a naive devotee of technology. The fact that some recipients of *Drift* returned to the distribution station after only a short while, disappointed that they had not been able to hear anything, indicates that this work counteracts stereotypical ideas about interactivity by deliberately not providing constant feedback.

Interactive art does use effects of illusion, immersion, and flow. It does reside in artificial realms, as does play. But it goes a step further by provoking disruptions that induce conscious reflection on the process of interaction itself. When there is not only awareness of artificiality but also explicit examination of its effects, the result is a mental distance to the object of aesthetic interest, even when the object of aesthetic interest is one's own behavior. This reflective component of art reception is the point at which art and play part ways.[218]

Self-referentiality and self-reflection

At the beginning of chapter 2, we saw that an artifact, in order to be considered an artwork, must either seek to convey something or invite the viewer to reflect on something. This meta-level (Danto's "aboutness") can be constituted by a reference to something that lies outside the composition. The work may follow a certain iconographic tradition or adhere to established sign systems. Often, however, works do not refer primarily to extraneous themes, instead exposing their own functionality or mediality and stimulating reflection on these attributes.[219]

This kind of self-referentiality was used as an artistic strategy before the modern era, even though it is primarily associated with modernism.[220] Self-referentiality can be found within a single genre (for example, the focus of Yves Klein's paintings is the substance of the paint); it also can serve as a mode of comparison across genres (for example, Lucio Fontana's canvases feature slashes that create a contrast between painting and plasticity). In interactive art, the complexity and the novelty of the media component further encourage the use of self-referential strategies. Erkki Huhtamo employs the term 'meta-commentary' to "refer to an art practice which continuously de-mythicises and de-automates prevailing discourses and applications of interactivity 'from the inside' utilising the very same technologies for different ends."[221] In interactive media art, we are not dealing with a work showcasing its own paint or plasticity, but with a system scrutinizing its own interactivity or an interface design examining its own underlying programming language.

As has already been discussed in relation to theories of the performative, the self-referentiality of action-based art is not limited to the formal characteristics of the action proposition; it may also inform the actions and processes that are staged or enabled. In interactive art, the interpretability of the interaction proposition enters

into an interplay with the interpretability of the processes of its realization. The system's propositions and the recipient's actions can reciprocally comment on, orchestrate, or counteract one another. This is what happens when the audiovisual feedback to physical relationships arouses associations with energy fields, as in Cillari's *Se Mi Sei Vicino*, or when the supposed precision of technical systems provokes a feeling of disorientation in the recipients, as in Rueb's *Drift*. As *Drift* shows, such self-referential interpretability doesn't necessarily exclude the use of references to traditional sign systems. That work's use of literary passages dealing with the topic of being lost creates a link between traditional signification and processual self-referentiality. In fact, the use of traditional sign systems or narrative assets to contextualize actions, processes, and materialities can reinforce self-referential allusions. In *Room of One's Own*, Lynn Hershman employs film scenes to stage a communication situation in order to comment on processes of presentation and observation that are typical of the art system. When Agnes Hegedüs' *Fruit Machine* invites recipients to piece together components of a slot machine in a kind of jigsaw puzzle, her reference is not only the entertainment industry but also recipients' expectations of interactive art. The purpose of the symbolic elements in these cases is to contextualize the work's processuality and mediality.[222]

The self-referential allusions of the interaction proposition—or its realization—are complemented by invitations to partake in individual self-reflection, which can occur at different levels. In *Very Nervous System*, David Rokeby's goal is heightened sensitivity to bodily self-awareness; Blast Theory's *Rider Spoke* is concerned with meditations on one's own life; Berkenheger's *Bubble Bath* encourages the recipient to consider his position with respect to media-based systems.

Robert Pfaller criticizes art's focus on self-reflection as fostering a kind of narcissistic desire. In his view, the recipients of interactive art are no longer interested in "something which is different to themselves."[223] Here Pfaller is in tune with Rosalind Krauss, who highlighted the narcissistic tendencies cultivated by video artists as early as the 1970s.[224] Although these observations cannot be dismissed, they disregard the critical potential of artistic projects that invite the recipient to take a step beyond naive self-representation. David Rokeby shares this view: "While the unmediated feedback of exact mirroring produces the closed system of self-absorption . . . transformed reflections are a dialogue between the self and the world beyond."[225] Thus, self-reflection is not limited to affirmative self-adulation; rather, like other forms of referentiality, it can trigger various epistemic processes.

