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Repositorium für die Medienwissenschaft

DFG Deutsche Forschungsgemeinschaft

Philipps Universität Marburg

Paradigms of interaction: Conceptions and misconceptions of the field today

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No. 30 – 2003

Abstract

This article gives a selective overview of the use of interaction as a concept in computer game and literary theory in the last decades. It uses this overview as a sounding board for a (re)definition and refinement of the concept, arguing that for analytical purposes we need to approach from a more stringent perspective how interaction concretely functions in both single-user and multi-user "text" forms. Following, it discusses primarily the scope of interaction in various genres, outlining three basic interactive" text" types: static, pseudo-dynamic and dynamic.

Both academics and practitioners working with games and digital narratives have written about the concepts *interactivity* and *interaction* in relation to digital art forms such as games, interactive drama, and hypertext fictions (see for instance Pearce 1997, Murray 1997, Ryan 1997). Unfortunately, most have tended to define these concepts in normative and discursive ways that render them useless for the concrete analysis of a digital work. A story of statements such as "a high degree of interaction is more rewarding than a low degree of interaction," have so vitiated the terms *interaction* and *interactivity* that some theorists have explicitly discarded the associated concepts (see for instance Aarseth 1997, 2002 and Manovich 2001), although their theories implicitly discuss interactive functions.

Nevertheless, practising academics working with interactive works of art and entertainment must necessarily address their interactive aspects. Fruitful approaches to interaction must neither abandon the concepts nor break interactive functions into many tiny sub-functions (for an example of this approach, see Manninen 2000). This article attempts to help develop a useful understanding of the general functions and characteristics of *interactivity* and *interaction* and broaden the paradigms of interaction that exist today. I begin by revisiting the concept and its use in several disciplines (primarily game studies and literary studies) in order to understand what exactly has been meant and implied by these words. I then propose a set of working definitions and a primitive grammar of interactivity, which

can provide concrete guidelines during the analysis of an interactive digital work, and I widen the concept to encompass forms of interaction other than the communicative and conversational forms. Finally, I propose a categorisation of interactive texts based on their differences in scope of action.[1]

Historical use of the concept

Literary theorists addressed interactive texts as early as 1984, when Anthony Niesz & Norman Holland discussed a text-adventure game in an article in *Critical Inquiry*, enthusiastically claiming that print literature does not "yield the sense of true dialogue that one gets from computerized interactive fiction" (Niesz & Holland 1984, p. 113). In 1989 Richard Ziegfield confronted the "new literary genre" of "interactive fictions" (Ziegfield, 1989). In his article, he made a very basic distinction between simple (predetermined) versus complex (simulated) interactivity as part of a longer analysis of the characteristics of this genre, including its advantages to adventurous authors.

A few years later, Brenda Laurel in *Computers as Theatre* (Laurel 1991) classified interaction using three parameters: frequency, range and significance. In other words, how often can the user interact? How much interaction takes place via the system? How deep is the interaction; does it influence the development or structure of the system? Most importantly, Laurel turned the discussion away from the technical aspects of interaction and instead asked whether interaction make us feel that we are part of a representation or not, thus drawing attention to the importance of the user's *reception* of an interactive work.

Michael Joyce, in his essay collection *Of Two Minds* (Joyce 1995), distinguished between "truly interactive" hypertexts and a non-formulated opposite (Joyce 1995, p. 203). To Joyce, the critical distinction was the ability to influence the "materiality" of text versus simple choice making. It was Joyce who introduced the useful distinction between *explorative* and *constructive* hypertexts: texts that can only be traversed, and those that can be added to (see for instance Joyce 1988, or Joyce 1995, p. 177-180). Joyce also poignantly argued that for the writer and reader of hypertexts, "the issues at hand are not technological, but, rather, aesthetic, *not what and where we shall read but how and why*" (Joyce 1995, p. 183, my emphasis). Like Laurel he thus foregrounded the importance of meaning-making and motivation in the understanding of the workings of an interactive text.

