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Beyond the HUD

User Interfaces for Increased Player Immersion in FPS Games

Master of Science Thesis

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Cover:
A conceptual view of the visual UI conventions of FPS games, see page 32.

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Finally we would like to thank our friends and family for putting up with us while we spent a little over six months doing little else than writing about, talking about and playing games – Of course all in the name of science.

This thesis is dedicated to all the people who work, have worked or will someday work with creating games that entertain, engage, thrill, scare, humor, intrigue, educate, challenge and annoy millions of people throughout the world.

ABSTRACT

The concept of immersion has been adapted by game developers and game critics to describe a deep and positive game experience. While the definition of this concept varies, the user interface of the game is often said to affect the degree to which players can immerse themselves in a game experience. In cooperation with game developer EA DICE, this master thesis aims to investigate how the notion of immersion affects, and is affected by, the user interface (UI) of first-person shooter games, with the ultimate purpose of delivering user interface guidelines for increased immersion.

By conducting a study of contemporary first-person shooter (FPS) games, the current state of user interfaces in FPS games is documented. With the addition of a subjective study of FPS games as well as games of other genres, a design space for UI designers is mapped out in order to provide a structure upon which the guidelines can be built. A literature study of various resources within the fields of ludology, cognitive science and media studies is conducted in order to gain increased understanding of what immersion is and its relation to the game experience. The knowledge acquired is used to formulate various hypotheses of how player immersion is connected to the user interfaces of FPS games. These hypotheses are evaluated by user studies and user tests.

Looking at the results of the user tests and the literature study, a final definition of immersion is proposed, upon which the guidelines are based. The first guideline, *Know Your Design Space*, explains the user interface design space of FPS games and encourages UI designers to look at it as a set of tools. *Know Your Game* discusses how the competitive focus of the game and the game fiction affects the user interface from an immersion point of view. The guideline *Establish Player Agency* focuses on how the player can be transferred into the game world by acting within it as an agent rather than simply a player of the game. Finally, *Strengthen the Player-Avatar Perceptual Link* suggests how the user interface can link the player closer to his in-game character on a perceptual level.

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TERMINOLOGY

First-Person Shooter (FPS)

A first-person shooter game is commonly referred to as a FPS and as the name implies FPS games are played from a first-person point of view, rather than the third-person perspective otherwise associated with character-driven games. By convention, FPS is a game genre focused on gun- or projectile weapon based combat in which the action is seen through the eyes of a protagonist.

Head-Up Display (HUD)

A head-up display, or HUD, is any transparent display that presents data without requiring the user to look away from his or her usual viewpoint. The origin of the name stems from the user being able to view information with their head "up" and looking forward, instead of angled down looking at lower instruments. In games, the term HUD refers to the method by which information is visually conveyed to the player whilst a game is in progress. The HUD is frequently used to simultaneously display several pieces of information such as the main character's health, items, and indicators of game progression and goals.

Player Avatar

The player avatar in a game is the instance controlled by the player, the character through which the player acts and explores the game world. In this thesis the term *player character* will sometimes be used, referring to the avatar as a fictional character in the game's narrative rather than as a player controlled instance.

Overlay

Presenting an element in an overlay manner means that the overlay element is visually superimposed onto a background image.

Diegesis

By utilizing the concept of diegesis one can define what is and what is not part of a virtual world, and what the characters inhabiting this alternative world can and cannot see. In movies, non-diegetic elements are for example the subtitles or the musical score, while diegetic elements are the elements that make up the world that the film characters live and act in.

Single Player (SP)

Playing a single player game, or playing the single player mode of a game, means playing a game in which no other human players take part.

Multi Player (MP)

Playing a multi player game, or playing the multi player mode of a game, means playing a game in which other human players take part either in a competitive or a cooperative way.

Level Designer

A level designer builds the geometry of the game, by constructing the actual world that the player moves through and explores.

Art Director

An art director is in charge of the overall visual appearance of the game, producing conceptual graphics meant to guide and inspire the other members of the game development team. The art director makes decisions about what artistic style and visual elements the game should rely on.

Game Designer

A game designer develops the rule-set of the game, which includes balancing the challenges posed to the player and adjusting the learning curve of the game, developing the set of actions by which the player can act within the game, to ultimately make the game a challenging yet enjoyable experience.

1 INTRODUCTION

Lately, the concept of immersion has become a popular buzz-word in the game industry. However, the notion of immersion is used inconsistently and the exact meaning of immersion might depend on the source. According to designer/developer Luca Breda the essence of immersion can be said to be a state of experiencing deep emotion linked to a medium, in this case games (Breda 2008). Others say that immersion is the removal of the barriers between people and their medium of entertainment, until the medium becomes as real as everyday life (Woyach 2004).

One aspect of games identified as related to immersion is the user interface, and particularly the visual overlay user information known as the HUD (head-up display). Some say that a conventional HUD serves as a layer preventing the player to immerse himself or herself into the game (Wilson 2006), while others say that moderate use of HUD elements does not harm immersion and is in fact needed to provide the player with necessary information (Breda 2008).

Some argue that the concept of immersion contradicts the nature of play itself. Game design theorists Katie Salen and Eric Zimmerman speaks of the immersive fallacy, arguing that play is characterized by the player adopting a kind of double-consciousness that puts him or her both inside and outside the game world at the same time (Salen and Zimmerman 2004).

1.1 Purpose

With immersion as a starting point, the scope of this master's thesis is to examine how user interfaces in FPS (first-person shooter) games can be designed to strengthen the game experience and help to engage the player in the game. This will be done through a study of user interfaces in games in general and FPS games in particular, and a literature study in parallel. This knowledge will then be applied to construct hypotheses regarding how FPS game user interfaces affect the game experience. These hypotheses will be supported by literature and evaluation through user testing, and ultimately shaped into design guidelines for user interface designers of FPS games.

1.2 Delimitations

The guidelines delivered as a result of this master thesis will be designed for action games played in a first person perspective on game consoles (Xbox360 and PlayStation 3). Hence, the possibilities and constraints of traditional PC control interfaces (such as mouse and keyboard) will not be considered or discussed.

Nintendo's latest video game console, the Wii (2006), will not be considered throughout this thesis since EA DICE is not currently developing games for this system.

The guidelines will not take narrative details into consideration, nor will narrative have any impact on the deliverables. However, as every game theme (science fiction, World

War II, etc.) brings a game setting with both opportunities and restrictions on how information can be conveyed to the player, this delimitation does not involve the theme of games.

It is also presumed that it is not the role of the UI designer alone to decide on what information that should be made available to the user, and with which resolution or level of detail this information is to be made available. Hence issues such as these will not be elaborated in much detail in this master's thesis report.

Since the experience of playing a game is quite different from using other software, usability will not be covered by the report unless it is a relevant aspect of immersion or an immersive game experience.

Throughout this report the term user interface (UI) will be used, and in a broader sense than what might usually be the case. While user interfaces in games might traditionally be viewed of as the information presented in a layer on top of the actual game (the heads-up display and menus), the term as used in this report refers to all informative elements within the game, regardless of whether it is channeled visually, auditory or by haptics. The term user interface as used in this report does not refer to user input through controller peripherals.

1.3 Specification of Question Formulation

The main question that this thesis addresses is:

How is immersion related to the experience of playing a FPS game, and how can this knowledge be of use when designing the user interface?

To answer this, the following sub-query's have been formulated:

- What is the design space of user interfaces for games?
- What is immersion and how is it related to the game experience?
- How is immersion connected to user interfaces of FPS games?

2 BACKGROUND

The master thesis work documented in this report has been performed in cooperation with the Swedish game developer EA DICE. Among a number of topics suggested for the master thesis, it was mutually decided that investigating current trends towards removing HUD elements in FPS games for increased player immersion would be of greatest interest for EA DICE. To make the size of the project reasonable in terms of the width of the scope, it was decided that thesis should exclude all hardware platforms except current generation game consoles.

2.1 EA DICE

2.1.1 Company History and Current State

Swedish game developer EA DICE started out under the name Digital Illusions, releasing the game Pinball Dreams in 1992 and subsequently Pinball Fantasies the same year. Shifting focus from pinball games to racing games, and eventually turning to war themed first-person shooters with vehicular features, EA DICE is today a diverse game development studio developing games both for PC and current generation game consoles. While maintaining strong focus on its critically acclaimed Battlefield series (with Battlefield: Bad Company released in 2008 and a sequel in development), EA DICE has recently explored new ground with Battlefield offspring Battlefield Heroes (currently in development) and the new IP Mirror's Edge (released in 2008). (EA DICE, 2009)

Except for the currently in development title Battlefield Heroes, EA DICE is mainly focused on action-games played from a first-person perspective. With the development of Mirror's Edge, EA DICE explored the first-person action genre from a non-shooter perspective, emphasizing movement throughout the game environments rather than offering combat-heavy gameplay.

What is likely an effect of the non-traditional nature of Mirror's Edge (from a first-person action game point of view), the game features an unconventional user interface in which overlay HUD elements are almost non-existent. Instead of presenting user information in a layer on top of the game, the 3D geometry itself is utilized to guide the player throughout the game by highlighting environmental objects that are of interest for the player. This is called Runner Vision, and has generated attention among game critics.

2.1.2 Target Group of EA DICE Games

No official information is available from EA DICE regarding the target group of their games. Hence, to match the purpose of this thesis, the target group has been defined rather widely as people playing current generation console games and that are familiar with the FPS game genre.

2.2 The FPS Game Genre and how it has Evolved

The first-person shooter is a video game genre which builds the game play around gun-based combat seen through a first-person perspective of the main protagonist and often emphasizes action rather than puzzle solving. The first title that could be said to represent the modern FPS game was Wolfenstein 3D (id Software, 1992); it was this title that established most of the genres persistent characteristics. Wolfenstein was followed by the hit series Doom and Quake from the same developer. From about 1992-1996 FPS user interfaces were designed with a clear split between a "world view" and a "tool bar" similar to the layout seen in productivity tools. There was often a distinct frame dividing the part of the screen concerned with the game world from the part concerned with providing player feedback and information (see Picture 2.1).

Picture 2.1. Wolfenstein 3D shows a clear division between game world and player information.

While previously having been a heavily PC oriented genre FPS games were successfully introduced to the console market with the title GoldenEye 007, followed by the Halo series that established consoles as a platform for competitive on-line FPS games (Cifaldi, 2006a). Around 1997 there was a clear shift in focus in FPS interface design philosophy heralded by the bold design choices of games such as GoldenEye 007 (Rare, 1998), that had few user interface elements on screen at the same time, and many of them (like the health indicator in GoldenEye) were context sensitive, only fading into existence when relevant. The interface elements were now presented as being superimposed onto the game world rather than in a separate form, thus mimicking a heads-up display in an aircraft (see Picture 2.2).

Picture 2.2. In GoldenEye 007 the HUD had a circular design showing remaining health (to the left) and body armor (to the right). This information was only visible when under fire.

The game Half-Life (Valve, 1998), was one of the first FPS games that successfully introduced narrative and puzzle elements to the genre without compromising on the action or phasing of the game experience. Half-Life was later modified and released online as the popular competitive FPS Counter Strike (Cifaldi, 2006a). At the end of the nineties HUD elements were becoming more and more transparent and some games now attempted to integrate their HUD elements into the story and game world itself (see Picture 2.3).

Picture 2.3. In Half-Life the HUD is semi-transparent and complemented by a computerized voice giving feedback on health, radiation levels etc.

Both the Half-Life and Halo series' had HUDs that were (at least partly) explained by the fact that the main characters were wearing sophisticated technical suits that could provide feedback on health-states and other relevant information to the player character rather than to the player directly. At the midpoint of the 00's the first-person shooter was one of the most commercially successful and fastest growing video game genres on the market (Cifaldi, 2006b).

Throughout the genres evolution, focus has been put on the development of cutting edge real-time 3D graphics, constantly pushing the hardware of systems by depicting as detailed game worlds as possible. Similarly, games such as Half-Life has made progress in interactivity, artificial intelligence and simulating physics (Klevjer, 2006a), resulting in increasingly responsive and interactive game worlds.

2.3 Current Generation Game Consoles

The Xbox 360 (by Microsoft, released in 2005) and the PlayStation 3 (by Sony, released in 2006) were the first home consoles that offered high-definition graphics. They are considered to belong to the same generation of home video game consoles and many of the games created by third party developers (not working directly under Microsoft or Sony) are released simultaneously on both systems (Wikipedia, 2009b).

The standard game controller for the Xbox 360 has two vibration motors that enable it to give haptic feedback in stereo by varying the output of the different motors.

The standard PlayStation 3 controller (called Sixaxis) featured a motion sensor capable of measuring rotational orientation and translational acceleration, but lacked vibration motors (Wikipedia, 2009c). In 2008 a second controller version (called DualShock 3) which featured both motion sensors and vibration motors was released (Wikipedia, 2009a).

2.4 Voices of the Game Industry

In the article "Off With Their HUDs!", former concept designer Greg Wilson takes a stand against conventional heads-up displays in games. He bases his arguments on three points; 1) high-definition television sets use technology that can be sensitive to persistent on-screen elements, 2) the heads-up display hinders players to immerse themselves into the game world, 3) people relatively new to games can be overwhelmed by all information presented in a traditional game heads-up display. From an immersion point of view, Wilson claims that artificial overlays might be efficient but not a part of game world, hence distracting the players from the environments that they are immersed in. For increased immersion, he suggests incorporating information into the environment, exploring audio cues, and theme the HUD according to the game world, among other things (Wilson, 2006).

Designer/developer Luca Breda elaborates more on the subject, identifying "flow", "suspension of disbelief" and "presence" to be key aspects of immersion in games. According to Breda, there are four factors determining to what extent a player is immersed in a game: attention, concentration, atmosphere, and empathy. Ultimately, he lists three different types of immersion in games; short-term immersion being the involvement in the small choices and simple challenges of the game, long-term immersion occurring when the player sets up long-term strategies, and narrative immersion which is the attachment to the characters, action and plot of the game (Breda, 2008).

In the article, Luca Breda touches on how heads-up displays are connected to immersion, claiming that a wide-spread opinion is that the HUD information is often placed in the periphery of the screen distracting the player's view from the focal point and hence breaks immersion. However, the author has a conservative attitude towards this, claiming that while HUD elements might not help immersion they will not necessarily harm it either, as there is a player acceptance of the HUD. Looking at the user interface of games beyond the HUD, Breda mentions multi-sensory information and audio effects as a way of achieving immersion – increasing only visual information, he says, is not enough. Other factors affecting the level of immersion are the "affordances", consistency and credibility of the game (Breda, 2008).

Game journalist Christian Ward relates immersion to the realism of the game world. In the article "A Break in Immersion", he rants against elements that shatter the illusion of the game world and takes the player out of the game experience. Ward speaks of breaking the fourth wall – when a game, or characters in the game, refers to something outside the fictional game world – as a phenomenon weakening the immersive experience (Ward, 2009).

3 THEORY

The work documented in this master's thesis report builds on various studies, theories and concepts explored previously by others. The field of ludology provides an understanding of what constitutes a game experience and what elements it consists of. This can be linked to human behavior by looking at cognitive science. To gain an understanding of the concept of immersion and how it relates to games, media studies is of relevance. Finally, the master thesis work process itself builds largely upon design methodology.

3.1 Ludology

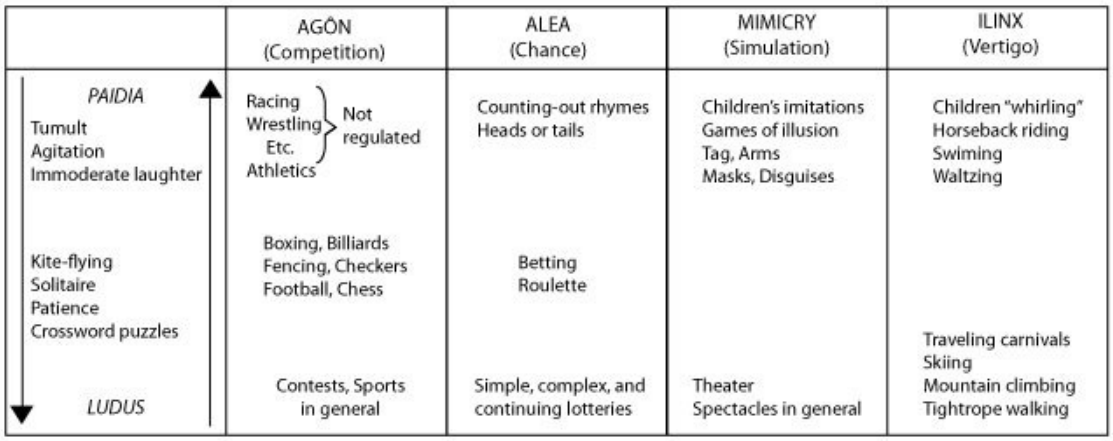
Ludology is the field of game studies from a multidisciplinary perspective. It studies how humans relate to games and play. It is of relevance to this thesis in providing a framework for looking at gaming and games both as an activity and as artifacts in and of themselves.

3.1.1 The Nature of Play and Games

In the book "Man, Play and Games" from 1958, french philosopher Roger Caillois proposes a classification of play and games, based on the primal pleasures that people seek when engaging in these activities (see Picture 3.1). According to Caillois, there are four fundamental categories of games:

- **Agôn (Competition)**, games with a competitive nature
- **Alea (Chance)**, games of chance in which the participants have no control of the outcome
- **Mimicry (Simulation)**, residing into a closed, conventional and in certain respects imaginary universe
- **Ilinx (Vertigo)**, the pursuit of a sensory-rich experience of movement, speed and chaos

To this categorization, Caillois adds a scale measuring how governed the activity is by rules. On this scale, the extreme points would be a) Paidia, the primary power of improvisation and joy, and b) Ludus, the urge to be challenged by difficulty and competition (Caillois, 2001).



Picture 3.1. The driving pleasures of games and play, according to Caillois.

A more recent attempt to provide a list of what motivates people to play games, taking computer/video games into account, is presented by Chris Crawford in the book The Art of Computer Game Design (Crawford, 1984). According to Crawford, these motivations are:

- **Fantasy/Exploration**: Being transferred into an alternative world available for exploration
- **Nose-Thumbing**: Playing a role not socially acceptable in real life (such as a pirate or thief)
- **Proving Oneself**: Demonstrating skill
- **Social Lubrication**: When the game is of minor importance, and mainly fills the purpose of being a tool for socialization
- **Exercise**: Playing games for mental or physical training
- **Need for Acknowledgment**: Being acknowledged by the game (or another human player) by interaction

3.1.2 Rules and Fiction

In the book Half-Real, video game researcher Jesper Juul speaks about two major elements that builds a game; rules and fiction. The rules of a game describe what players can and cannot do, and what the response to certain player actions is. These rules are designed to be objective, obligatory and unambiguous. The rules create a so called state machine; a tree of different game states, in which each state branches off to other states, with each branch representing a player action. In short, in a certain game state the player can act in a number of different ways, resulting in another game state. According to Juul, to play a game is to interact with and explore this tree of different game states in order to reach an as positive outcome as possible (Juul, 2005).

The fiction describes the more subjective and optional parts of the game such as the world, setting and story of the game. The fiction is conveyed through relatively direct channels such as the graphics, sound and text in the game, but by also second-hand sources such as the rules of the game, the game manual or even advertising. Fictional worlds are incomplete; there is no fiction that is able to cover every detail of the world it

describes. Hence, filling the voids of the fiction is left to the player's imagination (Juul, 2005).

Where Rules and Fiction Meet

Juul speaks of the game space as a place where fiction and rules overlap. In other words, the geometry and level design of a game serves as space where rules and fiction interplay. Rules can cue the player into imagining a fictional world (*I am not punished for killing, maybe the game is set in a war*), and fiction can in reverse cue the player into understanding the rules of the game (*The game is set in a war, so killing might not have any negative consequences*) (Juul, 2005).

Incoherent Game Worlds

Fictional worlds are not only incomplete – the world portrayed by some games might even contradict the fiction itself (*Why does Mario have three lives in Donkey Kong?*). These worlds are incoherent. A game with a coherent world is a game in which nothing prevents the player from filling the voids of the game fiction by imagination (Juul, 2005).

Juul speaks of incoherent worlds as optional. By conventions, "the player is aware that it is optional to imagine the fictional world of the game". In some case ignoring the fictional game world is actually desired by the player such as when the game experience is extremely rule-centric, for example when playing highly competitive games (Juul, 2005).

3.2 Cognitive Science

Cognitive science studies the nature of intelligence and provides models of how we view the world and its informational content and how we organize our impressions. It is of relevance to this thesis in further expanding the understanding of how a player's reasoning might work while playing games and what sets these situations apart from actual life.

3.2.1 Frame Theory

Sociologist Erving Goffman introduced the concept of framing as an explanation to how people employ schemas of interpretation (a collection of stereotypes) to understand and respond to events in the world. For example, if a person is rapidly opening and closing his eye it can either be attributed to a physical frame ("the person has something in his eye") or to a social frame ("the person is winking at me, trying to get my attention"). A frame can either be a part of ones primary framework – a collection of reference frames that rely on primal knowledge – or relying on the primary framework. For instance, understanding the action of unfolding an umbrella in the rain requires residing in a frame part of ones primary framework, while interpreting the action of unfolding an umbrella on a theatre stage to a soundtrack of falling rain and thunder requires residing in a frame based on ones primary framework (Goffman, 1974).

Sociologist Gary Alan Fine applied Goffman's frame analysis to games by conducting field studies of people playing role-playing games during the 1970's. Fantasy role-playing

games, he argued, were particularly suited for this type of analysis since the players' main reason for playing was engrossment in the game world rather than winning. Fine notes that when playing a fantasy role playing game the participants are oscillating between three major frames; a social frame, a player frame and the character frame. The social frame is a primary framework that does not need the support of other frameworks but depends on the ultimate reality of events occurring (that a few friends are playing a game together), this is the frame inhabited by the person. The player frame is inhabited by the person as a player whose actions are governed by a complex set of rules and constraints. The character frame is inhabited by the person as an agent in the game world, and addresses the fact that in role playing games the player does not only manipulate the character (as a game piece), but to some extent he or she *is* the character. Two persons may be mortal enemies within the character frame but best friends within the social frame (Fine, 1983).

The existence of frames outside of a primary framework, such as the character frame, relies upon the players' willingness to assume an unawareness of his other selves (that of a person and a player). Players must play by the rules and characters must know only that information which is available within the game frame. Even though the person might know the weakness of a particular monster (from having looked it up in the monsters manual) it would be cheating to exploit this as an inexperienced character in the game world (Fine, 1983).

3.2.2 Affordances and Signifiers

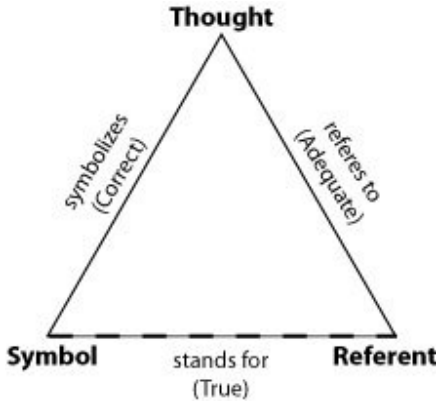
An affordance is a quality of an object, or an environment, that allows an individual to perform an action. The term is used in a variety of fields from perceptual psychology to human-computer interaction and interaction design, and was first introduced by Psychologist James J. Gibson in his article "The Theory of Affordances" where he defined affordances as "all action possibilities latent in the environment". According to Gibson, these affordances are all independent of the individual's ability to recognize them, but still dependent on the actor and their capabilities. A rock only affords throwing if one is strong enough to lift and throw it (Gibson, 1977).