In sum, simply noting that interactive art can be self-referential is simplistic, for the "self" that is referenced can be any one of a variety of actors and processes. Projects may refer to the entire art system, to their own genre, to artistic traditions, to the technology they use, to media-based constellations, or to the recipient's behavior.[226] Thus, to say that an artwork is self-referential doesn't sufficiently describe its interpretability.

Self-referentiality encompasses a broad spectrum of possible references within the various institutional, medial, technical, and symbolic systems of reference.

Aesthetic distance and knowledge

We have seen that what differentiates interactive art from play is the fact that interactive art provokes irritation and frame collision and uses different forms of self-referentiality. Unlike the traditional performing and visual arts, the potential interpretability of interactive art doesn't address a distant spectator; rather, an interaction proposition must be activated by the recipient. The work achieves its realization in the process of interaction. Thus, in order for knowledge acquisition to take place, materiality and interpretability must be brought forth and experienced at the same time. Aesthetic distance in interactive art is thus not an absolute value or a stable constellation; rather, aesthetic experience manifests itself in a process of oscillation between flow and reflection, between absorption in the interaction and distanced (self-)perception, and between cathartic transformation and cognitive judgment.

Not all theorists agree that reflection is possible at all during absorption in an activity. Marvin Carlson claims that states of flow impede reflexivity through the merging of action and awareness, the total concentration on the pleasure of the moment, and the loss of a sense of self or goal orientation.[227] Although Mihály Csíkszentmihályi shares this view, he sees reflection as a necessary counterpart to flow. He argues that, because flow prevents reflection on the act of consciousness, interruptions of this state, however minimal, are essential: "Typically, a person can maintain merged awareness with his or her actions for only short periods, which are broken by interludes when he adopts an outside perspective."[228] In the same vein, John Dewey describes a rhythm of surrender and reflection. He asserts that the moment of surrender is interrupted in order to ask where the object of the surrender is leading and how it is leading there. Because surrender to the object is consuming through "cumulation, tension, conservation, anticipation, and fulfillment," one must distance oneself enough to be able to "escape the hypnotic effect of its total qualitative impression."[229]

Both Csíkszentmihályi and Dewey thus posit an alternation between states of flow and reflection. Goffman, by contrast, believes that flow and reflection can occur in parallel. He argues that a person can be simultaneously active in different channels of activity, observing and reacting to other occurrences while engaged in a concentrated action and even communicating in a "concealment channel."[230] Martin Seel, too, argues for a simultaneous existence of reflective and immersive modes of experience when he points out that "for the process of art-related perception, it is not decisive which of these forces—sensuous sensing, imaginative projection, or reflective contemplation—takes the lead; rather, what is decisive is that they come together one way or another and enter into *one* movement sooner or later."[231]

Whether or not the dominant mode in the active realization of interactive art is an alternating or a parallel manifestation of reflective and immersive moments, what matters in this context is that aesthetic distance or reflection is not only possible in the experience of interactive art, but is an essential counterpart to absorption. Aesthetic experience of interactive art is specifically shaped by the interplay between immersion and distance, for only in this way can one's own actions become available as an object of reflection.[232]

The present study has shown that oscillation between different modes of experience, different levels of reality, different systems of reference, and different forms of action is characteristic for interactive media art. The multi-layered, open-ended, and occasionally contradictory interpretability of the interaction proposition finds its counterpart in the subjective perceptions and contextualizations that guide its realization. The knowledge that can be achieved through aesthetic experience feeds on the oscillation between flow and reflection.

The reflective moments of such an epistemic process do not necessarily require the recipient's own action, which, in fact, may sometimes impede distanced reflection. Consequently, the mode of experience of vicarious interaction, as described by Golan Levin, is certainly justified in interactive art, too. Nonetheless, such experience remains one-sided or fragmentary, for it lacks the states of flow and cathartic transformation that complement reflection. The difference between the aesthetic experience of vicarious interaction (Levin) or reflexive imagination (Blunck) and that of active realization is that in the former cases the reflective elements are in the foreground. It is not possible to generalize the significance of this for the experience of interactive art; it can only be assessed with respect to individual works, and perhaps only with respect to each individual experience of a work.