The same year, in the article "Transforming Mirrors" (Rokeby 1995), artist David Rokeby took a closer look at interactive artworks, discussing what "significant interaction" consists of (in an implicit comparison to meaningless interaction). He

emphasised that in the end, what counts for the artist is to make people *believe* they can interact and influence the work in question.

Marie-Laure Ryan in her article "Interactive drama: Narrativity in a highly interactive environment" (Ryan 1997) distinguished between works with low and high interactivity, that is, interactivity that leaves "no mark" in comparison to interaction that turns you into the "co-author of the plot".[2] She also introduced a number of different schemes useful in identifying different forms of interactive story structures; these are further developed in her later book *Narrative as Virtual Reality* (Ryan 2001). She is one of the few people who have tried to graphically represent what different forms of interactive structures or "patterns" may look like. Mark Bernstein is another pattern mapper, presenting several hypertext structures in his article "Patterns of Hypertext" (Bernstein 1998).

In 1997, game designer Celia Pearce published *The Interactive Book*, in which she distinguished between gratuitous and meaningful interaction. The former is the interaction you have with a cash dispenser; the latter is the interaction you have with digital pieces of work that gives you the "feeling you make sense". One of the sensible criteria for making sense is to let the user know that her choices of interaction have consequences. Hence, gratuitous interaction has no consequence or pertinence to the further experience of a work. Meaningful interaction does.

Another milestone in the body of literature on digital aesthetics, interaction, and narrativity is Janet Murray's *Hamlet on the Holodeck,* also from 1997. In this book, she proposed that we use the concept of *agency* rather than interactivity, as something that "goes beyond participation and activity" (Murray 1997, p.128). When we discuss whether something is interactive, she argued that we are actually referring to the computer's ability to be procedural and participatory. From the designer's perspective, she abandoned the notion of "writing" and instead suggested "scripting the interactor": that when we design an interactive piece of work we think in terms of how to implement agency and how to make the user react to it.

Espen Aarseth's seminal work *Cybertext – Perspectives on Ergodic Literature* (also published in 1997) discarded the concept of interactivity, but nevertheless defined an *ergodic* work as one that requires a "non-trivial effort" of the reader in order to be read or used. That is, conscious choice and concrete engagement with the materiality of the text in some form is necessary to produce it. This could also be described as a process of interaction between text, text-producing machinery, and operator (Aarseth 1997, p. 21), and Aarseth has in general been influential in pinpointing the necessity of taking the text-producing *machinery* into account when looking at these *non-trivial* or ergodic texts.

K.K Nygaard, M. Wiibroe and P. Bøgh Andersen in 2001 broke with the tradition specifying "good" and "bad" interaction. In the article "Games and Stories" they made

a tripartite distinction between different *levels of interaction* (Nygaard, Wiibroe and Bøgh Andersen 2001) in 3D environments.[3] They discuss the level of story interaction (influence on the turn-out of the story, characters), the level of plot interaction (influence on the access to information and when to get it) and finally, they introduce a level of kinetic interaction, which is the form of interaction that enables an avatar's movement through a simulated world.

Newer works in the field have tried to examine the concept of interaction, not in relation to specific works or from a merely aesthetic point of view, but in relation to specific historical or scientific contexts. Notably, media archaeologist Erkki Huhtamo in the article "From cybernation to interaction: a contribution toward the archaeology of interactivity" (Huhtamo 1998) discussed the rise of the use of the word *interaction* and shrewdly pointed out that as term and marketing gimmick it was not used before the early 1990's.[4] Huhtamo also traced some basic perspectives on interaction (here primarily understood as a human-system relation) further back and related it to the history of automation. He identified an age-old dichotomy in our understanding of the automat (the machine): we have perceived it either as a system, which allows control of and intervention into human activity (an automated system, a dehumanising machine), or as a system function, which relieves us of the triviality of repeated actions (an activity initiated by man, an extension of him). Hence, the process of interacting with the machine can be understood as an either liberating or restrictive activity, giving us, the humans, more control of the world or taking it away from us. Thus, interaction as activity either allows us control – or allows the control *of* us.[5]

Jens F. Jensen's recent articles (see for instance Jens F. Jensen 1997, 2001) have provided a much needed framework within which to understand the concept of interaction, by identifying the trends in the major disciplines that inform various uses of the concept; these will be further discussed below.

