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,

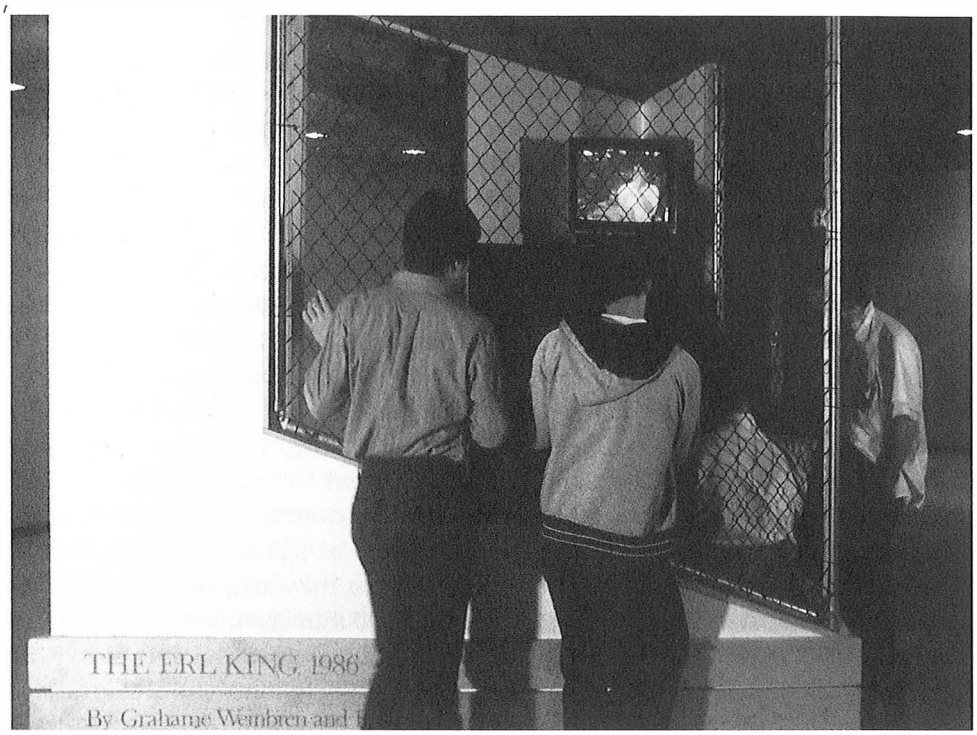

Figure 4.1
Actors of interactive art. Roberta Friedman and Grahame Weinbren, *The Erl King* (1983–1986/2004), installation view, Los Angeles Museum of Contemporary Art, 1986.

