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Measuring The Impact of Narrative on Player's Presence and Immersion in A First Person Game Environment

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MEASURING THE IMPACT OF NARRATIVE ON PLAYER'S PRESENCE AND IMMERSION IN A FIRST PERSON GAME ENVIRONMENT

A Thesis

by

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ABSTRACT

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In the virtual environments (VE) literature, presence has been described as the feeling whereby an individual feels as if he or she is actually in the VE. In the videogame literature, the related concept of immersion is viewed as an effect facilitating player engagement. This thesis examines how narrative and graphics quality influence presence and immersion in a first person game. Three levels of narrative and graphics quality are used in an empirical study: text narrative with high quality graphics, no text narrative with high quality graphics, and no text narrative with low quality graphics. Results showed that there is a significant difference in players' presence and immersion with rich narrative provided through text narrative together with high quality graphics versus no narrative and low quality graphics, and the use of text narrative results in greater presence and immersion than high quality graphics alone.

DEDICATION

The completion of my graduate studies would not have been possible without the love and support of my family. Special thanks to all my friends, especially the ones that motivated me every day on the lab and the campus, every person that got excited with my work, all the inspiring videogames that I have played and the Human and computer interaction community that contains the brightest ideas in the world.

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I will always be grateful to Dr. Richard Fowler, chair of my thesis committee, for all his mentoring and advice. From the basic concepts of Human and Computer Interaction and Visualization, he showed me how the theory and the practice fused together in this amazing research, other fields that were obscure to me became clear with human subject data gathering and analysis. Having a basis on this will greatly help me in my future endeavors. My thanks go to my thesis committee member: Dr. Wendy Lawrence-Fowler and Dr. Zhixiang Chen. Their advice was critical and insightful, making this piece of work extremely valuable.

I would also like to thanks to my colleagues at the University of Texas - Pan American, their passion on Virtual reality, Visualization and Videogames will always prove supportive on this research. Also, I would like to acknowledge the many volunteers who as human subjects for the experimental part of this research.

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CHAPTER I

INTRODUCTION

Topic

This research addresses questions that many researchers in virtual environment and videogames area have investigated: What factors influence the feeling of being in a virtual environment, as if it was real? By delineating these factors it will be more possible to create virtual experiences that feel authentic and real, without necessarily modeling reality in a perfect way.

Preface and Background Information

Today, simulations and virtual reality are used in many applications. For example, training for something very common like driving can be practiced using a simulation that will educate the user in the different skills that are needed to correctly drive and to recognize symbols and understand the rules and laws for driving. Other examples in training include preparation for emergencies for both regular civilians and people specially assigned to deal with the situation, like firemen or policemen. Military applications are another area, in which soldiers can learn skills for combat or other kinds of situations that occur in a war and conflicts.

Both scientific and engineering tasks can benefit from these technologies. They can augment design or provide visualizations of both data a graphics, e.g., an engineer could better

plan the construction of a bridge by watching a three-dimensional representation of the principles of physics he or she will be working with. Even more effective would be to create the design in a virtual environment, so that a simulated virtual experience of the design could be done in a in the comfort of his or her office.

Medical applications are vast, not only in terms of performing surgical procedures, but also checking patients and even conducting treatments, such as psychological procedures to cure phobias.

Educational applications are seemingly infinite. For example, having students visiting virtual representations of historical moments, the pyramids in Egypt, or even solving physics problems in a world where their experiment will react in accord with physical laws and even feel real could be spectacular for the professor.

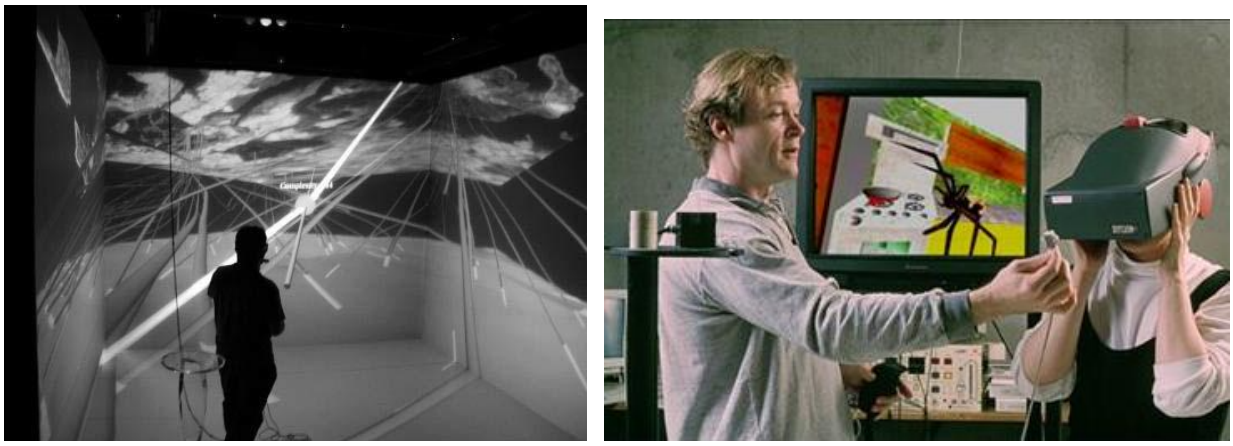

Figure 1 shows different applications of Virtual Environments. Pictured left we can see the user taking a look at a virtual oilfield (Gruchalla, 2004), pictured right the use in the treatment of phobias (Waterworth, 1999).

Last but not least, the use of virtual environment in entertainment provides an extraordinary range of applications. For example, imagine traveling to a favorite location in matter of minutes, or playing your favorite game and actually believing that you are in a real adventure to save the world. This last part is what any game developer would like to achieve,

complete immersion in his or her game where people's excitement rises to the highest levels, like the power of a rollercoaster.

Interests in all of these applications provide the reasons for interest in identifying the factors that contribute to users' feelings of presence and immersion. To explore these factors it is best to find what elements make the user think consciously or subconsciously that an environment is real or not. Significantly, the feeling of reality need not be accomplished by emulating all features of reality. Rather, it is more useful to identify what particular elements make users perceive the virtual environment as real, the feeling is called presence.

Many authors have identified factors that indeed affect the feeling of presence. Authors such as Sanchez-Vives and Slater (2005) have listed these factors, which have been obtained in more than 15 years of research in the area. These include:

- The display technology used: this accounts for the screen size and resolution.
- The visual realism: how real the graphics appear to be.
- The sound: How rich, and directional the sound is.
- Tactile feedback: touching sends a feedback on the object behavior, weight and material.
- Body representation: the use of realistic avatars, the representation of your virtual body.
- Engagement: how everything responds fast and correctly to your interactions with the world.

Additionally, videogame researchers have stated that presence is not enough to achieve entertainment amazement, and they are also concerned about how some videogames that are not even realistic can achieve effects similar to presence.

For example, how is it that players can play videogames that are quite realistic, like *Half-Life* (1998) or *Battlefield 3*(2011), and can also feel the same playing videogames like *Tetris* (1984), which are quite abstract? This is because when it comes to content, there's a whole world of unexplored territory in this field. It's not only about the technology used, but the content, too.

Figure 2 shows the videogame *Battlefield 3* (pictured left) which shows very realistic first person gameplay and *Tetris (2011)* (pictured right, PlayStation 3 version) which shows a very abstract puzzle solving activity. Both achieve very high levels of Immersion.

In the videogame literature this effect is called immersion, and is a very complex phenomenon that can produce effects similar to presence, but is concerned with content. Laura Ermi and Frans Mäyrä (2005) have proposed the SCI-model to describe the Immersion case. According to the model, immersion contains: sensory immersion, which is the audio visual execution, challenge-based immersion, how much difficulty the game offers to the player according to his or her current skill, and imaginative immersion, which is associated with the fiction presented in the game.

The inclusion of imaginative immersion in their model suggests that content can be a strong component in determining how the player feels about and believes in the world that is provided by the game. The narrative structure of the game can be very influential in the user's experience of presence and immersion. Narrative can overlap with certain elements of the virtual world and add greatly to the overall effect. An example of this would be entering in a world that

just looks like a city versus having the city populated by people with different tales to tell via their social behaviors, and even adding to those, occurrences like unexpected events and twists of fate. Another example would be having a emergency training scenario in which events just happen versus a whole narrative as to why the events happen, together with interactions with characters that might develop more insight or even feelings, making the scenario much more realistic.

Narrative is a key element, and its overall effect on immersion and presence is strong.

Goals

Knowing that narrative can enhance presence and immersion effects for users involved in virtual environments and videogames, the goal of this thesis is to explore the nature of the effects of narrative on presence and immersion. The author believes that presence and immersion have valid, reliable and mature ways to be measured, and, by subjects' interaction with a videogame designed to have different levels of narrative, important information about the effect of narrative can be determined. Additionally, there is a possibility that presence and immersion, together with varying levels of display technologies, size and stereoscopy, can interact, thus creating an even bigger effect. Specifically, the goal will be to measure presence and immersion, while varying narrative and display technology, in a videogame environment using a first person perspective.

Tasks to attain the Goals

The author proposes an experimental design that will be able to capture the effects by using presence and immersion questionnaires already validated by the scientific communities. Subjects play a first person videogame internally developed for this research, where narrative

levels can be controlled. Effects of narrative are measured within subjects. Effects of display technologies can be measured with a between subject approach, a regular desktop display versus a 3D stereoscopic projector with 3D glasses, which increases both display size and the effect of depth perception. The data gathered will be analyzed using standard analysis of variances (ANOVA) to check for statistical significance and effect. Finally, results will be discussed leading to the conclusion of the research.

Reasons for the Study of the Topic

The reasons behind this thesis go beyond university requirements. The author has a genuine interest in the development of virtual environments as an important technology now and in the future and the development of videogame as an important entertainment media comparable to cinema and music. Adding to that the presence of faculty with enough knowledge to guide and supervise this research at this institution, and the current research goals also influenced heavily the direction of this thesis.

CHAPTER II

LITERATURE REVIEW

Virtual Environments

Virtual environments have been considered for a relatively long time. Ever since renowned scientists like Sutherland (Sutherland, 1965) proposed his ultimate display whereby the technology was described that would allow the user to enter another, virtual world. The subsequent development of 3D graphics showed that such environments were possible, yet, the road has not as it easy as it initially seemed.

The term Virtual Environment (VE) is usually used synonymously with Virtual Reality (VR) (Slater, 1994), although the term VR is usually associated more to the broad area that includes the study, interaction and creation of the VEs, or, simply, as a popular term. To be inside of a VE the user has to be exposed to technology that not only sends signals to most of the senses, which can be visual, auditory, tactile, etc., but also gives feedback on natural ways to interact with the environment by providing display updates that track users' head movements and positions, changing perspectives accordingly. Additionally, other body parts, such as arms and hands are represented in that virtual world, thereby simulating the user in the VE with a Virtual Body (VB).

Some scientist are quite enthusiastic about the importance of VEs, saying that they "are the most advanced human-computer interfaces yet developed" (Meehan et al., 2002) because VEs can emulate any everyday activity, e.g., being an airplane pilot or medical procedures. VEs

like that are highly limited by technology and budget. There's no such a thing as a mass produced VE, but there are VEs that can be created with the most important part in order to create a great experience.

It is also known that VEs have a tendency to be evaluated depending on its application's success (Meehan et al., 2003). Although this is not the only measurement that can be made, it is a valid one. But at the same time, retrospectively, we can say that if a proposed VE is effective without having all the components that define a VE, then it also be in itself a VE at a functional perspective. This can be seen with many attempts to create very simple VEs with limited budget, e.g., portable VEs or even VEs that just contain components that are mass produced, such as a desktop PC, TV, surround systems and even innovative interactive hardware like movement detecting depth sensing cameras, accelerometers and gyroscopes, to name a few. Of course, the more advanced equipment a VE has, the more the user will be involved with the experience and get better results from it (Gruchalla, 2004), since VEs try to override the senses form the real world (Slater, 2004), but that doesn't imply that the desired effect can be reached with minimal hardware setups.

Videogames

Clearly, the word "videogame" comes from "video" and "game", which are both different things, but it tends to be assumed that videogames are just games with video form. Hence, the words are fused as a single noun to distinguish it as a new medium in itself (Golding, 2008). Video is recognized as a raster display that can range from monitors, TVs, and small LED screens to Head Mounted Displays (HMD), or even entire theaters and CAVE like experiences. Games are essentially systems with certain rules and different outcomes. More formally, Jesper

Juuls defines a game as “a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are optional and negotiable.” (Juul, 2003)

Games can be seen as a three state machine, with the first state being prior to the actual game where all players have all their resources and positioning balanced, and they are ready to compete. The second state would the development of the game, or game play, where the players interact with the mechanics and try to accomplish an objective following certain rules. The third state would be the end of the session and the declaration of a winner according to the rules (Järvinen et al., 2002).