As individual—and thus unique—experiences, aesthetic experiences of interactive art can never be representative. This assessment applies to all reception of art, but its significance is emphasized by the requirement of active realization that characterizes interactive art. The provocation of reflection through action is also present, in principle, in all participatory art forms. However, the potential levels of representation and systems of reference are significantly increased by the use of digital media, insofar as processuality is already present as a potential in the interaction proposition. Rokeby describes this relationship as "partial displacement of the machinery of interpretation from the mind of the spectator into the mechanism of the artwork."[233]

The Ontological Status of Interactive Art

Having located the aesthetic experience of interactive art in the oscillation between flow and distancing and in the oscillation between action and reflection, we can now

Figure 4.11
The ontological status of interactive art. Sergi Jordà, Marcos Alonso, Martin Kaltenbrunner, and Günter Geiger, *reactable* (since 2007).

take a step back in order to examine the question of the ontological status or workliness of interactive art.

Presentation versus performance

The visual arts (and literature) are usually analyzed in terms of the classic triangle of artist (or author), work (or text), and observer (or reader). In the performing arts, the performance is also seen as an entity in its own right in the process of realization of the work. Although the performing arts may be set down in scripts or scores, they are still always created with a view to performance (either by the artist or by an interpreter). Visual arts, by contrast, traditionally denote artistic artifacts that are exhibited rather than performed. However, the boundaries between the genres are by no means as rigid as the traditional academic disciplines tend to suggest. Musical presentations are enhanced by the visual presence of the musicians, and dramatic performances use material elements in the form of scenery and costumes. On the other hand, it has been possible since the nineteenth century to animate images, rendering them performable.[234] And ever since the invention of media storage technology, both performances and animated images can be recorded and thus stored in material form for

subsequent presentation. Moreover, as was discussed in chapter 1, artists have been actively promoting activities that cross genres (for example, in the context of intermedia and action art) since about 1950.

There have always been hybrid forms of performing and visual arts, but interactive art creates a new kind of relationship between these genres. As we have seen, interactive art is based on an interaction proposition that has been developed and constructed by an artist and can be activated at any time in the form of an individual realization—whether or not the artist is present. This twofold basis in presentability and performability must, therefore, be taken into account for an ontological definition of interactive art.

Concept versus realization

Nelson Goodman classifies art not in terms of the way it is presented, but in terms of its nature, distinguishing between autographic (singular) and allographic (potentially repeatable) works.[235] In Goodman's classification, autographic works are artifacts based on the principle of authenticity—for instance, paintings. Allographic works are ideational concepts—for instance, texts or notations. Gérard Genette defines a notation both as an index and as an instrument for distinguishing between obligatory (constitutive) and optional (contingent) aspects of a work's realization.[236] Thus, the notation contains all the indispensable components of the work, but each realization is an individual interpretation.

In interactive art, too, constitutive factors (which are defined by the artist) are combined with contingent factors (which cannot be influenced by the artist). However, the artistic concept has already been given a manifest structure and thus, in a certain sense, has been autographically cast as a technical system and often also as a physical object or installation. This kind of constellation is not envisaged by either Goodman or Genette, for here a singular artifact, which can be considered autographic, embodies a processual potential that is not based on a notation, but on a set of constituative rules.

The IFLA (International Federation of Library Associations and Institutions) model, offers a different way to describe the complex relations between concept and realization. That model starts at an even earlier phase of the production process, in that it views the work concept as an abstract entity—as a distinct intellectual or artistic creation. In other words, the point of departure is the artistic idea. According to the IFLA model, the concept takes on form as an expression, which is defined as "the intellectual or artistic realization of a work in the form of alpha-numeric, musical, or choreographic notation, sound, image, object, movement, etc., or any combination of such forms."[237] Thus, "expression" is the term used to refer to the articulated structure of texts or musical pieces (musical scores, for example) that can nonetheless be the basis for different material realizations. The possible realizations—termed

"manifestations"—represent another phase of the genesis of the work. Thus, the IFLA model envisages the potential existence of different versions of one work, whether as conceptual derivations or as adaptations for different presentation contexts.[238] The advantages of this distinction, which seems rather abstract at first glance, become clear when it is applied. In Tmema's *Manual Input Workstation*, for example, the general idea of gestural manipulation of audiovisual structures, as well as their differentiation across different program modes, can be understood as a concept, whereas their realization as a performance and their realization as an installation can be seen as different expressions of the same concept. However, these expressions can only manifest themselves in the context of the concrete set-up of the work, which may vary with the location of the exhibition or performance.