Later on Donald Norman redefined the term to mean only the perceived affordances in the environment thereby taking into account not only on the physical capabilities of the actor, but also their goals, plans, values, beliefs and past experience (Norman, 2002). In the article "Signifiers, Not Affordances" Norman addresses the importance of including signifiers in designs (Norman, 2008). A signifier, as defined by Norman, is some sort of indicator or signal in the physical or social world that can be interpreted meaningfully. Signifiers indicate critical information, even if the signifier itself might be just an accidental byproduct.

Norman exemplifies signifiers with an empty train platform, signifying that the train has just left, a flag showing wind direction and strength, and a trail through a park, signifying a shortcut. None of these examples are purposely designed with these signifying properties in mind, but are still very useful to us in every-day life.

3.2.3 Semiotics

Semiotics is the study of communication, signs, symbols and the construction of meaning. Ogden states that in order to make meaning out of language, or any other sign system, we have to move between three separate dimensions: the conceptional domain (the thoughts in our minds), the symbolic domain (the words and symbols we use to communicate), and the things in the real world, that we refer to in our thoughts and with symbols (Ogden, 1923). The connections between these dimensions are described in a semiotic triangle (see Picture 3.2).



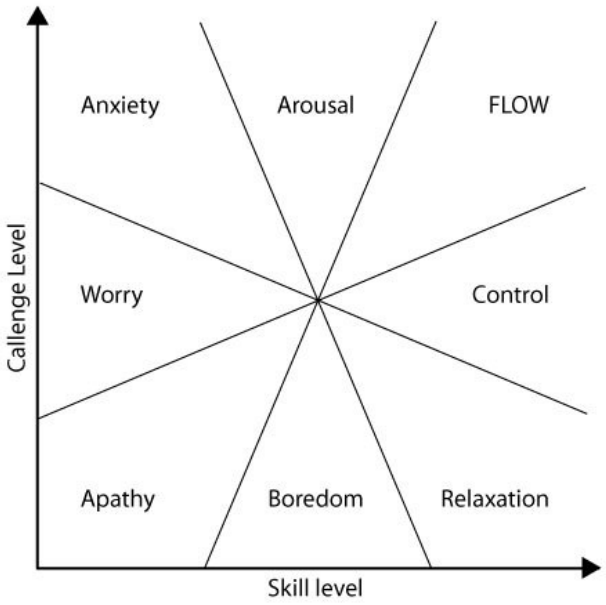
Picture 3.2. A semiotic triangle describing the relations between a symbol, a thought and its referent.

Every object, phenomenon or concept known to us will be represented in our minds as a thought. This thought can then be represented as a symbol. In semiotics the form that a symbol takes is called a sign vehicle; this could be a word, a picture, a sound or a gesture all referring back to the same mental concept and referent. Any interpreter of the sign will have to identify the sign as actually being a sign and then connect the sign back to the correct referent (or at least to an adequately correct referent) in order to construct any meaning out of the sign (Ogden, 1923).

3.2.4 Flow

Flow is a psychological concept introduced by Micheal Csíkszentmihályi. It describes the mental state of operation in which a person is engaged in an activity by a feeling of energized focus, full involvement, and success or progress in the activity itself. Csíkszentmihályi states that in order to induce flow, an activity needs to; have clear goals, require concentration and focus, provide immediate feedback, provide a good balance between challenge- and skill level, provide a sense of full control and be intrinsically rewarding. Characteristic of a flow inducing activity is that the person engaged experiences a loss of self-consciousness and sense of time as his or her awareness is narrowed down to the activity itself (Csíkszentmihályi, 1990).

The relationship between the skill level and challenge level of a task as pertaining to flow is further described by Csíkszentmihályi in Picture 3.3 below.



Picture 3.3. The concept of flow.

3.3 Media Studies

Various works in what could be broadly described as media studies helped illustrate people's understanding of, and relations to, fictional worlds and present some attempts to describe what it means to be immersed in said worlds.

3.3.1 Immersion

The notion that future technologies will be able to create fully immersive representations that are undistinguishable from that which they represent is a common theme in contemporary science-fiction films (The Matrix and Star Treks' "Holo deck" to name a few) and has featured in written fiction in various forms since the end of the 19th century with the novel Against Nature (Huysmans, 1884). In the epitome cyberpunk novel Neuromancer (Gibson, 1984) the internet, referred to in the novel as "the matrix" or "cyberspace", is accessed through a direct neural interface which renders it a wholly immersive, multisensory, parallel reality. Gibson's view of the future of human computer interaction is considered one of the defining myths of the information age (Lovén, 2001).

The concept of immersion is today considered in many media contexts, but is perhaps most commonly used when talking about virtual reality and games (Brown, Cairns, 2004). Within the field of virtual reality research the term immersion is considered related to a sense of presence, often called tele-presence, and defined as; “[the] extent to which a person’s cognitive and perceptual systems are tricked into believing they are somewhere other than their physical location”. (Patrick et al., 2000)

Digital media theorist Janet Murray defines immersion in a similar way, adding that being immersed in a media experience is very pleasurable, regardless of its content:

"the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus."

"We enjoy the moment out of our familiar world, the feeling of alertness that comes from being in a new place, and the delight that comes from learning to move within it... In a participatory medium, immersion implies learning to swim, to do things that the new environment makes possible." (Murray, 1996)

3.3.2 Engagement, Engrossment and Immersion

In their article A Ground Breaking Investigation of Game Immersion, Brown and Cairns describes the road to an immersive experience, in a game context, as a three step process. In order to create an immersive experience, similar to that defined by Patrick, the game first has to engage and then engross the player.

Player engagement depend on the accessibility of the game; the complexity of the control scheme, the amount of investment and attention required from the player to fully master the game, as well as the game, in turn, constantly providing something worthy of attending to (Brown, Cairns, 2004).

After the player has become engaged in a gaming experience there is the chance that the player develops an emotional connection to the game that goes well beyond the attention of the engagement phase. In this stage, called engrossment, the player's emotions are directly affected by the game and the player will start to become less aware of her surroundings as well as becoming less self aware (Brown, Cairns, 2004).

Full immersion is achieved when players have to commit (nearly) all their attention, their cognitive/perceptual systems, to playing the game. Games that forces the player to pay great attention to both visual and auditory cues, thus using their own senses to interpret the game world much as in real life, are the most likely to approach a state of full immersion. First person shooters and role playing games are hailed as the game genres that are best at evoking something resembling an immersive experience (Brown, Cairns, 2004).

3.3.3 Suspension of Disbelief

The literary term suspension of disbelief, introduced by Coleridge in his work Biographia Literaria, describes the willingness of an audience to forsake their knowledge of the real world for the sake of entertainment. The concept was originally contrived to explain how a modern, enlightened audience might continue to enjoy gothic, romantic and otherwise supernatural fiction (Coleridge, 2007).

Part of the suspension of disbelief concept is the idea of something called "the forth wall", an imagined boundary separating any fictional setting and its audience. When this boundary is broken, for example by a character speaking directly to the audience or

otherwise implying that they are in a work of fiction, this is referred to as breaking the forth wall (Bell, 2008). In games, having characters referring to save points or controller buttons would be a clear example of this kind of break since they recognize the existence of a player external to the game world.

Game designer Ernest Adams claims that these kinds of breaks in games are "a direct slap in the face" to the players, taking them straight out of any immersive state (Adams, 2004). Others disagree however, game designer Matthew Weise points out that the player-game relationship is more complex than that of the actor-audience and that a forth wall in gaming is better viewed as a flexible membrane resistant to brakes (Weise, 2008). This notion is similar to arguments made by theorists like Murray and Juul, pointing out the dual nature of games in that they play out both in reality and in a fictional universe simultaneously and is dependent on "audience" participation. Dying in the game world is fictitious, but losing the game is real (Juul, 2004).

The concept was also criticized by Tolkien in his essay On Fairy-Stories. In it he argues that an author can bring the reader to experience an utterly strange world through the rigorous use of internal consistency and rationality alone. The reader can enjoy these worlds without needing to suspend their knowledge of what is "real" and instead treats them as self contained worlds within their own minds (Tolkien, 1986).

Marie-Laure Ryan elaborates on this further by proposing that any unspecified detail in the description of a fictional world is filled in by our real world knowledge or our knowledge of specific genre conventions (Ryan, 1991). This approach to fiction is called the principle of minimal departure and helps explain why, even though we have no direct experience of wizards we assume that they have some kind of magical powers when encountered in a fictitious setting (Ryan, 1991).

3.3.4 Diegesis

In the structuralist-linguistic understanding of narratives the term diegesis refers to the world in which the events of a story occur (Genette, 1980).

In film theory the term diegetic typically refers to the internal world created by the story that the film characters themselves experience, as well as any previous events or characters referred to in the story. Film components like the musical score, narration (by a disembodied narrator) or subtitles are usually referred to as non-diegetic elements, since these can not be perceived by the characters within the story-world (Bordwell, Thompson, 1993). Consequentially, every component that can be perceived by the characters of the film is diegetic.

3.3.5 Agency

Agency is originally a philosophical concept that describes the ability of humans and other creatures (real or fictional) to make choices, and to execute those choices by acting in the world they inhabit (Hyman, Stewart, 2004).

One of the most basic forms of agency in modern video games is control of the camera and the link to the point of view of the player avatar. They mediate both agency and subjectivity in its most basic sense; the ability to move, look and hear (Klevjer, 2006b). Murray argues that the ability to navigate by landmarks, mapping out a space mentally and admiring the change in perspective derived from moving around in an environment, are all central pleasures when experiencing virtual worlds, and are independent of the content (theme) of the world (Murray, 1997).

3.3.6 Affordance Theory in Games

In their article "Interaction and Narrative" Mateas and Stern talk about the concept of agency (mentioned above) and its relation to what they call the formal and material affordances in a game world.

Material affordances are defined as the things in the game world you can interact with and any effects that the player can have on the game/game world.

Formal affordances are defined as that which motivates the player and helps him/her choose from and prioritize between all the available actions.

To give some examples the authors imply that most classic adventure games such as The Secret of Monkey Island have a heavy imbalance between material and formal affordances. In a typical adventure game there are a lot of objects to pick up and interact with (many material affordances). However, oftentimes players have a hard time understanding why these interactions matter in the overarching plot of the game, and how to prioritize certain actions over others (few formal affordances).

On the other hand the authors praise the game Quake as finding a very good balance between material and formal affordances. Given the plot and setting of the game the player can derive the following formal affordances: everything that moves is trying to kill the player, the player should try to kill everything, the player should try to move through as many levels as possible. This set of formal affordances overlap well with the games material affordances; the player can pick up and fire different weapons, the player can pick up objects that make him or her stronger, the player can pick up keys and interact with doors, buttons, elevators and teleporters that will help him or her proceed through the levels. (Mateas, Stern, 2006)

3.4 Design Methodology

To provide a methodological framework for conducting this thesis, as well as aiding in selecting the most suitable methods for different activities, various works in design methodology was studied.

3.4.1 Divergence-Transformation-Convergence

Designer John Chris Jones describes a general design task as a three stage process consisting of 1) "breaking the problem into pieces" 2) "putting the pieces together in a

new way" and 3) "testing the consequences of the new arrangement". In his book *Design Methods* he refers to these stages as Divergence, Transformation and Convergence.

Jones recommends diverging when the objective is tentative and the problem boundary is undefined (Jones, 1992). In the case of this thesis this was very much the case, since both the user interface design space and the concept of immersion were relatively unexplored.

The transformation phase is supposed to identify critical aspects and constraints and set up realistic goals and sub-goals of the design solution. This is most often done by creating one or several solution-patterns than can later converge into a final "product". It is important to remain flexible and free to change and redefine sub-goal throughout the transformation phase (Jones, 1992).

In the convergence phase the designers work to reduce the number of uncertainties and pick out the most promising design solutions. The range of remaining alternatives should become more detailed, narrowing in on the solutions that best address the requirements identified earlier. A modern design process is often a series of micro-iterations of these three distinct phases, with the result of one convergence phase feeding into a new divergence phase in order to gradually zero-in on the final design solutions (Jones, 1992).

3.4.2 Methods for Gathering of User Feedback

Question Based Information Gathering Methods

Question based methods of gathering information are suitable when information about user behavior and user attitude is wanted. Question based information gathering can be done using methods such as individual interviews, group interviews or questionnaire studies (Karlsson, 2009a).

The form of question based methods can vary from completely structured to completely unstructured. An advantage with the structured form is that it is a fast and simple way of collecting data and analyzing it. Disadvantages are that the user may not be willing or able to answer the questions given, that probing can not be used, and that the lack of personal contact that is an effect of standardized questions may affect the user's response in a negative way (Karlson, 2009a).

Unstructured methods of gathering data are suitable for letting the user express opinions in their own terms, which is important in order to gain a deeper understanding for him or her. Examples of unstructured methods are conducting focus groups (a form of group interview) and deep personal interviews (Karlsson, 2009a).

Focus groups can be used to gather qualitative data and generate hypotheses regarding a certain problem or question formulation. This should later on be tested or verified by more quantitative methods (Karlsson, 2009a).

Deep individual interviews can be used to gain a fuller understanding as to why sertain user attitudes have arisen. This method should be used with a probing interview

technique, to make the interviewee feel comfortable and speak naturally about opinions and feelings regarding a certain topic (Karlsson, 2009a).

In both focus group discussions and individual interviews, there are a number of factors that should be considered. First of all, flexibility should be considered if the participant reveals relevant information outside of the interview structure. Visual stimuli should be used. Preconceived notions of the interview subject should be quelled. If needed, the participant should be allowed to demonstrate usage. Finally, non-verbal information given by the interviewee should be observed (Karlsson, 2009a).

Observation Based Information Gathering Methods

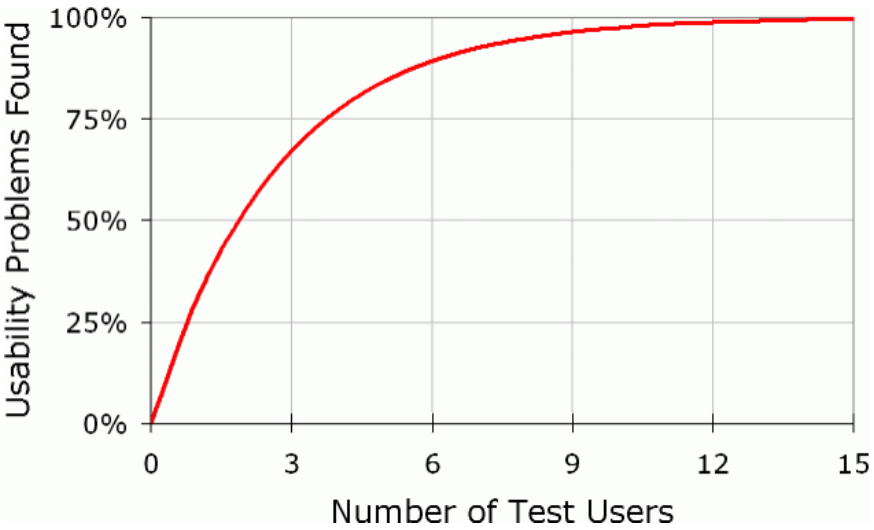
Observation based information gathering methods can be used to avoid disadvantages with question based methods, such as bias caused by unintentional influence of the person interviewing, or unwillingness to answer certain questions. A disadvantage with observation based methods is the inability to observe feelings, attitudes and preferences of the participant (Karlson, 2009b).

Merging Questions with Observations

Considered a base methodology for human-computer studies, observation based methods (observing how the user handles the product tested) are often combined with question based methods (e.g. questionnaires and/or interviews). The former are used to form an idea of how the test participant reasons when using the product, while the latter are used to elicit the participants subjective view of the product. The observation based method can be combined with encouraging the participant to talk aloud while experiencing the product (Karlson, 2009a).

3.4.3 The Appropriate Number of User Test Participants

Usability researcher Jacob Nielsen has compiled a graph that shows the relationship between the number of test subjects and the number of usability problems detected in the tested product. This graph (see Picture 3.4) clearly shows diminished returns already at about five test subjects. Nielsen suggests that although the graph seem to show that the optimal number of test subjects is somewhere around 15 people, it would be even more effective to test the product in three iterations of five users each, with some modifications to the design between tests (Nielsen, 2000).



Picture 3.4. Relationship between number of users and number of usability problems detected (adopted from Nielsen, 2000)

Although this thesis deals with user experience in wider terms than simply looking at usability, there is little reason to suspect that Nielsen's model of diminished returns would not still be valid. Running a test on five users with similar levels of domain knowledge would, according to this model, elicit about 85% of the problems with the user experience and is therefore considered as valid data in the scope of this thesis.

4 PROJECT PLAN

This master's thesis was planned to be carried out over a period of five months (20 weeks). Before the project was initiated, a project plan was suggested and accepted, which is documented in its original form in this chapter.

4.1 Planned Method

The work will be divided into three phases: 1) preliminary study, 2) idea generation and user testing in iterations, and 3) formulation and visualization of results.

4.1.1 Preliminary Study

The preliminary study will consist of a literature review/situation analysis, as well as focus group sessions with people playing games. The literature review and situation analysis comprises:

- Looking at game theory
- Reading academic articles on subjects related to the thesis, for example immersion
- Looking at design documents for games
- Looking at other literature that might be relevant
- Studying games in general
- Studying games with interesting design choices regarding the user interface
- Examining how information is conveyed in other forms of art by looking at cinematography, comic theory, etc.

The preliminary study will be wrapped up by conducting at least two focus group sessions on the subject "Problems and opportunities with information visualization in games". The purpose of these sessions is to provide input for the idea generation phase.

After an analysis of the results from the preliminary study the following will have been answered:

- What type of information is communicated to the player?
- What channels are available for conveying this information?
- What opinions do people playing games have on this subject?

4.1.2 Idea Generation and User Testing in Iterations

With the results from the pre-study as a starting point and by employing several creativity techniques a series of concepts will be developed. These will then be realized by the best means at hand. The concepts will then be presented to players in user test scenarios or workshops. Any concepts appreciated by players will be further developed and evaluated within an iterative framework of at least two loops for each concept.

The following approaches are reasonable alternative approaches to realizing the design concepts for user evaluation:

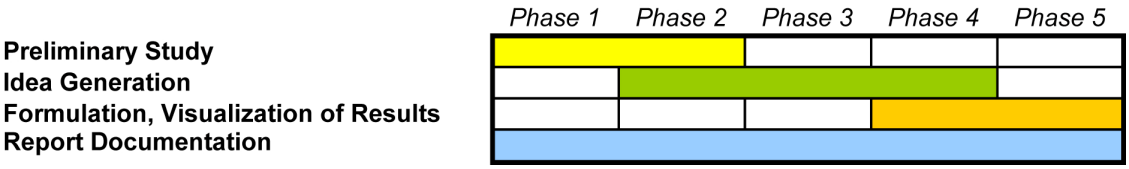
- Pre-recorded in-game footage with new UI elements super-imposed
- Transparent applications running in a layer on top of the game, faking interactions by triggering graphics manually
- Collaboration with employees at DICE to create custom builds of older titles with new elements added.

4.1.3 Formulation and Visualization of Results

The results delivered will be divided into a) a series of UI design guidelines, and b) one or several exemplifying game scenarios illustrating how to best make use of the guidelines.

4.2 Time Plan

The work process will be divided into five intervals of four weeks each. A rough estimation of the time distribution between the different project activities is pictured below (see Picture 4.1).



Picture 4.1. Time schedule for the master's thesis.

5 EXECUTION

The execution of the project, in terms of methodology, is described in this chapter. The work process was largely conducted as initially planned, although some changes was made to the original planning (see Chapter 4) when considered justified by the circumstances.

5.1 Preliminary Examination

The preliminary examination was largely executed according to what was planned, although what would be the subjective part of the game study was extended to be updated sporadically throughout the entire project. This felt natural as games were played and game related material was read outside of the planned project activities, but still occasionally happened to relate to the thesis in one way or another.

5.1.1 Literature Study

In order to create a therotic framework for this thesis a large literature study was conducted as one of the first steps. The study included papers and books on game design from both a narratologist (games are a kind of stories) and ludologist (games are "play") perspective as well as topics form cognitive psychology, media studies and sociology as well as industry sources such as developer blogs and the Gamasutra portal. The result of this study makes up the *Background* and *Theory* chapters of this thesis.

5.1.2 Game Study

The game study was split up into an objective game study and a subjective game study. The objective game study was conducted in order to look at how contemporary FPS games normally convey user information, and what conventional paradigms exist. The purpose of the subjective game study was to look at existing ways of conveying user information in games by more unconventional and innovative approaches.

Objective Game Study

To gain better insight into the state of contemporary console FPS games and their user interfaces, a structured game study was conducted. The qualifying criteria were that the game had to be played from a first-person perspective, available on the Xbox360 or Playstation3 and had to have had been released no earlier than 2003. In order to cover game titles of varying commercial success, games were selected based on their combined score at Metacritic (an online service that ranks games by collecting and compiling review results from a large number of game magazines and websites).

Of all Xbox360 and PS3 FPS games released when the game study were executed, the game with the lowest average score was *History Channel: The Battle for Pacific*, with a score of 35/100. *Bioshock* and *The Orange Box* ranked highest with an average score of 96/100 (Metacritic, 2009). The interval ranging from the lowest to the highest ranked game was divided into ten sub-intervals, and from each interval three games (or as many

as were available, if fewer) were selected as objects for the study. In total, 19 games were studied. The full list can be found in Appendix 1.

The games selected were then played in an analytic manner for 30-60 minutes each. The user information conveyed by each game was documented and labeled according to the type of information (e.g. “indication of taking damage”) and how it was conveyed (e.g. “vibrating the controller using haptics”). The results were gathered in a spreadsheet. As the study progressed emerging patterns concerning UI paradigms were identified, resulting in heat-maps showing what solutions were very commonly employed and what solutions were unique to one or a few games (see Appendix 2).

Subjective Game Study

The subjective game study was purposely conducted in a more unstructured way, by selecting games to study based on own knowledge, tips from tutors and other people involved in the project, and by reading game blogs. This choice was deemed to suit the purpose of the subjective game study (to look for novel and unusual examples of user interface design choices) best.

The selected games were analyzed, and the results were used as input in the idea generation phase that followed.

5.2 Idea Generation in Iterations

What was initially planned as a phase dedicated to generate and visualize various conceptual ideas and evaluate them in an iterative process, turned into a phase of 1) mapping out the UI design space for FPS games and 2) iteratively generate and evaluate hypotheses regarding immersion, how it affects the game experience, and how this can be strengthened by the user interface of the game. The reason to this slight change of strategy was that the concept of immersion and how it affects the game experience was more ambiguous than initially expected. Apart from turning the planned idea generation into a hypothesis generation, this also required a rethinking of what user interfaces in games are and how far into the game they extend, hence mapping out the design space became a major project activity.

5.2.1 Mapping Out the Design Space

Generating a proper model of the design space of user interfaces in FPS games was performed in three iterations. The result of each iteration was evaluated internally by the master’s thesis students and discussed with employees with different roles at EA DICE (the potential users of the design space). As the design space does not concern end-users (people playing games), no external user studies were performed for evaluation purpose.