Videogames are also labeled as computer games and defined simply as “all games played using computer processing power.” (Juul, 2003) Of course, that definition might be expanded to further understand the range of computer games. A later, more complete definition states that a videogame is “a game played using computer power and a video display. Can be computer, cell phone, or console game.” (Juul, 2005)

Still, the definition can be lacking if we want to really cover all the modern spectrum of what is considered a videogame. We can find different examples now that that show that all kinds of devices are using games in their usual application lineup. Social games such as *FourSquare* (2009) or *Miso* (2010) are games, as discussed here, that are played using a display device, but are very different from what is considered a traditional videogame.

Today, videogames are everywhere, and they impact a significant portion of the modern population. They have evolved significantly since their beginnings. By the late 90’s videogames already featured 3D environments. Now, enhancement in quality, graphical power and art has

brought realistic and fully interactive worlds that can be play with several types of controlling schemas, from the traditional gamepad and joystick to camera sensing technologies like the Kinect. The videogame industry has seen steady grow, and 72% of households in America play them, with consumer spending of $25.1 billion in 2010 (ESA, 2011). Videogames are used mostly as an entertainment media and as a distraction. Nonetheless, games can be used for education and even scientific research, not only about the human being but also for other fields.

Related to the concept of what is a game is the concept of gameplay itself, again, a word composed of two parts "game" and "play", the latter referring to the activity of recreation and enjoyment. In the end, what gameplay really describes is "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) Game developers, journalists and videogame aficionados usually use the term to describe the moments on which they are able to interact with the game under certain rules and reach a certain objective.

Presence

Over the years the VE specialists have being debated the definition of presence, and there is not a definitive definition, but we can characterize it in several ways. The most basic insight is to understand that presence is a feeling, something that the human being feels, and therefore is subjective and not something that can be looked at directly or be directly measured empirically. Presence can be felt when a subject enters a VE and feels like he is inside of the Virtual World, or in few word, like he or she is "being there" and not in the real world (Slater, 1994). This concept is better described as "a mental state in which a user feels physically present within the computer mediated environment." (Draper et al., 1998) Another perspective in which we can

define presence is that used by Meehan et al., where they state that it is "perceiving stimuli as one would perceive stimuli from the corresponding real environment." (Meehan, 2002) This is basically taking a more physiological approach, and therefore is a bit less subjective. In the end, presence itself is a component that is important for any VE, since if a VE doesn't feel like is real then its purpose is compromised and its overall utility or scientific value.

Research has developed several methods to measure presence. Questionnaires are the most often used. Since presence itself is subjective, self report can try to capture the nature of the human feeling. Physiological responses can also be measured. By finding similarity between real life scenarios, for example, accelerated heart beat when a subject get close to an edge of a high building, a conclusion can be drawn that the subject' feeling of presence is high. Also, breaks in presence can be observed by watching how the subject reacts to certain situations in a VE that lead to disrupting the feeling of "being in" the environment.

There's further evidence of presence in the application in of VEs in therapy, for example in the management of anxiety and phobia. A subject can confront their anxiety or phobia source in VE, which is less threatening than in the real world and manage the reduction of feeling in a controlled way. This approach has also been used with paranoid ideation, post traumatic stress disorder, pain distraction and other kinds of triggering (Sanchez-Vives et al., 2005).

VE technology provides a powerful tool for neuroscience research with the ability to create experimental conditions with full control of all elements. Scenarios that can be too complex to control or too expensive to reproduce can be created without problems. Even "magical" scenarios where the reality is bent to some degree can be done on these environments. Also the 3D modeling of neural structures can be studied with visualization in VEs. Different layers of reality can be altered in controlled form in virtual reality can be exploited to analyze

scientifically the basis of consciousness. “consciousness occurs when we can generate, automatically, the sense that a given stimulus is being perceived in a persona perspective.” (Damasio, 1998)

Presence is not only studied on very complex VEs, but also in other types of media like movies, books, and of course, videogames. There is disembodiment when gameplay occurs, and people forget about their real bodies and more on the inside game character body. Players even say thing like “I got him”, as if they were the character. Even if it is a famous character like Mario, the player doesn’t become Mario, “Mario becomes me.” (the player) (Jennett et al., 2008b) In other words, the player feels control over the character and not what it would be their virtual persona, which is invisible. Another difference with VR is that presence in videogames is gradual while on VR is almost immediate (Jennett et al., 2008b).

Gomes (2005) describes how presence can be achieved with videogames through interactivity and high fidelity graphics that computers are capable of today, therefore emulating the “window to a world” that cinema uses regularly. Therefore, a player immersed in a highly realistic world would not only increase presence but also agency. Gomes also touches upon “affordances” in videogame, and discuses that “every object is a tool that extends the user’s body and enables her to participate in the ongoing creation of the virtual world” and that would be thought the avatar as a “…direct expression of their environment, written into the gamescape as a capacity for its distances.” In videogames, the world reacts to the player according to the capabilities of the avatar and its perception of that world.

Bracken et al. (2005)(2006) tests how HD displays, such as HDTVs and EDTVs, should increase this feeling of presence. Also, he states that players that had a better score in a videogame skill test than others may also have an increased feeling of presence. The experiment

is described as having several participants play a videogame in regular NTSC 480i vs. others playing at 480p and 1080i. The first hypothesis was not completely supported, although there is a difference in immersion produced by games in high definition vs. games in standard definition. The second hypothesis was not supported either, in this case the result went the other way, where lower game skill player reported higher presence than the others. The author states that although the result was not the expected, there is still a relation between resolution and presence in videogames. The second result was more curious. The author states that the lower skilled players might be reporting higher levels of immersion because they are unfamiliar with today's technology, or that they might have to focus more in order to survive the challenge of the game. Also, since the game was played from the beginning, the challenge provided might not be enough for skilled players to put enough attention to the experience. Later, the same author will performs the experiments with different results (Bracken, 2009). This time confirming that, indeed, high definition images can affect at least one dimension of presence.

Immersion

The term "immersion" is often used in the computer world, in entertainment and videogames. It is usually a word that is used to denote many things, therefore some people mistake it for presence when in fact, although can have some overlap, they are separate from each other. Witmer et al. state that Immersion "is a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences" (Witmer et al., 1998), and that it can lead to the feeling of presence. Therefore is a state on which the subject is isolated from the physical environment by depraving it's sensations from it.

More specifically, in the context of VEs, Immersion refers to "what the overall VE system can deliver" (Sanchez-Vives et al., 2005), meaning the quality of the graphics, field of view, quality of display, frame-rate, latency, sound, and other sensory systems.In other words, the properties of the system and not a human response. This is how the VE literature typically uses the term Immersion

However, videogame researchers have been quick to point out several differences in the VE concept. As noted before, this concept was already being used to define qualities of some games. Saying that a game is immersive is something positive and usually relate to many elements that convey exactly what hardware does, but with game elements.

Jennett et al. (2008a) provides a good description of what videogame researchers see as immersion: lack of awareness of time and the real world, Involvement and sense of being in the task environment. They also mention how immersion differentiates from other related concept of engaging experiences like flow, cognitive absorption and presence. To describe flow, a player could be immersed in a game, but still remember things from the outside world like going to a meeting. For flow the user is "so involved that nothing else matters." (Jennett et al., 2008a) Also some games may not have strong flow, but still provides good immersion. Cognitive absorption is more an attitude towards information technology while immersion is an occasion in videogame playing. Presence is more a state of mind while immersion is an experience in time. Also, abstract games, with no tie to a physical world, can provide immersion, but no presence, and there can be presence while being aware of time, like doing a very boring task but still feel that you are in the virtual environment. "immersion, rather, is the prosaic experience of engaging with a videogame." (Jennett et al., 2008a)

In Brown et al., 2004 research subjects described immersion as "a sense of being cut off from the world you actually inhabit" and when "You just forget about the things around you and you're focused on what you're doing in the game." In the research they also describe three theoretical levels of immersion. The first stage is engagement, which relates first to the gamer preference, for example, a player that doesn't see appealing on a sport game will raise a barrier against it. Also, it relates to control and their feedback. Well designed controls will let a player become an expert on the game. Time invested is also a factor. The time invested will let the player become familiar with the game, but also mean how resistant they are on investing time on it. Since players easily lose track of time while immersed they might feel guilt on doing it. Effort can be another factor, how much the player is willing to take on the challenges of the games. Attention is willingness to concentrate on the games and also is a barrier of this first stage. Second stage is engrossment and is related directly to the construction of the game. Elements can be visuals, interesting tasks, plot and how much effort developer put into this. At this level there is emotional involvement with the game, and attention and emotions are affected by the game. Lastly, gamers are less aware of their surrounding in the real world. Total immersion is the last and third stage and is related to presence. When the player forgets that they are playing a game. But is a fleeting experience, and not permanent. The elements here are empathy, usually with the avatar or character, and atmosphere which is made by the different elements of the game (Brown et al., 2004).

Immersion and presence in a videogame context don't seem too different, since they both talk about the sense of being in another world vs. the feeling of being surrounded by another reality that takes over our attention and perception. Nonetheless, videogame researchers favor the term immersion, since presence it's mostly use in the context of teleoperators and the metaphor

of transportation. Also immersion relates more to gameplay as a task, and from here is where the real difference begins.

According to Ermi et al. (2005), there are three kinds of immersion. Sensory immersion is related to the audiovisual execution of games. Challenge-based immersion relates to the satisfying balance of challenges and abilities that a game provides. Imaginative immersion is the element whereby the player uses his or her imagination to enjoy the fantasy of the game. In this view, Immersion is heavily influenced by the task itself of playing a game, and elements such as enjoyment can create deeper Immersion.

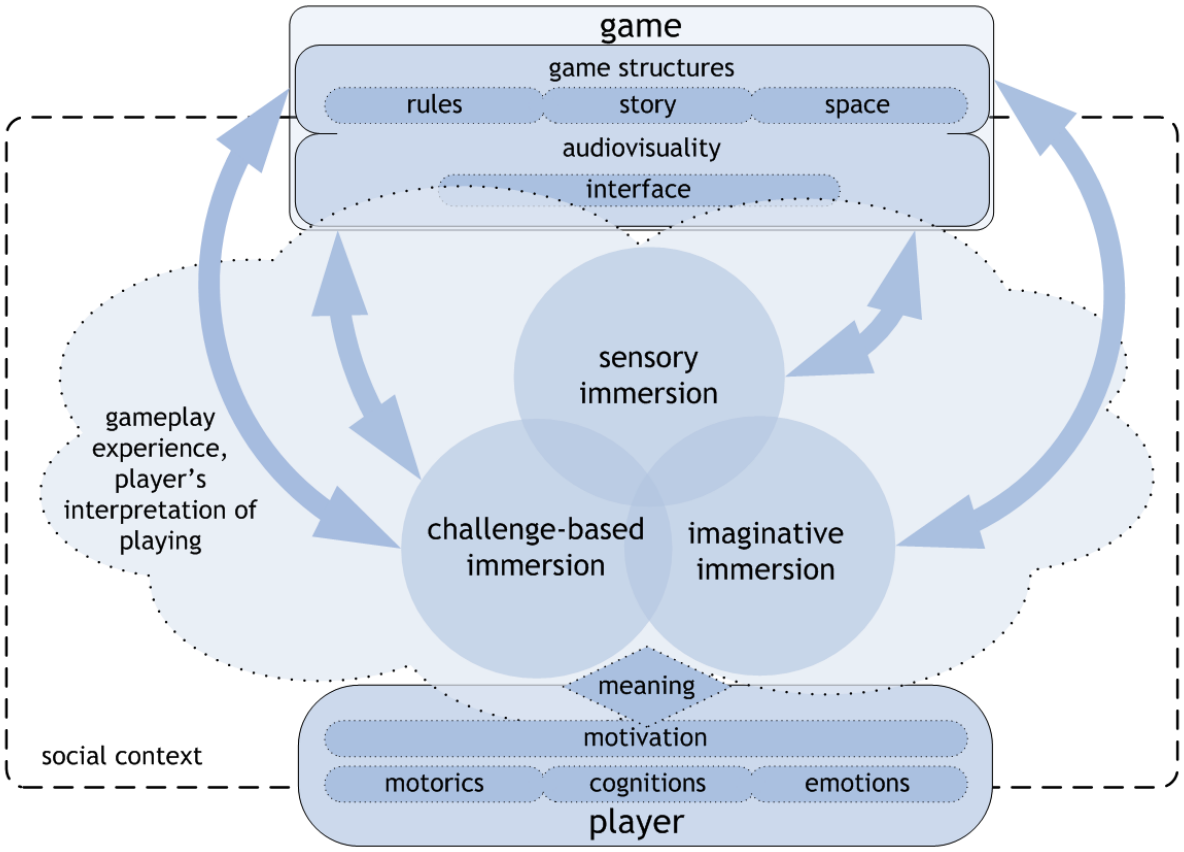

Figure 3. Ermi et al. (2005) et. all explain with this diagram how Immersion in videogames can be separated and have an integral role throughout the experience.

