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INTERACTIVITY

Lori Landay

Interactivity is the potential for, or phenomenon of, interaction; interactivity can be a property of an artifact, a perception, or an experience. *Interaction* is an action that occurs as two or more participants exchange information (people, artifacts, materials, or machines) that has a reciprocal effect on each other. As human experience, interaction can involve the entire body and all the senses and emotions. The most common example of interaction is a conversation between two people, in which each responds to the other in repeated exchanges, taking into account the information in the previous communications. Interactivity in video games or other forms of new media (for example, websites, interactive digital art, or learning interfaces) most often refers to communication between a human and a computer. The person controls a computer system to do something that is meaningful to them; the system changes because of, and responds to, the user's input as one of the participants in the interaction, and there is a loop of information exchanged. The person may perceive that they are interacting with the computer system in a reciprocal way as if they were participating in a conversation. The interactivity of an artifact such as a video game has come to mean part of the user experience, and is closely related to the concept of gameplay in that interactivity encompasses what a player does to engage in the reciprocal-feeling activity with the system.

Contested Definitions of Interactivity

The definition of interactivity has historically been contested, with scholars from different fields emphasizing either technology, the communication setting, or the perceiver, yielding different insights and interests. Seeking to combine approaches, some define interactivity as predicated on the connections between systems, context, and perceivers, such as when Spiro Kiousis writes, "interactivity is both a media and psychological factor that varies across communication technologies, communication contexts, and people's perceptions" (2002, p. 355). Brenda Laurel (1991) explains that in the mid-1980s, the rage for a definition of interactivity prompted her to offer the idea of interactivity as a continuum of three variables: frequency, range, and significance of user choices in a system (1986), but she revised her earlier work to include the perception of participation, a "thresholdy phenomenon":

> You either feel yourself to be participating in the ongoing action of the representation or you don't. Successful orchestration of the variables of frequency, range, and significance can help create this feeling, but it can also arise from

other sources—for instance, sensory immersion and the tight coupling of kinesthetic input and visual response. If a representation of the surface of the moon lets you walk around and look at things, then it probably feels extremely interactive, whether your virtual excursion has any consequences or not.

(1991, pp. 20–21)

In a similar vein, motion-tracking and biosensor performer and researcher Robert Wechsler elucidates, "we must think of interaction primarily as a psychological phenomenon, rather than a technical one" (2011, p. 62), and adds, "interaction is a feeling you can achieve in a performance setting. It relates to spontaneity, openness and communication" (p. 64). Margaret Morse explains that the "inter" prefix in interactivity is significant:

inter- joins what is other or different together. That liaison between mind, body, and machine, between the physical world and the other virtual scene, requires a translator or *interface*. . . . One interacts by touching, moving, speaking, gesturing, or another corporeal means of producing a sign that can be read and transformed into input by a computer.

(2003, p. 19)

Definitions categorize interactivity as a property of the system, the medium, the user, or a combination of two or all three. The field of interaction design often encourages a perspective in which the designer thinks about how people will use the artifact in order to work from a perspective that foregrounds the user experience in designing the aesthetics and technical aspects. In discussions of video game design, interaction is necessarily a property of the system, characteristic of the medium, and also the "thresholdy" experience that Laurel discusses above. In video game studies, interactivity is closely associated with "gameplay," which seeks to combine the three aforementioned properties, and the concepts of immersion and agency.

Nearly everyone discussing the term interactivity mentions that it is not well understood, having suffered from a too-broad application that conflates interaction with any action causing an outcome. Nevertheless, the term persists because it refers to what game designer Chris Crawford argues is

the very essence of the entire computing experience . . . the computer revolution that began twenty years ago [c.1980] arose from the ability to close the loop with the user, so that input, processing, and output were part of a continuous interaction. Pre-personal computers could handle budget calculations, but the spreadsheet (an interactive budget) caught fire. Pre-personal computers had text-formatting programs allowing users to print out documents, but it was the advent of the interactive word processor that made PCs so compelling.

(2004, p. 45)

Therefore, despite misuse and contested definition, interactivity continues to be essential in video game studies, and it has specific meanings in the fields that inform it—such as computer science, communications, sociology, contemporary art, and design.