Generating Design Space Models

The starting point for the first design space iteration was merging two different theoretical models to form a design space, in which the different types of UI information encountered in the preliminary game studies could be fitted. Each iteration that followed started out taking the evaluation results of the previous iteration into account, and with

this knowledge in mind penetrate the theoretical model from another point of view or taking another theoretical model into account.

Evaluation by Stress Testing

Throughout all three design space iterations, the different model variations were stress tested using the proposed design space to categorize diverse examples of UI elements selected from the preliminary game studies. If a UI case could not be explained by the model or was a borderline case, this was an indication that the design space might be in need of rethinking.

Rather than first developing a design space model and then evaluate it through stress testing as two separated processes, stress testing was an integrated part of mapping out the design space.

Evaluation with Employees at EA DICE

The results of the two first iterations was informally presented and discussed with the tutor at EA DICE for further evaluation. While the feedback was informal it was still valuable input for the following iteration.

For the final design space model proposed, a set of relatively unstructured interviews was conducted with a number of other employees at EA DICE (two game designers, two UI designers, two art directors, one level designer and one producer). The employees were asked questions regarding their own roles at the company, how they would define the role of the UI designer, and how their own role was connected to the role of the UI designer. After this, a simplified version of the design space model was presented, after which the validity of said model was discussed. This feedback was used to confirm that the design space was an appropriate tool for the UI designers at the company, fitting their work process and not infringing on the role of other professionals in the same project.

5.2.2 Working Towards UI Guidelines

A second iterative process was utilized for setting up hypotheses explaining how immersion affects the game experience and how this is connected to the user interface (viewed with the design space previously developed in mind). This was done in three iterations, with the first iteration evaluated by interviews and a focus group, and the second iteration evaluated by user testing through observations combined with individual interviews. The purpose of the third iteration was to formulate the guidelines by taking the results of previous iterations into account, hence this last iteration was performed without evaluation.

Evaluation of the First Iteration

The results of the first iteration were evaluated by conducting five deep individual interviews, and performing a focus group discussion with the majority of the group consisting of persons previously interviewed. The participants was selected to match the target group defined in the Background chapter, but as it was slightly difficult to recruit enough people this profile was expanded to also include people using PC as their platform of choice rather than consoles.

Deep individual interviews were used in order to gain understanding of the player attitude to immersion in games, affecting factors, and how this is related to the user interface and the first hypothesis generated. Each interview took approximately 20 minutes.

Following the recommendations of Marianne Karlsson (see 3.4.2), a fairly unstructured interview form was considered most appropriate to reveal as much valuable information as possible. For this reason, probing was also used to as high extent as possible. Visual stimuli (in the form of different screenshots illustrating different user interface approaches) were shown to the interviewees to trigger feedback and ease explanations. Finally, words of subjective value were avoided in order to overcome the potential unintentional influence that the interviewer might have on the interviewee.

The interviews were followed up with a focus group with roughly the same purpose as the individual interviews, but with a larger focus on providing input into the next iteration and subsequently the generation of new hypotheses. Six persons took part in the focus group discussions, with four of those being interviewees in the previous interview study.

Once again, the discussion was unstructured (an effect of the focus group format), and more governed by visual stimuli than an interview script. Movie clips from a number of games (Mirror's Edge, Dead Space, Bio Shock, Battlefield: Bad Company, Far Cry 2, Call of Duty: World at War, Killzone 2, House of the Dead: Overkill, Fallout 3 and Doom 3) showcasing different UI approaches were used as stimuli, to spur spontaneous discussion starters rather than forcing the participants through a bullet-point guided discussion. Of course, the focus group moderator maneuvered the discussion topic into a new direction if irrelevant discussion or silence occurred.

The interviews and the focus group discussion were audio recorded. The comments and statements considered relevant were transliterated and then analyzed by looking at whether the material confirmed or declined the proposed hypothesis.

Evaluation of the Second Iteration

To evaluate the hypotheses generated in the second iteration, three sets of observation studies in combination with small interviews sessions were conducted. For each set of tests – five tests in each set – the participants played a number of games. After each play session, the participant was asked questions regarding what he or she experienced in the game, and each test was concluded by a small number of finishing questions. The selection of games to be included in each set was based on the hypothesis that was to be tested in that particular set of tests. The duration of each test session (both observation and interview) was approximately 40-60 minutes. Following the strategy of the first interviews and focus group, probing was used and words of value were avoided when interviewing the test participants.

The choice of a combined observation-interview method was made since it was noticed from the user studies in the first iteration that the comments were slightly colored by the fact that the participants *observed* (by visual stimuli) rather than *experienced* (by actually

playing). Another advantage is that the method shows both the objective and the subjective side of the user's way of reasoning (see 3.4.2).

The users taking part in the tests were selected on the basis of the target group defined for the project (see 2.1.2). To avoid exposing the test subjects for unnecessary learning thresholds, a requirement was that the users should be familiar with current generation console controller interfaces, such as the Xbox360 controller or the DualShock 3 for PlayStation 3.

No users that had participated in early interviews and/or focus group were re-used for these evaluation tests, to avoid priming the users into a biased game experience. Since the participants of the early user studies had been questioned explicitly about player immersion and engrossment, this would likely have affected their attitude and reasoning in later tests.

Answers to questions were documented in a spreadsheet, observations were noted, and the material was analyzed after each set of tests using the same approach as in the previous iteration.

6 RESULTS OF PRELIMINARY GAME STUDY

The game study was split up into an objective game study and a subjective game study. The objective game study was conduced in order to look at how contemporary FPS games normally convey user information, and what conventional paradigms exist. The purpose of the subjective game study was to look at existing ways of conveying user information in games by more unconventional and innovative approaches.

6.1 Objective Game Study

Looking at the results of the objective game study in which 19 contemporary FPS games were included, a number of conclusions can be drawn regarding how information is normally conveyed in FPS games. Drawing on semiotic sign theory, a systematic approach would be to separate informational content (the information that the UI elements convey) from informational vehicles (the UI elements themselves – *how* the information is conveyed).

6.1.1 Categorizing Informational Content

When analyzing the information conveyed to the user in FPS games, a natural division would be to categorize the informational content into two types: game-state feedback and affordance amplification.

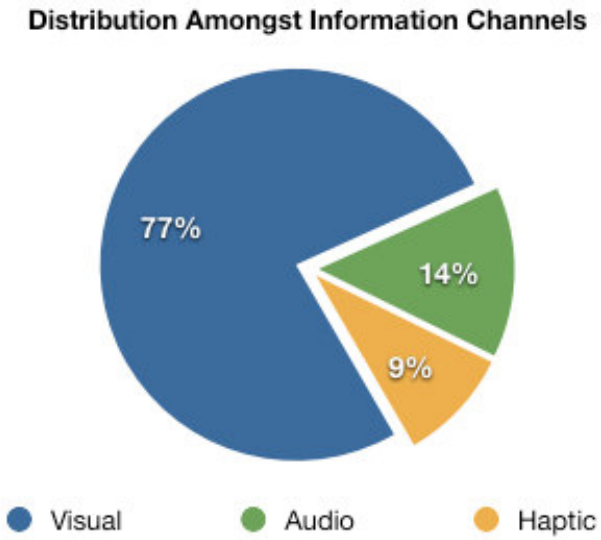
Game-state feedback informs the player about the current state of the game. The nature of individual types of game-state feedback differ quite a lot from each other, which motivates a sub-categorization within the game-state feedback category; there are the internal states of the player avatar (i.e. the health status, whether the avatar is crouching or standing, etc.), external states (i.e. the objectives of the player, the status of teammates, etc.) and system states (the state of the game as a system, i.e. loading, saving, reaching checkpoints, etc.).

Affordance amplification is informational content purposed to re-enforce the affordances of the environment and invite to player interaction. This category can be further explained by taking the concept of affordances into consideration (see 3.2.2); the environments in the game world afford certain actions to be performed by the player (i.e. certain doors can be opened, certain items can be picked up). Consequently, affordance amplification is information explaining (in more or less subtle ways) what in the game world that the player can interact with.

It should be pointed out that an informational vehicle – a user interface element – can contain both game-state feedback and affordance amplification. An example of this would be an indication of a point of interest (game-state feedback) that is also an indication of an interactive object of interest (affordance amplification).

6.1.2 Categorizing Informational Vehicles

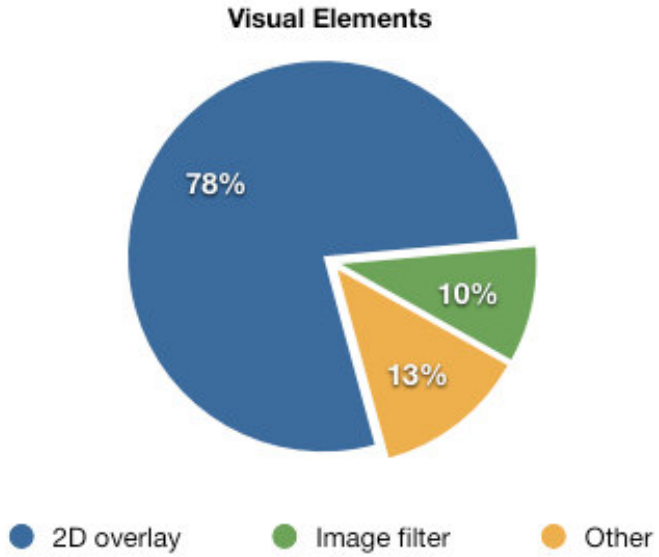
A natural categorization of informational vehicles (user interface elements), given the hardware possibilities and constraints of modern-day consoles, is to divide the information conveyed into three main information channels; visual, auditory, and haptic information (see Picture 6.1).



Picture 6.1. Distribution of information amongst the visual, auditory and haptic channels.

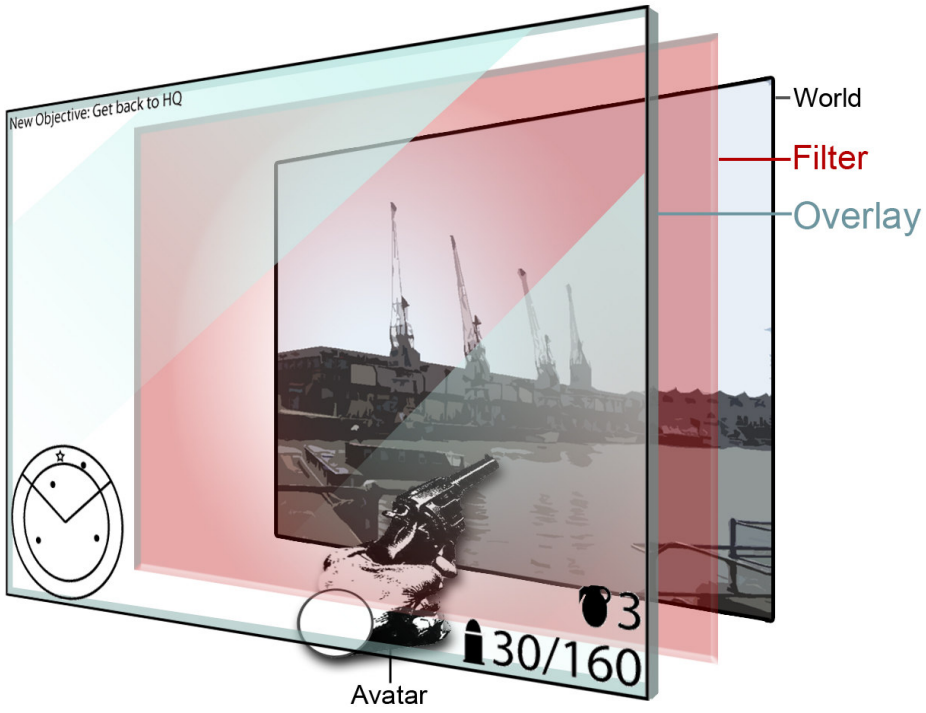
Analysis of the results of the objective game study shows that almost four fifths of the user interface elements unveiled were of visual nature, while fourteen percent were auditory UI elements and a mere nine percent were of haptic nature.

Looking in detail at what kind of information is conveyed in each of these main channels, interesting conventions and paradigms can be found.



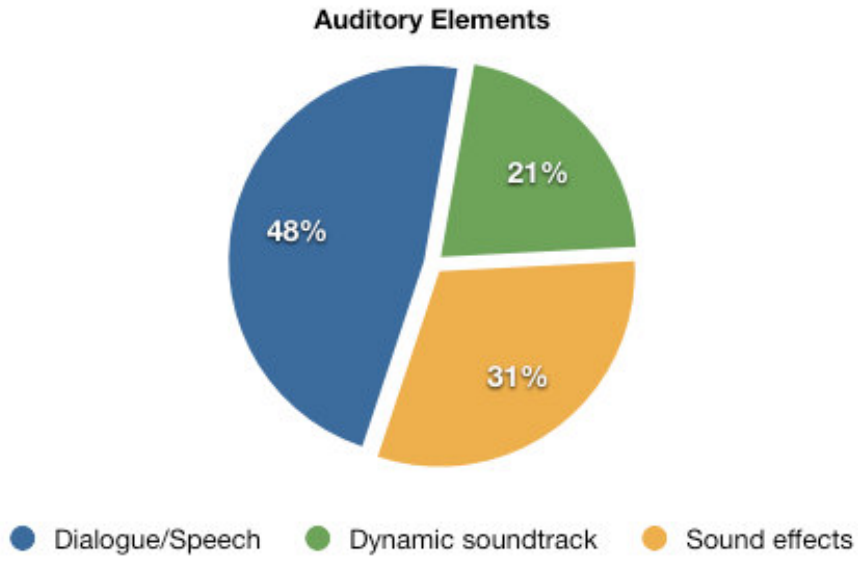
Picture 6.2. How information is conventionally represented visually.

In the visual channel – what UI elements that are represented with graphical means – nearly four fifths of all the UI elements identified in the objective game study was presented in a 2D overlay manner (see Picture 6.2). These are elements layered on top of the game-world visible to the player, superimposed on the screen (see Picture 6.3)



Picture 6.3. A conceptual view of the visual UI conventions of FPS games.

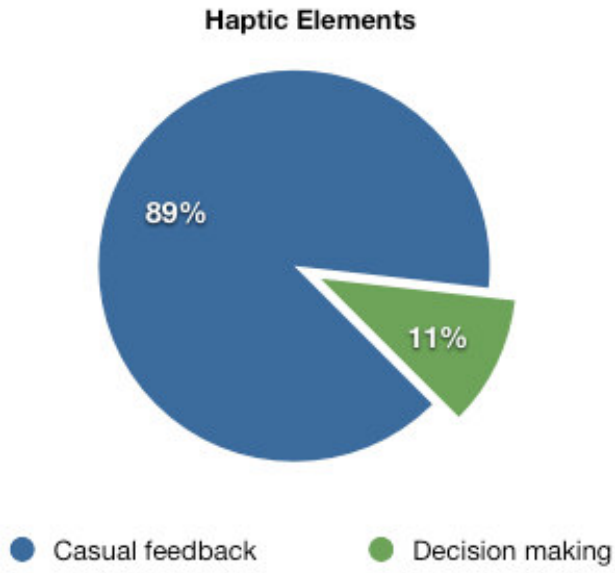
Looking at the second largest group of UI elements in the visual channel, information conveyed through image filtering makes up one tenth of the visual UI elements. This is information conveyed through full screen image filtering or distortion (see picture 6.3), for example by having the image gradually fade to an intensive red hue to convey a low level of health.



Picture 6.4. Categorization of information presented in an auditory manner.

During the objective game study there were relatively few cases where sound was used as the primary vehicle for conveying information, instead sound often served as supportive feedback to information that was primarily visual in nature. Most audio encountered in the objective game study usually served as redundant feedback to player actions, like a thumping sound when jumping or a series of clicking sounds when reloading a weapon.

In roughly half of the cases where sound did serve as a primary vehicle, it occurred in the form of speech or spoken dialogue, usually from friendly characters helping the player to progress in the game. One third of the auditory feedback encountered where labeled as sound effects, commonly used to convey critical health levels or the proximity of specific enemies. The remaining auditory elements occurred as dynamical changes in the soundtrack or the auditory ambience, to convey a specific game state.



Picture 6.5. Categorization of information represented through haptic vibrations.

The use of the haptic information channel was very one-dimensional, perhaps not very surprising considering the simplicity of the vibrators in console controllers (see Picture 6.5). Nearly ninety percent of the feedback channeled through controller vibrations is casual feedback caused by the physical relationships of the game world, such as the controller vibrating when the player fires his or hers weapon, or when the player is being hit by enemy fire. Consequently, only one tenth of the haptic information conveyed moves outside this primitive type of feedback, implemented in order to provide more sophisticated information easing the player in his or hers in-game decision making. Examples of more sophisticated use of haptics that occurred in the objective game study are vibrations used to signify that a bomb counter counts down in Conflict: Denied Ops, and utilization of vibrations to signify that the player's bow is strained to the maximum level in Turok.

6.2 Subjective Game Study

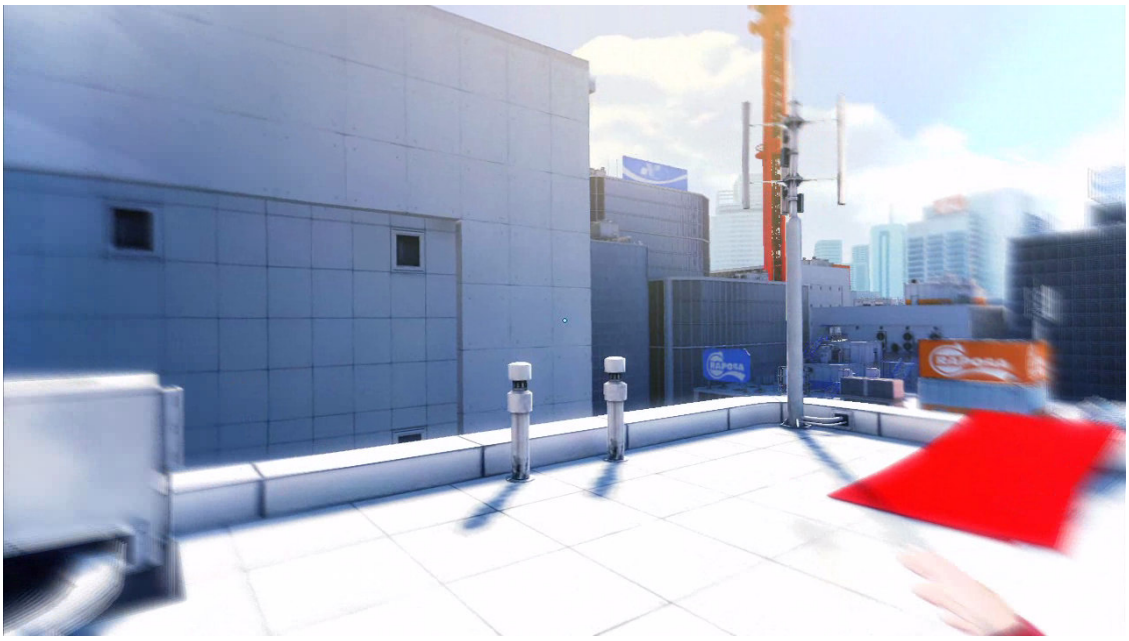
A subjective game study was conducted to capture design choices regarding the presentation of UI elements, that in one way or another move past the conventions and paradigms unveiled in the objective game study. This subjective game study was not limited to FPS games, as its main purpose was to serve as inspiration.

6.2.1 Mirror's Edge

One of few first-person perspective games emphasizing movement and flow rather than ballistic combat is Mirror's Edge (EA DICE, 2008). The games main protagonist Faith is a "Runner", with a wide and relatively complex set of movements available for the player controlling her; jumping, climbing and wall-running are all common moves that the player must master in order to progress through the environments of the city in which the game takes place. Due to this unconventional control scheme, the user interface of the

game differs quite radically compared to other games played through a first-person perspective.

To convey the wide set of actions possible, Mirror's Edge features a user interface solution called Runner Vision with two purposes; 1) showing what in the environment that the user can interact with (e.g. drainpipes that can be climbed, edges that can be shimmied across, springboards that can be used to leap across roof tops), and 2) giving the player a sense of direction in terms of guiding the player along with recommended paths. This is done by coloring objects of interest that affords some type of interaction red (see Picture 6.6), in sharp contrast to the games environments that are distinctively colored bright (with occasional elements of a clear color theme such as blue, green or orange).



Picture 6.6. A springboard colored red to invite to player interaction in Mirror's Edge

The lack of combat focus in the game has also resulted in Mirror's Edge being completely free from HUD elements when playing the main Story Mode; there is no health-bar or digits showing how much ammunition are left if a weapon is equipped. The game also features two competitive modes called Time Trial and Speed Run, in which the objective is to traverse the game environments as fast as possible. In these modes, digits for passed time and speed of the player are presented in an overlay manner. In the Time Trial mode, there is also overlay graphics indicating the check points of the level.

Picture 6.7. Time Trial mode in Mirror's Edge, with a ghost avatar visible to the left and a checkpoint beacon to the right

In the Time Trial mode of Mirror's Edge, the user interface features additional information presented in the geometry. Locations of the check-points are conveyed through red light beacons visible from far. There is also a "ghost" representing the player's previously fastest path through the level and how he or she traversed this path at the time, presented as a red semi-transparent humanoid avatar running along with the player (see Picture 6.7).

Finally, Mirror's Edge also makes heavy use of image distortion to convey the internal state of the player character and hers perception. Apart from more conventional approaches of conveying lowered/critical health (edges of the screen fading to red) or being electrocuted (edges of the screen fading to blue), the game conveys the feeling of speed by blurring the edges of the screen and small light beams appearing at the edges. The same effect, complemented by shaking the camera, is used when falling towards the ground.

6.2.2 Dead Space

Dead Space (EA Redwood Shores, 2008) is a science fiction themed action game with a user interface that exploits the sci-fi setting to provide a HUD fully presented in the game geometry in a diegetic manner. Holograms, projected on invisible planes, are used to present environmental information such as the status of doors (locked/unlocked), what items that can be picked up and what they will do (see Picture 6.8), the amount of ammunition in the weapon that is used, inventory and map menus, etc.

