

INTERACTIVITY IN COMPUTER GAMES

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ABSTRACT

In this paper we attempt to clarify the popular term 'interactivity' within the context of computer games by classifying it into three categories: personal interactivity, social interactivity and environmental interactivity. Each category of interactivity contains five subcategories and success stories from popular computer games are given for each section to highlight the depth and quality of interaction the selected games provide.

INTRODUCTION

Interactivity is a popular catchword and selling strategy for new media but everyone has their own idea about what interactivity is. Is it simply a computer system that responds to user's actions? Is it the ability of the user to control and modify messages? And what is so interactive about computer games? According to Lievrouw and Livingstone (2002) interactivity is not unique to new media but is generally considered to be a central characteristic of it. Researchers often focus on the ambiguity of the concept, conceptualization difficulties, and overuse of the term, because various fields defined interactivity from different perspectives and associated it with different terms: synchronicity, control, rapidity and speed, participation, choice variety, directionality, hypertextuality, connectedness, experience and responsiveness (Rafaeli and Ariel, 2007).

Lievrouw & Livingstone (2002) defined three forms of interactions for emerging communication systems: user-to-user interactivity, user-to-documents interactivity and user-to-system interactivity. According to the level of receiver control on the messages (low and high) and the direction of communication (one-way and two-way), user-to-user interactions are classified into four groups: monologue, feedback, responsive dialogue and mutual discourse. Based upon the level of receiver control on the messages (low and high) and the nature of the audience (active and passive), user-to-documents interactions are classified into four groups: packaged content, content-on-demand, content exchange and co-created content. According to the center of control (human and computer) and the nature of the interface (apparent and transparent), user-to-system interactions are classified into four groups: computer-based interaction,

human-based interaction, adaptive interaction and flow. An ideal interactive system, according to these models, takes the form of mutual discourse, co-created content and flow.

User-to-user interaction, which is mediated through one or more of the five senses, primarily composes of verbal and non-verbal communication forms such as gestures, poses, facial expressions, etc. From a computer gaming perspective, it takes two different forms: player-to-player interactions experienced in multi-player environments and the information exchange between the player and a synthetic agent or a non-player character (NPC). Player-to-player interactions, which enable communicators to have more control over their experience beyond the constraints of time and geography, can be classified as mutual discourse where the sender and receiver roles become nearly indistinguishable. On the other hand, player-to-NPC interactions in computer games can take different forms such as monologue, feedback or responsive dialogue. The interaction level depends on the believability and the AI capabilities of the agent. Although it may seem strange at first, players may attribute human characteristics to virtual agents. The more believable and realistic these characters and their behaviors are, the more human-like the communication process becomes.

In terms of user-to-content interactivity, traditional computer games are usually shipped to online or brick and mortar stores in the form of packaged content. Online gaming platforms like Games for Windows or Xbox Live provide content-on-demand, allowing users to purchase games or game add-ons, to gain and keep track of their achievements (gamerscore) in order to display their progress and prowess to the community. Content exchange can be experienced in computer games that provide special tools or scripting languages to their players. Players can use these tools or scripting languages to modify the existing game or to create new chunks of content, both of which are usually shared on community websites. Modifications change the gameplay process by altering the game mechanics, the virtual environment, the appearance and behavior of 3D objects and virtual characters. And finally, interactive storytelling refers to gaming environments where real-time feedback collected from the players is used by the game engine to continuously modify the content as it is being delivered. Although the player is passively providing a feedback of his/her preferences and play style while actively playing the game, these systems can be classified as being closest to co-created content.

The study of user-to-system interactivity or Human-Computer Interaction (HCI), which aims to improve the interactions between users and computers, is not only concerned with hardware and software but is also the intersection of several fields of study such as psychology, sociology, cognitive science, human factors, interface design, etc. Today's computer games can be classified as computer-based interaction where the player makes his/her selections from the presented information. The interfaces used to interact with a computer game (personal computers, gaming consoles, gamepads, etc.) are usually not transparent but apparent. Interface transparency can be experienced in immersive 3D environments where head-mounted displays, sensing gloves or other specialized equipment are used to block the sensations from the real world and to help the user focus on the sensations of the virtual. But it can also be argued that, regardless of the transparency of the interface, our minds won't really want to do the work of separating media from reality if the media image is pleasant or motivating at a deep psychological level (Castranova, 2007). This is a reasonable explanation since some players lose themselves in the gaming environment and experience the flow state described as activities that provide a sense of discovery, a creative feeling of transporting the person into a new reality or previously undreamed-of states of consciousness (Csikszentmihalyi, 1990).