However, even the IFLA model doesn't cover all aspects of the variability of interactive art, insofar as each manifestation is subject to numerous realizations as different recipients interact individually with the work. Thus, not only different manifestations of a concept (by the artist) but also (and especially) its individual realizations (by the recipient) are contingent factors of the realization of the interactive artwork. Neither Goodman and Genette nor the IFLA model takes the reception activity of the public into consideration.[239]

As was explained in chapter 3, the moment of realization of the artwork is central to theories of the performative. These theories use the concept of event to emphasize the here-and-now presence of an aesthetic configuration. Erika Fischer-Lichte sees an event-oriented—as opposed to work-oriented—perspective as the sine qua non for contemporary performances.[240] Dieter Mersch describes the event of the artwork as a positing or self-manifestation, as something unexpected that cannot be influenced, and also as a fracture or disruption. In Mersch's view, events (unlike actions) occur unintentionally. Mersch describes an event aesthetics "rooted not so much in the mediated (thus in processes of staging and representation) as in incidents that take place."[241] He sees traditional modern art as being based on an artwork-oriented aesthetics, whereas the art of the post-avant-garde, in his view, operates with an event-oriented aesthetics.[242]

This is not the place to debate whether the art of the late twentieth century and the early twenty-first century can be meaningfully described by the concept of event. But certainly the concept of event is still not ideal for an ontological definition of interactive art. The reduction of interactive art to non-intentional events does just as little justice to their ontological status as does the traditional concept of the work of art as an exhibition object. Even though there is scope for unexpected events in interaction processes, they are still based, on the one hand, on programmed feedback processes from the technical system and, on the other, on actions on the part of the recipients, some of which, at least, are controlled with intent. Moreover, the processes of gestalt formation, the perceptions, and the conditions that determine the experience of inter-

active art do not simply happen, but are actively constructed. In other words, interactive art cannot be adequately described by an event aesthetics. Analyzing interactive art requires an (inter)action aesthetics that does justice to the complex roles of artist and recipient alike in controlling or being controlled by the system's processes.

Interactivity

In chapter 2 of this book, the interactive media artwork was described as an artistically configured interaction proposition that takes on and reveals its actual gestalt only in the individual realization by the recipient. It is thus clear that, despite the necessity of interaction for the realization of each work, the work itself still cannot be reduced to the moment of its realization. Its workliness is based fundamentally on the inseparability of the recipient's action and the manifest entity of the system created by the artist. For even if the work always requires new realizations in order to exist, it is still based on an entity that has been created, that can be described, and that potentially can be conserved. This entity may be presented in different versions and manifestations, but it always maintains its own referenceable structure. The incorporation of interactivity in its very structure is what makes interaction possible in the first place. Whereas artistic movements belonging to the postwar avant-garde often sought to reduce the work to an allographic concept (by creating conditions for possible events, as in George Brecht's event scores) or to an autographic event (by reducing the work to a one-off action), in interactive art programmed processes add potentiality to the manifest entity of the interaction proposition. It is thus possible, in agreement with Peter Bürger, to observe a revival of the work of art, though not in its originally static form but rather as an artistic configuration of processuality that can be activated. Even if such action propositions do not necessarily require the use of digital technologies, this study has shown that technology substantially broadens the range of possible configurations. For the interactivity of technical systems creates new potentials for structuring time, a permanent presence of system processes, and different forms of liveness that rely on the system-based processuality.[243]

Medium and apparatus

As manifestations presented to recipients, visual artworks can be considered a type of medium. Jochen Schulte-Sasse explains that a medium can be described as a "bearer of information that does not convey the information in a more or less neutral way, rather fundamentally shapes it, inscribing itself into the information in a way that is specific to the particular medium, so as to give form to human access to reality."[244] Even if the visions of reality presented through art are often unusual or perhaps provocative (in fact, it is even legitimate to ask whether the objects of artistic presentations can be meaningfully described by the concept of reality at all), artworks are still usually bearers of information that they not only transmit but also shape. But is the

term "medium" also appropriate for interactive art or for the artistically configured system that invites the recipient to interact? In order to discuss this question, we must return to the distinction between data-intensive and process-intensive works. Whereas data-intensive works are certainly (also) bearers of information (insofar as they store pre-produced information, holding it in readiness for retrieval), process-intensive works focus mainly on the generation of information or of configurations in real time. In process-intensive works, information is not conveyed or activated; rather, information is created only during the process of interaction. In addition, both process-intensive and data-intensive works permit a kind of "access to reality" that deviates from Schulte-Sasse's definition in that it is not purely cognitive but rather is based on action.