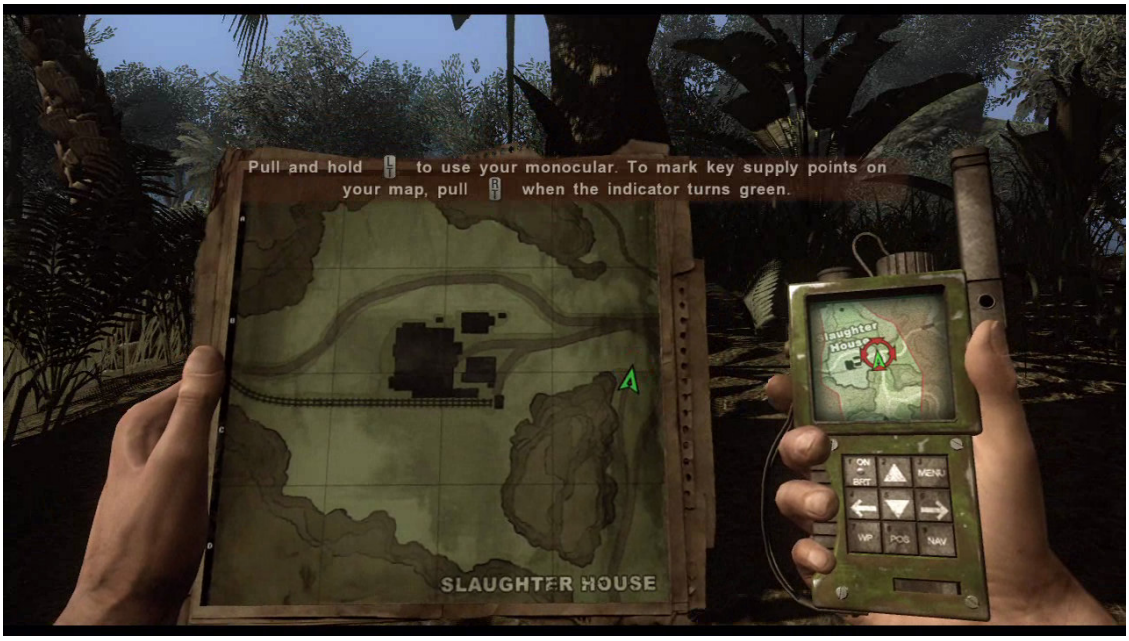
Picture 6.8. Hologram indicating that an object can be picked up by the player

Another bold design choice is to use the player character model to display the level of health. The protagonist's suit has a tube that runs along the spine of the character, displaying the health level in a manner equivalent of the health bar of a conventional HUD, but once again in a fully diegetic way (as it is explained by the game fiction).

Using the game fiction, Dead Space has pushed the user interface completely into the game world, separating it from games that utilize a more conventional approach to the user interface and the HUD.

6.2.3 Far Cry 2

Far Cry 2 (Ubisoft, 2008) excels its competitors when it comes to putting the user interface into the fiction and game world. Rather than overlooking the game environments through a pause menu map or a GPS/compasse representation presented in an overlay manner – a convention in FPS games (see 6.1.2) – the map used for navigation in Far Cry 2 is presented as a part of the game world, viewed by the player avatar holding it in his hands in real time without pausing the game (see Picture 6.9). Zooming in the map is done by having the character switching to another map of lower or higher resolution than the previous map.



Picture 6.9. The map and GPS device in Far Cry 2

This approach is consistently taken throughout the user interface of Far Cry 2. When resting to restore health, the player avatar sets his arm clock alarm to the time he wants to wake up, once again done in real time with the character wielding his arm clock and manipulating it. The game also features an in-game GPS device wielded by the character when the player deems it necessary.

The in-game navigation system is also strengthened by a novel sign-post system reminiscent of Runner Vision in Mirror's Edge (see *Chapter 6.2.1: Mirror's Edge*). In the junctions of the game, sign-posts are placed, showing the way to the various places of interest in the game world. When the player is supposed to travel to a specific location, the signs that guide the player towards this direction are colored red.

6.2.4 Killzone 2

Killzone 2 (SCE, 2009) has a way of communicating damage and level of health that distinguishes itself aesthetically from other FPS games. The user interface relies heavily on blood stains splattered in an overlay manner, as blood would appear if it would be splattered on a camera lens (see Picture 6.10). This signifies being hit by fire, with the blood appearing on a place on the screen corresponding to the direction of fire. Consequently, being under fire for a longer period of time results in more blood stains splattered on-screen, as the blood stains stick for a small period of time before the disappear. As the health system of the game is regenerative (level of health recovers automatically over time), the amount of blood stuck on the screen represents how damaged the player is at the moment.

Picture 6.10. Overlay blood splatter to indicate being hit by enemy fire in Killzone 2

This way of conveying health could be said to represent a more realistic UI strategy when compared with more conventional image filtering to illustrate lowered health (see 6.1.2), as the latter approach is more reminiscent of a visual representation of some kind of perception rather than mimicking the actual effect of being shot. It can however be discussed if the visual effect of being hit by fire would really be distinctive blood stains on your eye retinas. Nevertheless, the approach taken in Killzone 2 differs from most other FPS games.

6.2.5 Left 4 Dead

In cooperative multiplayer game Left 4 Dead (Valve Software, 2008) the player is always accompanied by three teammates (that can be controlled either by other human players or by artificial intelligence), and the game-play focuses on staying together as the team progresses through the game levels. This puts certain demands on providing the player with information not normally considered in single-player games played without teammates, which has led to some interesting design choices.

First of all, Left 4 Dead explores the potential of audio and how it can convey user information that strengthens the game experience. Teammate speech and dialogue is used to a great extent; conveying information about your status (e.g. "If you don't find first aid you're not gonna survive") as well as the teammates own status (e.g. “Not gonna make it”), if acting in a certain way (e.g. “Reloading!”), pointing to useful objects (e.g. “Pills here!”), warning about certain types of enemies (e.g. ”Boomer!”) etc. Ambient audio is used to convey the presence of more powerful types of enemies, providing crucial information while stile being a natural form of representation of information fitting well into the game fiction.

Picture 6.11. Glowing silhouette outlines (upper right) indicating position and status of teammates in Left 4 Dead

As far as the graphical part of the user interface is concerned, Left 4 Dead utilizes a traditional HUD, but adds a deeper layer to the user interface by working with informative elements presented visually in the game geometry. If a teammate should wander off and is not visible due too walls or floors blocking the line of sight, a glowing silhouette outline of the teammate still enables the player to keep track of the position of him (see Picture 6.11). These outlines are color coded, to not only convey the teammate's position but also his or hers status (for example, a blue colored outline signifies that the teammate is unharmed, while orange symbolizes being exposed to danger). Outlines are also used to indicate that certain objects in the game environment can be picked up and equipped by the player, with the object being outlined when the player direct his or hers line of sight in the direction of the object.

6.2.6 Rockstar Games Presents Table Tennis

Rockstar Games Presents Table Tennis (Rockstar San Diego, 2007) uses controller haptics in a novel way to provide the user with information hard to convey in a subtle visual manner. Vibrations in the controller is utilized to give players a feeling of how near the edge of the table that a ball would end up, letting players aim the ball with high precision. The vibrations grow more intense as the aim approaches the edge of the table, indicating not only if the ball will hit or miss the table, but also provide a preview of how good the shot will be (skilled table tennis players aim for the outside edge of the table to put pressure on their opponent).

This is a good example of how unconventional use of controller haptics (normally used for feedback such as firing a weapon or taking damage) can enhance the game experience with more information without adding this information to the graphical part of the user interface.

6.2.7 Grand Theft Auto IV

While third-person perspective action/driving game Grand Theft Auto IV (Rockstar North, 2008) makes use of an in many ways traditional HUD, a few design choices regarding the user interface has been taken in an attempt to provide a richer game experience. The player character Niko owns a cell phone, used for briefing the player through missions (a person guides you via the phone or by sending SMS messages) and getting contacted by non-player characters. The player can also user the phone himself to call people in the contact list of the phone, or use the dial pad of the phone to call any custom number. When the phone is used, it appears in an overlay manner in the low right corner of the screen (see Picture 6.12).

Picture 6.12. The Grand Theft Auto IV phone appearing in the bottom right corner

This is interesting from a UI point of view, not only because of using a graphical replica of a fictional device instead of a menu or traditional HUD solution, but also because the phone is also used to make non-fictional choices and actions. If the player fails a mission, a SMS message is sent to the phone, asking if the player wants to restart the mission (the player replies 'yes' or 'no'). The phone is also used to access a game menu, appearing as a menu in the phone, from which he or she for example can start a multiplayer game or start a new single player game.

It should also be pointed out that Grand Theft Auto IV lacks a start menu entirely. When the game is started for the first time, a new single player game will automatically be started. Starting the game when it has been played before, it will automatically continue from the last save file. Consequently, some of the options that normally reside in the start menu are accessed through the phone.

6.2.8 Metroid Prime 3

Metroid Prime 3 (Retro Studios, 2007), and its predecessors, features an ambitious attempt to put the conventional HUD into the game world and explain it with the game fiction. The player takes the role of a main protagonist whose high-technology suit provides information by projecting it inside of the helmet visor of the suit. Accordingly, the HUD is still presented overlay, but on an arched surface rather than flat (see Picture 6.13).

Picture 6.13. The HUD in Metroid Prime 3, mimicking the appearance of a helmet visor

The visor metaphor is implemented thoroughly. The HUD is visually framed by the edges of the helmet. The HUD surface (the helmet visor) responds to changes in climate (e.g. being covered in frost under cold circumstances) and lighting conditions.

6.2.9 Tom Clancy's Splinter Cell: Conviction

Spy-themed action game Tom Clancy's Splinter Cell: Conviction (Ubisoft Montreal, 2009) makes ambitious attempts to explore the possibilities of putting the user interface inside the game world. The game briefs the player through the missions and partly tells the narrative by projecting text and moving pictures onto not only walls and floors (see Picture 6.14), but also on the characters if they happen to be in the way (like if a person would stand between a projector and the surface it projects on). The projection metaphor is not explained by the game fiction (like in Dead Space, see above), but more akin to approaches taken in experimental cinema or video art displays.

Picture 6.14. The current mission objective projected on the wall of a building in Tom Clancy's Splinter Cell: Conviction

This is an interesting design choice, especially as the use of the projector effect explores the boundary between what is part of the game world and what is not.

6.2.10 Heavy Rain

Upcoming game Heavy Rain (Quantic Dream, 2009) features a user interface completely freed from a conventional HUD, with occasional button prompts in an overlay, yet existing in the game world as they can be occluded by in-game characters and objects. This information becomes harder to see as the characters mental state changes.

Picture 6.15. Spatial user interface elements in Heavy Rain

The user interface also features elements presented spatially (see Picture 6.15), not entirely dissimilar to the holograms of the Dead Space user interface (see 6.2.2). As in Dead Space, fiction is used to explain the existence of these elements in Heavy Rain; the character is wearing a pair of advanced forensic glasses, able to pick out details in the environment and augment the characters vision with visual information superimposed on top of the "real" world.

6.2.11 Bioshock

Bioshock (2K Boston, 2007) is a game that attempts to create an atmospheric and living game world for the player to explore. Besides characteristic graphics and art design the game relies heavily on sounds to make the journey through this world engaging and exciting. Many of the important objects in the game world emit characteristic sounds so that the player knows when he or she is approaching something of importance, for instance different types of vending machines have their own specific sounds. Enemies and traps, such as sentry guns and surveillance cameras, also emit specific sounds that can help detect danger before it is too late, giving the player a chance to sneak up and disable a camera rather then triggering an alarm.

Picture 6.16. The Big Daddy character in Bioshock will not attack the player unless provoked, in which case the lights on his helmet turns red.

The game also uses a reoccurring color coding system to help distinguish the mode of certain enemies and objects (see Picture 6.16). Lights on these objects are either red (hostile and will attack the player), yellow (hostile, but will not attack unless provoked or triggered) or green (friendly and will protect you from attacks).

7 MAPPING OUT THE DESIGN SPACE

Building on the results of the preliminary examination, a design space suitable for user interfaces in FPS games was developed in an iterative process. With the design space in its final shape, a number of categories of UI elements were identified from the results of the preliminary game studies, fitted into the design space, and named for convenient reference in future discussion and argumentation.

7.1 Analysis of the Preliminary Studies

The objective game study shows that user interfaces in FPS games are conventionally mainly presented visually, in an overlay manner or by applying image filtering. When user information *is* presented in a haptic or auditory manner, the use of these information channels tends to relatively monotone; haptic feedback is dominated by casual feedback, while roughly half of auditory UI elements are character speech or dialogue. Consequently the potential of said channels – especially information presented in a haptic way – could be said to be uncharted from a user interface point of view.

Looking at the results of the subjective game study (see 6.2), there are various examples of games straying past the conventions discovered in the objective game study. Numerous games explores the possibility of making use of the geometrical space of the game to present user interface elements; Mirror's Edge, Left 4 Dead and Tom Clancy's Splinter Cell: Conviction provides examples of this. There are also examples where the fiction of the game is used to put the user interface into the game world in an effort to make it more believable, such as Dead Space, Grand Theft Auto 4 and Farcry 2. This shows what could potentially be done when taking a more explorative approach to designing the user interface of a FPS game.

It feels reasonable to take the notion of diegesis (see 3.3.4) into account when considering the UI design space of FPS games. In film theory, diegetic elements are those elements in the film which are part of the internal world and are experienced by the characters, while non-diegetic elements like subtitles and the film music exists outside of the film world. Accordingly, diegetic elements in games are those elements that are part of the internal world of the game and can be viewed by the game characters inhabiting this world, while non-diegetic elements reside outside of said world.

It also feels natural to draw parallels to Jesper Juuls notion of fiction (see 3.1.2), which describes aspects such as the world, setting and story of the game. Clearly, diegetic game elements are part of the game's fiction, while non-diegetic elements exist outside of the fiction (but might of course *refer* to the fiction, like the subtitles of a film refer to the narrative and dialogue of the film characters).

The results of the game study show that conventional user interfaces for a FPS games are mostly non-diegetic, as a large majority of the information seems to be conveyed through elements presented in an overlay manner. However, when looking at the subjective part

of the game study, there is clearly room for exploration by conveying information channeled through elements that are part of the game fiction; Dead Space, Farcry 2 and Metroid Prime 3 (see 6.2) are examples of games that distinguish themselves in this regard.

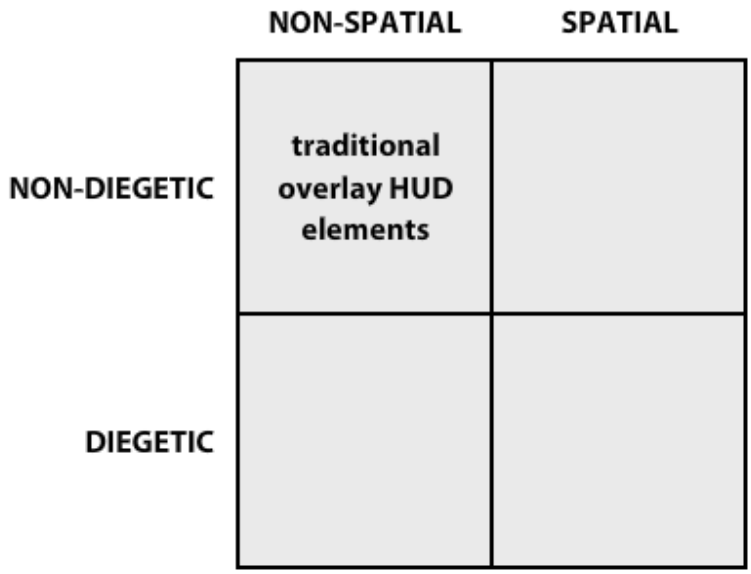
There is also reason to acknowledge the fact that there is a spatial dimension to user interface elements of FPS games. Jesper Juul speaks of the (3D) game space as a place where fiction and rules overlap (see 3.1.2). Interestingly enough, as the user interface is mostly rule connected (providing the player with game-state information used to make choices within the context of the game), there are cases when fiction and rules do not overlap, at least from an UI point of view. The game study shows that a user interface might be a part of the game world spatially but not in a diegetic way, as Mirror's Edge, Left 4 Dead and Tom Clancy's Splinter Cell: Conviction demonstrates (see 6.2). In other words, information might be presented outside of the fictional part of the game but within the 3D geometry of the game world. In a similar way, there are cases when fictional information is presented outside the 3D game space, such as the Grand Theft Auto IV cell phone (see 6.2).

It should be pointed out that when considering the diegesis, spatiality, and fictional nature of an UI element in this chapter (and throughout the rest of the thesis report), it is the UI element as an informational vehicle that is considered. A sign – in this case the UI element – consists of a sign vehicle (the appearance of the sign), referent (the information that the sign refers to), and the thought (the interpretation of the sign) which is subjective (see 3.2.3). Subsequently, a sign vehicle might be non-diegetic (e.g. digits indicating how many bullets are left in a weapon clip) while the referent (the amount of bullets in the clip) may be of diegetic nature.

7.2 Different Design Space Approaches

Three iterations were dedicated to develop a model of the UI design space of FPS games. Subsequently, three different approaches of how to view the UI design space of FPS games have been explored, presented here.

Given the analysis above, a natural starting point for charting the design space was to divide it into two dimensions: diegesis (is the UI element diegetic or not?) and spatiality (does the UI element exist within the 3D game space or not?). If this division is made, the design space can be illustrated by a four field chart (see Picture 7.1).

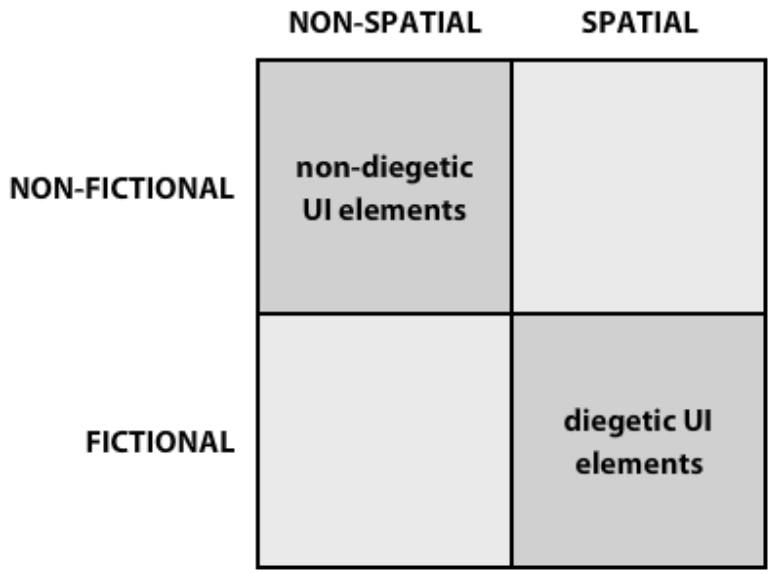


Picture 7.1. A diegesis-spatiality modeled design space. Conventional HUDs typically reside in the non-spatial, non-diegetic part of the design space.

One problem with the notion of diegesis is that there are some potential gray areas between what is diegetic and what is non-diegetic, which can be illustrated by the following examples:

- Blood exist in the Killzone 2 fiction (see 6.2.4), but the visual effect of having ones face splattered with blood would most certainly not be distinctive blood stains on the eye retinas. Are the blood stains diegetic?
- In Mirror's Edge (see 6.2.1), objects in the game world with the potential of aiding your traverse of the terrain the turns red and could be said to represent the main protagonist's ability to pick up valuable information from her surroundings. Is this Runner Vision non-diegetic?

This motivated an effort to look at an alternative way of mapping out a design space in which diegesis was not a dimension itself, but rather an area within the design space. If the spatial dimension (is the UI element presented in the geometrical game world or not?) of the previous design space was to be kept, and the diegetic dimension was replaced with the fictional qualities of the UI element (does the representation exist in the fictional world or not?), the design space would be represented by the model pictured below.

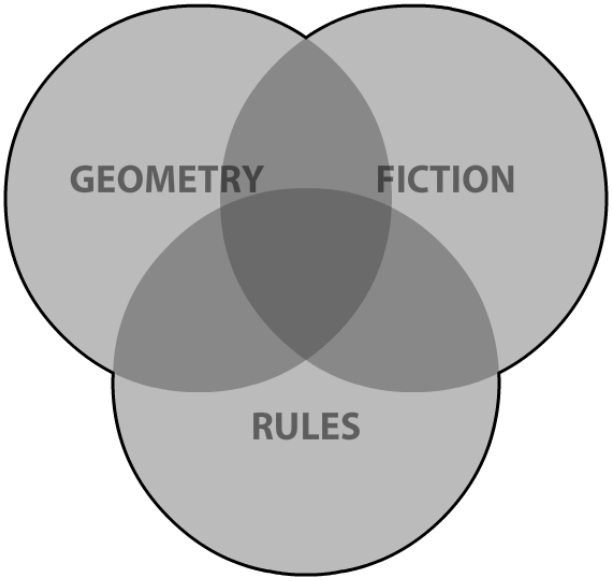


Picture 7.2. The design space modeled according to fiction and spatiality. Diegesis is now an area within the design space (upper-left, lower-right) rather than a dimension itself.

When taking Jesper Juuls notion of game fiction (see 3.1.2) into account, it also felt relevant to consider his notion of the rules themselves, as fiction and rules are interconnected according to Juul.

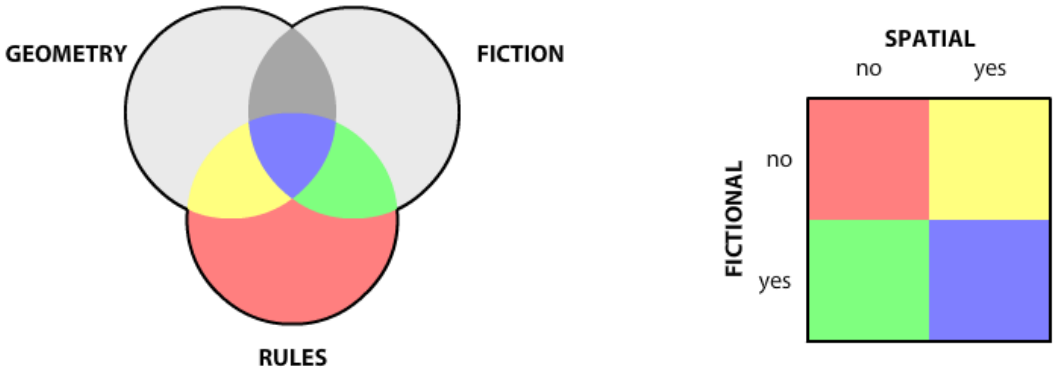
In the second design space model proposed (see Picture 7.2), a UI design space with two dimensions was laid forth, combining the spatiality in relation to the 3D game space, and the existential qualities within the fictional game world. Jesper Juul speaks of the game space as a meeting between fiction and rules. As mentioned before, there are cases (from an UI point of view) when fiction and rules do not overlap but are still in the game space, resulting in information outside the fiction part of the user interface but within the rule space; for example runner vision in Mirror's Edge. In a similar way, there are cases when entities both fictional and rule-based are presented outside the geometrical (3D) game space, such as the Grand Theft Auto IV cell phone (see 6.2.7).

An alternative take on the UI design space would be to describe it as the collision of the 3D game space, the fictional space, and the rule space (see Picture 7.3).



Picture 7.3. A design space model taking spatiality, fiction and rules into account.

While this put the UI design space in a larger perspective – geometry is normally associated with level design, fiction is the responsibility of the art director, and rules are the tools of the game designer – it did not change the design space itself that was proposed in the previous iteration. The user interface of a game conveys information that is rule bound; the rule space is the work space of the UI designer (it should be noted that this does not mean that a UI designer designs the rules of a game, as this is the responsibility of the game designer). The geometry space represents the spatial game elements while the fiction space represents the fictional game elements, so when these spaces intersect the rule space (see Picture 7.4), the model proposed in the second iteration is created (see Picture 7.2).