For this thesis, immersion will be treated as in the context of videogames, and sensory immersion will be the one associated to VEs.

Finally, some people might confuse some elements of immersion or presence as addiction or some symptoms of it, but so far there's no clear indication that this is the case. Overall it seems that there is in fact a relation with immersion and how highly engaged or addicted a player is when it plays videogames (Seah et al., 2007), but since there's no really clear separation between engagement and addiction there is no convincing evidence it is a primary factor.

Narrative

Narrative can be thought as sequences of events and the description of traits (Frasca, 2003). It can be found everywhere basically, in any traditional media, as well as in videogames. To be clear, an example is provided. If a player in a videogame sees a building being destroyed, then this is not only going through a series of sequences showing the explosion of this building, maybe even the cause of the explosion, but also the building itself and its surrounding will give context to the whole narrative. For example, if it is a big sudden explosion, and the building is modeled like a modern city building, the player might conclude that the act was made downtown in a modern city and even think that the cause maybe something related to terrorism. If the explosion was on an ancient Egypt pyramid, the player's conclusions would likely be quite different. Of course, since videogames are an interactive medium, narration itself is mainly done by the player and put together according to what is being shown on it. This means that, depending on how the rules of the games are, one player might be able to perceive a different story from another different player, and even in different play throughout the same game. In theory a videogame could let the player shape pretty much everything that will happen in it.

Narrative in terms of sequences usually follows a three act story arc: the beginning of a conflict, the implications of that conflict, and its resolution. Usually, gameplay revolves around the second act leaving most of the material involving first and the final act to non-interactive videos or cinemas (Lindley, 2002). This last statement has created much debate on how videogames could tell quality stories and at the same time have quality gameplay. Lindley states that there's a clear competition with both gestalts (narrative and gameplay) for attention of the player. Basically, if one is stronger than the other, then the other one is lacking impact in the overall game and won't be as complex. For example, consider multipath movies as being narrative focused, and space invaders as being gameplay focused. Another example would be having a gameplay decision shape the player's actions while it has no impact on narrative, like reloading a past saved game in order to get an item that the player needed to better perform later on. This means low level conflict doesn't have significance in the high level narrative.

Supporting this kind of idea, Bizzocchi (2006) also writes that the narrative arc structure presents difficulty to the control over videogame design and the implementation of details. If each part works in conjunction, its synergy will far exceed individual contributions, but some of the control is being given to the interactor (player), so some authorial control is lost. "Interaction denies detailed control over the narrative arc, and in the process interferes with a carefully designed framework for Coleridge's suspension of disbelief." But we can examine parameters of the story that may be more limited but useful to reaching the goal. This means that understanding this can define what role narrative can play on the game experience.

Nonetheless, some authors actually debate that that is not necessary the only outcome that the interaction of narrative and gameplay can bring. Brown says that "the gameplay gestalt is useless as an analytical tool on its own, since games need to be read in their entirety alongside

texts and historical contexts, in order to do them critical justice", and that this creates a disunity between these two elements because they are never presented alone during gameplay. Games are neither gameplay nor narrative, nor even both (Brown, 2007).

One example would be when narrative is used to introduce rules of gameplay, or conditions. For example the ice level in *Super Mario Bros. 3* (1988) or the dark knight training in *Final Fantasy III* (1990). Another example would be when gameplay elements actually shape the narrative, like when in *Valkyrie Profile* (1999) the player sacrifices members of their party, choosing which ones to develop passively and which ones to extend actively. Also in this game, we can see how gameplay elements complement the overarching theme which is of loss and redemption, in which the player is constantly involved in decisions revolving this theme and its impact.

In *Deus Ex* (2000) the reconfigurable storyline through the reading of the player gameplay can result in linear but different outcomes. "A good example comes at the end of the first mission when your character must decide through gameplay action rather than staid menu choices whether to execute, interrogate or even free a terrorist suspect." (Brown 2007) This kind of outcome produces what is called illusory agency, which means that the player believes that his or her different actions have consequences in the game world, as well as narrative, of course, although it might not be completely the case.

Gameplay and narrative can work together in common goals, a macro-gestalt experience. If the structure is flawed, then one of the gestalts will break the continuum, as in the game *The Bard's Tale*, where the player can favor narrative or gameplay and have different consequences in game. But done right, experiences like the Aeris death and posterior vengeance in *Final Fantasy VII* (1997) or *Metal Gear Solid 3 Snake Eater* (2004) final scene, where the player has

to kill “The Boss”, often have these qualities and are usually revered as having a “wow factor” and critical acclaim.

Nacke et al. (2008) prepared several *Half-Life 2* (2004) modifications for experimentation. Since *Half-Life 2* is a game that actually welcomes “mods”, and it’s a very flexible engine for first person shooter creation, the researchers chose it. They designed different levels that should convey different feeling to the player: one to convey boredom, another to convey immersion, and the last to convey flow. The subjects played these levels as they are being measured with electroencephalography, electrocardiography, electromyography, galvanic skin response and eye tracking equipment. Also there was videotaping of the subjects in experiment and a game experience survey. This experiment resulted in that the flow oriented level conveyed more high positive emotions and that there’s an important correlation between subjective and objective indicators of the game play experience.

Narrative influence on Presence and Immersion

Presence and immersion are desired in most videogames, so developers will use everything they can to augment these states. One of the trends is videogames with better and more complex narratives. However, it is not clear how narrative and presence/immersion can interact, nor is it clear how much impact narrative makes to create more depth on presence and immersion. Scheneider (2004) sought to analyze these questions, having the hypothesis that identification with the character in the game is greater with narrative present, and that there is a greater feeling of presence leading to more positive feelings and greater arousal. The experiment entailed subjects playing four different games: two that had no or limited narrative, i.e. *Doom 2*

(1994) and *Quake II* (1997), and two that did have narrative, i.e., *Outlaws* (1997) and *Half-Life* (1998). Each subject played all three games in short 8 minute sessions.

The results of the experiment confirmed the hypotheses. The problem with the research was that the subjects played completely different games, and also, that other factors beyond narrative could be influencing the enhanced emotions and feelings, i.e., , how they perceive the game. For example, *Doom 2* is a very different game than *Half-Life* in terms of graphical quality and game play flow and progression. For these games, it is difficult to exclude all narrative from a commercial game, especially first person shooters, since they are considered modern games. Most of modern games will have some level of narrative. Both of the games chosen in this research as not having a storyline actually have one, and they also have a setting for them. Though it is true that narrative elements are more deeply integrated in the other games, the experiment did not completely isolating the variable. So, one important problem here is how to isolate the narrative variable form other parts of the game to properly evaluate it.

Previously the point was made that illusory agency, makes the player their action actually interacts with the storyline, and this drastically increases immersion according to Brown (2007).

Imaginative immersion is a large part of the overall Immersion in the videogame context. Ermi et al. state (2005) that a "multi-sensory virtual reality environments such as CAVE, or just a simple screensaver, could provide the purest form of sensory immersion, while the experience of imaginative immersion would be most prominent when one becomes absorbed into a good novel." They also state that it is in this area that the game lets the player use his or her imagination to relate to characters and the story and fiction of the game. Hence, there is a large affect on immersion, and a game that lacks imaginative immersion will have less impact that the same game with one. That doesn't mean that a game needs imaginative immersion to be

immersive, for example a challenge-based game like *Tetris* (1984) has a good deal of immersion, but that is an area that effectively will increase it.

CHAPTER III

EXPERIMENTAL DESIGN

Background of the Experiment

The objective of the experiment is to investigate the effects of 1) videogame narrative and 2) sensory immersion on game players' subjective feelings of immersion and presence.

Though there is evidence of effects of narrative on presence and immersion when analyzing *different* games (Schneider, 2004), the variables that influence immersion and presence have not been separated from the games themselves, since they shape the whole experience of playing a videogame. Gameplay can be totally different from one game to the other, and even for games of a similar genre. Games like *Doom* (1993) have less complex narrative than games like *Half-Life* (1998), yet the gameplay experiences for the games are quite different: *Doom* favors more action and finding the way to the exit of the level, *Half-Life* shapes its goals according to the events on the game and also has other gameplay challenges, such as puzzles, as well as specific tasks solely for the sake of narrative progression. The difficulty of the challenge itself also impacts challenge based immersion, since the difficulty for different games will be variable, and, therefore, the experience for each player will be different depending on his or her expertise at playing videogames, which is not related to narrative at all.

To experimentally investigate the effects of narrative on presence and immersion, it is necessary to isolate the gameplay variable by making it constant through the whole experiment. By using the exact same level with the same challenge, and then manipulating it to give context

and a narrative that justifies every action in the game, the player will have exactly the same tasks, but with the variable of narrative controlled. To accomplish this in this experiment, three different levels, with narrative varied, but with similar gameplay experiences will be used for each subject, a within subjects experimental design.

Narrative is not only about the text spoken in the game but also the different objects, buildings, places and scenarios that support it. Narrative can be told without a single word just by looking a certain scenario. Additionally, in an interactive experience the narrator becomes the player. He or she can shape the very nature of the experience by interacting with the environment. Therefore, narration for this experiment is of two forms: 1) text driven narrative, where the events of the game are fully provided by the characters of the game, and 2) no text driven narrative, only the graphics of the game will give an expression of the environment, letting the player figure out what is all about. Playing with these levels will impact imaginary immersion, but this is completely expected part of the narrative overall effect.

In addition to narrative, the experiment also controls sensory immersion to investigate the narrative/immersion gestalt by examining how the immersion and presence can be enhanced by augmenting conventional desktop monitor display with large scale stereoscopic display.

A mixed experimental design is used: narrative is manipulated within subjects and sensory immersion is manipulated between subjects. Since measurement of the narrative factor on presence and immersion is done with questionnaires, in order to reduce the subjectivity involved in the subjects response a within subject design is used. For the sensory immersion approach, a between subjects design is used to reduce the play time and the duration of the experiment and avoid possible health related issues or fatigue that negatively impact results. Subjects will be use both display technologies prior to beginning their game play.

Hypotheses

The following hypotheses will be tested.

H1: Narrative facilitates player's immersion in the videogame: This will be tested by collecting data with a questionnaire that measures immersion. Results will be analyzed by comparing the narrative variable (three levels).

H2: Narrative facilitates player's feeling of presence when playing a videogame. This will be tested by collecting data with a questionnaire that measures presence. Results will be analyzed by comparing the narrative variable (three levels).

H3: The feeling of presence is higher when higher sensory Immersion is used in conjunction with narrative in a videogame: This will be tested by collecting data with a questionnaire that measures presence. Results will be analyzed by comparing the presence levels with the interaction of sensory immersion and narrative variables.

H4: Player's immersion is higher when higher sensory immersion instruments are used in conjunction with narrative in a videogame: This will be tested by collecting data with a questionnaire that measures immersion. Results will be analyzed by comparing the immersion levels with the interaction of sensory immersion and narrative variables.

Instruments

The Media - Videogame

The game developed for this experiment is a first person game implemented in Unreal Development Kit, or UDK, which is a 3D game engine designed primarily for first person shooter games, but which can be also be used for other game genres.

Choosing the game engine came after a long process of analysis of the different options for building the environment. Low level programming, using libraries like OpenGL or DirectX was considered, as was the use of game engines or modifying an existing game, for example *Half-Life 2* (2004). For this experiment we needed flexibility to build levels, program scripted events, personalize assets, use of already made assets, and reliability. Low level languages surely offer all the flexibility needed, any design would be possible given the time. However, this also meant the creation of several layers of software to create a whole game engine, a level editor, and the creation of assets that were going to be used on the game (Lewis, 2002). The engineering and man hours required for this was beyond scope of this thesis. Modifying an existing game would be the shortest path, but not the most flexible one. There would be the limitation of using only the assets included in the game, which would limit the design and also make the game look similar to the original one. Also, usually games that are modified don't include a level editor.

The game engine approach was chosen to develop the experimental materials. It provided enough flexibility to create levels as required and a wide variety of assets already available to work with. Additionally, game engines provide scripting systems to create functionality required by the experimental design. From the many game engines currently available, Unreal Development Kit, or UDK, was chosen because it is one of the most mature, free to use, and has a great deal of documentation and available through the internet. Additionally, it supports stereoscopic display, as required by the experimental design. UDK consists primarily of level editor with a WYSIWYG interface for most of the task. The experience of building a level in UDK is very similar to the one of modeling 3D objects in its interface and ways to navigate in a 3D polygonal world.

The process of building a level with UDK followed three main steps. The first was building the basis of a level with BSP brushes, which is essentially the abstraction of the level with no assets at all. The second step was the thematics of the level in which the level is augmented with textures, assets like objects, trees, statues, or any other which are already included with the engine or can be exported from other systems like Blender, 3D Studio MAX or Maya. Again, the inclusion of already made assets was an important feature because it assured that the game has good graphics without the need of a whole artistic team working for the experiment. The last step was the scripting, made with different tools inside the editor, like the visual scripting system called Kismet, the animation and camera system called Matinee, and for more customized option there is Unreal Script which is the code approach.