Interactivity as Communication and Control, or a Conversation

The loop to which Crawford calls our attention connects to Norbert Wiener's feedback loop. Indeed, at the core of all the different definitions and debates of interactivity are the original tenets of Wiener's pioneering idea of cybernetics. Communication and control still summarize what happens between a user and the computer system when someone plays a video game, whether it be *PONG* (Atari, 1972) in an Atari arcade cabinet, *Tetris* (Alexey Pajitnov, 1985) on a Game Boy, *World of Warcraft* (Blizzard Entertainment, 2004) on a laptop, *Mass Effect 3* (BioWare, 2012) with Kinect, or *Angry Birds* (Rovio Mobile, 2009) on a mobile.

Many scholars discussing video games and new media, including foundational work by Espen Aarseth, hearken back to Wiener's definition of communication as the exchanging of information in order to affect the environment: "information is a name for the content of what is exchanged with the outer world as we adjust to it, and make our adjustment felt upon it" (Wiener, 1954, p. 16). Aarseth borrows "ergodic," a term from physics, to describe the "nontrivial" physical effort necessary for a reader/player to "traverse" the cybertext (1997, p. 1). The physical movements, whether mouse clicks, joystick movement, or kinetic or haptic control, provide input that affects the text, and, in a video game, there can be a direct correlation between what the user does physically and what happens in the game. The feedback loop created by the physical participation of the user, the computer system, and the text (for example, the game) is a particular kind of communication and control. In *Game Feel: A Game Designer's Guide to Virtual Sensation*, Steve Swink details the loop in a process with the player on one side with the first three parts of the process of real-time control, and the computer on the other with the second three: (1) Senses (input); (2) Brain; (3) Muscles (output); (4) Controller (output); (5) Processor; (6) Display (output) (2008, p. 36) (see Figure 22.1).

Interactive architecture systems designer Usman Haque stands in the tradition of Wiener when he explains:

> At its fundamental, interaction concerns transactions of information between two systems (for example between two people, between two machines, or between a person and a machine). The key however is that these transactions should be in some sense circular otherwise it is merely "reaction."
>
> (Haque, 2006, p. 1)

Haque distinguishes between single-loop interaction, in which the outcome is within a "predetermined set of boundaries" and "multiple-loop interactive systems," in which the interaction is like a conversation built up through exchange of information and that each communicator takes into account. There is, for the human, a sense of agency, the ability to effect change. Others concentrating on new media have made a similar distinction between simple (and uninteresting) interactivity and a more dynamic, interactive system. Lev Manovich qualifies the term "interactivity" with "open" and "closed" to indicate whether the user has a role in generating the elements and structure of the cultural object (open) or chooses among fixed elements already ordered in a branching structure (closed) (2001, p. 40).

The elusive quality of "open" interactivity has been expressed by the metaphor of a conversation, of reciprocal human-to-human interaction, despite the myriad of ways that human-to-computer interactivity is not conversational. We find this at the begin-
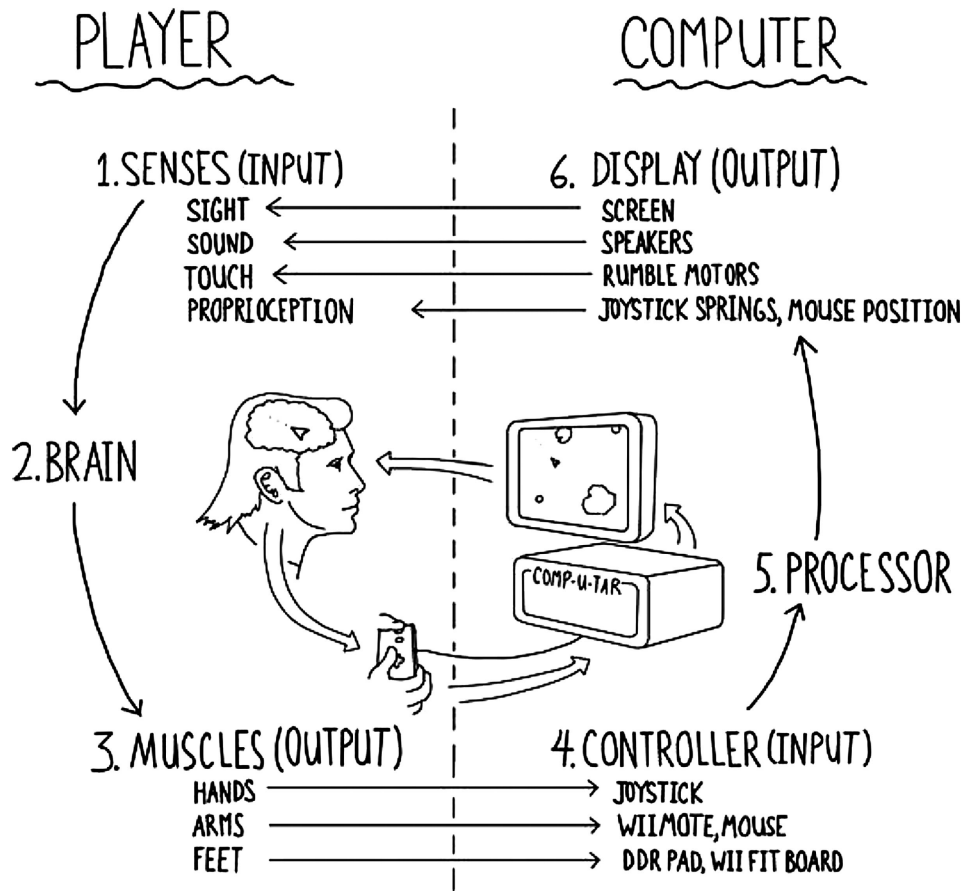
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PLAYER   COMPUTER

