

# Requirements Analysis of Presence: Insights from a RPG Game

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## Abstract

Virtual worlds are computer-based simulations intended for its users to have an impression of being in another place. Presence or the sense of 'being there' is a major design requirement for virtual environments where users inhabit an artificial reality in the form of two or three-dimensional graphical representations. Promoting this subjective experience has always been one of the major concerns of designers but this complex and difficult task requires the awareness of other design requirements and their effects on presence. This study aims to define various psychological and technological aspects of presence based on the virtual environment design requirements defined by Stuart (2001).

Previous research tried to define hypothesized factors of presence by using subjective user responses obtained from questionnaires. This study incorporates a different approach to define potential components of presence, specifying the individual design requirements for virtual worlds based on the conceptual framework designed by Stuart. This framework has not been applied to analyze the concept of presence before and it defines possible factors that contribute to a sense of presence, some of which have not been included on previous studies. In order to decompose presence into its components, researchers should also be aware of the design requirements delineated in this framework.

Detailed analysis of design requirements will focus on a computer role-playing game (RPG), giving examples from one of the best titles of the genre. Since role-playing games are social and interactive worlds where players are assuming the role of a virtual character that can be subjectively defined as a second-self, they are highly relevant to presence research. Thus,

selected design requirements will be discussed from a computer gaming perspective, by defining how each relevant requirement is addressed on the selected RPG and how they should be addressed by game designers.

## 1. Introduction

Presence, which is defined as the subjective experience of being there, is a psychological phenomenon that resides in the perceptions of the user. Also defined as the perceptual illusion of being in a virtual environment by means of a communication medium, presence is highly dependent on how users interpret and experience the virtual world. Before analyzing the various dimensions of presence, readers of this article should be familiar with some of the important terms about virtual reality (VR) that are closely related with presence. Among these definitions, three I's of virtual reality defined by Heim (1998) require special attention. These are Information Intensity, Interactivity and Immersion. Information intensity represents the level of detail resulting from continuous information transfer from the virtual world. In order to update the virtual world in real time, the system simultaneously transfers data to the user while it receives input information. Interactivity defines the way users interact with the objects of the virtual world, other users and computer-generated agents. Immersion is a VR system's ability to deliver a surrounding environment, shutting out sensations from the real world (Slater & Wilbur, 1997). Another important concept is involvement or engagement, which depends on the degree of significance or meaning that the individual attaches to the stimuli of the virtual world and represents a user's willingness to interact with the virtual environment (VE).

Bearing in mind the above definitions, we can proceed to analyze the concept of presence further. One of the most important studies on the dimensions of presence was conducted by Heeter (1992), who classified the concept into three components: personal presence, social presence and environmental presence. Virtual reality systems mainly focus on personal

presence, with the aim of creating artificial sensory information similar to the stimuli human senses detect and interpret in the real world. Personal or physical presence, which represents the sense of being physically inside a virtual world, is achieved by using special hardware such as head-mounted displays and trackers. These immersive systems ensure physical presence by shutting down sensory information from the real world. On the other hand, social presence represents the user's ability to communicate interactively with users or computer-generated agents within the virtual world; and environmental presence represents the user's ability to change the virtual world by his actions. If objects within the virtual world do not react to the user's actions, then the virtual environment does not constitute a realistic simulation.

Comprised of personal, social and environmental factors, presence is a multimodal concept with many technological and psychological dimensions. The input devices of a system send user commands to the computer and the output devices transmit the feedback to the user, but it is the human brain that constructs a sense of presence based on various stimuli received from both the real and the virtual world. From this point of view, research on the psychological dimensions of presence (Ijsselsteijn, 2002; Regenbrecht, 1998; Waterworth, 2003; Ijsselsteijn & Riva, 2003; Riva 2004) has defined it as a biological phenomenon, a neuropsychological process and a product of consciousness that relies on perceptual-motor abilities, mental states, traits, needs, preferences and experience of the user. It is a feeling and an activity of selective attention that originates from filtering and organizing conflicting sensory data taken from the real and virtual world. It depends on how the user perceives the world, how the user allocates his/her attention, and how he/she maintains a mental structure of the world. And like all human experiences, it is also influenced by emotions. Interaction with other characters and interpretation of a story/scene in the virtual world will invoke different emotions in different users, which is dependent on various user characteristics such as age, gender, personality traits, background, etc.