For the experiment, the level design has a very basic in which the player follows a linear path to finish the game. Each level made for the experiment consists of similar challenges to maintain the style and the gameplay interaction consistent thought them. Tasks include hitting switches to reveal new paths, searches for items and platforming, i.e., jumping floating platforms to get to a certain goal (Smith, 2008). The levels are not designed to contain any type element that might be considered violent; they are first person action/adventure games. The games are controlled with the standard PC setup for first person games, which consist of using either the arrows or the WASD keys to move the character, the space bar to jump, the E key to interact with objects and the mouse to look around and face a direction. There is an extra level that the player will use as a very short tutorial on how to use this controls and will be run by the player just before the beginning of the experimental session.

A primary goal of the experiment is to investigate the role of narrative in influencing subjective feelings of presence and immersion. Narrative in this experiment includes both visual

narrative and text based narrative. As detail later, three different narrative themes were used (temple, citadel, and station). The visual narrative based on a temple theme, created with textures on polygons, is shown below in Figure 4a. By removing the textures, only polygons remain, hence providing no visual narrative, as shown in Figure 4b. The other narrative manipulation is the addition of text based narrative to the textured visual narrative level. The three different variations of narrative used are the following.

- No Narrative. The player is shown only the objectives and challenges with no visual narrative (polygons only) and no text based narrative..
- Visual Narrative, no Text Narrative. The player is shown the same objectives and challenges as in the No Narrative condition, but with textures for the polygons forming the basis of the level.
- Visual Narrative, with Text Narrative. The player is shown the same objectives and challenges as in the two other levels, together with the textured polygon levels. Additionally, several scripted events will provide the player a narrative justifying each objective across the level (Lindley, 2002). The game level will contain text dialog that changes depending on the events shown to the player.

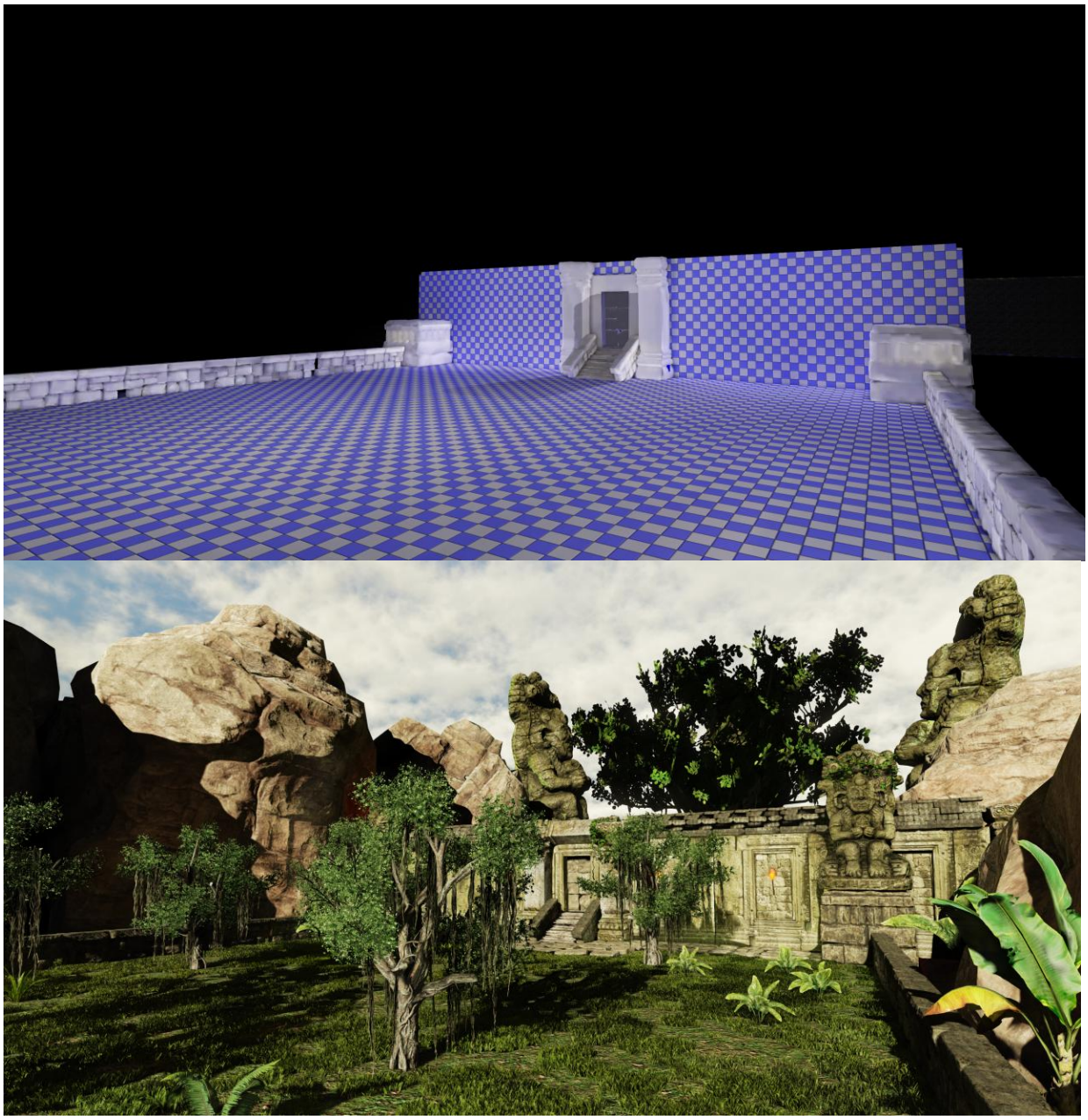

Figure 4. The top shows the polygon basis of the level the player interacts with. This is the no visual narrative condition. The bottom shows textures applied to the level, which provides a temple theme for the visual narrative conditions. The visual narrative conditions are presented with text based narrative and without text based narrative.

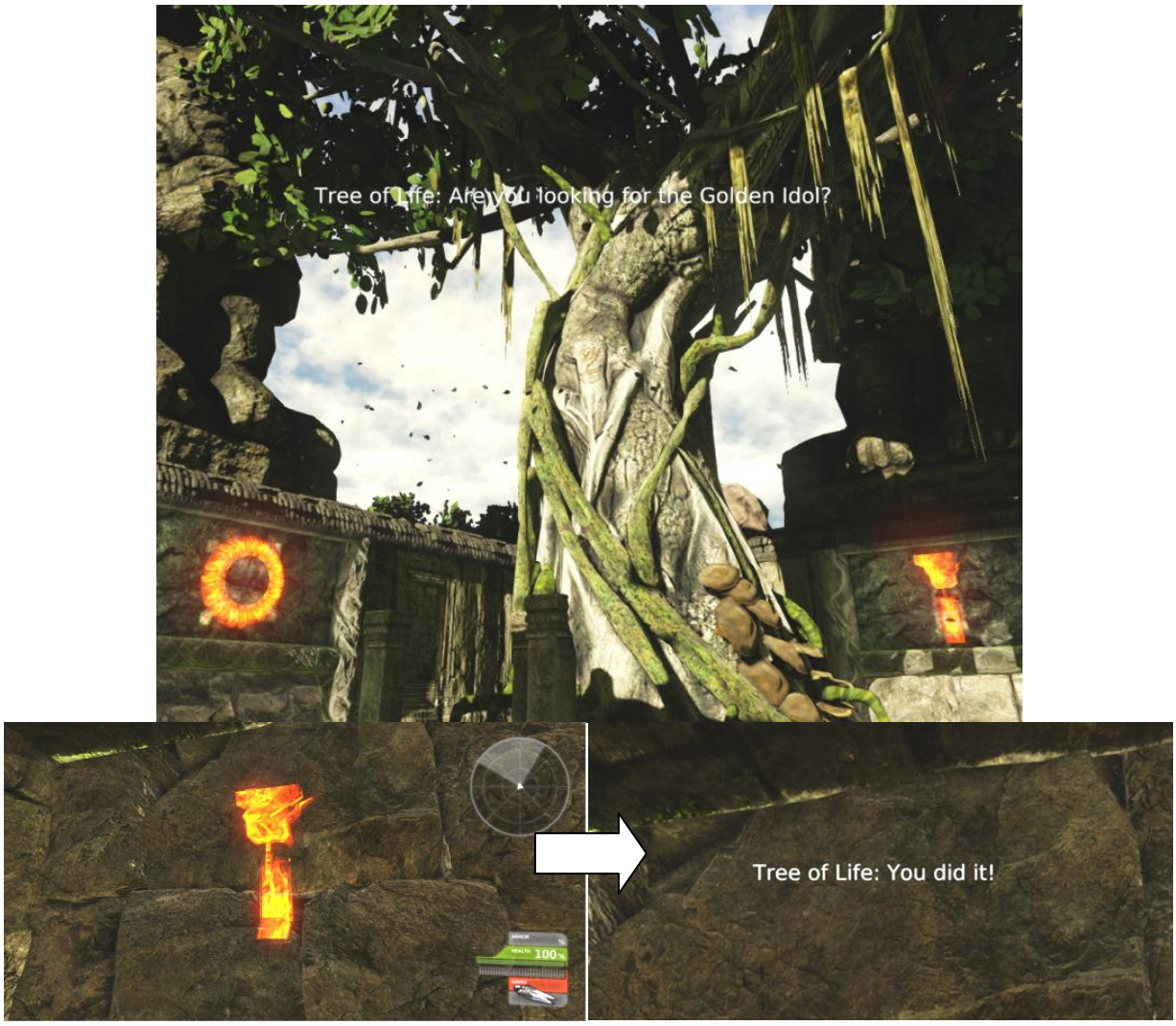

Figure 5. Dialogs are presented often and give context to all the objectives in the game. On top the Tree of Life explains to the player why he has to save him. On Bottom we see how when a player takes an Item the Tree talks to him guiding it's way and motives.

For each of the three levels used in the study, different narratives were used, and are described in the following.

The Temple Level. The player is an adventurer who gets into a temple in search of the "Golden Idol" being this main objective of the game. Figure 5 shows the level with textures applied, the visual narrative condition, and examples of text displayed for the text based narrative

condition. Inside of the temple he discovers a character that is a talking tree, the Tree of Life. He reveals that a triggering mechanism has been activated by the makers of the temple that will kill him which in turn will trigger the destruction of the whole world. The he instructs the player to save him by solving the challenge on the following room. If the player succeeds he will be faced with the final room where he can save the world by saving the tree or take the idol for himself. Either way the game finishes but with different epilogues.

Figure 6. Screenshot of the Temple Level.

The Citadel Level. The player is a monk living in a castle town with their fellow brothers at a local church. One day after finishing his duties he encounters none of his people at the church, just a note that warns him about the imminent release of the dragon that was trapped on the dungeons of the castle. All the people from the town have escaped already, but he is still trapped inside. The player must find a way to escape from the town before the dragon finally escapes and destroys everything. The level contains several scripted events signaling the

imminent release of the dragon and when the player it's out of town he can hear and see how everything is engulfed into flames, escaping just in time for him to live and tell his history.

Figure 7. Screenshot of the Citadel Level.

The Station Level. The player is a maintenance employee on a base stationed in another planet and was issued to fix some platforms in one of the military bases, he wants to finish early and travel back home. Suddenly troops from the opposing force storm the base via the sewers and he desperately needs a way to escape the place. He decides to get to the other side of the building where the emergency exit is located, but in order to do that her first has to deactivate the platforms to fix the elevator and then perforate the wall with a bomb. In the end he gets there before any of the armed enemies get inside and escapes to search a way back home.