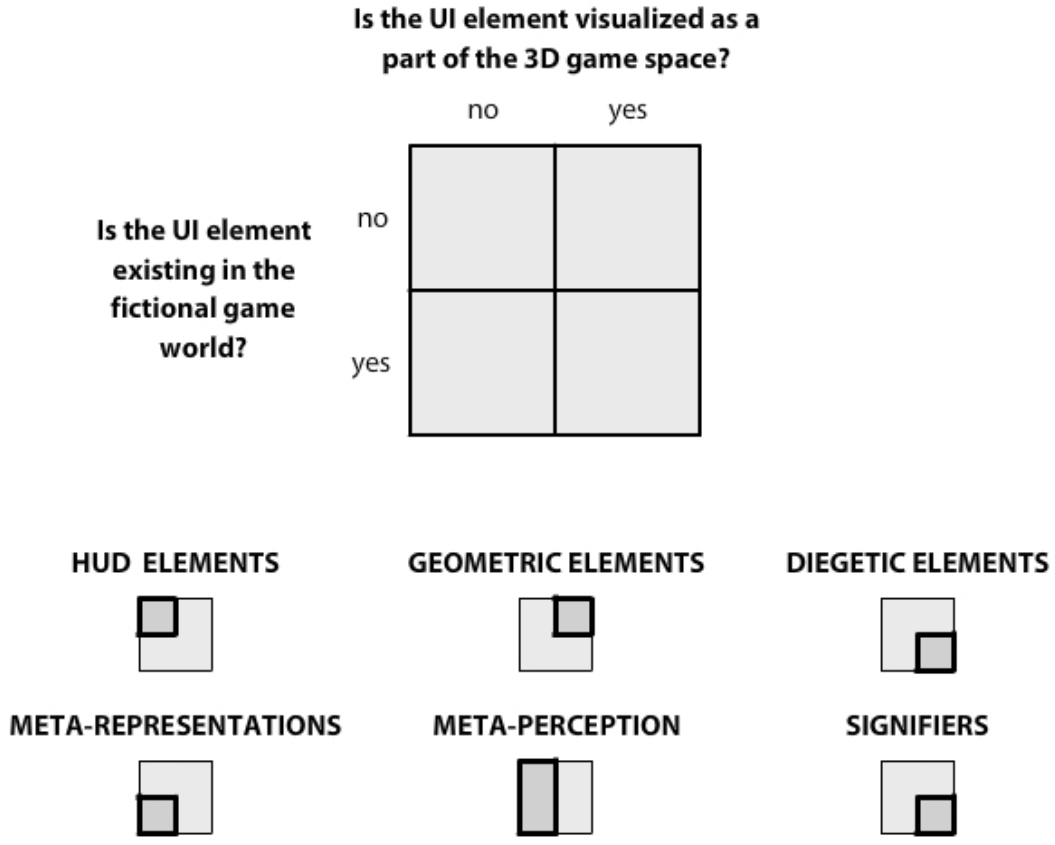
Picture 7.4. The design space model pictured to the left actually illustrate the same as the one to the right, but takes non UI-related elements into the picture.

This did not render the model unusable however, as it illustrates UI elements in relation to other game elements, and the role of the UI designer in relation to other roles in a game development process.

7.3 The UI Design Space of FPS Games

As diegesis proved to be a slightly ambiguous concept, the design space proposed in the second iteration was ultimately deemed to be more appropriate. The model proposed in the third iteration did not refine the design space itself, but it did put it in a larger context. Hence both the second and third models are appropriate, with the former isolating the design space for user interfaces, while the latter puts the UI design space in perspective and illustrates a design space possibly covering the game development process as a whole.

When placing the elicited UI elements from the preliminary game studies into the design space, six categories of UI elements can be noticed (see Picture 7.5): HUD elements, meta-perception, meta-representations, geometric elements, diegetic elements, and signifiers.



Picture 7.5. The design space, and how different identified categories of UI elements fits into it.

Non-diegetic elements are visual UI elements residing in the non-fictional, non-spatial part of the design space. These are elements presented in an overlay manner, and the objective game study (see 6.1.2) show that this type of element is what conventionally makes up most of the user interface of FPS games.

Meta-perception elements reside in the non-spatial part of the design space, and makes up for the broken perceptual link that occurs when a player is linked to a virtual avatar through a display, an audio system and a controller. Typically, meta-perception conveys information about ones in-game internal status in a way reminiscent of some kind of perception if it were to be visualized graphically. Conventionally, meta-perception is not connected to the game fiction, although games like Killzone 2 (see 6.2.4) proves that the fictional world can be used (using blood to inform the player of his/hers level of health, rather than an abstract visualization).

It should be pointed out that meta-perception is not restricted to the visual part of the user interface. For example, heartbeat audio can be used to convey a critical level of health, and a similar approach can be taken if the haptic information channel was to be used for the same purpose, by utilizing pulsating controller vibrations in a heartbeat manner.

Meta-representations are information carrying entities existing in the fictional game world, but visualized in a manner not spatial regarding the game world. Looking at the subjective game study, meta-representations could be exemplified by the Grand Theft Auto IV cell phone (see 6.2.6), which is a part of the player avatar's inventory but presented in an overlay manner.

Geometric elements are UI elements presented in the 3D geometry without being an entity of the fictional game world. Examples of geometric representations are the character outlines of Left 4 Dead, the runner vision or checkpoint beacons in Mirror's Edge, or the mission briefings projected onto the game environments in Splinter Cell: Conviction (see 6.2).

Diegetic elements are UI elements part both of the spatial and the fictional game world; entities that exist in the game world, and are presented as they were viewed by the player character (as opposed to meta-representations, which are part of the game fiction but presented outside the game world). Few games seem to explore diegetic user interface elements in a manner similar to Farcry 2 or Dead Space (see 6.2).

Signifiers are a sub-group of diegetic elements, and subsequently both part of the 3D geometry and the fictional world of the game. Rather than conveying information in a direct manner like normal diegetic UI elements, signifiers provide the player with subtle informational cues for the player to interpret by logical reasoning. A signifier is separated from the object that it provides information about; what the signifier carries information about is not the signifier itself.

Examples of signifiers have occurred in both the objective and the subjective game study. In the game Call of Juarez included in the objective game study, smoke is emitted from weapons that are close to breaking; in this case, the smoke is a signifier, signifying a weapon in bad condition. In Dead Space, blood trails are used at several places, as signifying danger and pointing the player into the right direction (see 6.2.2).

8 TOWARDS GUIDELINES

Partly in parallel with mapping out the design space, the concept of immersion in FPS games and its connection to the user interface was explored. This exploration was done in three iterations, with the first two described in this chapter and the last one – the final definition of immersion and the guidelines themselves – described in the two subsequent chapters.

8.1 Iteration 1: Merging Caillois and Frame Theory

Looking at the theory included in the literature study, Caillois' taxonomy of games provided a starting point for formulating an initial hypothesis regarding immersion connected to user interfaces in FPS games. Combining this with frame theory (as laid forward by Gary Alan Fine) and the notion of diegesis, a model of how immersion affects user interfaces in FPS games was constructed.

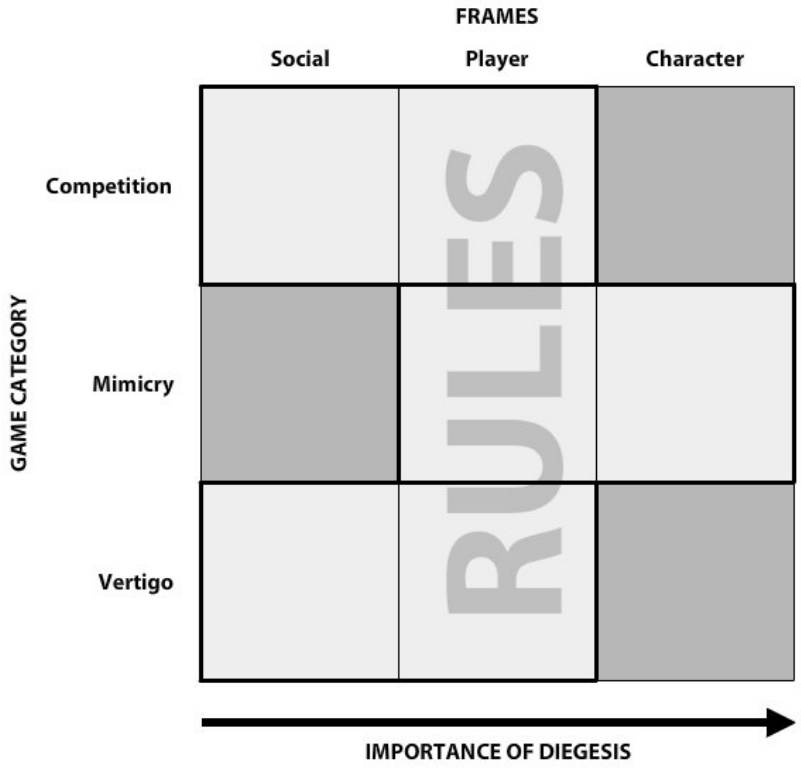
8.1.1 Constructing a Hypothetical Model

It is clear that games differ from each other in terms of what makes the game enjoyable and what components build the experience that players seek when playing the game. This was acknowledged by Roger Caillois as early as in the 1950's, when he classified games according their nature, dividing the games into categories of competitive games, games that build on chance, games of mimicry and pretending, and games of vertigo that builds on the pursuit of a chaotic and sensory-rich experience (see 3.1.1). While there have been relatively modern-day attempts to divide computer games into different categories, for example Chris Crawford's list of what motivates people to play games (see 3.1.1), these can often be reduced to Caillois' model without any larger difficulty. Hence, the simplicity and versatility of Caillois' taxonomy of games made it suitable as a foundation for an initial hypothesis of how immersion affects different FPS games and consequently their user interfaces.

When applying Caillois' taxonomy onto the FPS genre, games could be divided into several categories. FPS games that draw on the competition element are typically online multiplayer games, developed to play against other human players rather than fighting challenges posed by the artificial intelligence of the game. Games with mimicry as the main element that builds the game experience are games that focus on delivering a convincing fictional game world, and attempts to make the player take part in this virtual world in an as high extent as possible. Games of vertigo are games that emphasize movement throughout the 3D environments and deliver a sensory-intensive player experience, in which the player is linked closely to interaction with the game environments rather than acting in the fictional world as a character inhabiting it. While chance, the last category in Caillois' taxonomy, is a factor in many FPS games (regarding the randomness of the game world and the challenges posed to the player), it is not judged to be a factor dominant enough to justify it being considered an own category within the FPS genre.

While games differs from each other regarding what makes up the experience that makes players enjoy the game, it is also important to acknowledge that the player adapts different mindsets while playing a game. According to Gary Alan Fine, players (of role-playing games) move back and forth between three different frames when playing: the social frame, inhabited by the player as a person in the real world, the player frame, inhabited by the player as a person playing the game, and the character frame, inhabited by the player as a person being a character in the virtual world that is constructed by the game.

Merging Caillois' taxonomy of games with frame theory and the notion of diegesis, results in a model of how playing different games involve switching between certain frames, and consequently how this affects the importance of diegesis (see Picture 8.1).



Picture 8.1. A model of how different game experiences can be understood by frame theory, and how this is connected to the diegesis of the user interface.

First of all, the player frame is the frame one adapts to understand and make use of the rules of the game - how one reasons as players of the game. Since rules are a vital part of every computer or console game (or indeed any other game as well), playing a game will always involve adapting the player frame in one way or another. However, depending on what elements (competition, mimicry or vertigo) the game uses as main element to engross the player into an experience, playing a game will also involve adapting the person frame (reasoning as a person in the real world) and/or the character frame (reasoning as character in the game world).

The competition element of games involves switching back and forth between the social frame (competing against oneself or other human individuals, comparing the in-game achievements to one's personal goals) and the player frame (making use of, and exploiting, the game rules to achieve ones goals and be better than ones competitors). When a game focuses on the pleasure of competition, the user interface should support the competitive spirit and make sure that the game rules are clear to the player and that information conveyed to the player is unambiguous, rather than focusing on a user interface that brings the player as deep as possible into the fictional game world. Consequently, diegesis should be relatively inessential to the game experience in a competition focused game.

The mimicry element of games instead involves the social frame (adapting the game rules in order to take part of the game world) and the character frame (taking part of the fictional game world as a character inhabiting it). Here, the diegesis of the user interface should be an important tool to push the player into the character frame, rather than being reminded that the game is "just a game" by non-diegetic UI elements acting in a distracting way and blocking the player from fully being a part of the game fiction.

Playing games focusing on vertigo involves accessing the person frame on a sensory/perceptual level, and the player frame – as previously argued – on a rule-based level. According to Caillois, the goal of pure vertigo games is to achieve a sensory-rich experience (skiing, mountain-climbing, etc.). In FPS games, this can be reflected in fast and complex movement (exceeding the standard actions of running and jumping) throughout the geometrical game environments, the chaos that follows intense battle and explosions, scare and fright, etc. From a vertigo point of view, the user interface should try to push the player into the person frame, to try to connect the game to the player's primary framework of senses and reasoning regarding the real world and how one move about in it. Consequently, as in competition games, diegesis of the user interface should be of minor importance for the player experience.

In most FPS games, all three elements of competition, mimicry and vertigo (and chance) exist, however one element will be dominant over the others. Hence, the user interface should support the element most dominant, and avoid breaking whichever frame that the player happens to be in at the moment.

8.1.2 Hypothesis Evaluation

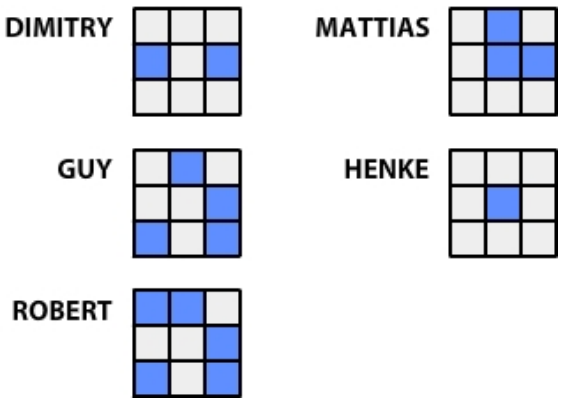
The hypothetical model developed was tested by conducting interviews, and performing a focus group discussion with a majority of the group consisting of the persons previously interviewed. Highlights from both the interviews can be found in Appendix 3.

Personal Interviews

For the interviews, five persons were selected. In order for the evaluation to cover people playing games focused on competition, mimicry, and vertigo, the selection was based on the playing habits of the potential interviewees. Those that usually played competitive multiplayer FPS games was said to have experience of competition focused games,

story-based single player games represented mimicry games, and those that had played Mirror's Edge (see 6.2.1) was considered to have experience of vertigo based games.

When interviewing the evaluation participants, information was elicited regarding what the interviewee considered to be an engaging and engrossing game experience, what elements breaks this experience, and how the user interface might influence it. An analysis of the comments, statements and attitude of each interviewee in relation to the model evaluated, resulted in a chart describing the results (see Picture 8.2). A full description of the interviewees and their attitudes elicited in the interview study can be found in Appendix 4.



Picture 8.2. For each interviewee. the player personality and attitude to the game experience was fit into the model evaluated.

Trying to fit the results into the hypothetical model turned out to be cumbersome, due to at least three reasons; 1) the results were somewhat scattered, 2) the notion of mimicry seemed to be inappropriate to use, and 3) the notion of vertigo seemed to require rethinking.

Five people were interviewed, which did not result in nearly as quantitative results as needed to give more than a hint that the model evaluated was appropriate. The results were too scattered to draw any qualitative conclusions regarding the model as a whole. It should be pointed out that researcher Jonas Linderoth has spent a great part of his doctoral thesis observing children playing games, analyzed the comments and statements made by them, and have constructed a *general* model (not specific to different types of games) based on frame theory (Linderoth, 2004). This shows that the scope of proving this model within the short period of time permitted by the planning of this master thesis might have been slightly too ambitious.

However, conclusions could still be made from the interview study. Comparing the results (see Picture 8.2) to the model evaluated (see Picture 8.1), it seems that people are indeed framed on a rule-based level when playing games based heavily on competition elements, for instance online multiplayer games played against other human players. The results also show that when playing story-based mimicry-heavy games, people are framed more deeply into the fictional world of the game. However, the appropriateness of the

term “mimicry” can be discussed, as modern day games attempt to deliver as detailed worlds as possible leaving as little to the imagination as possible. If anything, contemporary FPS games could be said to strive for anti-mimicry.

The results also brought up some question marks regarding if the vertigo element – while relevant to the game experience – can actually be dominant, submissive, or even compared to competition or mimicry. Researcher Rune Klevjer would argue that FPS games *are* games of vertigo, due to the way that the player moves about throughout the environments of a FPS game (Klevjer, 2006b). When the interview transliterations were analyzed, it was difficult to identify vertigo-specific statements and attitude from the interviewees. This could possibly be a result of the way the interview study was conducted, but vertigo might also be a part of the game experience in a way different than initially thought.

Focus Group

As the result of the interviews was quite scattered and was far from proving that the model tested was valid, the focus group was conducted in an almost completely unstructured manner, with the purpose of partly serving as a source of inspiration for the next hypothesis generation. Consequently, comments not directly related to the model evaluated but still valuable from an immersion point of view arose.

Looking at the comments of the participants, a few patterns kept repeating themselves throughout the focus group session.

First of all, games should respect the intellect of the players. Information on demand seems to be preferred to being force fed information, especially concerning things that the player might have already grasped, know instinctively or know from having played similar games in the past. Experienced players dislike being treated as first-time players.

The diegesis of the information given to the player might be just as important as the diegesis of the informative UI elements themselves. Focus group participants commented on how the game character might know things that seem impossible to know, given the fiction of the game world. One of the games shown during the focus group was Bioshock, in which the player is guided through the environments by a compass styled arrow; that the protagonist knew where he was supposed to go, even though he is as new to the game environments as the player is, seemed to disturb the participants. On the other hand, every participant seemed to accept the Mirror’s Edge runner vision (see 6.2.1) approach of guiding the player throughout the game environments. The reason for this acceptance might be that runner vision could be said to represent some kind of higher ability to scan the environments available to the main protagonist Faith, hence this does not spoil the game experience and break the fictional character frame.

Another example of non-diegetic *information* that the participants reacted negatively to was in Dead Space, a game which features a completely diegetic user interface (see 6.2.2), however with elements that refer to non-fictional information. What caused reaction during the focus group discussion was the fact that the projected screens in the

game world refer to buttons on the player's physical controller. Participants seemed to be sensitive to this kind of mix of rules and fiction, a blending of the rule-based player frame and the fictional character frame.

It should of course be noted that the participants of the focus group have likely been influenced by each other, the moderators of the focus group, by the interviews previously conducted, or the fact that they were observing rather than playing. However, this has likely just resulted in the participants being overly analytical, rather than giving misleading results. For example, it is questionable if the participants would have noticed the controller reference in Dead Space (mentioned above) if they had been playing the game rather than observing it.

8.2 Iteration 2: Six Factors of UI Immersion

With the results of the first iteration, another set of hypotheses was constructed. As many as possible of these hypotheses were evaluated by user tests conducted by letting participants play games with user interfaces illustrative in a manner fitting the purpose of the tests.

8.2.1 Constructing a Set of Hypotheses

With the conclusions of the first iteration as a starting point, a set of new hypotheses was generated. Looking at the evaluation of the hypothesis proposed in the first iteration, it seemed that using frame theory as the main tool to understand immersion (and how it is connected to the user interface) might be too ambitious and complex. Further, it seems like dividing different games into competition, mimicry and vertigo games might be misleading. As a result, the possibly confusing model was scrapped and considered not worth refining.

For the second iteration, a number of factors of how the user interface of a FPS game affects immersion (and vice versa) were formulated. Out of these, the factors that were considered relevant were selected and refined, ultimately resulting in six factors; level of competition, fictional persuasiveness, fidelity of spatial interaction, significance of navigation, rules transparency, and level of vertigo.

H1. Level of Competition

The higher the level of competition, the greater the demands on the availability of unambiguous information, which can be achieved with an overlay HUD.

The interview study conducted to evaluate the results of the first iteration showed that an increased focus of on competitive elements makes players reside in a rule-based framework, rather than engrossing themselves as deeply as possible into the fictional game world. The game experience in these cases is made up of decision-making rather than being a part of the game world as a character. Hence, for a game with a high level of competition, the user interface should be developed to provide the player with information that supports relevant decision-making within the game to an as high extent as possible.

In other words, the level of competition of the game determines whether an interface dominated by overlay HUD elements might be a reasonable strategy or not. In games based heavily on narrative, UI designers might want to go for an approach that brings the player as deep into the fictional game world as possible, by working with diegesis and avoiding a traditional non-diegetic HUD breaking the illusion. However, the more competitive elements the game experience builds on, the importance of being able to make strategic gameplay decisions grows for the players; in pure competitive multiplayer games, it is also important do make these decisions fast. Hence, ambiguous information should be avoided in these situations, and user interface elements presented in an overlay manner might be the most reasonable approaches that can be taken to achieve this.

H2. Fictional Persuasiveness

The higher the fictional persuasiveness, the greater the demands on a diegetic user interface and that said interface follows a consistent internal logic.

In both the interviews and the focus group conducted in the first iteration, it was mentioned that it is "allright" that games contain elements residing outside of the diegetic space, if the game world itself communicates that it is an artificial creation. However, as the fictional game world draws closer to a plausible world, the diegesis of the game elements seems to be more important in order to enhance the game experience. The internal logic of the fiction and rules also seems to be of major importance here (e.g. using a modern day GPS system to navigate will break the fictional persuasiveness of game set in a medieval world).

The fictional persuasiveness of the game determines how important the notion of diegesis is to the user interface. In games with fiction that attempts to deliver a game world nearly identical to the real world during some time in history, slightest non-diegetic element might affect the game experience negatively. In games that deliver plausible fictional worlds that are quite different from our own, diegesis might be just as important, but can be allowed by using artifacts and entities that builds on the game fiction (sci-fi, post-apocalyptic, magic, etc). If a game does not try to hide the fact that it is an artifical world, the level of diegesis might not be an issue at all.

H3. Fidelity of Spatial Interaction

The higher the fidelity of the spatial interaction, the greater the importance of amplifying available affordances and suppressing unavailable but deduced affordances, which can be done by geometric elements and signifiers.

One factor that was not touched in the first iteration was the affordances of the game world – how the affordances of the game world are communicated, and how deducing affordances not available in the rule framework of the game (e.g. the player trying to destroy a wodden box that cannot be destroyed) might break the game experience. Marie-Laure Ryan speaks of players filling the voids of a fictional world with real-world knowledge or genre conventions (see 3.3.3), which is one reason that players sometimes deduce affordances that do not exist within the game.

As graphical hardware constraints gradually disappear, 3D game geometry grows more detailed. As game environments grow more detailed, the amount of affordances that can be deduced from them grows larger. The amount of affordances allowed by the rule framework of games also tends to increase with time (see 2.2) – an increased fidelity of spatial interaction – with the effect of players expecting affordances to exist in a higher extent. The result of this is that players tend to deduce affordances in a wider extent, and when one of these deduced affordances does not have any counterpart in the rule framework of the game, the game experience will be broken.

The amount of deduced affordances is always larger than the amount of affordances actually available to the player (in Mirror's Edge, only some doors can be opened; in Grand Theft Auto, only some buildings can be entered). Affordances actually available to the player should be amplified by the user interface, while affordances not available yet deducable from the environment should be suppressed. If full diegesis is not a design goal, geometric elements such as the runner vision in Mirror's Edge (see 6.2.1) is an appropriate tool for UI designers – if diegesis is important to the game experience, signifiers might be a better tool such as smoke coming from barrels that will explode if the player shoots at them.

H4. Significance of Navigation

The higher the significance of navigation, the greater the importance of strengthening the player's sense of direction, which can be done with signifiers and geometric elements.