Research has also shown that presence depends on a user's ability to 'broadly focus' on meaningful stimulus from the VE (Fontaine, 1992; McGreevy, 1992) and that user attention is

guided by the meaningfulness of the presented information (Triesman, 1963). In order to focus attention on the virtual environment, the user must not be distracted when stimulated with the virtual world (see Witmer & Singer, 1998, for further analysis of distraction factors; see Lessiter, 2001, for further discussion of negative effects on presence). On this sensory dimension, presence in virtual environments is primarily concerned with the visual communication channel and representational richness of the mediated environment. The importance of sensory information richness on presence has been stressed by Sheridan (1992); and the need for a multimodal representation that focuses on all sensory channels was further emphasized by Held & Durlach (1992). The utilization of human sensory channels is both dependent on the technology used and the psychology of the user. For example, the representational richness of the virtual environment, also defined by researchers as realism (Lombard & Ditton, 1997), realness (Regenbrecht, 1998) or naturalness (Lessiter, 2001), primarily focuses on the meaningfulness of the user experience and scene realism. Scene realism is dependent on many technological factors (lighting, resolution, textures, etc.) but the consistency of the virtual environment stimuli with real-world user experiences defines the degree of mental realism, which is subjective by nature.

Conceptual studies on the nature of presence (Sheridan, 1992; Held & Durlach, 1992) and various studies on the hypothesized factors that influence presence in virtual environments (Lombard & Ditton, 1997; Witmer & Singer, 1998; Regenbrecht, 1998; Lessiter, 2001) also stress the different dimensions of presence. All the cited studies above focus on factors that contribute to a sense of presence, but when we look at presence from a requirements perspective, it is important to identify the design requirements for virtual environments and their effect on presence. Virtual environment design relies on several requirements, and it is imperative to define how designers should address these requirements in order to maximize presence. This study aims to define the different aspects of presence based on the virtual environment design requirements defined by Stuart (2001). Further analysis of design requirements and how they

should be addressed by designers will focus on a computer role-playing game (RPG), giving examples from one of the best practices in the computer gaming industry.

The reason behind the selection of a computer game to analyze the dimensions of presence is that computer games are popular virtual environments with thousands of dedicated players from all around the world. These virtual environments offer players the chance to be part of a virtual world, both as a viewer and a participant. Belonging to different cultures and nationalities, most of these players spend significant portions of their lives immersed within these virtual worlds. Computer gamers are potential subjects for researchers of social sciences; they are also useful candidates for research on psychological phenomenon like presence since they are already willingly participating in and interacting with virtual worlds. Steinkuhler (2006) and Ondrejka (2006) also stated that computer games provide virtually limitless opportunities for research and study in a world that is increasingly globalized and networked.

The computer game selected for this study is a role-playing game (RPG). An RPG is an interactive story where the game player controls an avatar called a player character (PC). The ancestors of RPGs are the MUDs, which are text-based fantasy worlds that were very popular in the past. Over time, MUDs evolved into stand-alone RPGs and MMORPGs (Massive Multiplayer Online Role Playing Games). Supported by the story, settings and combat systems of tabletop role-playing games, computer RPGs provide interesting social interaction opportunities for players. The availability of computer games to people all around the world signifies their openness. These virtual worlds offer mentally immersive virtual environments that are built upon social interaction. The artificial worlds created are separate universes with their own rules, culture, ethics, economy and politics. According to Fine (1983), players of RPGs are willing to leave their natural selves behind and enact a fantasy self. This represents a unique feature of RPGs: the willingness of its players to accept the fantasy world as a real world, which gives this genre of games a special meaning from a presence perspective. The selected RPG, "Elder Scrolls IV: Oblivion", has exceptional qualities that makes it a perfect candidate for analyzing

virtual environment design requirements. First of all, it is an outstanding game of the RPG genre. According to the GameRankings.com <sup>1</sup> user vote averages, it is the best RPG released so far and, based upon the average scores of computer gaming website reviews, it is the second best RPG ever released. It has a massive, open-ended and highly immersive world that does not limit the player with linear story structures but it actually promotes user freedom of choice. It combines real world physics with hundreds of AI-supported virtual characters that have a 24-hour schedule of their own, strengthening both behavioral and social realism.