An artifact whose purpose is the active production of objects or information is usually called a device rather than a medium. Here "device" is taken to be a generic term for the various systems used to translate, manipulate, or transform materials and information, and thus to be particularly applicable to tools, instruments, and apparatuses. Whereas a medium is a mediator *of* something, a device is a mediator *for* something: for a process that creates or at least substantially transforms a product. However, this kind of processuality is based on different characteristics for tools, instruments, and apparatuses. Whereas tools are used to mechanically manipulate material and to enhance a person's physical strength and abilities, we conceive of instruments as more sophisticated or complex. Instruments are used for scientific operations or to carry out measurements, availing of the physical or chemical properties of materials (e.g., glass as a prism, mercury for gauging temperature). A musical instrument also relies on physical effects (vibrations or frequencies, in particular), but, as Sybille Krämer points out, differs from other instruments in that its purpose is not enhancing efficiency but "worldmaking"—that is, the creation of artificial worlds that enable experiences not provided by our everyday surroundings.[245]

Most interactive artworks are invitations to select, manipulate, or generate information or configurations. Although the artist may have a quite specific intention, interpretability is never offered in the form of a finished composition; instead, it is an opportunity to act, or an invitation to create multimodal configurations. For that reason, these systems have much in common with musical instruments and could tentatively be described as multimodal instruments. However, in contrast to musical instruments, there is no direct physical relationship in interactive art between input and output, and, since the mechanisms of the transformation are one-off constructs not standardized as specific types of instrument, they are not known to their user.

Moreover, the concept of instrument doesn't entirely capture the nature of data-intensive projects, in which the focus of the interaction is not on the actual generation of multimodal configurations but rather on the selection, the arrangement, or the activation of assets. Even when the assets are not linearly ordered or spatially delimited in a clear way, often not every asset can be activated at any particular moment or in

any particular place in order to become part of the emerging gestalt. This is what differentiates such systems from musical instruments, which generally make all their options available at all times for use in sound production.[246]

The potential discursive functions of interactive art are also only inadequately captured by the concept of instrument. Dieter Mersch distinguishes between aisthetic and discursive media as means of presenting or means of declaring. Media that present, such as images or sounds, prioritize the creation of perceptions, whereas media that declare, especially words and numbers, are based on logical and syntactic structures.[247] A medium can convey both discursive and aisthetic information; an instrument, as a "worldmaker," has primarily aisthetic functions. As we have seen, interactive art operates both discursively and aisthetically.

Thus, if the concept of medium cannot adequately describe the ontological status of the interactive artwork, the concept of instrument is also stretched to its limits, because it does justice neither to the complex processes of mediation nor to the potentially discursive functions of interactive art.

Apart from tools and instruments, there is also another kind of device that can be taken into consideration as a possible reference model for interactive art: the apparatus. The term "apparatus" is used to denote a sophisticated device that usually combines several different functions or processes (such as, in the photographic camera, chemical processes of exposure, optical processes of focusing, and mechanical processes of shutter control) and is based on complex processes of transformation that are often controlled electronically or digitally.[248] The purpose of the apparatus is likewise not to simplify work, but to generate artificial worlds. As Krämer explains, the apparatus "permits experiences and enables processes that in the absence of apparatuses would not only exist otherwise in a weaker form, but would not exist at all."[249] Accordingly, Krämer denotes the apparatus as a medium with the form of a technical device. Thus, one could interpret Krämer's view as suggesting that the apparatus combines the medium and the instrument with the aim of worldmaking. It is therefore worthwhile to examine the apparatus more closely as a potential ontological model of reference for interactive artworks.[250]