1. SENSES (INPUT)   **6. DISPLAY (OUTPUT)**

SIGHT ← SCREEN
SOUND ← SPEAKERS
TOUCH ← RUMBLE MOTORS
PROPRIOCEPTION ← JOYSTICK SPRINGS, MOUSE POSITION

2. BRAIN

COMP-U-TAR

5. PROCESSOR

3. MUSCLES (OUTPUT)   **4. CONTROLLER (INPUT)**

HANDS → JOYSTICK
ARMS → WIIMOTE, MOUSE
FEET → DDR PAD, WII FIT BOARD

Figure 22.1 Steve Swink's "Interactivity in Detail" diagram shows six stages of an input–output loop between player and computer.

nings of definitions of interactivity, with the MIT Media Lab's original working technical definition of interactivity: "Mutual and simultaneous activity on the part of both participants, usually working toward some goal, but not necessarily" (Andrew Lippman, in conversation with Stewart Brand, quoted in Brand, 1987, p. 46). Its five corollaries are: interruptibility, graceful degradation, not losing the thread, limited look-ahead, and the impression of an infinite database. Lippman uses the distinction between a conversation and a lecture to get at the essential ability to change the exchange as it is happening without knowing how it will transpire, to "distinguish between what's interactive, which means mutual and simultaneous, versus alternating" (p. 46). The corollaries mean an interaction between a user and a system that is like a conversation in that (1) you can interrupt the other person for clarification, agreement, or to change the subject and the other person can return to finish the interrupted word or thought; (2) a request that can't be answered can be handled gracefully without stopping the interaction; (3)

an overall thread can be kept even when the thread diverges from the original goal of the interaction; (4) the end of the interaction is not preprogrammed but dynamic, like how a person cannot look ahead to see the end of a conversation that hasn't happened yet; and (5) the choices a user can make appear to be unlimited, despite there having to be limitations in the system.

The corollaries in Lippman's discussion are important for interactivity between humans and computer systems in general and video games in particular because those qualities of conversational interaction are what make an experience with an artifact dynamic. For example, when you can clearly see a series of binary choices in a game, there is not enough limited look-ahead or the appearance of an infinite database, and it is too easy and boring. The difficult task facing programmers and designers is to construct games that give the experience of gameplay that has a conversation's reciprocal feeling of exchange of effect. Activity that is not reciprocal, simultaneous, mutual, interruptible, is not interactivity. Clearly, much of what is commonly termed "interactive," including games, art, educational software, video, television, and other media, does not fulfill the more accurate definition of interactivity based on mutually-effecting exchange of information, but has been perceived of and experienced as interactive.

Chris Crawford's influential definition of interaction: "a cyclic process in which two actors alternately listen, think, and speak" (Crawford, 2002, p. 5) most fully articulates the conversational ideal of interactivity, but does the conversational ideal apply to a gamer's experience playing a video game? Often interactivity is equated with the concept of gameplay, as in Richard Rouse's discussion in *Game Design: Theory and Practice*: "A game's gameplay is the degree and nature of the interactivity that the game includes, i.e., how the player is able to interact with the game-world and how that game-world reacts to the choices the player makes" (Rouse, 2001, p. xviii). Jørgensen writes:

> [G] *ameplay* is not a feature designed into the game alone, but an emergent aspect of interaction between the game system and the player's strategies and problem solving processes. In short, *gameplay* is how the game is played, delimited by the game rules, and defined by the dynamic relationship that comes into being when the player interacts with these rules.
>
> (Jørgensen, 2008)