Sellers (2006) brought a brand new perspective to our notion of interactivity by defining four different levels of it that lead from perceptual, cognitive and psychosocial processes. Perceptual and physical interactivity comprises of the reactions humans give to physical stimuli, especially to bright colors, flashes, moving images, rhythmic or explosive sounds, and to specific proportions in form and color. Game players are also attracted by these pleasurable stimuli and they seek variety in these sensuous impressions. Short-term cognitive interactivity incorporates tasks that involve short-term memory and emotional focus. They combine together to form longer-term goals where planning and strategy come into play to define long-term cognitive interactivity. In this regard, computer gaming can be defined as a series of short-term cognitive interactions to reach a longer-term cognitive goal: the completion of the game or the mission of the protagonist. In a computer game, micro choices are moment-to-moment choices of a player; the way these micro-choices fuse as a long-term strategy defines the macro level of a choice (Salen and Zimmerman, 2003). And social interactivity is both an internal and an interpersonal process that becomes more important if players have persistent identities and are able to affect the game state together.

INTERACTIVITY IN COMPUTER GAMES

In a gaming environment, although it is being overshadowed by the attributes of the technology or characteristics of the medium, interactivity is a product of the computer mediated communication process and an outcome of player actions. According to Rafaeli (1988), interactivity is an under-defined concept that has little consensus on its meaning but it is not located in the features of the medium or user perceptions but in the relatedness of transmitted messages with previous exchanges of information where sender and receiver roles become interchangeable. In this sense, messages transmitted by a computer game are related with

the previous exchanges of information or the former actions of the player. The complexity of this relatedness varies from simply keeping track of game scores to interactive storytelling systems that analyze player actions throughout the game for a customized experience. Our first definition based on Rafaeli (1988) is:

Game playing is a retrospective experience where the player's previous actions or choices have an impact on his/her future.

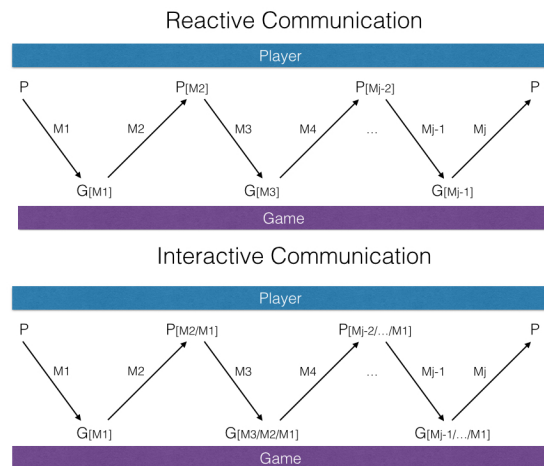


Figure 1: Interactivity model adapted from Rafaeli (1988)

Reactive communication occurs when the game is responding to every message or input send by the player but the system is not keeping track of the history of messages and simply reacting to the last message or input provided by the player. Interactive communication occurs when the game records the history of player actions or choices and responds to the player based on this knowledge.

According to Steuer (1992), interactivity in virtual environments is composed of three elements: speed, mapping and range. Speed is the response time of the virtual world; range represents the number of attributes that can be manipulated by the user; and mapping is a function of the types of controllers used to interact with the mediated environment. Computer games aim to provide instant feedback to player actions but the response time usually depends on the configuration of the personal computer if it is a PC game and on the bandwidth of player's Internet connection if it is an online game. The mapping or the controllers used to interact with the game ranges from standard keyboard or mouse for PC games and gamepads for consoles to specialized input devices such as joysticks, racing wheels or wireless remote pistols. It should be noted that speed and mapping are constant variables for console players. The range of attributes that can be manipulated by the player greatly varies, from the movement/rotation of simple objects in a Tetris game to massive multi-player gaming environments with thousands of objects and players to interact with. Speed and mapping are the technological variables of interactivity here but range is the key towards a meaningful definition of interaction in computer games. Our second assumption based on Steuer (1992) is:

The range of variables that can be manipulated and customized by the user determine the depth of interaction.

Every player interacts with something in a computer game but what is the range of variables that can be manipulated by the player? How do we classify these interactions?