The functioning and the potential of apparatuses was first discussed in the context of the "apparatus debate," a discussion, initiated in France in the late 1960s by Jean-Louis Baudry and others, that analyzes cinema as "an apparatus for the conduit of bourgeois ideologies" and is thus interested in the worldview implicitly conveyed by the institution of cinema.[251] The apparatus analyzed in that debate is not only the technical appliance of the film projector, but the entirety of the technical and institutional framework, including the conditioning of the viewer. Thus, apparatus theory initially focused exclusively on one specific apparatus (the cinema), and in analyzing it in terms of discourse theory rather than in terms of its aesthetics. Nonetheless, the apparatus debate has shaped our concept of the apparatus as a complex system that

is not transparent to the recipient. At the same time, it shifts the spotlight onto the recipient, who is described by Baudry as "chained, captured, or captivated"[252] and as a subject of cinema who voluntarily exposes himself to a simulation apparatus that imitates the effects of dreaming or sleep.[253] Siegfried Zielinski, by contrast, points to the existence of different "practices of subject positioning," which cannot be described satisfactorily by Baudry's apparatus theory and require a more precise differentiation.[254] Vilém Flusser joined the apparatus debate in the 1980s, focusing on technological or media-based factors.[255] His study is concerned with the photographic camera, which he considers exemplary. He defines the apparatus as a cultural product that "lies in wait or in readiness for something" in order to "inform" it (i.e., give it form).[256] Like Krämer, Flusser emphasizes that the apparatus neither carries out work nor creates products, and that its purpose is not to change the world but to change the meaning of the world. Flusser's apparatus is first and foremost a producer of symbols. Flusser calls the processes that take place within apparatuses "programs" in order to distinguish them from their material repositories. He thus concludes that "the question of ownership of the apparatus is irrelevant; the real issue here is who develops its program." Even if the operator of the apparatus—as a "functionary"—is closely entwined with his equipment, the apparatus is still a "black box" to him: "The functionary controls the apparatus thanks to the control of its exterior (the input and output) and is controlled by it thanks to the impenetrability of its interior."[257]

Though one may wonder whether "black box" is the best designation for the photographic camera, in view of its quite standardized technology (which is thus generally familiar to many users), the term is certainly appropriate for most interactive projects, for the recipient really doesn't know what to expect. He doesn't know how the technical system works, and thus initially he has no control whatsoever over its processes.

Flusser's technocritical and sociocritical position is especially interesting in the present context because it has much in common with criticisms that have been leveled against interactive art. As was noted in chapter 1, many critics of interactive art bemoan the fact that the program or its author patronize the user while feigning freedom of choice. As the present study argues, however, this situation can in fact be compared to the "fundamental asymmetry" of the relationship between reader and text described by Wolfgang Iser. Thus, it is not a hindrance to aesthetic experience; rather, it is one of its constitutive factors. If we abstract from the ideological subtext of Flusser's apparatus theory, we can use it to further scrutinize the aesthetic experience of interactive art from an ontological perspective. We can agree with Flusser that the apparatus not only broadens the possibilities for meaning production but also channels or limits them. Even Flusser points out that the productive use of such limitations may be the ultimate goal of working with apparatuses. Flusser argues that this is expressed by the fact that photographers (whom he distinguishes from functionaries or mere operators) do not play *with* their "plaything," but *against* it: "They creep into

the camera in order to bring to light the tricks concealed within."[258] People are attracted to interacting with apparatuses not only by the opportunity to avail of their invitation to produce meaning but also by the desire to test their limits. In this respect, too, parallels can be drawn between the apparatus and the interactive artwork, for in interactive art, too, the recipient is interested not only in exploiting the operational possibilities but also in exhausting the constitutive limits of the system.

Thus, the apparatus defines the modus operandi of interactive artworks quite accurately. Nonetheless, it would be going too far to claim the reverse—that every apparatus is an interactive artwork. For even if interactive artworks are characterized by the modus operandi of apparatuses, their ultimate objective is not to manipulate matter, or to convey information, or to make worlds. The thesis of the present study is that the aesthetics of interactive art manifests itself primarily as an aesthetics of interaction. The focus of interactive art is on the staging, the realization, and the critical analysis of interaction processes, not on the gestalt that may be created or conveyed by means of these processes. The epistemic potential of interactive art is based, as we have seen, on an oscillation between flow and distancing and between action and reflection that originates in the processes of interaction.