Since this study focuses on a computer game for analyzing the various elements of presence, it is important to specify which dimensions of presence we are dealing with. Computer games are not actually immersive systems: players do not usually use HMDs and data gloves to interact with the virtual world and typically see the virtual world within their monitors. These virtual worlds do not focus on physical presence but actually rely on social and environmental presence to create realistic simulations. Although presence in computer games has been identified by researchers as an important variable (Tamborini & Skalski, 2006; Peng & Lee, 2004), the relationship between exposure to game technology and presence, which depends on many technical issues and the psychology of the user, has not been thoroughly analyzed by researchers yet.

## **2. Requirements for Virtual Environment Design**

The subjective nature of presence makes it difficult for researchers to measure the degree of presence experienced by users. In order to define the determinants of presence, researchers generally use one of the three measurement methods identified by Insko (2003): subjective, behavioral and physiological measures. Subjective measures rely on user responses obtained from questionnaires; behavioral measures are based on observations that keep track of responses of users to the various stimuli of the virtual world; and physiological measures use

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<sup>1</sup> <http://www.gamerankings.com/itemrankings/simpleratings.asp> (Accessed on 20th November, 2007)

heart rate, skin conductance, or the skin temperature of users as determinants of presence. All these techniques are dependent on both the psychology of the user and the communication medium used to interact with the virtual world. The same questionnaire, observation, or physiological technique may get different responses from users based upon the technology used. Users that experience the virtual world with a desktop computer will have different degrees of presence than those with an immersive configuration (HMDs, data gloves, etc.)

Based upon subjective measures, previous research studies have identified different factors that contribute to the sense of presence. Lombard & Ditton (1997) defined six interrelated but distinct dimensions of presence: social richness, realism, transportation, immersion, social actor within medium, and medium as social actor. According to this model, the user is a social actor within an immersive and social virtual world with representations that look, sound and/or feels like the "real thing". The user is actually transported into a medium which also acts as a social actor by itself. Witmer & Singer (1998) presented four factors that contributed to a sense of presence: control factors, sensory factors, distraction factors and realism factors. According to this study, in order to increase the sense of presence, users should have control over the task environment which should respond with immediate and appropriate actions. He/she should interact with the environment by using natural or well-practiced methods and should be capable of anticipating what will happen next. The virtual world should have a multimodal representation that attempts to stimulate all senses. Information presented via sensory channels should contribute to each-other and should be consistent with the overall world structure. The world should offer meaningful experiences without anxiety/disorientation and the information conveyed should be consistent with real-world experiences. Regenbrecht (1998) defined a three-factor solution for presence: spatial presence, involvement and realness. Spatial presence is the sense of physically being present in the virtual world and involvement is the degree of attention focused on the VE. He also defined five other factors that are closely related to presence: quality of immersion, drama, interface awareness, predictability and exploration of VE. In order to promote the sense of presence, the user should be capable of exploring the VE, perceiving dramatic structures and

anticipating what will happen next, without being interfered by the user interfaces he/she uses to interact with the virtual world. Lessiter (2001) extracted four factors that influence presence: physical presence, engagement, naturalness and negative effects. Physical presence is similar to the spatial presence mentioned above and engagement is another convention for naming involvement of the user.

All the studies cited above tried to analyze presence from a top-down approach, by using subjective measures to determine the components of presence. However, the relative importance of each factor varies between users and the results are highly dependent on the technology used to simulate the virtual environment. This article uses a bottom-up approach to define the components of presence, specifying the individual base elements of a virtual reality system in detail and utilizing the conceptual framework designed by Stuart (2001). It is important to note that Stuart assumed some psychological constructs like immersion, engagement and involvement as internal elements of presence; they are not classified as individual design requirements. The framework of Stuart (2001), which has not been applied to analyze the concept of presence before, includes 23 functional requirements (including presence) for designing virtual environments. This framework is applicable to virtual environments and computer games since it explains important parameters for virtual environment design that are of varying degrees of importance depending upon the application in question. Among these requirements, stability, robustness, registration, calibration & customization, reconfigurability, connectivity and I/O bandwidth are pure technological variables. The remaining requirements are both technological and psychological constructs that rely on user perceptions and thus subjective by nature.