Another factor that was not covered in the first iteration was the loss of sense of direction that might occur when a player navigates a virtual space with his/hers real-world navigation skills, while being perceptually linked to this world through a display, audio system and a haptic controller interface. This issue is explored in the article Exploring Terra Incognita: Wayfinding Devices for Games, in which the authors argue that players are not able to build primary spatial knowledge within the worlds that they inhabit while they play (Bidwell et al., 2007).

The significance of navigation within the geometry affects the importance of spatial UI elements. In games in which navigation is of major importance, it is important to maintain the player's sense of direction within the game environments. The importance of diegesis affects the UI design approach to this; if diegesis is important, the use of signifiers is appropriate (e.g. blood trails in Dead Space to point the player in the right direction), if diegesis is of less importance UI designers could experiment with geometric elements (e.g. the light beacons in Mirror's Edge time trial mode to indicate the location of checkpoints).

H5. Rules Transparency

The higher the rules trasparency, the greater the importance of conveying the rules in a diegetic way, and that non-diegetic references to rules are separated to a tutorial part of the game.

During the focus group conducted in the first iteration, textual instructions (such as “Press X to pick up weapon” presented in an overlay manner) given to the player was mentioned as breaking the experience in games with narrative focus rather than competition-based. Focus group participants requested more subtle indication that an object could be interacted with, or that the non-diegetic instructions were limited to a tutorial separated from the main game.

The rules transparency of the game impacts on 1) how affordances are conveyed to the player, and 2) the diegesis of the learning/tutorial approach of the game. If the game does not make the slightest attempt to hide the fact that it is governed by a rule framework, affordances can be conveyed by fairly straight-forward approaches such as pure textual feedback (e.g. "Press X to pick up weapon") throughout the whole game. If this strategy is not desirable, designers should make an effort to restrict non-diegetic affordance references to a tutorial part of the game, and convey the rules in a somewhat way that falls somewhat more in line with the fiction (e.g. "You must find the fire escape ladder to gain access to the building" instead of "Find the exit to proceed to next level").

H6. Level of Vertigo

The higher the level of vertigo, the greater the importance of strengthening the perceptual link between the player and his/her game avatar, which can be achieved with meta-perception.

The evaluation of the first iteration showed that vertigo might be a factor vital to every FPS game, no matter to what extent it is competition based. As argued above (“H4. Significance of Navigation”) the game should make up for the fact that the player is perceptually linked to his/her game avatar merely through a display, audio system and a haptic controller interface. This should be equally important when it comes to linking the player to the internal senses of the player avatar when it comes to conveying sensory-rich information such as the level of health, sense of speed, sense of height, etc.

The level of vertigo is determined by how sensory-rich the gameplay is, and consequently to what extent the game should link the internal senses of the player avatar to the senses of the player. If the gameplay is sensory-poor, this link is of less importance. However, as the gameplay draws on sensory-rich elements such as health (a part of every conventional FPS), height or speed, the player needs to be linked closer to his/hers game avatar. This can be achieved by exaggerating (meta-representations, according to our previous terminology) and fortifying these senses visually, by audio, or by haptics; for example blurring the edges of the screen to indicate speed, or exaggerating traffic noises when jumping between rooftops.

8.2.2 Evaluation by User Testing

Three sets of user tests were conducted in order to prove the hypotheses formulated in the second iteration. In each test, the test participant was exposed to different user interface approaches, by playing two or more sessions with existing games utilizing a user interface suitable for what the test aimed to prove. Each session was followed up with questions. Due to limited time and the limited freedom in what to test that follows when

using existing games, not all hypotheses suggested could be tested. However, it is believed that the hypotheses not tested are still proved or at least justified by looking at what has previously been done within the field of ludology.

A detailed description of each test, the games included and why they were selected can be found in Appendix 5.

Significance of Navigation (H4)

The first user test to be conducted considered the hypothesis of significance of navigation; how UI designers can enhance the game experience by making up for the loss of sense of direction that occurs when connecting the player to an avatar inhabiting a virtual world via a display, audio system and haptics. The two games that were used in the test was Mirror's Edge, a game using geometric elements (see 7.3) to aid the player when traversing the game environments (see 6.2.1), and Bioshock, a game with an compass-styled 3D arrow presented as a HUD element (see 7.3) guiding the player throughout certain passages of the game. In each of these games, the significance of navigation was considered to be relatively high. A more elaborate description of the test can be found in Appendix 5.

The participants of this first test were not explicitly asked any question regarding their "sense of direction" (using that particular term) within the game per se, but rather if they considered it easy or hard to navigate through the environments (using the different approaches to navigational aid utilized by the game). While the navigational UI elements eased player navigation, the participants seemed to prefer exploring the game environments without navigational aid, stating that it gave a larger sense of freedom and gave a more rewarding experience when finding the right way through the environments on their own. When told to rank the different approaches to navigational guidance according to 1) usability and 2) game experience, every single test participant selected not having a navigational aid at all as the approach that strengthened their game experience the most. The approaches that were generally ranked high regarding the extent it made navigation easier for the player, were also the approaches that were least preferred from a game experience point of view. This shows that sense of freedom might be just as important as sense of direction.

It should be pointed out that while sense of freedom might be important to the player, it was observed that when sense of direction was lost in Mirror's Edge and the player was put in a stressful situation, players lost their connection with their game avatar and as a result also lost their flow throughout the game environments. When this happened, the participants acted within the game world using primary real-world knowledge or trial-and-error with little success, resulting in slightly confusing situations for example when trying open doors that could not be opened. This phenomena show that sense of direction is still important in order to link the player close to his/her game avatar.

The participants had issues with the navigational guiding being either too ambiguous or too unambiguous. This suggests that players do not want to be told explicitly where to go and what to do, but they do need to be hinted. As noticed in the focus group previously

conducted (see 8.1.2), this also suggests that considering the informational content of a UI element might be just as important as the way it is presented.

As Mirror's Edge runner vision does not only provide a navigational aid for the player, but also amplifies the affordances of the game world and aids the player to enact with an as wide range of interactions as possible within the game geometry, the first user test also happened to give feedback on the fidelity of spatial interaction hypothesis (H3) through the observations that were made during the test. As described above, the participants tended to deduce affordances out of the game environment that did not exist in the rule framework of the game (e.g. trying to open non-interactive doors). With runner vision turned off, participants interacted with the environments using a poorer range of actions than with runner vision turned on. For example, none of the five participants made use of a certain springboard technique to launch themselves into higher jumps, even though the opportunity was given on at least two places. The participants also had trouble discovering a "swing on crossbar" affordance, despite having experienced it during the game's tutorial just 5-10 minutes earlier. Some players also experienced a slight inconsistency with the runner vision approach of coloring interactive objects red, when encountering other geometry in the game colored red, and accordingly deduced affordances not existing in the game. These observations justifies, if not proves, the hypothesis of fidelity of spatial interaction; with an increased level of player interaction within the game geometry, it becomes increasingly important to separate affordances allowed by the geometry/rules from those that are deducable from the geometry but not actually existing within the game world.

When questioned about the fact that the navigational aid was something not part of the fictional game world and accordingly not visible to the characters in the game, none of the participants stated that this was an issue with Runner Vision or the Bioshock arrow. Only one person felt that the Mirror's Edge checkpoint beacons were out of place. The art style of Mirror's Edge and general user interface conventions within the FPS genre was mentioned as factors preventing said UI elements from breaking the experience. Issues connected to the navigational guidance were instead concerning inconsistency, or the information being either too ambiguous or too unambiguous.

When questioned about if Mirror's Edge runner vision strengthened the game experience, three out of five participants answered yes and only one person was taken out of the experience, irritated when he mistook other red details in the game geometry for runner vision. When answering the same question for the Bioshock compass arrow, no player thought that this approach had a strengthening effect. The same could be said for the ME checkpoint beacons, suggesting that geometric UI navigational elements does not automatically strengthen the game experience. It does however indicate that if done right (for example in the style of runner vision), geometric elements can strengthen the game experience.

Testing Level of Vertigo (H6)

In the second user test, the hypothesis regarding the level of vertigo was tested by looking at a specific type of perceptual information relevant for most FPS games; communication

of damage and the level of health. Four different games was included in the test – Battlefield: Bad Company, Call of Duty 4: Modern Warfare, Halo 3, and Killzone 2 – each with a distinctively diverse approach to communicating the feeling of being damaged and how close the player avatar is to being dead (or the other end of the spectrum; being of full health). A more elaborate description of the test can be found in Appendix 5.

Some of the test participants' opinions seemed to be heavily influenced by the games they had played before. Two out of the five test participants had played earlier games in the Halo series extensively, but were not very familiar with the other games tested. Both ranked Halo 3's way of communicating the feeling of being damaged high from a game experience point of view, while other test participants placed Halo 3 in the last place when asked to rank the games.

The test participants were asked to rank the games included in the test according to 1) how well the game communicates the feeling of being damaged, and 2) to what extent this strengthened the game experience. While players ranked the games quite differently as described above, they ranked the games in the same order for both question 1 and 2. This indicates that communicating the feeling of being damaged in an accurate way strengthens the game experience.

A majority of the test participants (the three persons that didn't favor Halo 3's way of communicating the feeling of being damaged) seemed to think that meta-perception (full screen image filtering and overlay, see 7.3) affected their game experience in a positive way. Some however had issues with meta-perception that was used to the extent that it causes a loss of control over the situation (for example image blur), while others seemed to find it irritating that it only made them notice the low end of the health range (critical health level) and that it was hard to notice it when it was used to indicate being hit by fire. Generally, the participants seemed to think that the Killzone 2 approach (see 6.2.4) was a good way to go, with the overlay blood stains symbolizing both being hit by fire and eventually critical health level when the perifery of the screen is covered with blood, without causing loss of control with blur or fading out the screen. This is also interesting from a design space point of view, as the use of blood fortifies this design solution in the fiction of the game (most other approaches are strictly non-diegetic).

As in the first test, no participant questioned about the non-diegetic nature of certain UI elements included in the test mentioned it as breaking the game experience. No participants were taken out of the game experience because of the overlay nature of perceptual emulation either. Once again, genre conventions were mentioned as a reason for accepting this kind of information. This shows that non-diegetic and meta-perceptual UI elements (see 7.3) does not necessarily weaken the game experience, despite being outside the diegetic part of the UI design space.

Testing Fidelity of Spatial Interaction (H3)

The aim of the third test was to prove the hypothesis regarding the fidelity of spatial interaction. The amount of affordances deduced from an 3D game space is always greater

than the amount of affordances actually allowed by the rule framework (e.g. only certain doors can be opened in Mirror's Edge yet some of our participants in the first user test tried to open doors that could not be opened), hence UI designers must amplify affordances allowed and supress non-existing but deducable affordances. This must be done to enable as rich spatial interaction as possible, and keep the player from trying to do things not allowed by the rule framework which might block the player's presence within the game world. The games included in this test were Resident Evil 5 and Dead Space (see 6.2.2), two games quite similar from a pure game mechanics point of view, but completely different in their approaches to amplify the affordances of the game world. A more elaborate description of the test can be found in Appendix 5.

Looking at results of the third test, it seems like non-apparent affordances are hard to discover without proper amplification. In the introductory Resident Evil 5 chapter that was included in the test, there were several possible interactions with objects that were difficult for the participants to discover. In an action scene that was a part of the session, the player was able to block the doors of a shelter by pushing shelves in front of them. This affordance (that a shelf affords pushing) is not amplified at all. None of the test participants discovered this interaction. The participants also had trouble discovering that certain objects in the game were breakable – only one participant discovered this the first time a breakable item was introduced (affordance amplified by a brief barely noticeable textual message), and one other participant discovered the affordance later on during the game session (when it was not amplified at all).

Apart from pushing shelves and smashing objects to pieces, participants had problems discovering that a window afforded jumping through it when trapped inside a building. The affordance was only amplified when standing close to the window, by a "Jump through window" button prompt. The problem was that the players rarely positioned themselves close enough to the window for the affordance amplifier to occur. This resulted in a state of confusion, when the players did not know how to escape the building. Only one of the participants discovered the affordance instantly. It should be noted that if enough time passes by, the player's partner Sheva positions herself next to window and communicates by dialogue that the window is a way out of the building (an affordance amplifier as such). However this occurs after a significant period of time and the participants tended to find the way out by trial-and-error before it happened.

While the results of the first user test actually managed to serve as better proof for the hypothesis of fidelity of spatial interaction (see above), the results of the third test shows that the hypothesis can be reversed; without proper affordance amplification, the player might play the game with a poorer set of actions than the rule framework supports. The affordance of breaking objects was not discovered by the majority of the test participants, resulting in poorer interactivity with the game geometry. The affordance of pushing shelves was not discovered at all, also resulting in the players missing out on possible interaction with the environment. The affordance of jumping through the window was only discovered instantly by one test participants, for the majority who didn't this resulted in a state of confusion until the affordance was found by trial-and-error. Note that a weakened game experience isn't necessarily a direct result of the player missing out on

optional affordances such as breaking boxes or pushing shelves, but might be an indirect result as affordances are hopefully put into the game to flavor and enrich the game experience. For affordances required to make progress through the game (jump through window) it should be important not to frustrate the player and force him/her to rely on trial-and-error, which might take the player out of the gameplay experience.

In line with the results of the first user test, there were some claims made during the third user test regarding the joy of discovery. Two of the persons taking part in the third test didn't mind that it was hard to discover which objects that could be smashed to pieces, with one claiming that the discovery of this affordance is rewarding enough to compensate for the lack of affordance amplification. Another participant had some complaints about the fact that the game didn't make him aware of the possibility to break apart objects, but suggested forcing the player to discover the interaction by "locking him into a room" with a breakable object, rather than using a user interface affordance amplifier. It should be noted that the remaining two participants didn't find the affordance hard to discover.

Dead Space, the second game that was tested, featured breakable boxes as well. Here, another test participant claimed the boxes to be too attention grabbing. He wanted more subtle affordance amplification, as he - as well as the participant mentioned above - found the rewarding feeling of discovery strengthening for the game experience.

Once again, this suggests that sense of freedom is important for engrossing oneself into the game experience, and that dumbing down the gameplay by being too explicit might take players out of the game experience. This might be especially relevant considering optional affordances – affordances not required to make use of in order to progress in the game.

As in the second user test, two groups among the participants can be noticed. This time, the participants could be divided into those who prefer the Resident Evil 5 approach of amplifying affordances with explicit non-diegetic button prompts throughout the whole game, and those who thought that the button prompt approach might be justified in the introductory part of the game but not later on. Perhaps not very surprisingly, the person that spent most time on games in the former group (two persons) spent about two hours per week playing games while the latter group (three persons) consisted of players that could be described as hardcore gamers. Accordingly, hand-holding seems to be preferred by players with a casual perspective, while experienced players might accept a tutorial approach of button prompts in the beginning of a game but might be taken out of the game experience if these button prompts are persistently used.

9 IMMERSION IN FPS GAMES

It is important to note that the goal of this thesis is not to provide a general or universal definition of immersion as a phenomenon, but rather to explore the concept from the perspective of the FPS genre in particular, in an attempt to better understand the alluring factors unique to FPS games and how these can be used to enrich the game experience.

9.1 The Immersive Fallacy

Salen and Zimmerman claim that the idea that "the pleasureability of a media experience lies in its ability to transport the participant into an illusory, simulated reality", is a fallacy. They state instead that the nature of play itself contradicts the idea that the computer game experience should be as immersive as possible. Play, they argue, is characterized by the player adopting a kind of double-consciousness (or hybrid consciousness) that puts him or her both inside and outside the frame of make-believe at the same time. It is from this meta-communicative state of mind that we derive the unique pleasures and experiences of playing a game (Salen, Zimmerman, 2004).

Similarly, Jesper Juul argues that players are always aware that the fictional aspect of a game, its theme, is fully optional and that this understanding is part of the cultural conventions surrounding games and play. In some cases, like in competitive multiplayer games, the removal of the fictional elements can actually be desired by experienced players (Juul, 2005).

Playing a video game, according to Linderoth, is moving back and forth between a primary framework concerned with rules and competition and a secondary framework concerned with mimicry and the theme of the game (Linderoth, 2004). If moving between different frames is the essence of a game experience, this is certainly a strong argument against immersion as an illusion; total immersion, if defined as believing that the game world is real, implies that the player would experience the game exclusively from a fictional framework. Linderoth concludes his book with stating that the idea of reaching an illusive state while playing games is an illusion itself (Linderoth, 2004).

Salen, Zimmerman, Juul and Linderoth's arguments against immersion seem reasonable. However, the idea of immersion still might prove a meaningful conceptual tool in understanding the unique pleasures of games, if defined as something other than an interactive illusion.

9.2 An Alternative View on Immersion

Various sources points toward immersion – defined as an illusory state – as a fallacy. This is also hinted in the results of the user tests conducted in this thesis; players do not seem to think that the non-fictional or non-diegetic nature of certain game elements affects the game experience negatively. There seems to be an acceptance of elements breaking the illusion of the game world as an alternative reality, not entirely dissimilar to the notion of suspension of disbelief (see 3.3.3).

While a sense of illusory presence in the game world might be unachievable and misleading when working towards immersion in games, the notion of presence itself might be valuable for understanding how players can be successfully transferred into to game world and linked closer to the game experience.

One way to work towards player presence is to bring the notion of agency into account (see 3.3.5), in order to strengthen the manifestation of the player within the game world as an agent able to act and make his own choices through reasoning. Klevjer's arguments draws towards agency being the actual essence of the game experience (Klevjer 2006b). Looking at the results of the first user test, participants actually preferred making their way through the game environments without any indicative or guiding information, even though it made progress cumbersome and limited the variety of actions performed by the player.

Flow, as defined by Csíkszentmihály (see 3.2.4), could be said to be related to immersion. Extending and balancing the player agency by providing a sense of being in control over the situation, combined with constantly adjusting the challenge level to match the players growing skill-set, will result in an experience related to flow. Brown and Carnis point out the similarities between flow and immersion in that both are considered to require full attention, alter one's sense of time and self and require a certain level of skill and knowledge. Still, flow is described as something maintainable whilst "total immersion" is a passing state indicating, that the two are not fully interchangeable (Brown, Cairns, 2004). In either case, flow is considered to be effect of game design rather than UI design, and will not be elaborated further in this thesis.

Looking at agency alone is not enough when immersion in FPS games is concerned; what sets FPS games apart from other games is the fact that they communicate the game world through the eyes of the player avatar. This subjective point of view through which the player observes the game world is close to how the player views, navigates and acts in the real world, outside the game (Klevjer 2006a). Consequently, in order to manifest player presence within the game world, the player must be allowed to elicit information as he or she would make use of perception in a real world scenario.

Further, player presence might be manifested when the player reacts to what is experienced in the game world with real world emotions such as anger or empathy. This is touched upon in the article A Grounded Investigation of Game Immersion (Brown, Cairns, 2004). While evoking player emotions is considered to be beyond the main responsibility of the UI designer (and consequently the scope of this thesis), it is still relevant for any definition of immersion based on presence.

When connecting agency, perception and emotions to the notion of presence, it is clear that these three phenomena have one thing in common: player presence within the game world implies accessing ones primary frameworks as defined by Goffman (see theory). These primary frameworks are the player's reference frames – the primal knowledge used in order to act and make sense of the real world.

9.3 Defining Immersion

For the purpose of this thesis, immersion will be defined as; moments during play when the players access their real world perception, reasoning skills or emotions (the primary frameworks of the player) to play the game or voluntarily adopt the game world as a primary world and reason from the characters point of view, rather than having to refer directly to the rules of the game. In these moments the player grows beyond being simply a player, instead taking the role of an agent in the fictional world (no matter how limited).

From this definition three distinct types of immersion factors can be described, immersion concerning reasoning, immersion concerning perception and immersion concerning emotions. As previously argued, emotional immersion is beyond the scope of this thesis, and will not be covered in this report.

9.3.1 Immersion through Reasoning

A game world in which players are encouraged to use their knowledge of the real world and knowledge of genre conventions (e.g. like knowing the weakness of vampires or werewolves) to solve game world problems enables the player to reside in a fictional frame rather than a rule-oriented frame whilst playing. This immersion factor closely resembles Klevjer's definition of realistic agency:

> *"Realistic agency is achieved when you do not have to play the game by following a set of instructions and when the behaviors of characters, objects and processes in the game can be ascribed to their own properties and capabilities rather than to rules that are external to them."*

Important to note is also that Klevjer's distinction between realistic agency and functional realism (Klevjer, 2006b). Immersion through reasoning does not dictate that the game world has to be realistic, as long as it is internally consistent. For example, none of Superman's powers are in the slightest way realistic, but Superman readers will tend to overlook this as long as his powers work in a consistent manner (e.g. if Superman can lift a blue truck, he should be able to lift a green truck as well).

Other than to striving for realistic agency this kind of immersion can be strengthened through the use of formal constrains, for instance restricting player actions by making the players themselves choose not to try the types of interactions that are not covered by the rule framework. Drawing on previous example, if Superman would learn that the paint-job of the green trucks contain traces of kryptonite, which would make it impossible for him to lift them, this would explain why Superman should avoid green trucks altogether and make perfect sense to anyone familiar with Superman lore.

The concept of diegesis becomes relevant when considering immersion through reasoning, in that it enables all the reasoning to take place within the fictional frame. Juul argues that players quickly learn to distinguish between task-relevant and task-redundant information, making experienced players shift their focus from the fictitious game world

to the rule oriented framework behind it (Juul, 2004). However, if the task relevant information has to be elicited from the game world itself, like following tracks in the snow rather than navigating toward a map marker when sneaking into the enemy base, the task will be fully contained within the games diegesis, thus preventing, or a least prolonging, a slide from reasoning as an agent in the game world to reasoning as a player following a set of rules.

The following are some examples from the game studies where immersion through reasoning breaks down for various reasons:

In Call of Duty 4: Modern Warfare, there are fences that the player can jump over by the press of a button, but on some places in the game the same (or similar) fences works as invisible walls made to confine the player to the playable parts of a game level. This type of inconsistency in the game world will disturb the players reasoning; similar objects should always behave in similar manners to support the reasoning skills of the player.

In Far Cry 2, firing a rocket at a shanty house will not destroy it or even make it move slightly. This is an example of real world objects behaving in unfamiliar or unrealistic ways and will obstruct the player's immersive reasoning. In this case, blowing up the shanty house with a rocket launcher might seem like a valid approach both from a genre and from a real-world stand-point, but it is prohibited by the rules of the game and can subsequently break the player immersion.

In Battlefield: Bad Company, the game world is not reset when the player dies. Instead the player is just returned to the world as if he or she was magically resurrected and is then able to rejoin the teammates in battle as if newer having been killed. Having objects, features or events in the game that can not be explained except by referencing the rules (like save point, extra lives and so called "spawning" as described above), might in some cases disturb the player's immersive reasoning. An incoherent game world (a world containing objects or events unexplainable by the game fiction) might force the player to reason from a rules perspective rather than a game-world perspective.

9.3.2 Immersion through Perception

Games played from a first-person perspective engage a player's perception in a way similar to real life. Clues about the whereabouts of objects and enemies are elicited from the environment in largely the same way as it would in a similar, real world situation. According to Rune Klevjer, FPS games can even be seen as games of vertigo (as defined by Caillois, see chapter) or motion "simulators" (Klevjer, 2006b).

Still, contemporary games only offer a visual, auditory and haptic rendition of the game world, leaving out many of the subtle things that makes up our real world perception (like our sense of balance, etc.). Klevjer speaks of the first-person avatar as putting constraints on how players move about within the game environments, as the first-person perspective can cause undesirable disorientation and vertigo (Klevjer, 2006b).