Today, theoretical examinations of the concepts of interactivity and interaction continue. As just one example, scholars in the field of Communication and Media Studies have introduced useful concepts such as "computer-mediated interactivity" (Mayer 1998) and "cyber-interactivity" (McMillan 2002), and applied a critical understanding to the use of the concept (see Mayer 1998, Kiousis 2002).

A disciplinary framework

The definitions of interaction presented thus far are primarily concerned with the interaction between user and work; they explicitly or implicitly operate with *interactivity* as indicating the ability to affect the text or artwork in question.[6] This

reading of interactivity is not necessarily exactly similar to that of other research traditions, and it is important to be aware of the possible differences in the application of the word within various disciplines, both when approaching literature in the field and when applying it oneself. Jens F. Jensen (Jensen 1997) has identified three concepts of interaction at play in the disciplines of Sociology, Media & Communication Studies, and Informatics (HCI or Human -Computer Studies). Jensen mainly discusses the concept in its "relational" sense; that is, he focuses on the entities among whom interaction occurs. He points out that whereas interaction in the sociological sense is defined as a relation between human and human, within media studies the concept of interaction refers to the relation between receiver and the media message (and the pseudo-dialogic instances of these, as when we actually talk to the television screen, often referred to as parasocial interaction) and, finally, within the tradition of Human-Computer Studies, interaction is thought of as the relation between human and machine. This observation is also supported and sketched in an article by Jonathan Steuer (Steuer 1995).

However, a discipline that Jensen does not refer to (as his initial study was written several years ago) is ludology or computer game studies. This discipline differentiates itself from those previously mentioned, in that it defines *interaction* in terms of the possibility of user action; therefore the interactive parties are posited as, on the one hand, the player, and on the other hand, the game world or game system itself and the rules governing the possible interaction with it. A radical ludologist might claim that the game world should ideally be readily accessible to the player at all times; an essential property of games is the ability to exert control over the game environment. The high value placed on player control has sometimes led to a commensurately dismissive attitude towards game elements that are not interactive, such as cutscenes (narrative inserts in the game, explaining what happens "in the story" of the game world).

Sheizaf Rafaeli, a communication studies scholar, has an interesting definition of interactivity, which can help make the game studies concept of interactivity more clear:

> Interactivity is a variable characteristic of communication settings. Formally stated, interactivity is an expression of the extent that in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions. (Rafaeli, 1988, p. 111)

In a communicative context, Rafaeli describes interactivity as an experience of causality and temporality: what is exchanged in the process of interacting depends on what has previously been exchanged. This meshes smoothly with the game-oriented understanding of interaction as continued user activity, that is, a series of interesting choices that ideally affect the user's subsequent choices and ultimately,

the outcome of the game (for more on the importance of "interesting choices", see for instance Rollings & Morris 2000).

Modifying definitions

Now that we have noted the ways different disciplines think of interactivity and interaction, let us turn again to Jens F. Jensen's broad and useful distinction between interaction and interactivity (Jensen, 2001), two concepts that are often used interchangeably. For our purposes we can, with Jensen, understand *interaction* as the actions of two or more agents (or agent-like entities) observed to be mutually interdependent. (Jensen 2001, p.34)

However, in order to avoid falling into a "conversational trap", thinking of the agents as humans engaged in dialogue, we need to understand the agents in question not necessarily as humans or human-like entities with a wish to communicate, but as agents in a more neutral sense. They are autonomous entities with the ability to influence other (forms of) agents and/or initiate action. This broadening of the concept of agents further allows the incorporation of an understanding of interaction that is not necessarily communicative, but rather manipulative or navigational (as is the case with interaction in most computer games). The moment in which interaction takes place can then be described as an activity or event, during which one active agent interacts with another agent capable of initiating action, in a specific interactive setting.