Below is the mapping of Stuart's virtual design requirements and previous studies on presence that defined the factors that contribute to a sense of presence. As it shows, previous studies on presence covered only a limited number of design requirements. In order to decompose presence into its components, researchers should also be aware of the design requirements





Responsiveness, stability, robustness, registration, calibration and customization are hardware-dependent requirements. Responsiveness is the ability of a system to minimize the time between a user's input and the system's response; stability refers to the lack of jitter and oscillation in the position of objects; robustness is the system's ability to withstand environmental conditions; and registration is the difference between a physical position and orientation and a reported position and orientation. These requirements are important performance characteristics for position trackers (Meyer, Applewhite, & Biocca, 1992) but responsiveness requires special attention since it is also a psychological issue. Responsiveness will be further examined in the next section from a user's perspective. Calibration allows the user to make adjustments in I/O devices using individual physical characteristics to improve ergonomics. Customization permits users to take into account their preferences for a more personalized and satisfactory system configuration. The user will feel more at ease if a system is calibrated and customized for his use. Computer games offer some performance characteristics that can be adjusted by users in order to provide a smooth simulation that is customized for their particular computer system.

Reconfigurability, degree of virtuality, choice of representation, safety and hygiene, connectivity, and I/O bandwidth are application-specific requirements. Reconfigurability is a designer requirement and since users cannot predict whether a system is reconfigurable or not, it is not a relevant variable for measuring presence from a user's perspective. Degree of virtuality is only important for augmented reality applications, where the border between what is real and what is virtual easily dissipates. The importance of safety and hygiene may vary for the application in question and choice of representation is a user preference. Some users will prefer iconic representations; some others will find realistic representations of objects more meaningful. On the psychological dimension, the impact of representation on presence may vary from one user to another.

Connectivity refers to the multiplayer capabilities of the virtual environment, while I/O bandwidth is the actual data transfer rate between computers. These two requirements are important for

networked virtual environments where application data is transferred from one location to another. A good example of networked virtual environments is Massive Multiplayer Online Role Playing Games (MMORPGs). Connectivity is also a user choice; some users will find multiplayer environments more enjoyable, while others prefer single-player environments and interaction with computer-generated agents instead of real persons. Since human players are more unpredictable than computer-generated characters and people like to compete with each other, users usually prefer playing against each other to playing against the computer (Wadley, Gibbs, Hew & Graham, 2003). Though every virtual environment needs a multi-sensory design approach, most virtual reality applications primarily focus on visual and auditory displays. In particular, the addition of tactile, olfactory and auditory cues to a virtual environment increases user's sense of presence and memory of the environment (Dinh, Walker, Song, Koboyashi, & Hodges, 1999).

### 3. Considerations for Game Designers

Before analyzing the selected design requirements, it is important to note that the selected RPG, is one of the best practices of the gaming industry that successfully implemented most of the selected requirements. Players of Oblivion can interact with both the content of the game (through game modding) and the virtual world (primarily PC-NPC interactions). The massive world has hundreds of locations to explore, a large variety of characters and objects to interact with. The game promotes sociability with the help of various guilds and a social ranking system. Representational richness, physical and behavioral realism are higher than most of its competitors during its release. Radiant AI is used to promote autonomy for virtual agents and the Havok physics engine attempted to provide realistic physical behaviors in objects.

**Interactivity:** Rafaeli (1988) defined interactivity as an under-defined concept that has little consensus on its meaning, but other researchers stated that interaction and interactivity have an important role in creating a sense of presence (Zahorik & Jenison, 1998; Sheridan, 1992).

According to Steuer (1992), interactivity in virtual reality is composed of three elements: speed, range and mapping. Speed is the response time of the virtual world; range represents the number of attributes that can be manipulated by the user; and mapping is a function of the types of controllers used to interact with the mediated environment. Steuer's definition primarily focuses on technological aspects of interactivity, but interactions in a virtual world are not imitations of real-life experiences; they involve different forms of social and psychological behavior unique to virtual worlds.

According to Biocca & Levy (1995), virtual environments are emerging communication systems aiming to provide full immersion of the human sensorimotor channels into a vivid computer-generated experience. Lievrouw & Livingstone (2002) defined three forms of interactions for emerging communication systems: user-to-user interactivity, user-to-documents interactivity and user-to-system interactivity. According to the level of receiver control on the messages and the direction of communication, user-to-user interactions are classified into four groups: monologue, feedback, responsive dialogue and mutual discourse. Based upon the level of receiver control on the messages and the nature of the audience, user-to-documents interactions are classified into four groups: packaged content, content-on-demand, content exchange and co-created content. According to the center of control and the nature of the interface, user-to-system interactions are classified into four groups: computer-based interaction, human-based interaction, adaptive interaction and flow. An ideal interactive system, according to these models, takes the form of mutual discourse, co-created content and flow.