Because of this, it is fair to argue that a UI element strengthening the player's in-game perception can increase player immersion. By bonding the player closer to the perception of his or her avatar, a player presence within the game world can be manifested resembling human presence in the real world.

It feels relevant to distinguish internal perception from external. The most obvious loss of perception when transferred into the body of an avatar in a game might be the loss of perception regarding ones internal status, such as the level of health. However, there is also need to make up for perception regarding the world external to the avatars body, such as the loss of direction and orientation that might appear as argued above. Looking at existing games, an example of such elements would be the character outlines in Left 4 Dead (see 6.2.5), making up for the fact that when playing a game it is nearly impossible to make use of the senses that are normally used to keep track of the position of others whom cannot be seen but can be heard.

Diegesis seems to be of less importance when considering perceptual immersion. The fact that players of certain competitive games strip the game of some of its fictional/cosmetic components might be seen as an attempt to strengthen the perceptual immersion (Juul, 2005), by taking away all the distracting elements that do not convey any relevant information, leaving the player free to fully engage the spatiality of the game world. As Murray argues, the vertigous pleasures of navigating a virtual environment are largely independent of its fictitious setting (Murray, 1997). This was also indicated in the user tests conducted in this thesis. In other words, UI elements strengthening the player-avatar perceptual link can also strengthen player immersion whilst still digressing from any sense of realism, fiction or UI transparency.

10 UI GUIDELINES FOR FPS GAMES

Building on the definition of immersion presented in the previous chapter, and consequently the results of the user studies and the literature study performed as a part this master thesis, four guidelines for UI designers of FPS games are presented in this chapter: Know Your Design Space, Know Your Game, Establish Player Agency, and Strengthen the Player-Avatar Perceptual Link.

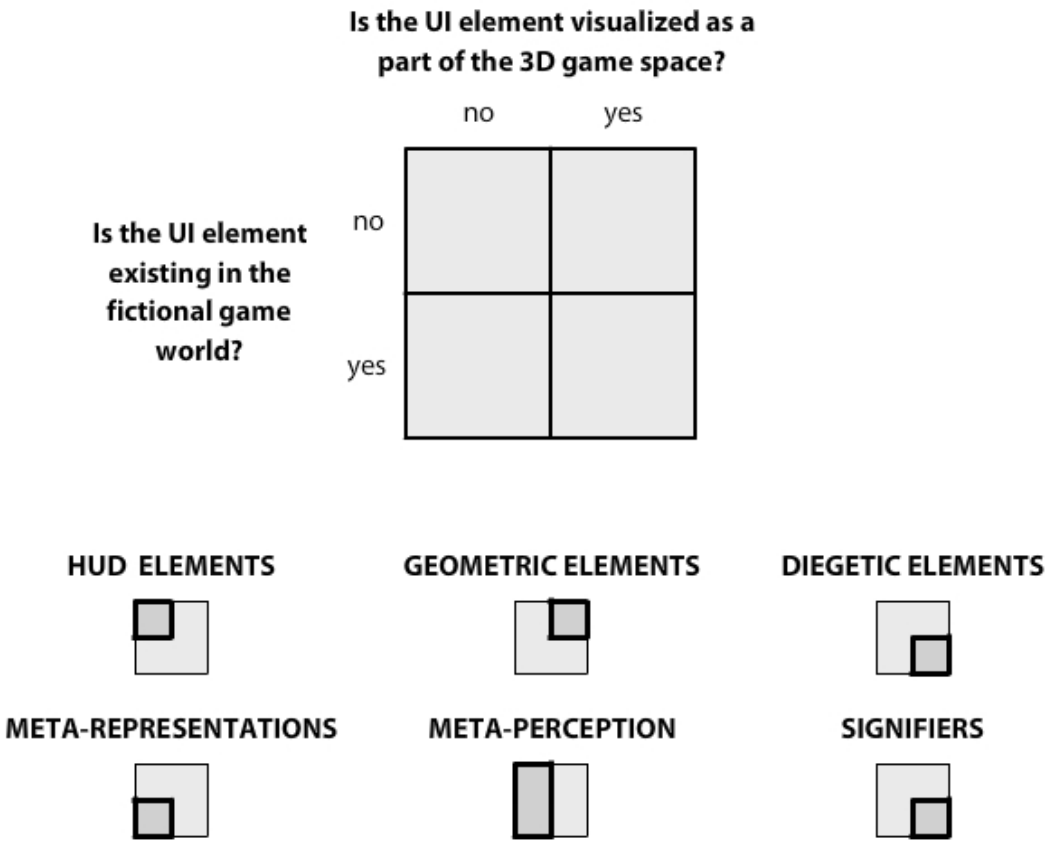
10.1 Know Your Design Space (and How to Exploit It)

The Design Space of User Interfaces for FPS Games

User interfaces for FPS games are not restricted to informative elements presented in an overlay manner, on top of the game world. User interface elements can be given spatial qualities, and be presented in the three-dimensional geometrical environment in which the player avatar is present.

A UI designer is not only able to exploit game geometry in order to present spatial user interface elements, the UI designer can also make use of the fictional world inhabited by the player avatar and other characters of the game. User interface elements with fictional qualities are information presented as a part of the fictional game world.

Note that fiction is distinguished from space. A fictional element is not necessarily presented in a spatial manner, and a spatial element is not necessarily a part of the game fiction.



Picture 10.1. The design space of user interfaces in FPS games

Looking at the design space of FPS game user interfaces, certain groups of UI elements appear (see Picture 10.1). These are the tools of the UI designer.

Non-diegetic elements are what conventionally make up the major part of the user interface of a FPS game. Visually, they are UI elements presented in an overlay manner, superimposed on top of the game world (see Picture 10.2). The non-diegetic nature implies that these elements are not a part of the game world; although they are seen by the player, they cannot be seen by the player avatar and other characters inhabiting this world. The non-diegetic nature also means that UI designers are free to create those in whatever shape desirable without having to fit them into the fiction of the game. Thus, non-diegetic elements are especially suitable for conveying information with a high level of detail.

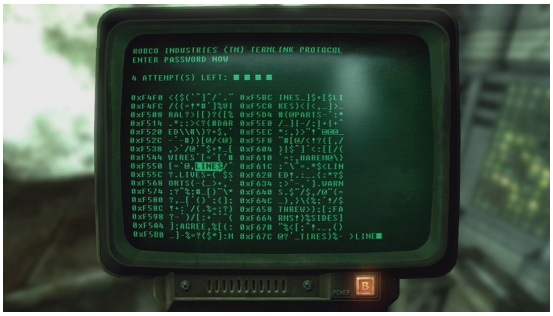
Picture 10.2. Non-diegetic elements

Another conventional group of user interface elements is **meta-perception**. These are informational elements emulating what could be described as the internal human

perception, linking the player to the senses of his/her game avatar in order to typically convey the effects of physical damage and changed health status. As non-diegetic elements, meta-perception is presented in an overlay manner but as full screen image distortion or filtering (see picture 10.3) rather than text, symbols and informative animated images (sprites). Consequently, meta-perceptual elements are more suitable for connecting to the players senses rather than conveying information with a high degree of detail. Typically, meta-perception is not fictional, however there are games that bridges meta-perceptual elements with the fictional world of the game by the use of blood or heartbeats to represent information.

Picture 10.3. Meta-perception; the edges of the screen are tinted red to symbolize physical damage

Meta-representations are elements presented outside the geometrical game world, but reside in the fictional world of the game (see Picture 10.4); a meta-representation represents an informational representation of the fictional game world. The most typical examples is would be devices and gadgets in the game avatars possession, for example GPS styled navigation systems and cellular phones, depicted outside the game space and typically visualized in manner optimal for the purpose of the meta-representation (e.g. the keypad of a cell phone, if the phone is used to dial a number in-game). Depending on the fictional setting of the game, this type of UI elements might be suitable for giving a somewhat plausible explanation to why certain information is available to the player.



Picture 10.4. A computer terminal visualized in an overlay manner

Geometric elements are presented as a part of the spatial game world (see Picture 10.5), but not the fictional. Due to the spatial qualities of these elements, they are especially suited for conveying environmental information, navigational information, and other information with spatial content. Additionally, the absence of a fictional link brings the same advantages as HUD elements; UI designers are free to visualize a geometric element in

Picture 10.5. The position of a concealed teammate, represented as a spatial outline

order to convey the information in an as desirable way as possible.

Informative elements existing both in the fictional and the spatial game world are **diegetic elements**, visible to both the player and to the player avatar through the same representation (see Picture 10.6). The advantage of diegetic UI elements is obvious; by presenting UI elements not only spatially but as an actual part of the fictional world of the game, there is no risk that the player will be blocked out of the experience due to the non-fictional nature of the informative elements. However, similar to meta-representations, the range of possibilities of diegetic elements is highly dependent on the fictional setting of the game. For instance, presenting information on holographic screens in a manner similar to Dead Space would feel awkward in a medieval fantasy-themed game.

Picture 10.6. The amount of ammunition shown in a diegetic manner as numbers on a display on the player's rifle

Finally, **signifiers**, a subcategory to diegetic elements, are diegetic UI elements carrying information about entities external to the signifier itself (see Picture 10.7). For instance, smoke is a signifier of fire, an empty train station platform signifies that the train has just left, and a pool of blood is a signifier for danger. Interpreting signifiers requires logical reasoning, hence the advantage of conveying information using signifiers is that they link the player closer to the game world in terms of the internal functionality of the game world and how it resembles the functionality of the real world.

Picture 10.7. Fire from a barrel signifying that it is about to explode

Contrary to what one might believe, a fully diegetic user interface is not automatically more immersive than a user interface incorporating informational elements represented outside of the diegetic spectrum. Of course, the diegetic element is an excellent tool for strengthening the game experience from an immersion point of view, however informational elements represented outside of the diegetic spectrum have their own advantages when pursuing an immersive game experience. Some have been mentioned above, and this will be elaborated more in the other three guidelines.

The Auditory and Haptic Channels

The design space of UIs in FPS games is not only visual; there is an auditory and a haptic information channel that can both be used with great success in order to convey

information to the player. No matter whether user interface elements are given a visual, auditory or haptic presentation, they can always be fit into the design space.

In theory, this works inversely: the design space and its categories can always be utilized, no matter how the user interface elements are to be channeled. However, it can be discussed if information presented haptically can be truly spatial, given the hardware constraints of the vibrating motors in the game controllers of current day video game consoles. Further, it is questionable if elements presented haptically can be truly diegetic; vibrating the controller in the hands of the player is a rather abstract form of information conveyance, not closely resembling any type of haptic feedback existing in the real world (other than the feedback given while playing games, that is).

Heart beat audio conveying critical health level is an example of auditory meta-perception (as heart beat pulsed vibrations is haptic meta-perception), and informative character monologue or dialogue is an example of diegetic elements. In the objective game study that was conducted for this thesis, two cases of novel use of the haptic channel were discovered. Of these, vibrations to indicate that a bomb timer counts down would be a non-diegetic element, and intense vibrations when the player strains a bow to the max are meta-perceptual elements.

UI designers need to realize that especially sound can play a crucial role in strengthening the experience of playing a FPS game. Games such as Bioshock and Left 4 Dead are great examples of games that, through clever sound design, stand out amongst the competition in providing very intense and engaging game experiences. More so than in other games, the sound effects in these titles often convey important, game related information rather than just providing the game with an atmosphere (serving only the role of auditory props).

10.2 Know Your Game

Level of Competition

A crucial factor to consider when designing user interfaces for immersion in FPS games is to what extent the game experience is made up by competition-focused elements. The level of competition of a FPS game ranges from fully progressive (e.g. single-player games focused heavily on narrative and engrossing the player into the fictional game world) to fully competitive (e.g. pure multi-player games played against other human players).

Competition based games are games of skill. Players of skill-based games are in need of information that they can use as a knowledge base to make decisions regarding their play strategies and how to act in specific game situations. Of course, as games are an interactive form of media, all games require decision-making and a basic play strategy, however in competition based games this is an essential activity, while in games of progression it is more of a peripheral activity mainly conducted by the player to disclose the narrative of the game.

Consequently, a game's level of competition should be reflected in the user interface. If a game relies mainly on fiction and narrative in order to deliver a strong game experience, the user interface should first and foremost fortify the player's presence within the fictional game world. Here, diegetic elements and signifiers are important tools to convey the information that the player needs in order to progress in the game, while engrossing the player in the game fiction. Ambiguity of the information conveyed to the player might not be an issue, and could actually strengthen the game experience as it brings in the ambiguous characteristics of the real world, making the fictional world of the game feel less virtual.

User interfaces of skill-focused games – games with a relatively high level of competition – should first and foremost support decision-making and formulation of play strategies in order to strengthen the essence of the game and fortify a strong experience. In games which build mainly on competitive elements, fiction is of less importance for the player. Here, non-diegetic and geometric elements are tools that can be used in order to provide clear unambiguous information to the player in a manner that is difficult to achieve with strictly diegetic elements.

It should be noted that a game can focus on competitive game play while still being a single-player game, as a player can compete against predefined goals, or goals set up by him or herself, just as he or she can compete against other human players. Consider the three different modes in Mirror's Edge (EA DICE, 2008). In the main story mode, the player takes the protagonist Faith on a trip with the goal of progressing through the narrative and unfolding the story that is told. In the speed run mode, the player does the same trip but with the slightly more competitive objective of moving quickly through the levels in order to record as fast times as possible. In the highly competitive time trial mode, the player is tasked with running as fast as possible through specifically designed tracks in order to set time records, collect points, and unlock new tracks.

The Importance of Considering Game Fiction

The fiction of a game determines the possibilities of the diegetic part of the user interface design space. What is potentially available in terms of diegetic UI elements varies greatly depending on the theme and setting of the game. A game with a distinct science fiction or fantasy theme, such as Dead Space, allows for diegetic UI elements to be explained by referring to exotic future technologies or magical artifacts. Making the same types of elements fully diegetic in a game focusing on, for example, historically accurate combat during World War II will require a lot more creativity and might prove very difficult. Moving between a historical setting and a modern day setting may also require an effort regarding carrying over informative elements, as illustrated in Design Example #1.

Design Example #1

In the Battlefield games, competing teams attempt to gain control over territories by raising the teams' flag on a flagpole, or take over a territory from the opposing team by first lowering the enemy flag and then subsequently raising ones own. While this was fully appropriate with the original Battlefield 1942 set during World War II, flags would feel slightly out of place as a resource for armed forces to fight over in a modern or future entry in the series.

A replacement to the flag more fitting to a modern fiction would have to be able to communicate at least four things in order to fully replace the flag and flagpole: it has to 1) be able to be seen from afar, 2) communicate current owner, 3) indicate how much time is left until it has been captured or re-captured, and 4) indicate what team (if any) is currently interacting with it. Furthermore, a constant change in ownership of the object would have to make sense from a fictional standpoint. Last but not least, a flag serve as a kind of symbolic claim to ownership over a territory prevalent in modern culture as a whole, and would in a best-case-scenario be replaced by something of equal symbolic value.

One approach to this problem might be to replace the flags with oil wells with drilling towers. Making the game revolve around the control of this type of strategic resource would fit the fictional setting of modern combat, having one team trying to set the wells on fire whilst the other team tries to put out the fires and get the wells back to start pumping oil. Some of the innate properties of oil wells serve as great signifiers for this purpose. A burning oil well produces large amounts of flame and smoke that will be seen from across the battlefield, as will a well striking oil as it shoots up from the ground (see Picture 10.8).

Picture 10.8. A fully burning oil well, an unclaimed oil well, and a fully producing oil well.

A building smoke column would signal team A setting a well on fire, subsiding smoke would signal team B regaining control of the well and putting the fire out. A building geyser of oil would signal that team B has gotten a well to start pumping and a subsiding geyser would signal that team A has turned off the pump and is about to set the well on fire. Any unclaimed well would simply do nothing.

The UI designer should communicate the importance of giving things in the game world informative properties. Encouraging level designers, character designers, animators and game play designers to consider this early on in development will prevent problems and ambiguities with the game's UI later on. All members of the design team should be aware that a game object can be designed not only as a prop but also as a prompt (information carrier) for the player's actions and behavior, like having the players weapon itself signal that it needs to be reloaded, thus removing the need for excessive use of overlay user interface components.

At the early stages of a project it can always be valuable to explore the design space by starting in the diegetic area rather than in the non-diegetic realm of conventional HUD elements. However, designers should be cautious of unproductive divergences into the realm of full diegesis when this conflicts with the overall experiences that the game aims

to provide. Lengthy explorations of diegetic UI solutions in a highly competitive multi-player game may often prove unproductive since this type of representations tend to be too ambitious and time consuming to correctly serve the needs of the player.

10.3 Establish Player Agency

The ability to act, make choices and execute those choices as an agent within the game world is called agency. This is one of the corner stones of immersion in FPS games. While designing player agency itself is beyond the responsibility of designing the user interface, communicating agency is an area highly important to the UI designer, in order to maintain the player's presence within the game world. Miscommunication of agency can result in players trying to act within the game world in a way not supported by the rule framework of the game, which ultimately means that the game experience will be broken and that the player will be taken out of the experience. Further, if agency is not sufficiently communicated by the game, players might not be transferred into the game experience to begin with, missing out on possible interaction and decision-making within the game world.

Agency and Affordances

The notion of affordances is central to the concept of agency. Simply put, an affordance is the quality of an object or an entity that makes a certain action possible. For example a large body of water affords the action "swim", a glass window affords the action "break", and a ladder affords the action "climb". The player agency of a game could be said to sum up all affordances possible for a player within the game.

As the FPS genre evolves and hardware grows more powerful, the level of interactivity within the game world tends to grow richer, and therefore the set of affordances available to the player grows wider. While this leads to richer player interaction in general, it also leads to a higher general *expectancy* of rich player interaction within the game world. Technological advancements also bring a higher fidelity regarding the graphical presentation of game world, which means that players will deduce affordances out of the game world to a higher extent.

Combining high player expectancy of rule-supported affordances with high player tendency to deduce affordances, there is a significant risk that an affordance deduced is not matched with an existing affordance. That is, if existing affordances are not amplified, and deducible but not existing affordances are not suppressed.

Communicate Player Agency (by Amplifiers and Suppressors)

UI designers have the power of fortifying the player agency within the game world by amplifying the affordances available to the player, and suppressing affordances that can be deduced but are not a part of the rules of the game. Tools for achieving this are the concepts of affordance amplifiers and affordance suppressors, presented below.

An affordance amplifier is a user interface element communicating one or several affordances of the game world, either in a subtle or direct way. The entire design space can be utilized when amplifying an affordance, however considering the

environmental/spatial nature of most affordances, UI elements with spatial qualities (signifiers, geometric elements or diegetic elements) are especially suitable as affordance amplifiers.

Affordance suppressors are user interface elements suppressing affordances that the player might deduce from the game world, but which does not exist in the rule framework of the game. For the same reasons as with affordance amplifiers, UI elements with spatial qualities can be used with advantage (even though any category of the design space could be utilized).

One way to construct affordance amplifiers and suppressors is to work with contrast, such as dynamically highlighting objects of interest with a protruding color while neutrally texturing objects that are not interactive (geometric elements), or the diegetic but slightly more cumbersome approach of putting interactive objects in light and non-interactive objects in shadow. An alternative diegetic design strategy is to work with signifiers and motion contrast, as exemplified in Design Example #2.

Design Example #2

During the user test involving player interaction in Resident Evil 5, the test participants were trapped inside a house, only able to exit the building by jumping through an open window. The test participants had trouble realizing that they could jump through the window, as the game did only communicate this affordance by a HUD button prompt when the player was close enough to the window. This resulted in a state of confusion, as the players did not know how to escape the building.

This situation could have been avoided by animating the curtains of the window to sway in the wind, symbolizing that window was open and that it leads outside, hence signifying the affordance of escaping through the window. By working with contrast in this way (the moving curtains would be the only objects in motion), the affordance is amplified and attention is drawn to the window, while the non-existing affordances of jumping through other windows are suppressed as the other windows are not calling for attention.

Immersion through Reasoning

While it is important to make sure that the player does not deduce non-supported affordances from the game world, it is just as important to maintain the player's sense of freedom within the game world regarding the feeling of progressing in the game through logical reasoning rather than being guided through the experience.

This poses a challenge for UI designers: players need aid to traverse across the game world and interact within it in an as rich way as allowed by the rule framework, yet they seem to immerse themselves into the game experience by making use of their own reasoning to progress in the game. Explicit information is not always desired from the player's point of view, and might reversely spoil the game experience by making the player feel that the game tells him/her what to do, or give the player more information than he or she desire to know.

Signifiers, as presented in the design space, should prove to be an excellent tool for amplifying affordances, as their logical nature appeals to the real world reasoning abilities of the player in order to link him or her closer to the game world. Further, the ambiguity that signifiers bring to the game world serves to bridge the game world closer to the real world. Lastly, the diegetic nature of signifiers means that they will not break player immersion from a fiction point of view. Once again, Design Example #2 is an example of using signifiers to make the player reason by him- or herself in order to progress in the game.

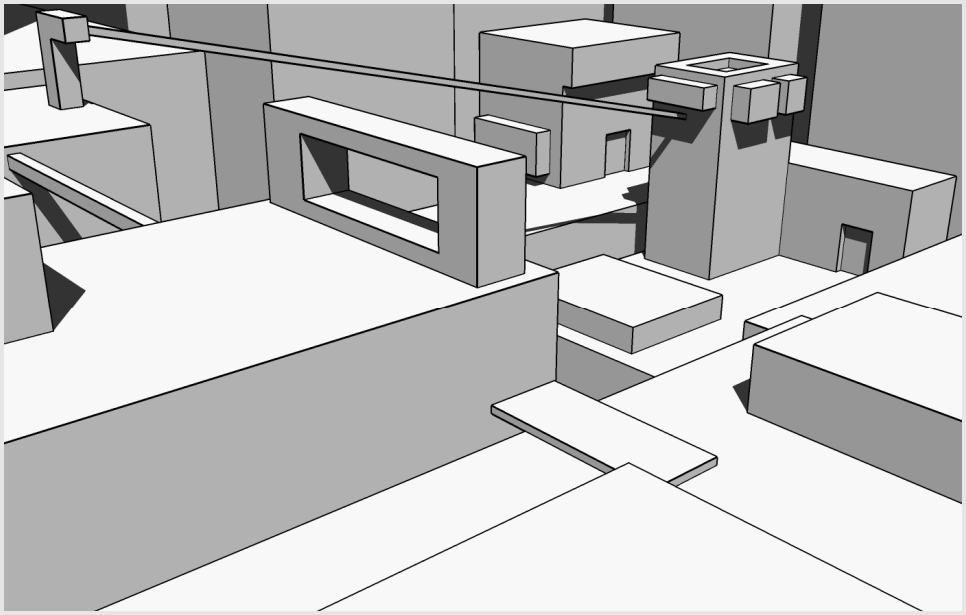
An optional strategy is to start out with providing information to the player with a low level of detail, increasing the fidelity of the information if the player fails to realize how what to do or how to progress. This can be done automatically by the game, requiring proper timing and context sensitivity in order to not frustrate the player (providing too much information too fast or at the wrong moment will make the player feel controlled, while too little information might set the player in a confused state of mind), or manually by the player, as illustrated in Design Example #3.