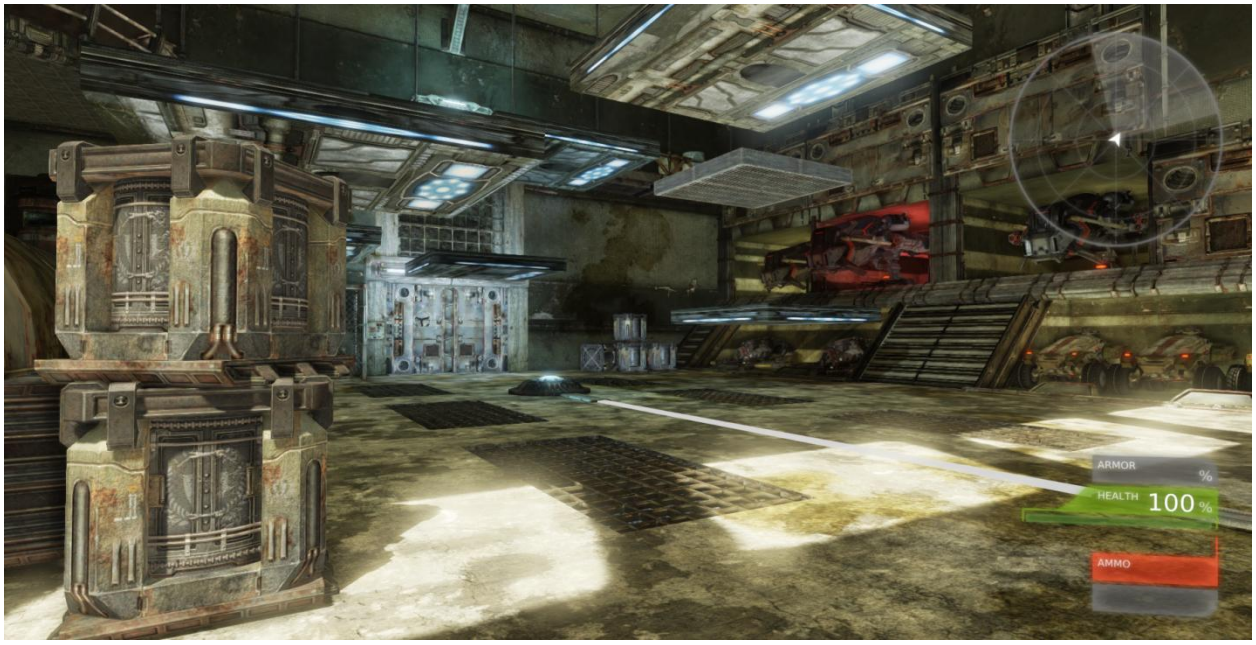

Figure 8. Screenshot of the Station Level.

Sensory Immersion Levels

Two levels of sensory immersion were used to investigate whether Sensory Immersion can increase the effect that narrative might have on immersion and presence. This work, with its focus on videogame play, uses both a regular setup that a player could use on a PC and a more immersive with increased size (Hendrix, 1996) and stereopsis (Barfield, 1999). The low immersion condition used a standard desktop monitor to display the game to subjects and the high immersion condition used a stereoscopic projector to create a wall size display viewed using LCD shutter glasses for 3D viewing. Figure 9 describes the presentations.

The low immersion condition used a 23'' wide screen. This is the base workstation in the lab on which the software was developed. Subject had 1feet and 5 inches of distance from the screen and a small 45 degree field of vision and a resolution of 720p running at 120hz.

The high immersion condition utilized a stereoscopic projector with active shutter glasses that provide 3D viewing for the subjects, as well as removing visual distraction from the lab

environment. The projected screen size is 6x10 feet, the subject had 5 feet and 4 inches of distance and a field of view of approximately 75 degrees.

The Projector used it's a DepthQ HDs-3D-1 running in stereoscopic mode at 120hz and 720p resolution. Both setups used equipment that ran Windows 7 64bits, 4GB of RAM and an Nvidia Quadro 5000 for graphical fidelity and speed. Nvidia 3D vision Pro technology was used for the shutter glasses.

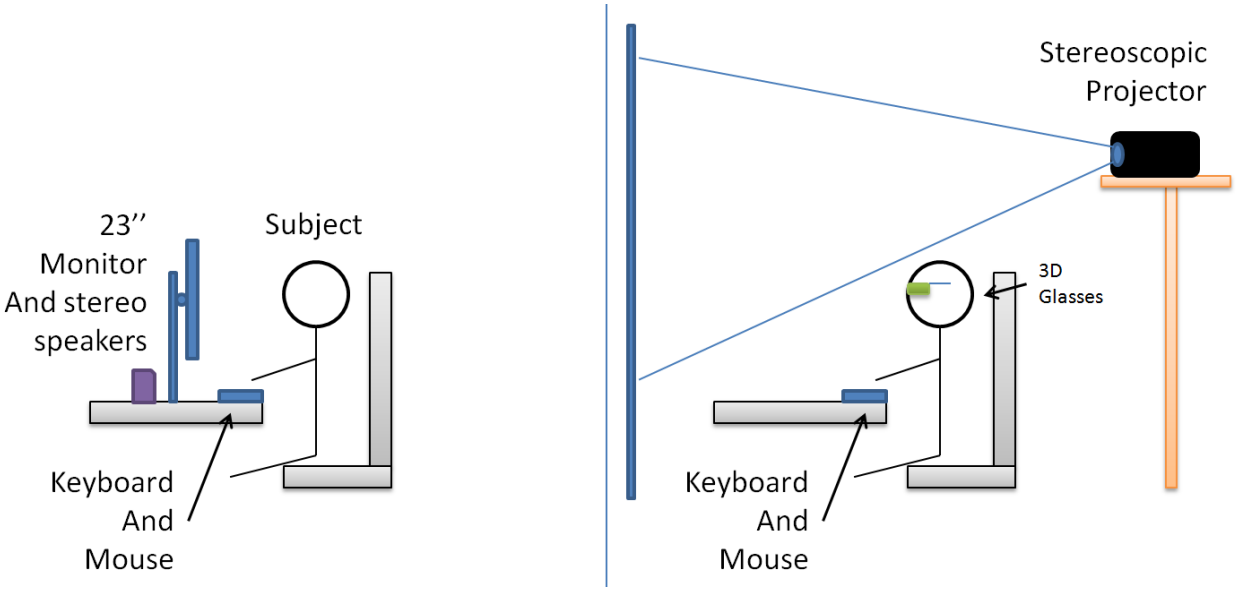

Figure 9. Two sensory immersion levels are presented to subjects. Left shows the low immersion condition, which employs a regular desktop setup. Right shows the high immersion condition, which uses a stereoscopic projector to present a wall sized 3D display.

Sound was provided using circumaural headphones on both setups to keep it constant and prevent any external sounds to reach the subject. Sound technology was kept constant since its influence it's not in the study objectives.

Data Collection

Three questionnaires were administered, one to collect demographic information about the subject and two to measure how players experienced the game with respect to subjective immersion and presence.

Demographic Questionnaire. A questionnaire (Norman, 2010) was completed before the subject participated in the experiments in order to know how involved he or she is in video games, as this might affect immersion and presence through prior experience, as well as how skilled they are in video game playing. This demographic data was used to analyze the results depending on sex, age and game habits of the subject, and to see if it has any relation to the results and any additional conclusion.

Presence Questionnaire. A questionnaire measuring subject presence (Lombard , 2009, 2011), validated for videogames, was also used. This is a multimedia questionnaire that is not meant to be used exclusively for virtual environments with high degrees of sensory immersion as with CAVEs and HMDs.

Immersion Questionnaire. A player immersion questionnaire (Jennett, 2008) was used to measure immersion throughout the whole experience. This questionnaire has been used with good results to measure immersion in videogames and was designed for this purpose.

Experimental Design

The experiment uses a mixed design with three levels of narrative and two levels of sensory immersion. For convenience the three levels of narrative are labeled as low, medium and high. Low narrative refers to the game having no visual narrative, i.e., polygons only with no textures, and no text narrative. Medium narrative refers to the game having visual narrative, i.e., textures applied to polygons to create the three themes (temple, citadel and station), but with no text narrative. High narrative refers to the game having both visual narrative and text based narrative. Each subject completed each narrative condition, i.e., narrative is varied within subjects. To minimize any affect due to the order in which subjects completed the three levels, a counterbalanced design, in which all possible orders of the condition are presented, was used. For the three levels of narrative in the experiment, six orders were required. The two levels of sensory immersion were varied between subjects, i.e., half of the subjects completed all three levels of narrative with the low immersion condition and the other half of the subjects completed all three levels of narrative with the high immersion condition. Subjects were randomly assigned to counterbalance order and immersion condition. 24 subjects completed the experiment. All pilot work and the experiment were completed after the University of Texas – Pan American (UTPA) Institutional Review Board approved the study.

Subjects

Subjects were recruited from students at the UTPA campus, with the age of 18 or more and received ten dollars for their volunteer effort. They were required to have prior experience with videogames sufficient to use the keyboard interface of the videogame. Volunteers who did not meet this criterion received the payment, but did not complete the games.

Experimental Procedure

Figure 10 diagrammatically presents the elements of the experimental procedure.

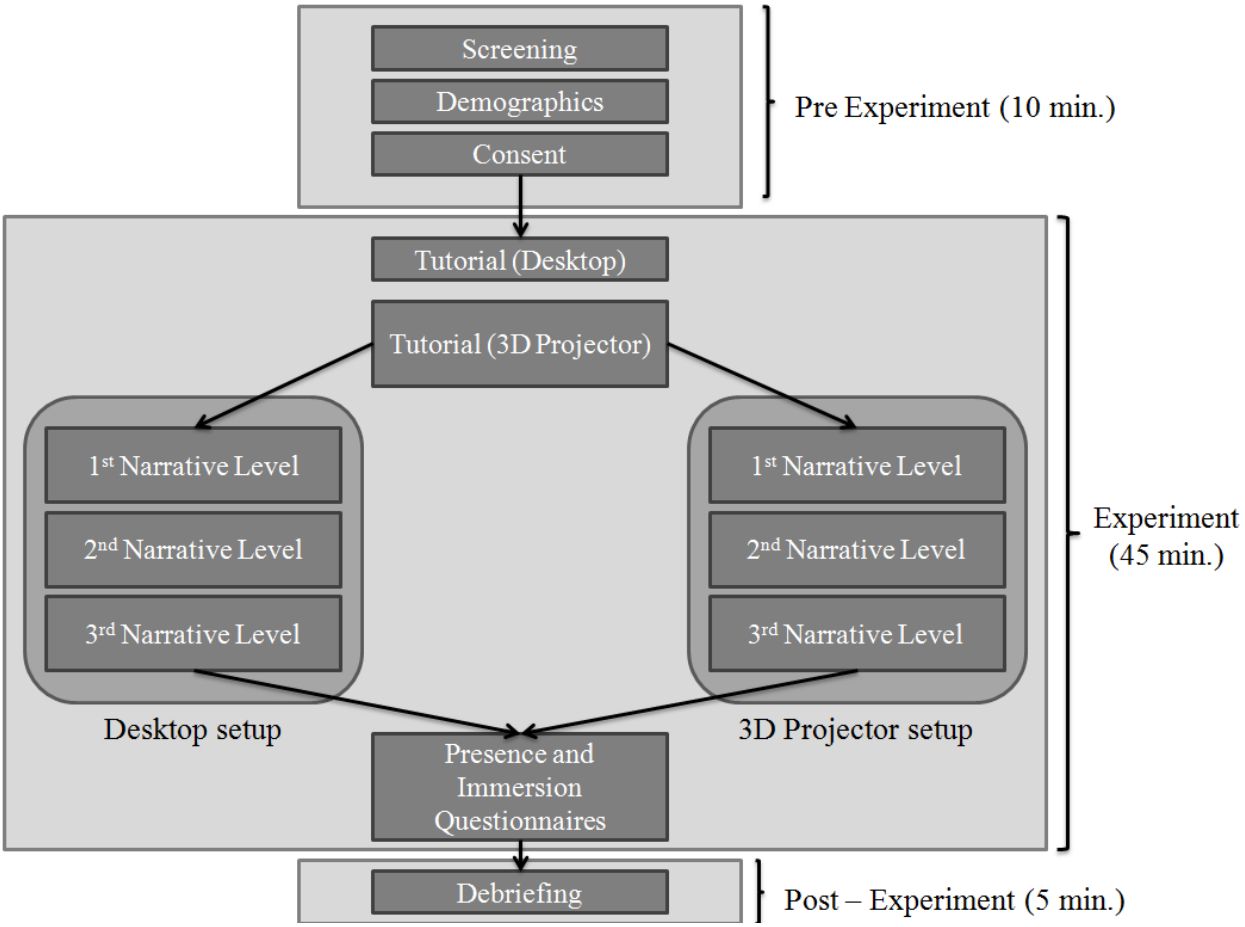

Figure 10. Diagram of the experimental procedure.

Pre Experiment

The Experiment was conducted in the UTPA Visualization Lab, a standard university laboratory providing a desk and office chair for subjects. Subjects first completed the screening questionnaire to determine that the level of game play expertise was likely to be sufficient to complete all tasks in the allotted time. Next, the demographic questionnaire was administered where basic data is gathered from the subject like age, gender, and video gaming habits. If the subject played videogames often and considered themselves from a moderate or higher player,

then the subject continued on to the experiment. The investigator then explained the experiment in detail and answered any question the subject might have about the procedures, the tasks, equipment, tools and systems. After that, the subject was provided with the informed consent form. The subject was allowed sufficient time to read it, ask any question regarding its content. Once the subject signed the consent form the experiment begins.

Experiment

The investigator the subject to the desk to be used and explained the first task. This was a tutorial, using a desktop monitor that teaches every action and movement the player will use in later tasks. After this, the subject played same tutorial game, but with the high sensory immersion display. After the subject has the glasses on in a proper way and it's comfortable, the tutorial level is ran again. The investigator then explained to the subject that, although the tutorial levels were exactly the same, the experience was not, and this is because of the sensory feedback on the second try.