According to these classifications, multiplayer games offer user-to-user interactions but single-player games do not; instead, they focus on PC-to-NPC interactions. PC-to-PC interactions of multiplayer games can be classified as mutual discourse, where the sender and receiver roles become nearly indistinguishable. On the other hand, PC-to-NPC interactions of single-player games can be classified as responsive dialogue, where messages exchanged reflect awareness of all earlier messages. In terms of user-to-content interactions, computer games usually provide

packaged content to their players where the only content creators are the game designers. However, the RPG game selected for this study gives players the opportunity to create custom content. The world creation tool of Oblivion, TES construction set, is available to everyone who owns the game. Because of this, Oblivion provides a wider range of interactions; thus, it can be classified as content exchange in terms of user-to-documents interactivity. In terms of computer-to-system interactivity, computer games offer adaptive interactions where the system adapts itself to the needs and skill levels of the players. Oblivion takes this process one step further, offering adaptable interactions using a special technique called 'level scaling'. During game sessions, the virtual world automatically adapts to the level and power of the player's character.

From a computer gaming perspective, Friedl (2003) defined three forms of interactions: player-to-player, player-to-computer and player-to-game interactions. Player-to-computer interaction defines the connection between the player and the computer's hardware and software, such as graphics and sound capabilities. Player-to-player interaction is unique to multiplayer games, and player-to-game interaction covers how the player interacts with the game as a media. One of the most important aspects of player-to-game interactions in an RPG is storyline, which defines the sequence and form of user actions. Building blocks of storyline are meaningful play and user freedom of choice. The importance of freedom in the users' actions within a virtual environment has been highlighted by Mantovani & Riva (1999) and meaningful play is defined as the relationship between player's actions and system outcome (Salen & Zimmerman, 2004). The selected RPG, Oblivion, offers a non-linear storyline that especially focuses on user freedom of choice.

**Sociability:** Sociability is one of the building blocks of virtual environments. In order to increase the sense of presence, virtual worlds should be capable of creating a strong sense of social life. The importance of sociability or social richness on the sense of presence has been emphasized by various researchers (Heeter, 1992; Lombard & Ditton, 1997), and computer games, regardless of their multiplayer capabilities, should support dynamical communities to enhance

sociability. Since each computer-supported social network develops its own norms and structures (Wellman, 1996), sociability in computer games also has its own rules. Oblivion is a single-player computer game and sociability primarily consists of interactions with NPCs. Ideally, sociable non-player characters shall exhibit entertaining, non-repetitive and near-realistic behaviors.

In order to increase sociability, game designers are trying to build social environments, even forcing the players to interact with PCs and NPCs (Ducheneaut & Moore, 2004). This is achieved by tying some of the game's activities to particular locations such as guilds or by designing quests too difficult for a single player to achieve. Guilds, which are a necessary part of the RPG social system, consist of a group of PCs or NPCs that share their resources and buildings. The social system is built on a rank system, where higher-ranked player or non-player characters manage the guild and support the novice. The RPG selected for this study focuses primarily on guilds and a rank system to achieve sociability. Players can join various guilds in the world of Oblivion, gaining rank as they complete quests and interact with NPC guild members, even becoming guild masters at the end.

**Viewpoint:** Viewpoint describes how users perceive their location. According to Friedl (2003), various viewpoints used in virtual environments have their own advantages and disadvantages, depending upon the requirements of the design. Some users will find the third-person viewpoint unrealistic, while others will find it more useful since they will be able to see the world around them from a wider perspective. Ideally, virtual environments will leave the choice to users, granting various viewpoints in their simulation. The selected computer game, Oblivion, incorporates the two most popular viewpoints: first person and third person. Difficult camera controls make the third-person mode non-suitable for action scenes but players often use it to take a look at their avatar and see if their armor/weapon looks impressive. Regardless of their powers and magical properties, weapons and armor can be disregarded by players if they do not look well enough and/or do not suit with their character's style.



Fig. 1. Character screenshot from clothing contest of Planet Elder Scrolls<sup>2</sup>.