Interactivity, by extension, can then be employed as a general term that describes the potential of an entire media form. Jens. F. Jensen defines interactivity as the measure of a medium's potential ability to let the user exert an influence on the content/or form of the mediated communication. (Jensen 2001, p.38)

This is not far from Steuer, who back in 1994 defined interactivity as

> the extent to which users can participate in modifying the form and content of a mediated environment in real time (Steuer 1994, pp. 67)

Jensen's definition of interactivity is useful because it encompasses the possibility of affecting both content and form (thus incorporating many of the versions of interactivity put forward in the literature reviewed), and simultaneously implies an interpretation of interactivity as a medium's potential ability to allow a user to exert influence. Hence, this definition does not assume that interactivity is a prerequisite for mediated communication, and we thus avoid the temptation to return to normative validations (as we would if we defined interactivity as an essential property of digital media, or as an intrinsic characteristic of a specific genre of art or

literature). Furthermore, the definition supports scalar measurement of the extent of interaction in a work, a valuable capability in light of the heterogeneous scales applied in much literature in the field. Steuer's definition adds further usefulness by including "modification in real time" as a defining feature. Since we wish also to analyse digital works in which multiple users interact with each other and a virtual environment in real time, it is helpful to include it in a working definition of what interactivity could imply today.[7] Let us then, for our purposes, define interactivity as

> the measure of a medium's potential ability to let the user exert an influence on the content/or form of the mediated communication in real time.

The importance of being able to interact in real time and the importance of real time interaction in creating a feeling of presence have been addressed in an illuminating way by Lombard & Ditton (Lombard & Ditton 1997). They have analysed factors that create feelings of *telepresence*: experienced user presence in a represented or simulated digital environment and the belief in the social nature of present agents and system. Building on Rafaeli's definition among others, they identify interactivity as one of the factors that helps create the feeling of telepresence:

> There are two aspects of interactivity that are especially important: the number of previous user inputs that are acknowledged in the current response of the technology [Rafaeli, 1988, 1990] and the speed (or lag time) of the response to user input. A computer which appears to have no memory of recent events in an interaction, or one that is excessively slow in responding, should be less likely to evoke the illusion that the medium is a social entity.

We can then conclude that *technologically successful interactivity*, regardless of scope, is interactivity that takes place in an environment that swiftly responds to the user's input and seems to contain a memory of the user's previous (inter) actions. This definition incorporates the meaningful interaction as defined by Celia Pearce (see above), and is also potentially useful from the perspective of story generation. Experiencing an interactive system, such as a game world, as a system that presents one with a series of interesting and non-trivial choices, is an experience of *interaction in time*; by virtue of this, one could argue, that in retrospect one's experience as a user is always already a *story* of the successfulness or failures of one's actions.

Furthermore, it is important to make distinctions between *who* is interacting (what type of agents), and *what* the agents involved in an interactive event are interacting with (for instance the world of a game system, another human, or the computer as a tool), in order to make clear and analytically applicable distinctions between various interactive functions. I propose we make a clear distinction between *the agents* involved in an interactive event, *the form of interaction* through which they exert influence on each other or the present environment, and *the scope of interaction* they are allowed. Finally, continuing from the definition of interactivity

just presented (and inspired by the paradigm of interaction from game studies), I suggest we add a fourth perspective on interaction, our experience of *interaction-in-time*. This could encompass the experience of being able to interact in real time, the system's memory of this interaction, and the way in which system memory relates to our experience of presence and influence on the interactive environment as a series of continuous choices and actions.

Scope of interaction: categories of interactive texts

I have elsewhere (Klastrup 2002, 2003) dealt with the typical *forms of interaction* identifiable in digital environments, including manipulation and navigation (interaction with the system or the environment) and information retrieval and social interaction (mainly communicative interaction). Readers interested in familiarising themselves with my study of these forms may consult those sources. Here I will primarily focus on an analysis of the *scope of action*.