Personal Interactivity

Computer games aim of creating artificial sensory information similar to the stimuli human senses detect and interpret in the real world so that the player will have a sense of being physically in a virtual world. This is personal or physical interaction, or the interaction with the second self. The player needs an avatar or a physical representation in the virtual world which is usually the protagonist of a story. This character or entity may have gestures, facial expressions and movements which can be classified as kinesics, which is body motion communication. He/she will have dialogue options and/or voice as a means of verbal communication. He/she will also have various equipment (clothing, armor, weapons, etc.) and abilities (skills, spells, feats, etc.) to play the game. Therefore, physical interaction can be analyzed in five sections: avatar, kinesics, verbal communication, equipment and abilities. Schultze and Leahy (2009) also defined the technological features of the second self as a body, possessions, animations, a profile, a camera and modes of communication. Given below are examples from popular computer games that offer rich interaction opportunities for personal interactivity.

Avatar: The *Elder Scrolls* series offered extensive customization options for the representation of your character. Besides common changes such as skin tone, hair color, hair model, eye color, etc. you can also adjust your character's brow, chin, cheekbone, nose, jaw and mouth with various sliders. There are hundreds of forum posts and YouTube videos on how to make your character look like celebrities. The *Dragon Age* series also provide similar customization options when you create your character.

Kinesics: The *Witcher Wild Hunt* used a motion capture studio, with the help of master swordsman Maciej Kwiatkowski, to practice and capture the protagonist's movements and all of the other combat animations for the game. Even the sex scenes in the game are constructed from over 16 hours of motion capture data. Realistic kinesics make the protagonist of the game more believable for the player.

Verbal Communication: The *Baldur's Gate* series offered well written dialogue options for the characters that captivate the player. The player can also select his/her character's voice from a preset of voices. Voice acting for the protagonist of the game is a major issue in game design because he/she will be the voice of the player in the virtual world.

Equipment: The *Diablo* series offered hundreds of different equipment throughout each game but with the material salvaging and item crafting options there are virtually an infinite number of items that the player can use. The legendary loot is the most captivating feature of the game. Similarly, the *Kingdoms of Amalur: The Reckoning* offer blacksmithing and sagecrafting skills for item customization. Sagecrafting skill allows the player to craft gems from shards found throughout Amalur, socket them into

equipment, and combine lower quality shards into higher quality shards.

Abilities: Games based on the famous *Advanced Dungeons & Dragons* tabletop role-playing game (RPG) offer a complex and rules heavy system with different classes that come with specific abilities, skills, feats and spells but the player can also customize his/her own class. *Baldur's Gate* and *Icwind Dale* series are the most prominent examples.

Social Interactivity

The player is rarely alone in the virtual world and he/she constantly interacts with other characters whether they are artificial or real. Some of the artificial characters simply populate the environment but others are merchants or key characters of the story. There are also support characters called henchmen that travel with the player and help him/her. Characters, artificial or real, also build factions or guilds in the game where they gather, share information and resources, help each other. And of course there are enemies scattered across the virtual world which oppose the player. Bartle (2004) also classified the inhabitants of the virtual world as characters, non-player characters and monsters. He also identified the roles of non-player characters as: to buy, sell, and make stuff; to provide services; to guard places; to get killed for loot; to dispense quests, to supply background information, and to do stuff for players. Given below are examples from popular computer games that offer rich interaction opportunities for social interactivity.

Non-Player Characters (NPCs): The *Mass Effect* series have various NPCs, each with a personality of his/her own. Players are inclined to form an emotional bond with these characters who fight side by side with him/her. This emotional bond, or the empathy between players and characters, creates a more powerful narrative effect (Freeman, 2004). Online tribute videos dedicated to various NPCs are indicators of this emotional bond.

Guilds/Factions: Guilds in the *World of Warcraft* offer many benefits including free items, opportunities for groups, access to trade skill masters, quest items, and greatly enhances the gameplay experience. Players can meet friends, share adventures, and find people to protect themselves. There are also guilds in single player games. For example, *The Elder Scrolls IV: Oblivion* was the Elder Scrolls title to employ the conventional four factions, which were called "Guilds". These factions included the Thieves Guild, the Mages Guild, the Fighters Guild, and the Dark Brotherhood.

Henchmen: Henchmen of the *Guild Wars* are computer-controlled adventurers who are always ready to travel with the player. Their skills, attributes, and levels will change as the player progresses. They count as party members and thus, claim their share of the party's loot and experience.

Other Players: The *MapleStory* is a free-to-play massively multiplayer online role-playing game where players can interact with others in many ways, such as through chatting, trading and playing minigames. Throughout the first six years eight million accounts have been registered and more than twenty million characters were created.