The second part of the experiment required subjects to play through the three different levels, either in high sensory immersion or in the regular desktop setup. For each level, the investigator asked the subject if he or she was ready to begin the level, to avoid any possible ergonomic problem that the user might have felt from previous levels, or to address any question that the user might have. Once the level started the investigator did not interrupt the user, unless the user wants to end the task altogether. Once a level was finished, the investigator congratulated the subject for his or her achievement, and play moved to the next level.

After completing game play the subjects completed the presence and immersion questionnaires. The investigator handed out and introduced the questionnaires to the subject,

followed by a quick explanation on how they should be filled out. Also the investigator will let the subject know that it's assessment of each of the questions must compare with all the experiences played through the whole experiment, even the tutorial. While these questionnaires are being filled up, the subject will not be interrupted unless needs clarification on one of the questions. Once the questionnaires were completed, the experiment ended.

Post Experiment

Finally, the investigator debriefed the subject and answered any other questions the subject might have. The investigator also asked the subject for any comments about the experiment.

CHAPTER IV

RESULTS

Questionnaire data were collected from subjects for subjective ratings of presence and immersion. For both measures, analysis of variance (ANOVA) indicates significant effects for narrative level ($p < .001$), but neither sensory immersion ($p > .05$) nor the interaction of narrative and sensory immersion ($p > .05$). The following sections detail these results, as well as present tests of assumptions required for interpretation of the ANOVAs.

Presence Measurements

For the presence questionnaire, data were analyzed using a 2-way factorial Analysis of Variance (ANOVA), using SPSS Statistics software. The three different levels for the within subjects variable, narrative, are: high narrative, medium narrative and low narrative. The between subjects variable, sensory immersion, has two levels, high sensory immersion and low sensory immersion.

Descriptive Statistics and Covariance Test for Presence Measures

The ANOVA of the presence data indicates that there is a statistically significant difference between the means of the different levels of narrative, but that there is no statistically significant difference between the means of the between subjects groups for sensory immersion. The order of subjects' rating of feelings of presence is in the expected order, high narrative (4.8)

> medium narrative (3.9) > low narrative (2.4), and the differences among all means is statistically significant. More detail is presented in Table 1 below.

Descriptive Statistics Table (Presence)			
Group		**Mean (Std. Dev)**	**N**
High Narrative	High Sensory Immersion	4.814 (1.366)	12
	Low Sensory Immersion	4.698 (1.166)	12
	Total	4.756 (1.244)	24
Med Narrative	High Sensory Immersion	3.904 (1.228)	12
	Low Sensory Immersion	3.937 (1.180)	12
	Total	3.920 (1.178)	24
Low Narrative	High Sensory Immersion	2.436 (1.163)	12
	Low Sensory Immersion	2.494 (1.034)	12
	Total	2.465 (1.076)	24

Table 1 shows descriptive statistics for the presence measurement.

The Equality of covariance matrices using Box M report it is 3.8, with a significance of 0.8. Since this is not significant, the null hypothesis is taken, meaning that the covariance matrices of the dependent variable are not equal across groups. Therefore, it is appropriate to use ANOVA.

Analysis of Variances (ANOVA) Results

First, a lower bound test is made to check for statistical significance in the data, this time to check the within subjects effects. This goes along with the previous multivariate test and products the same result.

Tests of Within-Subjects Effects (Presence)			
Source	**Mean Square**	**F**	**Sig.**
Narrative Trials	64.504	56.644	<.001
Narrative Trials * Sensory immersion Groups	0.104	0.091	0.765

Table 2 shows how the lower bound results for both the narrative trials and the interaction between them and the groups of sensory immersion. Sig. represents the p value.

Hence, in terms of the hypotheses for thesis, for narrative:

H0: There's no difference in presence effect between the different narrative levels.

H1: There's a difference in the presence effect between the different narrative levels.

H1 is accepted, since p is less than 1%.

For the interaction of narrative and sensory immersion hypotheses:

H0: Narrative and sensory immersion don't interact with each other to affect presence.

H1: Narrative and sensory immersion interact with each other to affect presence.

H0 is accepted, since in the difference is not statistically significant, as the p value on all test is greater than 10%.

Pairwise Comparisons - Narrative Trials (Presence)						
Narrative		**Mean Difference (I-J)**	**Std. Error**	**Sig.[a]**	**95% Confidence Interval for Difference[a]**	
(I) Trials	(J) Trials				Lower Bound	Upper Bound
High	Med	.835***	0.138	<.001	0.477	1.194
	Low	2.291***	0.252	<.001	1.638	2.943
Med	High	-.835***	0.138	<.001	-1.194	-0.477
	Low	1.455***	0.245	<.001	0.822	2.089
Low	High	-2.291***	0.252	<.001	-2.943	-1.638
	Med	-1.455***	0.245	<.001	-2.089	-0.822

Based on estimated marginal means

*p< .05. **p< .01. ***p< .001.

a. Adjustment for multiple comparisons: Bonferroni.

Table 3 showing the paiwise comparison between each level of narrative.

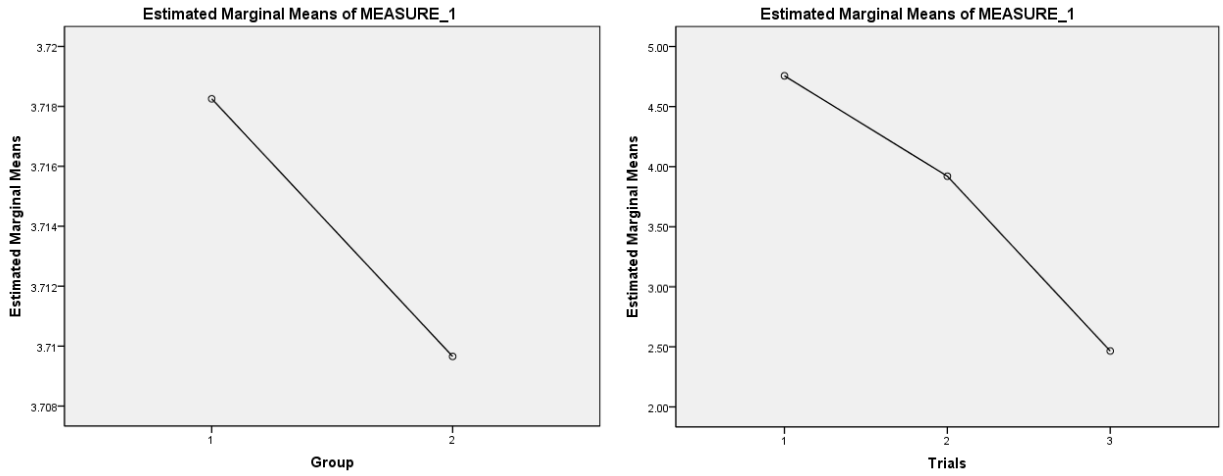

Figure 11. Left shows the sensory immersion groups on the horizontal axis and the means of the presence score of each one on the second. Right shows the narrative trials on the horizontal axis and the means of the presence score of each one on the vertical axis.

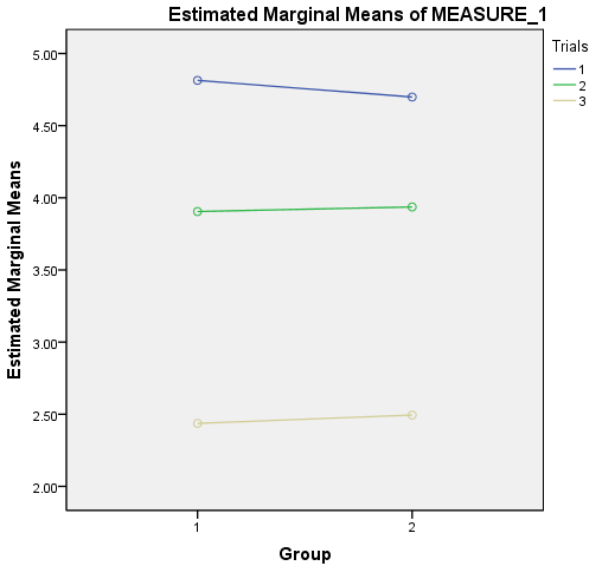

Figure 12. Shows on the horizontal axys the groups and on the vertical axys the trials for narrative levels with their corresponding presence score.

Immersion Measurements

As with the presence data described above, immersion data were analyzed using a 2-way factorial Analysis of Variance (ANOVA), using SPSS Statistics software. Results are similar.

Descriptive Statistics and Covariance Test for Immersion Measures

The ANOVA of the immersion data indicates that, as for the presence data, there is a statistically significant difference among the means of the different levels of narrative, but that there is no statistically significant difference between the means of the between subjects groups, sensory immersion. The order of subjects' rating of feelings of immersion is again in the expected order, high (3.7) > medium (3.4) > low (3.1), and the differences among all means is statistically significant. More detail is presented in table 4 below.

Descriptive Statistics Table (Immersion)			
Group		Mean	N
High Narrative	High Sensory Immersion	3.809 (0.476)	12
	Low Sensory Immersion	3.532 (0.775)	12
	Total	3.670 (0.644)	24
Med Narrative	High Sensory Immersion	3.610 (0.529)	12
	Low Sensory Immersion	3.196 (0.748)	12
	Total	3.403 (0.668)	24
Low Narrative	High Sensory Immersion	3.293 (0.562)	12
	Low Sensory Immersion	2.823 (0.775)	12
	Total	3.058 (0.705)	24

Table 4 shows the descriptive statistics of the Presence measurement.

The Equality of covariance matrices using Box M is 12.3, with a significance of ~0.1. Since this is not significant, the covariance matrices of the dependent variable are not equal across groups, it is appropriate to use ANOVA.

Analysis of Variances (ANOVA) Results

A lower bound test is made to check for statistical significance in the data, this time to check the within subjects effects. This goes along with the previous multivariate test and produces the same result.

Tests of Within-Subjects Effects (**Immersion**)			
Source	**Mean Square**	**F**	**Sig.**
Narrative Trials	4.532	13.99	0.001
Narrative Trials * Sensory immersion Groups	0.119	0.367	0.551

Table 5 shows how the lower bound results for both the narrative trials and the interaction between them and the groups of sensory immersion. Sig. represents the p value.

For table 5, the thesis hypotheses for narrative trials are:

H0: There's no difference in immersion effect between the different narrative levels.

H1: There's a difference in the immersion effect between the different narrative levels.

H1 is accepted, since there's a significant statistical difference, as the reported p value is less than 5%.

In the case of the interaction between we take the following hypotheses:

H0: Narrative and sensory immersion don't interact with each other to affect presence.

H1: Narrative and sensory immersion interact with each other to affect presence.

H0 is accepted, since in the difference is not statistically significant, as the p value on all test is more than 10%.

Table 6 shows the result for each one of the narrative levels compared to the other levels. Figures 13 and 14 show the plots of the data. The thesis hypotheses are:

H0: The narrative level is not statistically different from the other

H1: The narrative level is statistically different from the other

In all cases we take the H1, since the value for p is less than 5%, meaning they are all significant.

Pairwise Comparisons - Narrative Trials (Immersion)						
Narrative		**Mean Difference (I-J)**	**Std. Error**	**Sig.[a]**	**95% Confidence Interval for Difference[a]**	
(I) Trials	(J) Trials				Lower Bound	Upper Bound
High	Med	.267*	0.085	0.014	0.048	0.487
	Low	.613***	0.133	0.000	0.269	0.957
Med	High	-.267*	0.085	0.014	-0.487	-0.048
	Low	.345*	0.125	0.035	0.021	0.67
Low	High	-.613***	0.133	0.000	-0.957	-0.269
	Med	-.345*	0.125	0.035	-0.67	-0.021

Based on estimated marginal means

*p< .05. **p< .01. ***p< .001.

a. Adjustment for multiple comparisons: Bonferroni.

Table 6 showing the pair wise comparison between each level of narrative.

Table 6 shows the result for each one of the narrative levels compared to the other levels. The thesis hypotheses are:

H0: The narrative level is statistically different from the other

H1: The narrative level is not statistically different from the other

In all cases we take the H1, since the value for p is less than 5%, meaning they are all significant. Adding to that, there's a highly statistically significant result between high narrative and low narrative with a p value of less than 1%.