"Conversation" with Non-Player Characters

The kinds of "hyperselectivity" so dissatisfying in interactive movies on DVD (Perron, 2003, p. 247) do not feel interactive, and often dialogue with non-player characters (NPCs) is really selecting topics for the NPC to relate, to further exposition. To be sure, there are limitations with chatbot and dialogue tree programming that are continually eroded, and artificial intelligence systems such as Radant AI created for *The Elder Scrolls IV: Oblivion* (Bethesda Game, 2006) and used in the *The Elder Scrolls V: Skyrim* (Bethesda Game, 2011) games enable NPCs to interact with each other and their environment in ways that will undoubtedly become more "thresholdy."

In *Portal 2* (Valve, 2011), NPC Wheatley is a robot who initially accompanies Chell, the human, through whose perspective the first-person player experiences the game. Brilliantly voiced by British actor Stephen Merchant, eyeball-robot Wheatley provides company, comedy, and exposition, but in a surprisingly natural, neurotic, and humanly-flawed way. Given that the protagonist, Chell, is silent, as so many characters in

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single-player games are, there is no interactive conversation between you/Chell and Wheatley; however he is so cleverly scripted and performed that it feels like he is responding to your choices and outcomes, interpellating you. The superb writing, programming, and voice acting create a strong perception of interaction.

Artist David Rokeby commented on what it is we seek in interactive media: "Technology mirrors our desires; interactive technologies, in particular, reflect our desire to feel engaged" (Rokeby, 1996). Engagement suggests entertainment, distraction, attention, and emotional affect, but not necessarily what happens in a conversation or a feedback loop. *Portal 2* plays with the desire for engagement, not interaction with other people, to which "interactive" technology appeals (Figure 22.2).

Interactivity, Interaction, and Video Games

Within the field of new media studies (broadly defined), three major approaches to defining interactivity emerge: those that focus on the functions of features of particular technologies; those that focus on processes of interchange and responsiveness; and those that focus on users' activities, behaviors, or perceptions. The first foregrounds the system, and the second, the user's experience. Ultimately, the user's experience depends on the system, and the processes it affords, but whether the user's experience has to include any specific knowledge of how the system is providing interactivity is contentious (this is where debates about transparency come in). The third views interactivity as an experience or quality as perceived by the participant. Katie Salen and Eric Zimmerman frame their discussion of interactivity in *Rules of Play* with the question, "how does interactivity emerge from within a *system?*" (2003, p. 74) They present a model of interactivity with four modes: (1) interpretive participation that occurs in the imagina-

Figure 22.2 Wheatley in *Portal 2* is a programmed NPC reacting to the player's input, but he has been designed and performed to be perceived by the player as another autonomous participant in an interactive exchange.

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tion; (2) functional interactivity or utilitarian participation through which the player controls the material components, like buttons; (3) explicit interactivity as overt participation with the choices and procedures such as using the joystick or clicking the links in a nonlinear hypertext interactive fiction; and (4) beyond-the-object-interactivity as participation outside the designed system, such as found in fan culture. They conclude: "For our purpose, Mode 3, explicit interactivity, comes closest to defining what we mean when we say that games are 'interactive'" (2003, pp. 59–60).

The real importance of Salen and Zimmerman's treatment of interactivity, however, becomes clear when they connect it to "meaningful play," so that "the depth and quality of interaction" can be characterized by how a system responds to player choice (2003, p. 61), in the relationships between action and outcome. Therefore, although they are focused on the system, they are ultimately interested in connecting it to the player experience, and like many others, implicitly consider agency, the capacity to make a difference.

Degrees of Interactivity

There are other perspectives on interactivity from other fields that can also offer insights for video game studies, including how interactivity is approached in media and communications studies, philosophy, advertising, and education, and each approach leads to different emphases on defining interactivity. In constructivist approaches to designing web resources for education, "interactivity refers to active learning, in which the learner acts on the information to transform it into new, personal meaning" (Campbell, 1998, p. 1). Following this principle, in models of online learning, interactivity equating to active as opposed to passive learning is mapped onto kinds of activities that can be built into course design.

Interactivity is also of great interest to advertisers and marketers, and there are quantitative studies of uses of and attitudes toward interactive media. Ghouha Wu found that people had a more positive attitude to websites they perceived as more interactive (Wu, 1999) and more recent studies (Wu, 2005; Gao et al., 2009) have expanded the focus on perceived interactivity.