Enemies: The Nemesis system of the *Shadows of Mordor* provides randomly named enemies in Sauron's Army that are generated uniquely with each play of the game. Each enemy has their own personality and will rise or fall within their social structure as the game progresses. They are affected by the player's actions and they remember the player if they have encountered him/her before.

Environmental Interactivity

The player does not only interact with virtual or real characters but also effects his/her environment. The virtual world consists of objects ranging from a spoon to a skyscraper that can be manipulated or effected by the user. There are movable objects, destructible objects, constructive objects and upgradable objects in a virtual environment. The interactions with these objects conform to the laws of physics defined by the designers. The environment may also interact with itself regardless of player actions but may affect the player's gameplaying experience. Given below are examples from popular computer games that offer rich interaction opportunities for these categories.

World Physics: The *Star Wars: The Force Unleashed* series used the Digital Molecular Matter engine for realistic object and environment behavior, Euphoria Engine for intelligent characters responses to physics, and Havok engine for rag-doll physics and collision detection. The result is a delicate balance between realistic and entertaining physics. The physics engine also affects the manipulation of virtual objects, such as moving or destroying them.

Movable Objects: The Wizard character of the action adventure game *Trine 2* can magically move many things with his Levitation ability and conjure a plank or a floating platform into the world. Conjured boxes can be used for weight or for jumping on. By placing a plank on top of a box, one can levitate the box when standing on top to reach places one could not originally. Moving objects can be used for solving puzzles, protecting characters and/or defeating enemies.

Destructible Objects: *Red Faction* series are first-person shooters where all environments are fully destructible which means that every single building or structure in the game can be destroyed. Destroying objects is not only a visual effect but an integral part of the gameplay, meaning that the player could use explosives to dig holes through cave walls or blow holes in walls.

Constructive Objects: Gameplay of *Minecraft* involves players interacting with the game world by placing and breaking various types of blocks in a 3D environment. Other activities in the game include exploration, resource gathering, crafting, and combat.

Upgradable Objects: Sid Meier's *Colonization* is a a turn-based strategy game themed on the early European colonization of the New World. When the player founds a colony it already has the most basic structures, but improving them and constructing new ones can greatly further the player's cause in the New World. For example, a fort is a substantial improvement over the stockade and a fortress is an upgraded fort or an armory can be upgraded

into a magazine and a maganize can then be upgraded into an arsenal.

Conclusion

Interactivity in computer games is defined by the number of possible actions at a given time and the number of variables that can be manipulated by the user but these actions or manipulations are related with eachother and earlier player choices. The realism, playability, and believability of these player actions/manipulations determine the depth of interaction. It should be noted that the player should also feel himself/herself in the world mediated by the computer and should believe that he/she exists there (presence) and the player should also feel a sense of control over the events thinking that he/she can affect the virtual world. So, our definition of interaction in computer games is:

Interactivity is the extent to which a player can modify his/her second self, the characters and the objects that constitute the virtual world in a retrospective way so that the past interactions/choices will affect his/her future.

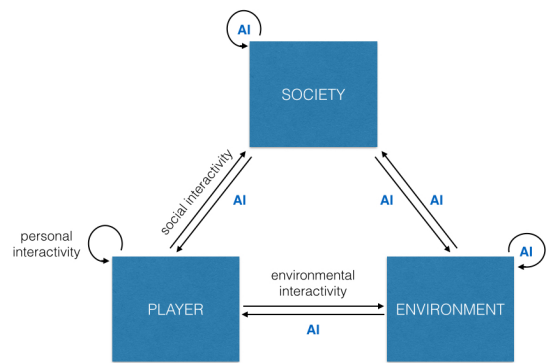


Figure 2: Interactivity in (single-player) computer games

It is important to note that the three interaction dimensions mentioned in this study are not necessarily correlated in the characterization of interactivity. They can be considered as independent dimensions/vectors that may or may not be applied to a computer game. The popular mobile game *Candy Crush* does not provide any form of personal or social interactivity but focuses on environmental interactivity. In this regard, role playing games require special attention because all three forms of interactivity are provided with correlations between them. Your actions/choices as the protagonist of the game affect the society, the environment and your second self.

The interactive nature of computer games has been a cliché among researchers but there is a need for classification of player interactions in computer games. What do the players interact with? How do they interact? What is the range of variables that can be manipulated by the player? In this paper, we attempt to answer these questions by defining three categories of player interactions: personal interaction, social interaction and environmental interaction. Five subcategories for each further explained the nature of

'interactivity' with examples from popular computer games that offer rich interaction opportunities.

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