Instrumental resistance and virtuosity

As early as 1934, John Dewey pointed out that an aesthetic experience is possible only where there is resistance on the part of the object of experience. Resistance is also a constituent element of the concept of the apparatus. The concept of resistance will be defined more precisely in this subsection, once again availing of a comparison with the musical instrument. As was explained above, one difference between an interactive artwork and a musical instrument is that the user of the interaction system is initially ignorant of its workings, and another difference is that the relationship between input and output is not based on physical processes. The musical instrument uses carefully calibrated but fundamentally simple physical or mechanical effects (air pressure, vibration, leverage, etc.). As a result, there is a direct physical or mechanical connection between the instrument and the person playing it. The manual operation of keys or the closure of tone holes to create vibrations of strings or air flows and the creation of friction in string instruments or of air flows in wind instruments are all straightforward bodily actions. The musician feels the physical resistance of the instrument. As Aden Evens points out, the instrument doesn't interpose itself between the musician and the music, but it also doesn't have the function of a transparent medium; rather, it offers the musician productive resistance. The musician uses his technical abilities to create sound by means of a productive encounter with this resistance: "musician and instrument meet, each drawing the other out of its native territory."[259] The resistance thus substantially determines the creative potential of the instrument. It challenges the musician, and at the same time it is the basis of his accomplishments.

Whereas, according to Flusser, users of apparatuses "control a game over which they have no competence,"[260] the aesthetic quality of a musician's performance is assessed in terms of his technical mastery of the instrument. The word "virtuosity" implies both technical bravura and the musician's ability to reproduce or interpret particular scores. The score permits a temporal separation between composition and performance, allowing for a practice period in between the two.[261] Composition and performance coincide only in improvisation, where the mediating score is absent and the musician's virtuosity becomes apparent in his combination of spontaneous creativity and technical mastery of the instrument. Consequently, Evens considers musical scores to be a constraint for musicians: "How much more difficult it is to discover the music's ownmost possibility when the correct note has been specified in advance. How can the musician become one with his instrument when a score stands between him and the music, mediating his experience of it?"[262] However, Evens concedes that the risk of failure is greater in improvisation. He argues that this is why musicians draw on methods that introduce unpredictable or chance elements, such as altering their instrument or incorporating random factors. In this way, Evens asserts, musicians deliberately increase the resistance of the instrument in order to maintain a quality of experimentation when improvising.[263]

Because conception and execution usually go hand in hand in the visual arts, interpretation and improvisation, as categories belonging to production aesthetics, become irrelevant. In interactive art, by contrast, the recipient's action has similarities with musical improvisation.

Interactive art: The resistance of the apparatus

The tension between action potentials and their restriction through the resistance of an existing system also conditions the realization of interactive artworks. The similarity between interactive art and improvisation is that both usually dispense with scores or directions. However, the recipients of interactive media art face a twofold challenge, because they are not even familiar with the workings of the system. In contrast to a musical interpreter who knows and has mastered his instrument, the apparatus operated by a recipient of interactive media art is entirely unfamiliar to him. The experimental exploration of the system's resistance is an activity in its own right—an aesthetic experience that takes place somewhere on the border between aesthetics of production and aesthetics of reception. For, as we have seen, the system can facilitate rapid understanding of its operations by clearly evidencing the link between constitutive and operational rules or by presenting a highly intuitive interface, but it can also turn the exploration into an irritating and unsettling experience through the use of intentional disruptions.

Flusser argues that an apparatus, in order to fulfill its function, must be complex: "The program of the camera has to be rich, otherwise the game would soon be over.

The possibilities contained within it have to transcend the ability of the functionary to exhaust them, i.e. the competence of the camera has to be greater than that of its functionaries."[264] Unfortunately, Flusser doesn't describe this competence in any more detail. A more in-depth analysis of the functionality of the apparatus and of its significance for the interaction process is needed to establish exactly how the apparatus-like resistance of the interaction proposition influences the processes of gestalt formation and the experiences that take place during the realization of the work.

The emergence of gestalt in art is generally considered to be a result of artistic productivity or creativity. According to Dieter Mersch, fundamental categories of creativity are sought within processes of imagination and figuration. On that view, the artist either creates "out of the free power of his imagination as an inexhaustible source of infinitely new images and ideas" or "refigures [images and ideas], recombines them, and transforms them into other forms that have never been seen before."[265] Following this line of reasoning, one could argue that interactive media art tends to leave in the hands of the recipient aspects of the figuration for which the artist has imagined a figuration apparatus in advance. However, this figuration apparatus is not a simple tool but a complex and resistant system. The extent to which the figuration is already determined in advance by the apparatus and the extent to which the user can intentionally control these processes—and thus their results—therefore vary. For example, sequences of sounds or elements of visual compositions, narratives, and communications may already be stored in the system, awaiting activation or selection by the recipient. Yet Golan Levin, in reference to audiovisual systems, criticizes systems that offer only limited possibilities for the manipulation or arrangement of pre-produced sounds. Though such systems may guarantee a satisfying aesthetic output, they greatly restrict the recipient's freedom. In Levin's view, when recipients have little to lose, they also have little to gain, apart from their pleasure in the artist's compositions: "[C]anned ingredients, all too inevitably, yield canned results."[266] By contrast, Masaki Fujihata, discussing his work *Small Fish*, defends the use of elements that have been composed in advance: "Small Fish is designed so that users will come to understand the musical structure proposed by Furukawa through precisely those limitations." Fujihata explains that, thanks to the use of pre-produced assets, classic musical structures—such as rising and falling sequences or different voices—can be heard "amongst the chaos."[267] What are at issue here are ultimately the pros and cons of what we have identified as the two main modes of experience of interactive art: constructive comprehension and expressive creation, each of which highlights different functionalities of the apparatus.