Personal experience will likely have taught most of us that the concept of *interaction* can easily be abused, such as when toy stores advertise for "interactive toys" whose interactivity consists of pressing a sound button on their belly. However, this misuse or abuse of the word tells us a great deal about what people expect interaction to be. An example of critics using the term in a partial and limited way can be observed at the website of the IP Top Awards (http://www.iptop.com/). On the site, the jury outlines the criteria they applied when choosing the nominees for the European fact sites with the "Best of European Interactive content":

- Is interaction between users and the site stimulated? Are message boards, email forms available?

- Can a user contact the staff of the site directly? Is there a possibility to phone/fax?

- Can users interact with other users? Via message boards and/or mailing lists?

- Does the site provide newsletters? Can users react to these newsletters? Are these reactions published? (http://www.iptop.com/categories.htm)

The jury's definition of interaction borders on an understanding simply of interaction as communication. They emphasise the way sites enables the users to be heard - and listened to. The possibilities of shaping content or interacting with objects on the sites are completely absent. Perhaps this is not surprising, since news sites need to produce content (news) that cannot be altered by the users (otherwise the sites would probably lose their credibility very quickly). However, users'

commentaries, as a supplement to the on-site content, are valued, as they produce more content and furthermore show ~~s~~ the site owners' willingness to let the voices of their readers be heard (signalling values such as "freedom of speech" and "democratic dialogue").

Interaction in the world of factual websites is often judged in the same way as the IP Top jury do, explicitly or implicitly: it is a question of enhancing communication and catering for the interests the reader communicates to the site. The user of these sites, on her side, does not want to make a lot of choices in order to reach the wanted information or in order to communicate with the site. Thus, expectations of what one should be able "to do" on a fact site are pretty clear, both in the minds of producers and users.

Interactions within fictional environments are however intrinsically different. Users of digital works tend to want as much (challenging) user action to take place as possible, whereas the developers might want to restrict interaction to better control the player's experience of the world or story in question. Depending on one's familiarity with these types of texts, the user (from a normative point of view) might consider more or less interaction as a positive asset in the work she engages with, and hence be somewhat oblivious as to whether more or less interaction actually *functions* well in the work at hand.

This tension between on one hand wanting as much user interaction as possible, and on the other hand wanting to restrict it, becomes clear in games or digital stories with a didactic purpose: the teacher (developer) will want to ensure that the student using the material gets to know certain information at certain times (for instance, students might need to know how to divide before they can solve the division puzzle). In this case, a positive outcome depends on the teacher being able to control when and how the students can interact with the material given. Less interactive parts of a digital work might also be a necessary part of many games: cutscenes can serve to inform the players about the universe in which they move, display important features of the gameplay, or inform the player of important developments taking place in other parts of the world that she does not currently have access to. Thus, the need for more or less interaction depends on genre and design intentions and the quality of it should be evaluated accordingly. Hence, we should always aim at relating our judgement of the quality or scope of interaction to the specific function of it in the work and genre in question.

Static, pseudo-dynamic and dynamic "texts"

Sites such as Amazon and the sites (news, commercial, marketing) that receive the IP Top awards offer their users a form of static interaction that make possible only

choice-interaction, a mode of interaction in which the reader is offered the choice between (for instance) looking at this book or that book. The choice-interaction or *explorative-interaction* (cf. Michael Joyce) also characterises most hyperfictions (for example, do you want to read link a, b or c?).

However, some site or game designs, such as Amazon or the Danish game *Blackout*, use certain rhetorical moves to cleverly mask this basically static form of interaction as well as the fact that you are always dealing with pre-written text.[8] Small programmes that put your name or your choice of words into a text make it look *customized*, regardless of the fact that all the contextual and adjoining text is the same for every user of the site. Common gimmicks observable at commercial sites include addressing you by your name when you enter (quite common in online bookstores). The combined mail- and website story *Online Caroline* seemingly sends very personalised mail s to the user, but in fact only changes a very few words in the standard e-mail that all the story participants eventually receive (Walker 2002, Cole 2001). Hence, on an overall scale, we need to recognise works that are *pseudo-dynamic:* texts that imply that you as an individual user have a specific effect on the work, but which are in fact *static* interactive texts, whose form and content are on the whole predefined and already fleshed out, allowing little space for the presence and choices of the individual user.