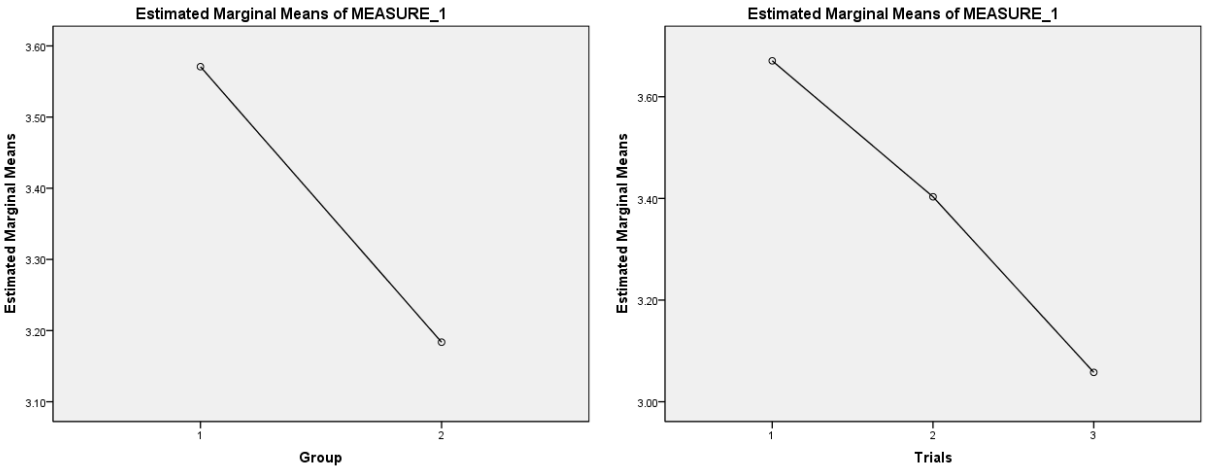

Figure 13. Left shows the sensory immersion groups on the horizontal axis and the means of the immersion score of each one on the second. Right shows the narrative trials on the horizontal axis and the means of immersion score of each one on the vertical axis.

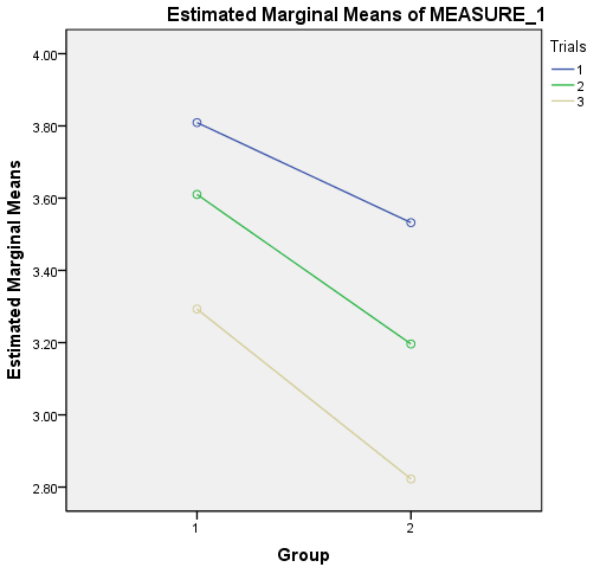

Figure 14. Shows on the horizontal axis the groups and on the vertical axis the trials for narrative levels with their corresponding immersion score.

CHAPTER V

DISCUSSION

The work in this thesis has explored the relationships among narrative and sensory immersion using well-tested instruments to measure game players' feeling of presence and immersion. Overall, results indicated that narrative, both visual and textual, had strong effects on game players' feeling of presence and immersion. However, results indicated no effect of sensory immersion in the conditions used, nor was there an interaction of narrative immersion and sensory immersion. This section discusses these results in the context of the hypotheses of the thesis. Additionally, observations of subjects during the experimental trials and comments by subjects after the experimental trials provide additional insights regarding the effects of narrative and sensory immersion during game play. This section begins with these observations and comments.

Subject Observations and Comments

Many observations made the investigator sure that subjects were indeed experiencing significant levels of presence and immersion while during game play. Also, it is important to note that some subjects will tend to be more immersed than other in the game, which is referred as the subject ImmerseAbility (Norman, 2010). One subject mentioned that it "tended to be easy for [him] to be immersed in videogames", and that was confirmed by several physical reactions in all the levels. Several of the subjects had physical reactions to the levels, e.g., some of them

attempted to move their real bodies in order to get to a certain position inside of the game. Subjects' leaning forward and backwards was a very common phenomenon, and also strafing to the sides. A few subjects even attempted to jump from their chairs when they were trying to perform a difficult jump in the game. Subjects often reported the loss of time tracking and location, as well as the disconnection from sensory data that corresponded to the real world. One subject in particular mentioned that she "didn't notice the coldness of the room until [she] finally finished playing."

Subjects also reported other factors that were negative for the feelings presence and immersion case. Some complained about the repetitive gameplay structures used on the game, in particular the moving platforms, and this occurred mostly when the game was a bit harder than they expected it. One mentioned that the "moving panels really took you out of the zone and could be frustrating", which is in accord with the immersion SCI-model (Ermi, 2005) as the challenge immersion. In fact this was to be expected, as the game was developed to have a linear challenge progression since they were not meant to be played in a fixed order to get a controlled challenge curve, and also, they have to be similar enough to avoid the subjects like more a game or the other because of preference to a particular gameplay mechanic.

Another subject suggested that, as the game got more realistic, the list of demands from the player increased he tended to expect more from the game in terms of consistency of realism, and that little details decreased his levels of immersion and presence. "In [the high narrative] level and [medium narrative] level, making the graphics realistic, but realizing that the character couldn't jump on things that I could, brought my immersion level down." The same subject also suggested that the contrary will occur in the low level immersion, stating that "since the graphics weren't realistic I didn't expect it to be real and I immersed myself better than other games."

Though this commentary has validity for the particular subject, suggesting some sort of uncanny valley (Mori, 1970) (Brenton, 2005) of virtual environments and realistic videogames, the results still show that narrative power is more significant than this effect. Of course, we might make the assumption that a game not well developed and full of errors could disrupt any other positive effect, but this was not the case on this experiment.

Some subjects complained about the sounds that their in-game body made, with most comments indicating that their avatar must be very heavy. This was likely because the default sounds in development kit were not changed, and they represented a robotic avatar. This phenomenon has been very well documented as the break of presence effect (Slater, 2000), and the author doesn't believe that affected the results significantly, since most of the subjects reported being in state of immersion and presence throughout the experience.

Focusing on the high narrative experiences, subjects made a number of different comments. Regarding the Citadel Level, a subject mentioned that the he was "more into it, because of the sense of hurry the story provided, that [he] had to escape from a dragon." This shows a very positive effect of narrative for both presence and immersion. Another subject simply mentioned that "the level with text had more immersion", favoring the text format as an immersive inducing component in videogames. The detail of the game was frequently mentioned by subjects. "The details on the [High Narrative] level were pretty cool and the environment makes me get more into the game." Although this overlaps with the graphical quality factor that presence should be augmented with (Welch, 1996), details also come from the narrative and how everything in the game is driven by it. Nonetheless, other research shows that the impact of graphical realism on presence is not significant (Zimmons, 2003).

A very interesting effect was also reported by several subjects in the absence of a literal narrative. In this case it was up to the players themselves to generate their own narratives by interpreting the experience. For the medium narrative level, a subject reported that he "thought of other games with similar environments" and therefore was playing as if that similar narrative were in effect. Most interestingly, in the low narrative condition (no textures on polygons) some subjects reported thinking about different settings, such as an alien base or a place somewhere in the deep space. Is indeed impressive how the human mind can create narrative from so scarce elements. Still, the induced narrative tended to be more immersive and to create the feeling of presence in the subject more than the visual narrative.

Effect of Narrative on Presence

The effect of narrative is very significant and creates greater levels of presence. In all results these thesis hypotheses are accepted. A general increase in effect occurs from one narrative condition to the other, from low narrative to high narrative. Still, we see some difference between the high vs. medium and the medium vs. low. This might be due to the overlapping effect of the graphical quality. The lower quality graphics on the polygon based level that represented the low narrative must have provoked a deeper lose in presence, which was expected. Nonetheless the fact that more presence is achieved just by the existence of text and a well developed three-arc narrative can enhance presence. The results matched perfectly with the expectations of the author and hypotheses of the thesis.

Effect of Narrative on Immersion

The effect narrative on immersion is weaker than on presence, and, though the effect is significant, it is only when comparing from the highest level to the lowest. For immersion, it seems that there is not the same statistical difference between having text or not in the game, when compared to the effects for presence, indicating that a narrative structure might be not necessary to achieve a high level of immersion. Part of this seems to, again, be explained by the SCI-model (Ermi, 2005), which notes that immersion is not only comprised of imaginary immersion, but also of challenge and sensory immersion. Obviously, the other parts of immersion affect the results, but, saying that there is a difference between high and low narrative indicates that narrative in fact influences the effect. Graphical fidelity in games is a plus for realistic games, but is not an essential factor in the enjoyment or the creation of immersion in the player. Again the *Tetris* (1984) example fits well. A very important note on this is also made that games usually present narratives that go beyond text, to animation or interaction induced, and produced by the player (Meadows, 2002). This could also be affecting the differentiation between the levels. Still, although immersion tends to be a more complex phenomenon, the difference is confirmed therefore the hypothesis is also confirmed.

Presence and Immersion vs. Sensory Immersion

Lastly, the results for the interaction of sensory immersion with presence and immersion did not support the hypothesis of the thesis. Before jumping into any conclusion stating that this goes *against* the hypothesis, several factors must be considered. The measurements for this interaction was as a between subject factor with questionnaires as an instruments. Questionnaires' effectiveness is reduced considerably when this kind of experimental design is

used. Following pilot testing, the limitations of the between subjects design became clear, and the design of the experimental session was modified to include exposure to *both* desktop and large screen stereoscopic displays, as an attempt to provide subjects experience with both display types. Still, due to the subjective nature of questionnaire the author believes that the effect was not correctly captured in the experiment, hence the result. Is widely known that sensory immersion affects both presence and immersion (Hedrix, 1996)(Barfield, 1999) (Ijsselsteijn, 2001) (Wouter, 2009), and it's interaction with narrative was expected, but not found (though p = ~.09 for presence) contradicting many results.

To accurately tell if there's no interaction between the two, a more complex within subject would have to be performed in which the number of levels to be created for the experiment would expand to at least six, and the time of each experiment will be at least double, suggesting a two session experiment per subject. Another alternative would be the use of a different, less subjective, method of measurement, like physiological measures for presence (Meehan, 2002), and vision tracking for immersion (Jennett, 2008). Both were not available at the time of these experiments.

CHAPTER VI

CONCLUSION

This thesis has described and analyzed the results of an experiment to measure the effect of narrative on both presence and immersion in a subject in a first person videogame setting. It was the goal to detect any difference between the various narrative levels using subjective experience measured using questionnaires. The experiment showed a large statistically significant difference between the different narrative levels. Narrative increased both presence and immersion. Especially for presence, the differences increase for all the levels, showing narrative enhances presence, as is desired in the development of videogames and similar virtual environments. Also, the experiments showed increases for immersion, but only if narrative is compared at the extremes. Text narrative didn't provide a difference when compared with environment induced narrative, but there was a difference when narrative was the minimum. The experiment did not find a statistically significant interaction between narrative and sensory immersion. Still, the author believes that more work can be done to accurately assess this question.

Considering the limitations of the experimental design proposed on this thesis, it is would be useful to repeat the experiment for the interaction between narrative and sensory immersion using less subjective methods of measurements, like heart rate and vision tracking.

The experiments could also add another level of narrative that uses voices induced narrative, instead of text. Games today include this type of technology, assuming that it produces more immersion, and there's no reason to doubt that. What could be investigated would be how much more powerful voice can be than text for presence, and in what conditions. Additionally, effects of the quality of the narrative could be investigated. The quality of how a story is narrated tends to be an important factor on how narrative media is criticized. For example, the voice acting of a character in game could be good or bad, and the production values impacts the final product, which can affect presence and immersion.

Another work that could be tried in the future is how the SCI-model accounts for results and the predictive the power of its three components. This might separate the conflation of narrative and immersion.

The results of this experiment give empirical evidence that presence is affected by narrative, affirming the theoretical beliefs of many authors.

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APPENDIX A

APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE
(Norman 2010)

Circle or check your answers.

1. In what year were you born: (yyyy)

2. Gender: Female Male

3. Racial/Ethnic Identity (Check all that apply):

African American Asian Caucasian

Hispanic Native American Other:

4. Current Situation:

4.1 Student: College Undergraduate Graduate Student

4.2 Employed: Job Title/Position: Other:

**5. On average, how many hours a day do you spend on a web browser (e.g., Firefox, Internet Explorer,
Safari)?**

0-1 1-2 2-4 4-8 8-12 More than 12 hours per day

6. Check which gaming platforms you use on a regular basis:

Play Station 3 Nintendo Wii Xbox 360 Nintendo DS/I Nintendo 3DS PSP

Cellphones Smartphones iPod PC (Windows or Mac)

Web browsers (e.g. Flash Games, Facebook) Other:

7. Check which types of games you generally like to play:

Action/First Person Shooter (e.g., Halo, Call of Duty)

Fighting (e.g., Moral Combat, Super Smash Brothers)

Adventure (e.g., Colossal Caves, Cyan World, Myst, Monkey Island)

RPG (Role Playing Game) (e.g., Final Fastasy, Batman)

MMORPG (Massively Multiplayer Online Role Playing Game) (e.g., World of Warcraft)

Sports (Football, Soccer, Golf, Baseball, Boxing, etc.)