Whereas constructive comprehension has close parallels with the figuration model (in the form of activation, realization, and synthesis of the pre-programmed assets of the interaction proposition), expressive creation can be described as an imaginative activity (in which forms, movements, or actions are produced and then processed by

the technical system).[268] Both figuration and imagination are, however, determined in interactive art by the resistance of the apparatus, in the sense of a productive resistance that substantially shapes the aesthetic experience of the interaction.

From artwork to device and back

Whereas a musical instrument offers a physical and technical resistance which is overcome by virtuosity, the resistance of an interactive artwork is an experimental challenge. Its resistance is based on the interaction system developed by the artist—with its own logic, which may include paradoxes and delusions. The aesthetic experience of interactive art thus depends on (among other things) the originality of the system, or at least the system's novelty for the user. The functionality of a musical instrument, by contrast, is known and standardized, like the workings of the cinema projector or the photographic camera. Standardization is required for the commercial use and distribution of apparatuses and for the composition of complex scores. At the same time, standardization helps the user in becoming acquainted with a device and in practicing how to operate it. The more familiar the user is with the workings of a device, and the more mastery he has over it, the less attention he gives to it. Instead, his attention is focused on the result he creates. By contrast, the apparatus within the interactive artwork is unique, unknown, and novel, so greater attention is given to its exploration. There are, however, examples of interactive audiovisual systems that were originally created as artworks and then proved so popular that they are now being standardized or sold commercially. One example is *reacTable* (2003–2005) by Sergi Jordà, Martin Kaltenbrunner, Günter Geiger, and Marcos Alonso, a "music table" featuring musical building blocks tagged with markers that can be operated simultaneously by several different users. Another example is Toshio Iwai's *Tenori-on*, a portable panel with 256 LED keys that allow melodies to be programmed, played, and visualized. Both of these systems are now sold commercially and can thus be practiced on at length.

In principle, many interactive artworks offer the recipient the possibility of penetrating the operational and constitutive rules of the system through exploration until he is able to operate the system with virtuosity. Then, however, the ontological status of the interaction proposition changes fully from artwork to device, for the exploration of the system's workings fades into the background and the potential moments of reflection diminish.[269] The outcome of the interaction gains in importance because it becomes increasingly controllable and, as an independent result, can itself assume the status of an artwork. As the virtuosity of the recipient increases, the aesthetic experience is ultimately transformed entirely into an aesthetics of production. This point is also made by George Poonkhin Khut, who for this very reason explicitly avoids focusing on instrumental possibilities for expression: "My reluctance to frame the interaction in terms of expression stemmed from concern that audiences might

become fixated on the notion of expression and lose sight of the work's primary goal as a system for sensing and reflecting on their own embodied subjectivity."[270]

To sum up, the concept of the apparatus is of great value for identifying the ontological status of interactive art. The concept of the apparatus does justice to the combination of presentability and performability that characterizes interactive artworks in that they are simultaneously manifest entity, invitation to take action, and basis for performance.[271] Like the apparatus, the interactive artwork calls out to be activated. Both the apparatus and the interactive artwork enable both exploration and expressivity, insofar as complex and programmed resistance—a constitutive element of aesthetic experience—can also lead to the production of (audiovisual) formations. Thus, what we have in interactive media art are apparatus-like artworks whose epistemic potential must be sought in the process of interaction. However, this process may also turn into an experience guided exclusively by production aesthetics. Then the interaction system becomes a device that is used to create manifestations that, in turn, proffer themselves for contemplative reception.