Finally, there are texts, or perhaps rather environments, that do not limit their possibilities of interaction to choices in a menu or a questionnaire, but which truly adjust their actual content to the individual user's preferences and actions. These texts are *dynamic*. They do not contain a complete and predesigned content, but present a framework for interaction and events. *Codeworks* (to use a term coined by artist John Cayley) that produce content according to the behaviour of the user are one example (for instance by following a user's surfing patterns and then, processing this pattern, presenting her with relevant info "grabbed" from the internet). Another example is a simulated environment such as that of action- and skill-games: the game session you create by manipulating game objects in a game environment as simple as *Tetris* should in principle be able to be different from the sessions other users perform. Finally, the most striking examples may be found in the multi-user world. In a world like *EverQuest,* each visit is never the same as the previous visit, as the world itself is constantly updated and other users come and go at random around you. While a game world system can put some restrictions on your behaviour, social interaction in a multi-user environment can never be fully scripted in advance. You cannot program people.

Actual and "perceived" interaction

Looking at interaction at play in the different works should make it obvious that we must take into account the difference between the *perceived* interactional mode of a text and the *actual* interactional possibilities of the text, which is often only revealed after two or more readings or uses.

> We trade subjectivity for participation and the illusion of control; our control may appear absolute, but the domain of that control is externally defined. We are engaged, but exercise no power over the filtering language of interaction embedded in the interface. Rather than broadcasting content, interactive media have the power to broadcast modes of perception and action (Rokeby, 1995, p. 154)

As David Rokeby argues, the content of interactive media is often not control, but the *illusion of control* that we as players believe we have. Making a distinction between how a user perceives an interactive piece and how the piece actually functions (behind the level of presentation) might enable us to make a more clear-cut distinction among the scope of actions in interactive texts. First, we need to make a basic distinction between interaction possibilities on the level of code and interaction possibilities as feigned through the user interface and perceived by the user. It is not only a question of being led to believe that one as a user has a lot of influence on the text at hand, as is the case in *Online Caroline*. There might actually be a number of interaction possibilities in a specific piece of work, which the user of the work *might not* discover at all, due to the programming of the interface. This was the case with some of the first hypertext novels such as *afternoon* (Joyce 1987), in which some links are invisible and have to be found by randomly clicking on words in the text. This distinction between interaction as perceived and interaction as programmed can also be formulated as a difference between interaction that achieves its effects on respectively a semiotic and a non-semiotic level (semiotic here understood as that which relates to the production of meaning and content).

If we are looking at a piece of work from a narrative point of view, we can say that interaction can have an effect on either the level of presentation of story or the level of story content. Interaction on the level of presentation means the ability to change the sequence of events, for instance when and how often they are presented or if they are presented at all. Interaction on the level of story content means the ability to not only change the events themselves, but the entire universe in which they take place. However, both levels - presentation and story - inform the level of interpretation: the final interactive activity performed by the user.

In contrast, if we analyse a work as a simulated world (the text as game system), interaction does not necessarily need to have or create meaning on a higher level; it

can simply be surface interaction or fabric interaction. *Surface interaction* involves manipulating objects in the world and navigating through the world by choosing the direction and style—of movement (moving on the surface). *Fabric interaction* indicates the user's ability to manipulate the world itself, its *fabric*, for instance by adding her own objects (houses, clothes, etc) and ultimately by changing the rules of its physics the world or game system itself. (Striking examples include virtual worlds such as MOOs, which typically allow users to build and expand the world, by way of adding code, both to the database and to programming of a specific object). Whereas the distinction between level of presentation ("discourse") and level of story definitely makes sense when we are talking about *narrative* texts, the surface/fabric distinction is a much needed addition, when we are analysing graphical and navigable environments in which the production of story or the recreation of authorial intention is not necessarily an essential part of the interactive activities.