**Responsiveness:** Responsiveness is the delay in the user's perception of the effect of an action on the system. On the technological side, it is determined by the hardware configuration of the user, but it also depends on the user's perception of the virtual world. To some users, a system may seem very responsive and to others the same system may not seem responsive at all. Responsiveness of a virtual world is closely related to the form of the environment and the activities that players undertake. Research has shown that the ability of a user to construct a mental map of the environment directly affects responsiveness (Bentley, 1985; McCall, 2005). The world of Oblivion includes thousands of objects and hundreds of characters that are responsive to user actions. Almost every single object seen on the screen can be picked up and examined by users; but the real-world physics makes it difficult to perceive how objects shall respond to physical forces. NPC AI is assumed to be responsive to user actions, but may

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<sup>2</sup> <http://planetelderscrolls.gamespy.com/View.php?view=Articles.Detail&id=44> (Accessed on 6th February, 2008)

sometimes be too responsive (such as summoning a guard instantly inside a home to arrest the player if he is stealing property) or unresponsive (such as impassive NPCs that do not take any action even if the player throws fireballs inside their homes in the middle of the night).

**Veridicality:** The virtual environment, with its physical appearance (technological dimension) and object behaviors (psychological dimension), should accurately represent the real world we are living in. Behavioral realism, which is the consistency of information with the objective world, is one of the hypothesized realism factors that contribute to a sense of presence (Witmer & Singer, 1998; Freeman, 2000). Oblivion primarily focuses on the physical appearance of the virtual world to create a realistic simulation. For instance, even weather is dynamic in nature and region-based. A double-layered sky provides realistic cloud movements and wind speed affects the motion of trees, grass, and even store signs. The physical realism of Oblivion largely overwhelms the behavioral realism employed by the game. Behavioral realism depends on the AI system which is often criticized by players to be unresponsive.

**Autonomy:** Autonomy, presence and interactivity are three major characteristics of a VR system (Zeltzer, 1992). To sustain the feeling of presence in a virtual world, virtual agents should behave like real persons and be able to make autonomous decisions independent of other entities in the environment (Aylett & Luck, 2000). The AI is a primary focus of Oblivion. The Radiant AI system developed for the game allows designers to breathe life into a world with well over 1500 characters. Having 24 hour schedules for the NPCs increases their believability, but designers should implement autonomy with caution, bearing in mind that autonomous characters are more lifelike if they are sociable. Characters of Oblivion do wander in the streets, talk to each-other and go to bed at night, but most of the time they ignore player actions and respond with a limited set of dialogue options if approached by the user.

**Physics of the Virtual Environment:** Physical properties of the virtual environment, such as space exclusion, gravity, friction and inertia should conform to real-world physics. Sutcliffe (2003) stated



that user interaction with virtual world objects should conform to the laws of physics that constrain real-world interaction. Oblivion uses the Havoc physics engine, which allows interactions with objects and other characters in real-time for more lifelike worlds and animations. One of the new features that improve the game experience is the use of physics-based sound. Sound categories are associated with material types on objects and they are simulated depending on collisions that occur in the game. Thus, dropping a sword on the stone floor of a cave will sound different than dropping it on the floor of a wooden house.

**Representation of the User:** Virtual environments should provide their users with appropriate body images to represent them to others and to themselves. The most interesting feature of RPGs is the character creation process, which offers the player the chance to create a customized character for him or herself in the virtual world. Players choose their own background, race, physical appearance, gender, age and skills to create a unique personality in the virtual community. According to Kelly (2004), most players see their RPG characters as extensions or representations of their real selves. This process of creating a character is like creating a second self and this view is quite different from how players of other genres see their characters. Customization of the user representation acts as a mode of personal expression and helps the users in acquiring an identity and making their virtual character real (Taylor, 2002). Oblivion grants its users the ability to customize their physical appearance in detail, as well as providing a wide selection of attributes and skills. The facial customization screen of Oblivion is probably the most detailed one ever presented in an RPG.

**Resolution:** The representational richness of the mediated environment, which is also discussed in the first section of this article, affects the degree of presence experienced by users. On the technological side, those with a better computer configuration can experience the virtual world with higher resolutions. On the other hand, if the representational richness of the virtual world degrades user playability, users will not or may not wish to interact with the virtual world. The richness issue is also dependent on how experienced the user is: hardcore gamers may find a

virtual environment poor in representation, but first-timers may find it compelling. Oblivion offers a very rich and enormous virtual world, which is one of the greatest strengths of the game. The world of Oblivion, with tens of cities, hundreds of dungeons and its multitude of wildlife, is a very good example of high representational richness. The level of detail is customizable; users can turn off or adjust some graphic options if their system is not running the game smoothly.