To try to address the complexity of interactivity, some have turned to models of relative levels of interactivity. Rafaeli (1988) posed a definition based on "responsiveness," measuring whether a medium can be receptive and react responsively to a given user. Choice figures prominently in Lutz Goertz's definition (1995), which has a scale of interactivity along continuums of degree of choices, degree of modifiability, number of selections and modifications, and degree of linearity or non-linearity (Jensen, 1998, p. 197). Carrie Heeter (1989) has six dimensions: (1) extent of choice; (2) effort needed to access information; (3) degree of responsiveness of the media system; (4) potential for registering all user behavior in a form of feedback; (5) degree to which users can add information to the media system others can access; and (6) the degree to which the media system fosters interpersonal communication between its users (cited in Jensen, 1998, pp. 199–200). Jenson offers a definition for media and communication studies: "a measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication" and extends it with four dimensions of interactivity: transmissional, consultational, conversational, and registrational. (1998, p. 201) As touched on above, Haque and others also think about simple and more complex and usually interesting forms of interactivity.

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Interactivity in Art and Performance: Insights for Video Games

Interactive art not only encourages but demands that people break the traditional first rule of art spectatorship: don't touch! As in the field of interactive fiction, artist practitioner-theorists as well as scholars have explored and defined interactivity in interactive art, often in ways that can be illuminating for understanding interactivity in video games. In particular, Stroud Cornock and Ernest Edmonds's early (1973) concept of "the matrix", a dynamic art-system in which meaning is made through the process of exchange among the artist, audience, and the art system (or artifact), posits interactivity as the medium of the artwork (Cornock & Edmonds, 1973, cited in Muller et al., 2006, p. 197).

Thinking about interactivity as a medium as well as a property or potential emphasizes the entire matrix of exchanges that includes the audience/player. Moreover, in interactive art, the physical interaction, the haptic or kinetic action necessary for interactive art to be experienced, can either control or influence movement or other elements on a screen, or in a physical space, and a person experiencing interactive art can often be watched by others as performance, performance in the medium of interactivity. In contemporary dance, for example, practitioner-theorists have experimented with interactivity as a medium in which dancers perform, and have written insightfully interactivity in historical or philosophical contexts (Kozel, 2008). Bolter and Gromala even propose "performance" as "an even better word than *interaction* to describe the significance of digital design in general. As users, we enter into a performative relationship with a digital design: we perform the design, as we would a musical instrument" (2003, p. 147).

Interactivity and Narrative

There is an area of overlap between approaches to interactivity in video game studies and in the field of interactive fiction (also called IF, hypertext, or interactive narrative). Regardless of whether interactivity and narrative are antithetical or can co-exist (a question played out in the ludology vs. narratology debates in video game studies), to read or watch a narrative unfold without having any interaction with it other than interpretive is not the same as playing a game. As Michael Mateas and Andrew Stern contend, and attempt to transcend in their formulation of interactive drama:

> The ephemeral quality of gameplay, the experience of manipulating elements within a responsive, rule-driven world, is still the raison d'être of games, perhaps the primary phenomenological feature that uniquely identifies the computer game as a medium. Where gameplay is all about interactivity, narrative is all about predestination. There is a pervasive feeling in the game design community that narrative and interactivity are antithetical.
>
> (2000, p. 643)

In the narratology vs. ludology debates, some would seek to categorize video games as a kind of interactive narrative; others view interactivity and narrative as mutually exclusive, if they align narrative with fixed and predetermined. However, narrative as defined by restrictions and choice is not the only lens through which to explore the relationships between interactivity and narrative, as Michael Nitsche (2008) deftly demonstrates with his focus on 3-D space in video games and virtual worlds, and a result-

ant shift from narrative to narrating, a "distinction between event and telling of event in video games. Often the player might control the actions but their presentation is defined by the game system" (2008, p. 55). Subtle understanding of story and telling in games, of how players perceive their experiences in that context, provides insight into how interactivity occurs not "in" a computer system, from the perception of the player, but "in" video game space and events. When sound, image, and action are considered together, as Karen Collins does (2013), "interactivity is both a physical and psychological engagement with media" (p. 15) that is "multimodal" (p. 22).