Racing (e.g., Need for Speed, Mario Kart)
Simulation (e.g., The Sims)

Strategy (e.g., Starcraft, Age of Empires)

Puzzles (e.g., Cut the Rope, Tetris, Bejeweled, Peggle)

Other:

8. On average, how many hours do you play video games per day?

0 1/2 1 2 3 More than 3 hours per day

9. A typical gaming session will last how many minutes?

0 1-5 6-15 16-30 31-60 61-120 more than 120 minutes

10. In general, how many times per day do you play a video game?

0 1 2 3 4 More than 4 times per day

11. How would you characterize yourself as a gamer?

Do not play video games

Casual, once in while

Moderate, every other day or so

Moderate, fairly often

Heavy, every day

Hardcore, major part of my life

12. Have there been others in your past or current living situation that you would classify as a moderate to hardcore gamer? (Check all that apply)

Siblings (Brothers or Sisters)

Parents (Mother or Father)

Children (Sons or Daughters)

Other Relatives (Cousins, Aunts, and Uncles)

Close Friends

Roommate(s)

Significant Other (Spouse, Boy Friend, or Girl Friend)

APPENDIX B

APPENDIX B

MEDIA QUESTIONNAIRE (PRESENCE)
(Lombard et al., 2009)

Thank you very much for agreeing to complete this questionnaire.

There are no right or wrong answers; please simply give your first impressions and answer all of the questions as accurately as possible, even questions that may seem unusual or to not apply to the particular media experience you just had. For example, in answering a question about how much it felt like you were "inside the environment you saw/heard," base your answer on your feeling rather than your knowledge that you were not actually inside that environment.

Throughout the questions, the phrases "the environment you saw/heard" and "objects, events, or people you saw/heard" refer to the things or people that were presented in the media experience, not your immediate physical surroundings (i.e., the actual room you were in during the media experience).

Please circle the numbers that best represent your answers. All of your responses will be kept strictly confidential.

How much did it seem as if the objects and people you saw/heard had come to the place you were?

1st Level	Not at all	1 2 3 4 5 6 7	Very much
2nd Level	Not at all	1 2 3 4 5 6 7	Very much
3rd Level	Not at all	1 2 3 4 5 6 7	Very much

How much did it seem as if you could reach out and touch the objects or people you saw/heard?

1st Level	Not at all	1 2 3 4 5 6 7	Very much
2nd Level	Not at all	1 2 3 4 5 6 7	Very much
3rd Level	Not at all	1 2 3 4 5 6 7	Very much

How often when an object seemed to be headed toward you did you want to move to get out of its way?

1st Level	Never	1 2 3 4 5 6 7	Always
2nd Level	Never	1 2 3 4 5 6 7	Always
3rd Level	Never	1 2 3 4 5 6 7	Always

To what extent did you experience a sense of 'being there' inside the environment you saw/heard?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

To what extent did it seem that sounds came from specific, different locations?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How often did you want to or try to touch something you saw/heard?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

Did the experience seem more like looking at the events/people on a movie screen or more like looking at the events/people through a window?

1st Level	Like a movie screen	1	2	3	4	5	6	7	Like a window
2nd Level	Like a movie screen	1	2	3	4	5	6	7	Like a window
3rd Level	Like a movie screen	1	2	3	4	5	6	7	Like a window

How often did you have the sensation that people you saw/heard could also see/hear you?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

To what extent did you feel you could interact with the person or people you saw/heard?

1st Level	None	1	2	3	4	5	6	7	Very much
2nd Level	None	1	2	3	4	5	6	7	Very much
3rd Level	None	1	2	3	4	5	6	7	Very much

How much did it seem as if you and the people you saw/heard both left the places where you were and went to a new place?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How much did it seem as if you and the people you saw/heard were together in the same place?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How often did it feel as if someone you saw/heard in the environment was talking directly to you?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

How often did you want to or did you make eye-contact with someone you saw/heard?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

Seeing and hearing a person through a medium constitutes an interaction with him or her. How much control over the interaction with the person or people you saw/heard did you feel that you had?

1st Level	None	1	2	3	4	5	6	7	Very much
2nd Level	None	1	2	3	4	5	6	7	Very much
3rd Level	None	1	2	3	4	5	6	7	Very much

During the media experience how well were you able to observe…:

…the <u>body language</u> of the people you saw/heard?

1st Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well

…the <u>facial expressions</u> of the people you saw/heard?

1st Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well

…<u>changes in the tone of voice</u> of the people you saw/heard?

1st Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well

…the <u>style of dress</u> of the people you saw/heard?

1st Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well
2nd Level	Not well	1	2	3	4	5	6	7	Very well

How often did you make a sound out loud (e.g., laugh, speak) in response to someone you saw/heard in the media environment?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

How often did you smile in response to someone you saw/heard in the media environment?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

How often did you want to or did you speak to a person you saw/heard in the media environment?

1st Level	Never	1	2	3	4	5	6	7	Always
2nd Level	Never	1	2	3	4	5	6	7	Always
3rd Level	Never	1	2	3	4	5	6	7	Always

To what extent did you feel mentally immersed in the experience?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How involving was the media experience?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How completely were your senses engaged?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

To what extent did you experience a sensation of reality?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How relaxing or exciting was the experience?

1st Level	Very relaxing	1	2	3	4	5	6	7	Very exciting
2nd Level	Very relaxing	1	2	3	4	5	6	7	Very exciting
3rd Level	Very relaxing	1	2	3	4	5	6	7	Very exciting

How engaging was the story?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much

3rd Level	Not at all	1 2 3 4 5 6 7	Very much

For each of the pairs of words below, please circle the number that best describes your evaluation of the media experience.

1st Level	Impersonal	1 2 3 4 5 6 7	Personal
2nd Level	Impersonal	1 2 3 4 5 6 7	Personal
3rd Level	Impersonal	1 2 3 4 5 6 7	Personal
1st Level	Unsociable	1 2 3 4 5 6 7	Sociable
2nd Level	Unsociable	1 2 3 4 5 6 7	Sociable
3rd Level	Unsociable	1 2 3 4 5 6 7	Sociable
1st Level	Insensitive	1 2 3 4 5 6 7	Sensitive
2nd Level	Insensitive	1 2 3 4 5 6 7	Sensitive
3rd Level	Insensitive	1 2 3 4 5 6 7	Sensitive
1st Level	Dead	1 2 3 4 5 6 7	Lively
2nd Level	Dead	1 2 3 4 5 6 7	Lively
3rd Level	Dead	1 2 3 4 5 6 7	Lively
1st Level	Unresponsive	1 2 3 4 5 6 7	Responsive
2nd Level	Unresponsive	1 2 3 4 5 6 7	Responsive
3rd Level	Unresponsive	1 2 3 4 5 6 7	Responsive
1st Level	Unemotional	1 2 3 4 5 6 7	Emotional
2nd Level	Unemotional	1 2 3 4 5 6 7	Emotional
3rd Level	Unemotional	1 2 3 4 5 6 7	Emotional
1st Level	Remote	1 2 3 4 5 6 7	Immediate
2nd Level	Remote	1 2 3 4 5 6 7	Immediate
3rd Level	Remote	1 2 3 4 5 6 7	Immediate

Please indicate how much you disagree or agree with each statement below.

	Strongly Disagree						Strongly Agree
The way in which the events I saw/heard occurred is a lot like the way they occur in the real world.							
1st Level	1	2	3	4	5	6	7
2nd Level	1	2	3	4	5	6	7
3rd Level	1	2	3	4	5	6	7

The events I saw/heard could occur in the real world. 1st Level 1 2 3 4 5 6 7
2nd Level 1 2 3 4 5 6 7
3rd Level 1 2 3 4 5 6 7

It is likely that the events I saw/heard would occur in the real world. 1st Level 1 2 3 4 5 6 7
2nd Level 1 2 3 4 5 6 7
3rd Level 1 2 3 4 5 6 7

Overall, how much did the things and people in the environment you saw/heard…:

…sound like they would if you had experienced them directly?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

…look like they would if you had experienced them directly?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

…smell like they would if you had experienced them directly?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

Overall, how much did touching the things and people in the environment you saw/heard feel like it would if you had experienced them directly?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How much did the heat or coolness (the temperature) of the environment you saw/heard feel like it would if you had experienced it directly?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

These next questions are about the media experience as a whole.
Have you ever seen the media presentation/experience you had today before?
____ No ____ Yes

How personally relevant was the content of the media experience to you?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

How was the picture quality during the media experience?

1st Level	Very poor	1	2	3	4	5	6	7	Very good
2nd Level	Very poor	1	2	3	4	5	6	7	Very good
3rd Level	Very poor	1	2	3	4	5	6	7	Very good

How was the sound quality during the media experience?

1st Level	Very poor	1	2	3	4	5	6	7	Very good
2nd Level	Very poor	1	2	3	4	5	6	7	Very good
3rd Level	Very poor	1	2	3	4	5	6	7	Very good

How comfortable were you with your viewing position?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

Overall, how satisfying or enjoyable was the media experience you just had?

1st Level	Not at all	1	2	3	4	5	6	7	Very much
2nd Level	Not at all	1	2	3	4	5	6	7	Very much
3rd Level	Not at all	1	2	3	4	5	6	7	Very much

Please use the space below to provide your comments about the media experience..

THANK YOU <u>VERY</u> MUCH FOR COMPLETING THIS QUESTIONNAIRE.
WE TRULY VALUE AND APPRECIATE YOUR TIME AND EFFORT !!
PLEASE RETURN THIS QUESTIONNAIRE TO THE STUDY COORDINATOR

APPENDIX C

APPENDIX C

IMMERSION QUESTIONNAIRE
(Jennett et al., 2008)

Your experience of the game

Please answer the following questions by circling the relevant number. In particular, remember that these questions are asking you about how you felt at the end of the game.

To what extent did the game hold your attention?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent did you feel you were focused on the game?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

How much effort did you put into playing the game?

1st Level	Very little	1	2	3	4	5	A lot
2nd Level	Very little	1	2	3	4	5	A lot
3rd Level	Very little	1	2	3	4	5	A lot

Did you feel that you were trying you best?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent did you lose track of time?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent did you feel consciously aware of being in the real world whilst playing?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you forget about your everyday concerns?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent were you aware of yourself in your surroundings?

1st Level	Not at all	1	2	3	4	5	Very aware
2nd Level	Not at all	1	2	3	4	5	Very aware
3rd Level	Not at all	1	2	3	4	5	Very aware

To what extent did you notice events taking place around you?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

Did you feel the urge at any point to stop playing and see what was happening around you?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you feel that you were interacting with the game environment?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you feel as though you were separated from your real-world environment?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you feel that the game was something you were experiencing, rather than something you were just doing?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent was your sense of being in the game environment stronger than your sense of being in the real world?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

At any point did you find yourself become so involved that you were unaware you were even using controls?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you feel as though you were moving through the game according to you own will?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you find the game challenging?

1st Level	Not at all	1	2	3	4	5	Very difficult
2nd Level	Not at all	1	2	3	4	5	Very difficult
3rd Level	Not at all	1	2	3	4	5	Very difficult

Were there any times during the game in which you just wanted to give up?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent did you feel motivated while playing?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

To what extent did you find the game easy?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you feel like you were making progress towards the end of the game?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

How well do you think you performed in the game?

1st Level	Very poor	1	2	3	4	5	Very well
2nd Level	Very poor	1	2	3	4	5	Very well
3rd Level	Very poor	1	2	3	4	5	Very well

To what extent did you feel emotionally attached to the game?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent were you interested in seeing how the game's events would progress?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

How much did you want to ''win'' the game?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

Were you in suspense about whether or not you would win or lose the game?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

At any point did you find yourself become so involved that you wanted to speak to the game directly?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

To what extent did you enjoy the graphics and the imagery?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

How much would you say you enjoyed playing the game?

1st Level	Not at all	1	2	3	4	5	A lot
2nd Level	Not at all	1	2	3	4	5	A lot
3rd Level	Not at all	1	2	3	4	5	A lot

When interrupted, were you disappointed that the game was over?

1st Level	Not at all	1	2	3	4	5	Very much so
2nd Level	Not at all	1	2	3	4	5	Very much so
3rd Level	Not at all	1	2	3	4	5	Very much so

Would you like to play the game again?

1st Level	Definitely not	1	2	3	4	5	Definitely yes
2nd Level	Definitely not	1	2	3	4	5	Definitely yes
3rd Level	Definitely not	1	2	3	4	5	Definitely yes

BIOGRAPHICAL SKETCH

Raul Huerta graduated from The University of Texas-Pan American with a Master of Science in Computer Science degree on August 2012. He completed his Bachelor of Science in Computer Science degree at the Universidad Rafael Belloso Chacin in 2005. His permanent mailing address in the United States is 3016 Princeton Ave, McAllen TX, 78504.