Fig. 2. The Imperial City, capital of Cyrodiil in Oblivion.

**Navigation Techniques:** The movement of the user within the virtual environment, also called viewpoint motion control, is an important VE interaction task affecting the experience of space. Selection of the navigation technique actually depends on the size of the virtual world and the psychology of the user. Users may visit and navigate virtual worlds ranging in size from small cities to large countries or even galaxies with multiple planets. Small worlds can be easily traveled by conventional methods such as walking or riding a horse, but large worlds require discrete transportation techniques like teleporting. Although Stanney (2002) advised designers to use smooth transitional methods between locations and to avoid the use of teleportation, these techniques are frequently used in RPGs. On the other hand, the mode of travel also depends on

what the player wants to achieve and how he/she feels about the virtual world. For casual players who wish to explore the entire virtual world, walking may be the preferred option instead of teleporting everywhere. In terms of presence, one navigational form does not have a significant advantage over another and Oblivion grants its users different navigation techniques: walking, riding a horse or fast traveling to any location. Designers should always employ different navigation techniques, leaving the choice to users.

**Locus of Control:** Virtual environments should give their users the opportunity to create and control the content of the virtual environment. The more control users have over the virtual environment, the greater the experience of presence (Witmer and Singer, 1998). In the virtual world of Oblivion, players have some control over the content of the VE: they can customize the character class they play, the spells they cast and the magical items they use. Another control mechanism over the content of the virtual environment is game modifications. Oblivion comes with the TES World Construction Set, allowing players to create custom modifications or “mods” that may be added to the original game and shared amongst users. Users can create and customize the virtual world as they like, but since “modding” requires basic understanding of 3D objects and scripting techniques, it remains the privilege of an elite group of players.

#### **4. Conclusion**

Virtual environments are interactive and immersive artificial realities with high information densities that provide their users an impression of being in another world. Designing virtual environments that promote the sense of presence experienced by users is a complex and difficult task. Designers must be aware of the unique design requirements and their effects on presence, and should consider different play styles and player types as defined by researchers (Bartle, 2004; Louchart & Aylett, 2003). Relative importance of these requirements may change for the application in question but designers should know how they would address each requirement.

According to Laramée (2002), players may experience computer games in a linear fashion but they must not be linearly constrained. The selected RPG, "Elder Scrolls IV: Oblivion," provides an open-ended game-playing environment, incorporating quests and things for the player that can be carried out in any order and in a variety of ways. This non-linearity promotes user freedom of choice in the virtual environment. On the other hand, too much freedom breaks the challenge-based and imaginative immersion experienced by the players. Sociability in Oblivion primarily consists of interacting with the NPCs through various guilds and a rank system in the virtual world. RPGs often allow deep connections with NPCs through shared adventure and dialogue (Christian, Riedl & Young, 2002), but Oblivion does not offer NPC companions to its players. Repetitive dialogue and relatively low number of voice actors seriously diminishes sociability.

To achieve higher veridicality even when the simulated environment is a fantasy world, the virtual world design should enable users to interact with the environment and the objects within as they would interact with the real world and its objects. Real-world physics enhances the sense of presence experienced by users but without touch and force feedback, too much realism in world physics breaks the sense of presence. Wandering around in Oblivion, users can accidentally hit objects and knock them over. Autonomy creates realistic NPCs but autonomous intelligent characters should also have their own personalities, goals and capabilities, possessing knowledge of the world they inhabit. It must not be forgotten that socially capable autonomous characters are an important building block for character-based games (Tomlinson & Blumberg, 2002).

The extent of this paper is to indicate a number of variables that need to be considered in order to maximize presence in virtual environments, especially in computer games. This study does not claim to have identified all of the design requirements that affect presence but it tries to address how certain requirements should be addressed by designers. Future studies on technological and psychological variables can provide better insights, giving the opportunity to group these

variables into meaningful components. Statistical analysis can provide better justification for the design requirements and the explanatory power of each requirement on presence can be better rationalized. Further studies on immersive virtual environments can provide an opportunity to analyze the differences between desktop systems and physically immersive environments in terms of their design requirements.

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