To conclude, in different forms of interactive texts, different levels of influence can be identified. One must examine both how the text is configured on the level of code and how it on a higher level seemingly allows its reader to engage with it. Ultimately, analysing an interactive work is much a question of discovering its *architecture of interaction*: what functions of interaction it offers and how it "programs" its users to use these functions through interaction with the environment and perhaps also other users. A thorough analysis of this architecture requires an awareness of all available forms of building material, from paint to bricks.

Three interactive genres and the future study of interaction

Part of the analysis of the grammar of an interactive piece of work is the identification of the scope of interaction in the work, both as it is presented to the user and as it functions on the level of code. We can now condense the variations of scope previously discussed into a typology of three basic forms of interactive texts or genres:

Type of text	Interaction
static-interactive texts content fully programmed, manipulable sequences	on level of presentation or surface
pseudo-dynamic interactive texts mainly programmed content, but with certain gaps to be filled by data such as individual user information, so as to maintain the illusion of adjustability	mainly on the level of presentation or surface
dynamic interactive texts content emergent, mainly programmed to adjust the actual rendering of text and content according to the choices and movements of the users	on the level of story content or fabric

Fig. 1. A typology of interactive texts

This article has argued that in order to analyse digital texts with interactive functions, we need concepts that can explain the interactive *elements* of these texts and their *relation* to each other. In an analysis we can apply several perspectives on interactive functions. We need to distinguish between interaction in a communicative sense (the more traditional understanding) and interaction in a game world sense, and to be aware of the importance of both these paradigms of interaction to the user's experience. We can look for *forms* of (inter)actions, the *agents* that can actively affect other agents within the framework of the interactive

environment, and the *scope* of interaction presented in the work. Finally, in a thorough analysis, we can then relate these aspects of interaction to the experience and implementation of *interaction-in-time*. Here I have particularly focused on aspects related to the *scope of text*, the interactive *genres* and the various ways in which they present their possibilities of interaction.

Interaction is still an appropriate word to describe some frequently occurring features of computer-mediated communicative environments and texts. Rather than trying to propose an entirely new term to explain what interactive digital art and entertainment *do*, I have found it more rewarding to direct attention towards defining and refining the understanding of interaction, and building on this, to identify the several functions of interaction in specific works. Thus I hope to have avoided a normative discussion of the usefulness and application of the term in general. I have also pointed out that when dealing with a normatively contested field of study as that of *interactivity*, it is necessary to reflect critically on the implications of one's own approach. What do we think of as an *action* and how does that inform the way we think of *inter-actions*? What is the role of code in relation to the way we perceive an interactive work? How does the way we use the word *interaction* relate to a paradigmatic understanding of what the word refers to? Realising the senses in which we think of *interaction* and what we mean by *interactivity* will always be a good starting point for any analysis of a work with interactive functions.

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Notes

1. It should be noted that this article is part of a larger research project, which attempts to rethink and revise the concept of interaction so as to be able to apply it more concretely to especially multi-user worlds and games.

2. This article was published in a special issue of *Modern Fiction Studies*, which focused on digital fiction and was guest edited by Katherine Hayles.

3. The article was published in an anthology named): *Virtual Interaction: Interaction in Virtual Inhabited 3D Worlds* (Ed. Qvortrup, Lars), focusing on interaction in 3D environments.

4. This article was published in the anthology *The Digital Dialectic* (Ed. Lunenberg, 1999).

5. The question of interaction, not as activity, but rather as "interpassivity" or a new form of control has been raised in recent articles by for instance Laetitia Wilson (Wilson 2003) and Mark Andrejvic (Andrejvic 2001).

6. For a work that relates this aspect of interactivity to interactivity in a broader sense, that is: interactivity between medium-user, medium-society and user-society, see Klaus Bruhn Jensen's article "Interactivities. Constituents of a Model of Computer Media and Communication" (Bruhn Jensen, 2000)

7. Indeed, both the expectation and the awareness of being able to interact with others in real time is an essential characteristics of multi-user game- and entertainment environments.

8. For a thorough analysis of the *Blackout* game see Klastrup, 1999.