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

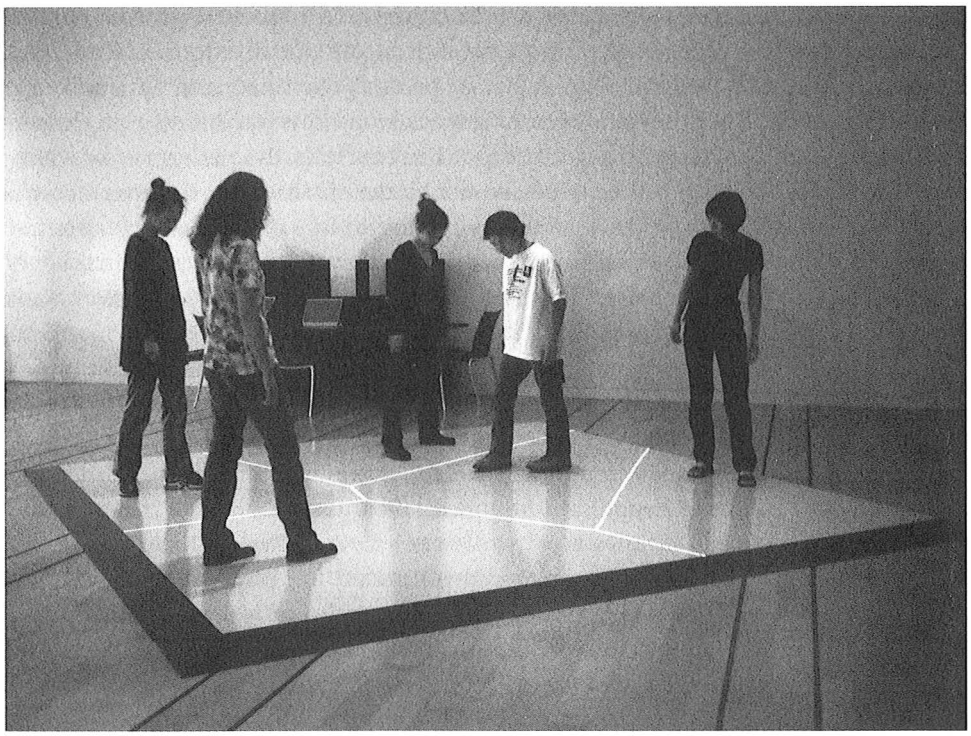

Figure 4.2
Spaces of interaction. Scott Snibbe, *Boundary Functions* (1998), installation view (© Scott Snibbe).

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

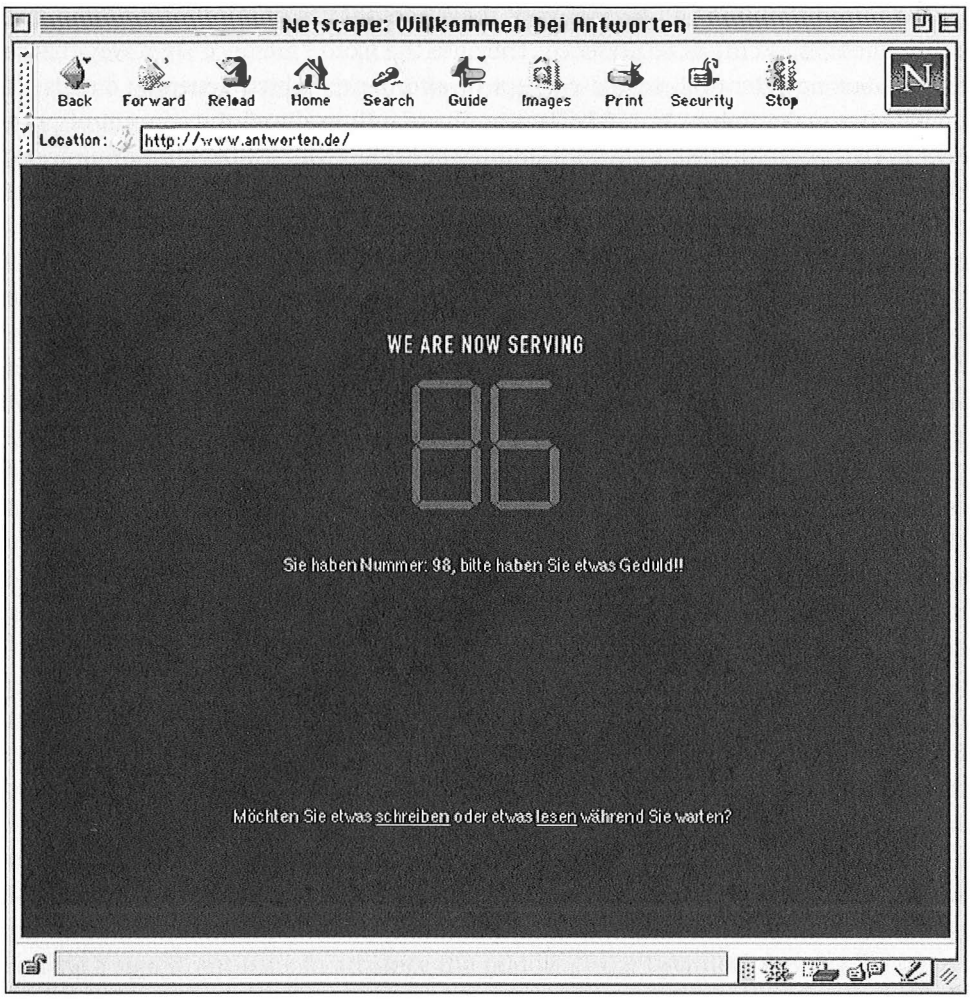

Figure 4.3
Interaction time. Holger Friese and Max Kossatz, *antworten.de* (1997), screenshot.

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