It is the quality of the experience rather than the specific features or kinds of choices that creates the "thresholdy" feeling of interactivity. How choices shape the experience of interactivity in interactive fiction, interactive drama, or video games as interactions between humans and computer systems become increasingly sophisticated, it becomes more and more difficult to ascertain whether one is choosing among a fixed set of choices or generating one's own elements. If we recall Lippman's corollary of the impression of an infinite database, we see that the perception of unlimited possibility is more important than the actual number of choices, or of knowing the number of choices.

Video game critic and game designer Ian Bogost's point that the quality of interactivity within a representation abstracts rather than simulates reality (2007) can lead us to consider an important distinction between interactivity in video games and agency. A player does not need to experience the kind of agency that matters in reality, the ability to enact change in one's situation, because he or she is engaging in play within an abstracted representation. Interactivity in a video game, which is necessarily constrained by the system even if there is the perception of an infinite database and limited look-ahead (and perhaps other of Lippman's more conversationally-oriented corollaries such as interruptibility, graceful degradation, and not losing the thread).

Importance for Video Game Studies

There are two aspects of interactivity that are most important for video game studies: (1) interactivity may be the element of video games that best distinguishes them from other media and cultural forms (such as visual art, cinema, literature, database); and (2) the quality of interactivity in a game may be a way of identifying genres of video games. First, interactivity, as Chris Crawford has argued, is a particular affordance of computers. In particular, it is essential for video games because, no matter how one defines interactivity beyond the systems approach, if someone does not act on and with the system, they are not playing a video game, but are doing something else. Although some argue that all cultural objects are interactive, such as when Lev Manovich writes, "All classical, and even more so modern, art is 'interactive' in a number of ways. Ellipses in literary narration, missing details of objects in visual art, and other representational 'shortcuts' require the user to fill in missing information" (2001, p. 56), interpretations and meaning-making do not change the object itself, or participate in the ordering or other choices of experiencing it in a way that is manifested. Moreover, there is not the reciprocal exchange of information between a reader and his or her book, for example, or a spectator and the film s/he is watching, that there is between a gamer and game. Although the kind of input may differ (joystick, mouse, keyboard, kinetic, haptic, voice), as well as the platform and content, it is the specifically "ergodic" nature of the action of interaction, the combination of physical, intentional, and responsive activity of interactivity that makes interactivity particularly important for video games.

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Although new media forms other than games can also have the property of interactivity as defined here, interactivity is a defining aspect of video games.

Second, the kind of interactivity, when interactivity encompasses gameplay, may be used in video game studies to categorize video games into genres. Mark J. P. Wolf argues:

> While the ideas of iconography and theme may be appropriate tools for analyzing Hollywood films as well as many video games, another area, interactivity, is an essential part of every game's structure and a more appropriate way of examining and defining video game genres.
>
> (2001, p. 114)

For Wolf, interactivity is gameplay, and along with motivation and goal, can be used to categorize video games in the most meaningful way. Although the genres themselves provoked debate, the principle of categorizing video games by interactivity was not substantially challenged. In practical terms, interactivity in video games is what a player can do in them—the choices and action that comprise gameplay.

As those in video game studies seek to delineate and understand what is meaningful and unique about video games, and as video game designers continue to create new experiences for gamers, they find new ways of exploring the meanings of interactivity. Bogost's relevant interaction, Salen and Zimmerman's meaningful play, Laurel's threshold, Nitsche's idea of how game spaces induce narratives—all of these are harder to pin down than a feedback loop in a system, but they point to interactions that engage emotionally, psychologically, and kinetically.

When considering interactivity as a perception of the user, the illusion or experience of participation takes precedence over systems-based definitions of interaction. As one extension of this line of inquiry, Sherry Turkle's discussion of "relational artifacts" such as robot pets, that "present themselves as sentient and feeling creatures, ready for relationship" raises questions about what emotions such artifacts will evoke in their users, about "what loving will come to mean," how it will "affect people's way of thinking about what, if anything, makes people special?" (Turkle, 2005, quoted in Seifert et al., 2008, p. 18).

Questions about interactivity like the one Turkle asks lead to explorations of the broadest issues, such as whether the feeling of reciprocity possible in human-to-computer, or ergodic interactivity can ultimately provide a deep acknowledgement of being-in-the-world for the user, of what, using Bolter and Gromala's term, the *performance* of interactive experience has and could entail in the future. Whether from a theoretical, ludic, or game design perspective, it makes sense to think about interactivity in video games from the user's perspective, as experience, or the potential for experience, and to pay increasing attention to perceived interactivity rather than hunting for technical definitions to describe a phenomenon essential to the enjoyment of video game play and meaning.

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