Design Example #3

When user test participants played Mirror's Edge with Runner Vision turned off, they tended to navigate the environments in a slightly confused way without making use of the wide set of affordances available to the player. Yet, the players preferred playing the game without any type of guidance, as they seemed to appreciate the rewarding feeling of traverse the environments through own reasoning even though they occasionally got stuck during the play session.

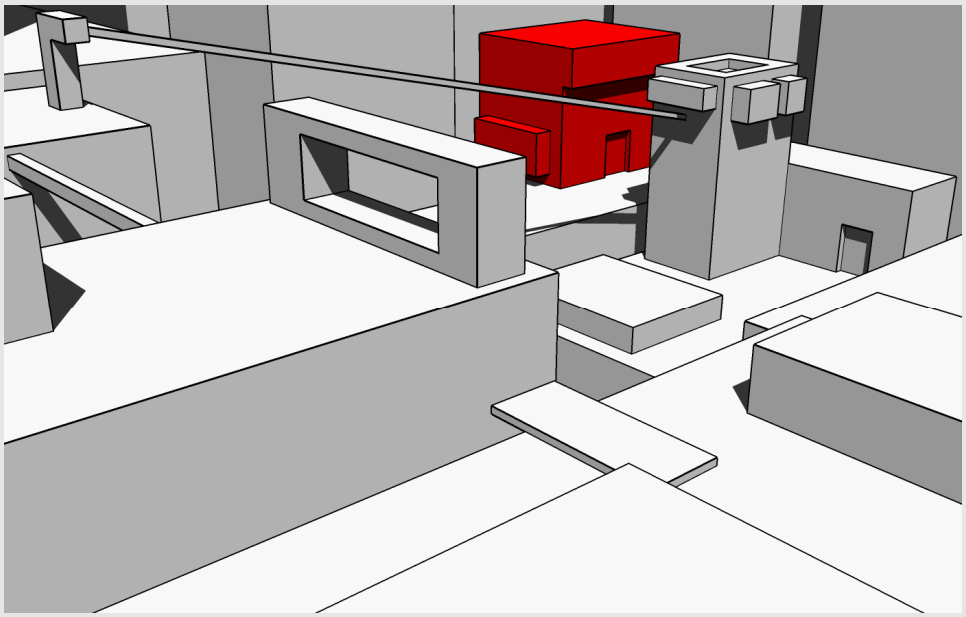
One strategy for UI designers to apply in order to provide a sense of freedom while avoid the frustration of getting stuck is to deliver guiding information with an increasing level of detail as the player requests it. In Mirror's Edge, there is a button for turning the head of the avatar, Faith, to a far point of interest in order to give the player a sense of where he or she is supposed to be heading. By further developing this feature and giving the player more detailed information as he or she requests it, players can be immersed into the game by reasoning while not be taken out of the experience by frustration.

By default, no affordance amplification or navigational guidance would be provided to the players at all, allowing them explore the environments of the game by own reasoning. Pushing the guidance button once would turn the eyes of Faith to a far object of interest, in this example the entrance of a building (see Picture 10.9).



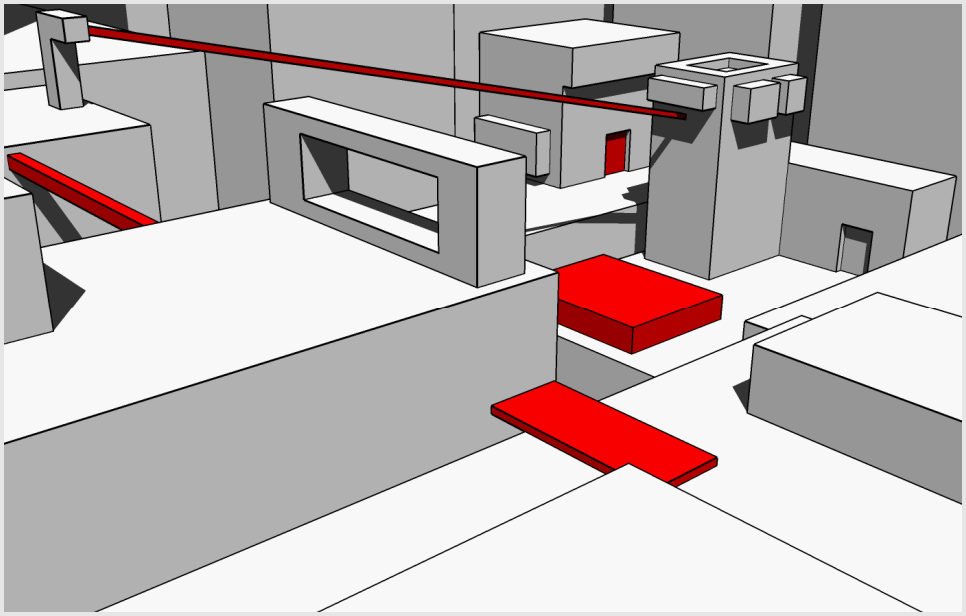
Picture 10.9. A view of a conceptual game environment, with the eyes of the avatar (the camera) faced towards a building of interest.

Pushing the guidance button twice would highlight the whole building (see Picture 10.10), to amplify that the building offers the affordance of entering it.



Picture 10.10. Geometric element highlighting the point of interest.

Pushing the button a third time would amplify the affordances of the objects that the player must use to progress to the long-term goal (see Picture 10.11). In this case, the affordances amplified would be “leap from springboard”, “balance over beam”, “zip-line down the wire”, “land on mattress”, and “open door”.



Picture 10.11. Geometric elements used to amplify the affordances required to reach the point of interest.

Another diegetic approach to affordance amplification is demonstrated affordances; making use of a character inhabiting the game world to demonstrate a certain action to the player. While this seems to be relatively rare as a conscious design choice in games, it is part of the learning process in multiplayer games, in which player agency in the game world in a more or less high extent is understood by observing the actions of human competitors and teammates. While it might not require an as long consecutive thought chain as a signifier (hence not appealing as much to the logical reasoning skills), a demonstrated affordance still builds on logical reasoning (seeing a connection between another agents actions and one's own) while at the same time being relatively clear and unambiguous. An example of how demonstrated affordances can be exploited making use of the player avatar itself is given in Design Example #4.

Design Example #4

In one of the user tests in which the participants played through the introductory level of Mirror's Edge, the participants had problems understanding that the escape of a roof top flooded by security guards was to jump from the roof and grab the stilts of a helicopter hovering nearby. Most players instead either turned back the way they came from, or tended to deduce non-existing affordances like attempting to interact with doors and panels in the surroundings that were not interactive.

A way of avoiding this kind of confusion might be to design a kind of on-demand mission briefing showing the player snapshots of locations, objects and events still ahead. These snapshots could be envisioned and explained in a similar manner as it is often done in so called heist movies. In these movies, typically revolving around an elaborate theft or scam of some kind, the planning-scene and the execution-scene are often edited together in temporal juxtaposition and shown in parallel.

Picture 10.12. A heist-movie style briefing for the introductory level to Mirror's Edge showing Faith crawling through an air vent, a helicopter and a hostile security guard - all features encountered in the level.

In a game like Mirror's Edge this scene could be played back in the minds eye of the main protagonist, Faith. By mixing shots of blueprints, and objectives with shots of how Faith actually envisions herself carrying out the plan, the player would be given clues about the affordances of the game world by demonstration (see Picture 10.12). If one of the shots was focusing on Faith jumping for the helicopter, more participants in the user test might have tried to approach it in the first place, without falling into a confused state of mind.

While demonstrated affordances are powerful when done right, unintentional demonstrated affordances that are not matched within the player agency can break the game experience and consequently the player immersion. For instance, the player's computer controlled peers in the single-player campaign of Call of Duty 4: Modern Warfare can open doors to buildings, however the player himself cannot open the same doors (and have to wait for his teammates to open a door if he reaches it before they do). In order to keep the logics of the game world consistent and hence strengthen the game experience, this should be avoided.

Distinguishing Progression Affordances from Optional Affordances

A distinction between progression affordances and optional affordances should be made. Progression affordances are affordances tied to actions *required* in order to make progress in the game, while optional affordances are tied actions purposed to expand the player agency within the game world but are *non-mandatory* from a progression point-of-view. For example, shooting explosive barrels in order to achieve more effective means of defeating enemies in a game is often not required in order to progress, but it

gives the player a choice to act within the game world in a different way and hence increases the depth of the game.

When it comes to progression affordances, relying on trial-and-error in order to figure out what to interact with and which decisions to make within the game world will eventually make players frustrated and take them out of the game experience. Hence, affordance amplification is crucial to consider, as the actions of these affordances are required in order to progress. Consider the following quote from game journalist Tom Chick (Chick, 2009) regarding affordances not only discovered by trial-and-error but also directly contradicting the logical reasoning skills of the player:

> *"Hey, Resident Evil 5, I'm well aware that I'm supposed to throw a grenade into the boss monster's mouth. I kind of got the message from the way grenades keep getting spawned. Then there was the cut scene every time I incapacitated the boss monster, which zeroed in on the thing's mouth. So that's what I've been trying to do for twenty minutes by actually equipping a grenade and throwing it at the boss monster's mouth. I'm pretty sure a couple of them hit, so why don't you give me a break?*
>
> *Because, frankly, I had no idea you expected me to walk directly up to the boss monster's mouth, at which point I would be prompted to press a button to script equipping and tossing a grenade. Last I checked, a grenade was a ranged weapon."*

While it is important for UI designers to avoid making the player discover progression affordances by trial-and-error, it is not always necessary to amplify optional affordances. The rewarding feeling of discovering a seemingly hidden affordance within the game world is an immersion factor itself. This factor is however dependent on the player making use of his or her logical reasoning skills to find the affordance, rather than just stumbling across it.

Reification of Non-Integrated Rules

Finally, to increase the player's sense of agency in the game world the rule system governing it should be made to seem like something concrete, rather than something abstract, in the mind of the player. This is successfully achieved by integrating the rules with the activity that the game is trying to simulate, like have the player-character die when falling a great distance, standing to close to an explosion or being shot too many times. A game rule is integrated when it can be fully understood by applying real world reasoning alone. In most games however there are rules that cannot, for one reason or another, be successfully integrated in this way.

The rules that can not be integrated should instead be reified in some manner, allowing players to reason about them from the perspective of the game character. An example of an attempt at reification is the "enemy artillery" solution to the problem of wandering past the boundaries of the map in the game Battlefield: Bad Company. The game is played on large, open levels where the player is free to roam. However, these levels are

still limited in size and have a designated play area. Instead of blocking the player with an unexplained invisible wall when approaching the edge of a map, the player is alerted that they are now "in range of enemy artillery" and have to turn back quickly or face certain death. In many cases reification can be achieved by semantics alone, but caution should be taken not to confuse the player by needlessly replacing familiar game terminology for the sake of immersion.

10.4 Strengthen the Player-Avatar Perceptual Link

Given today's hardware, a game experience can only be channeled to a player through visuals, audio and a limited form of haptic feedback, and so much of the nuances and richness of real world human perception is lost to the player. Even though people rely heavily on sight and hearing to navigate in the real world there are a number of senses and basic perceptional mechanisms that are never employed when playing video games, serving as an obstacle to a higher degree of involvement in the game world. By overcoming these perceptual blockades and strengthening the player-avatar perceptual link, a higher level of player immersion can be achieved.

Communicating Internal States

The most significant loss of perception that occurs when transferred into a virtual world is the broken perceptual link to the internal states of the player avatar. There is no possibility for players to make use of the perceptional mechanisms normally used to estimate ones status of health, exhaustion, etc. Further, basic internal mechanisms such as sense of speed or sense of height are reduced to interpreting information conveyed visually, auditory and haptically.

In order to create a more visceral game experience and hence strengthen the player immersion, UI designers must make up for this perceptual loss. Here, meta-perception (as previously presented) should be an appropriate tool in order to connect the player more closely to his or her in-game avatar.

Visually, meta-perception normally presents information by full-screen image filtering, distortion and overlay. This is a convention in the contemporary FPS genre, and by nature seems to be either metaphorical (e.g. the screen tinted red to symbolize damage) or trying to recreate an actual physiological state (e.g. simulating tunnel vision when a character is suffering from severe blood loss). For example, most FPS games attempts convey a sense of health or damage by means such as tinting the screen red, or applying a black fade growing from the edges of the screen towards the center to simulate some sort of tunnel vision as the player is damaged or the health level gets low. Generally, this seems to be appreciated by players and bonds them closer to the player avatar. There are examples of games taking visual meta-perception past the conventions, for example blood splattered in an overlay manner in Killzone 2, or rays of light running from the edges towards the screen to the center to signify high speed in Mirror’s Edge.

Important to point out is that there is an auditory dimension to meta-perception that is filled with potential but seems to be largely unexploited. By removing the spatial qualities of diegetic auditory information (normally conveyed as a 3D audio source), the

information can be augmented in order amplify certain elements of the game-world. In real life, there is a phenomenon called the cocktail party effect, where one is able to pick out certain sounds (e.g. ones name) from ambience (e.g. several concurrent conversations). This effect could be simulated to make sure the player does not miss crucial information conveyed in dialogue, by amplifying the conversation sound sample to a constant volume no matter in which direction the player avatar faces or where he or she is located spatially. Another example would be to strengthen the sense of high altitude within a game with an urban fictional setting, such as Mirror's Edge, by strategically amplifying the sounds of street level traffic to be much louder than what would be realistic, as presented in Design Example #5.

Design Example #5

In Mirror's Edge, a major part of the game takes place on roof tops and other areas of high altitude in a city. While the game succeeds far beyond conventions when it comes to embodying the player into the avatar, there is still room for exploration when it comes to auditory dimension of the game in order to link the player closer to the game world. For instance, by dynamically amplifying street level traffic noise depending on how the player moves through the environments of the game, a sense of high altitude can be fortified while also providing the player with information relevant to the game experience.

As the player approaches edges of roof tops from which a fall would lead to death, traffic noise would gradually intensify to signify the danger of falling down or jumping across a high gap to another roof top. If the player chooses to jump across a gap, the traffic noise would be amplified to a climax when the player is in the air with nothing below him and street-level ground, to reinforce the real world feeling of thrill and excitement when jumping over gaps. Further, to help the player distinguish between gaps possible to jump across and gaps leading to certain death, street-level traffic noise could be combined with the wind singing when standing close to edges leading nowhere but to a lethal fall.

Similarly, the haptic dimension of meta-perception seems to be almost completely uncharted when it comes to information that is not redundant feedback (such as vibrations reenacting the recoil when firing a weapon). Primal haptic feedback such as conveying being hit by fire or pacing vibrations in a heartbeat manner to convey a critical level of health is not uncommon, however more sophisticated information is rarely conveyed in a haptic manner. This is perhaps not very surprising given the limitations of the haptics in console controllers, yet there are possibilities that UI designers should explore. Design Example #6 illustrates one way the haptic dimension can be exploited to convey information hard to express as detailed but still subtle in a different manner.

Design Example #6

One of the problems that the first-person perspective brings to FPS games in which the environment itself can be a danger to the player, is that the player might be forced turn the field-of-view in order to visually uncover information vital to the player. For example, in order to time jumps over gaps with little room for margin in Mirror's Edge, the player do not have the same precise feeling for where the feet of the avatar are placed as in real life. Instead, the player has to turn the head of the avatar down to see where the feet are placed, with a loss of control over the jump as a result.

In the example above, the player would be able to maintain as high degree of control over movement as in real life if an information channel different from the visual where to be exploited. For instance, controller vibrations growing more intense as the player approaches the edge of buildings could be utilized. By presenting information about the avatar proximity to edges in a haptic manner like this, the player would be able to fully focus on making crucial jumps without being distracted by imprecise information.

Maintaining a Sense of Direction

Being transferred into the body of an avatar inhabiting the virtual world of a FPS game also causes a certain loss of external perception regarding the world outside the player avatar. This mostly affects the player's ability to navigate through the environments of the game world; in other words the sense of direction and orientation of the player.

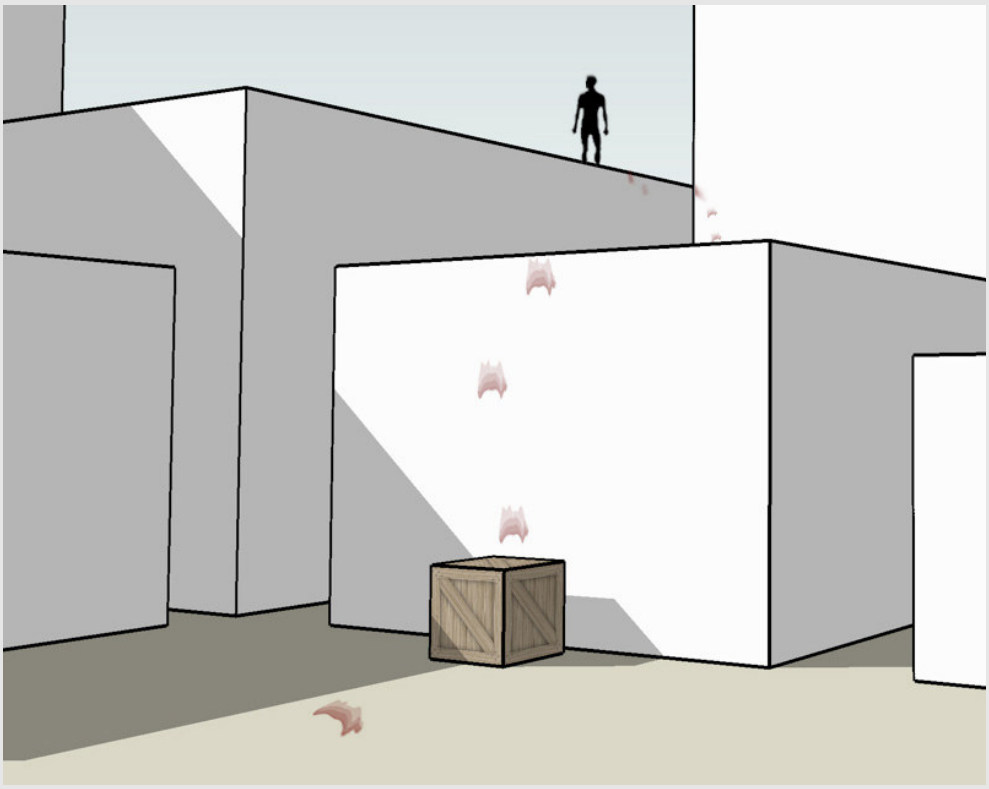
As with external perception, this loss should be compensated by the user interface of the game. By providing certain elements aiding the player to maintain a sense of direction and orientation within the game world, the player can be kept close to an immersive game experience.

As previously argued, giving as explicit information to the player as possible might not always be the best option from an immersion point of view. When testing the different approaches to navigationally aiding the players in Mirror's Edge, all of the five test participants stated that traversing the game environments with no navigational aid at all gave them the strongest game experience, mentioning the sense of freedom and discovery as the reason for this preference. Interesting to note was that without navigational aid, the participants progressed the tested game level largely by trial-and-error, which would contradict previous arguments against trial-and-error. However, the participants seemed to experience their progress as a result of their own reasoning rather than trial-and-error. While the test was conducted under special conditions, this shows that appealing to the reasoning skills of the player is as important here as when dealing with agency.

Due to the logical reasoning nature of signifiers, this design space category once again proves to be suitable for maintaining a sense of direction while still letting the players immerse themselves into the game experience by using their reasoning skills. Unintentional use of signifiers enhancing the player's navigational skills already exists in many FPS games; for example, not removing the bodies of killed enemies, blood stains from enemies or bullet holes in walls gives the player an increased sense on direction regarding which parts of the environment that he or she has visited. Subsequently, unnecessary backtracking is avoided, taking the player out of the game experience by frustration. In other words, by letting the player wreak havoc and avoid tidying this up, the sense of direction is enhanced. In FPS games with minor focus on firearms battle, this information can still be provided but might require an effort from UI designers, such as Design Example #7.

Design Example #7

In order to strengthen the player's sense of orientation, the player's progress through the game world should leave some kind of trail through the environment, preferably in a way that is fully diegetic. Any tool or gadget that the player uses to traverse the terrain and progress trough the world (e.g. a grappling hook) could be designed to leave some kind of lingering evidence that will help the player avoid unnecessary backtracking. In games such as Mirror's Edge, with both minimal weapon use *and* minimal tool use, one way of still creating this type of signifiers would be to have the player character's shoes leave smear marks in the environment (see Picture 10.13). In a game that involves running along vertical surfaces or scaling walls this seems only natural since these activities would wear out the soles of the shoes quite quickly. Having the player stepping in puddles of water or drying paint would also produce a similar effect.



Picture 10.13. Smear marks from the soles of the shoes are left on vertical surfaces to indicate where the player has already scaled the walls. Marks could also be left in tight turns or at the starting point of a jump.

While the avoidance of unnecessary backtracking strengthens the game experience, it is equally important to enhance the player's sense of direction regarding the environments that are yet to be explored by the player. Signifiers play an essential role here as well. If the player's objective is to reach a helicopter pad, actual helicopters landing and taking off from the helicopter pad will signify the position of the pad even from a large distance; if the player is to locate an open window inside a building, the sound of breezing wind growing louder as the player gets closer to the window signifies the position of the window; blood trails in the environment signify danger, thus serving as a indicator of the direction in which the player must go in order to seek out the blood-thirsty monster that is to be defeated.

11 DISCUSSION

11.1 Method

11.1.1 Game Study

Due to the fact that a great amount of information was collected in a relatively small amount of time in the objective part of the preliminary game studies, the documentation of this information might not be as qualitative as it could have optimally been. Additionally, it was conducted at an early point in the project, when the sub query and the boundaries of the project were still to be clearly defined. The judgment of what information to include in the study might have shifted somewhat from situation to situation, also affected by the fact that the study was conducted individually by two persons. For example, the definition of what information is part of the user interface and what is not, what information is consciously conveyed, and what information is decision-grounding for the player, might have been slightly floating. However, since the purpose of the objective game study was to look at how user information is normally conveyed and what paradigms exist in FPS games (with the ultimate purpose of mapping out a design space for user interfaces in FPS games), this definition fluency was a natural part of the process of studying games as the definition grew more mature with the number of games added to the study. Yet, the study could perhaps have benefited of being documented in a more scientific and structured way.

Further, the auditory information conveyed in the games included in the objective game study was hard to document due to the subtleness of audio compared to visual information. When user interfaces are considered in general (in theory as well as practice), audio is an area often overlooked, perhaps due to its hard-to-grasp nature when compared to the tangibility of visual pixels. Consequently, there was not any methodology for specifically studying the sound of user interfaces known to the authors, which might have affected this part of the objective game study.

The selection of game titles to be included in the objective game study was made in an as objective way as possible, but was of course colored by the fact that certain games were more available to the report authors than others (for example through the online demo download service of Xbox360). Further, the authors had limited access to a PlayStation3 game console, reflected in only three PlayStation3 titles being included in the test.

The selection of games, and subsequently the result, of the subjective part of the game study was obviously colored by the authors of this report. This was a conscious decision, to stray as far away as possible from the paradigms and conventions covered in the objective part of the study. The process of mapping out a design space (as capable of diverse UI solutions as possible) is believed to have benefited rather than suffered from this.

11.1.2 User Studies

Initial Interviews and Focus Group

When looking at the results the interviews and focus group purposed to prove or deny the hypothesis laid forth in the first iteration regarding how immersion is connected to user interfaces in FPS games, one should keep in mind that the participants did observe game footage and screenshots rather than playing the games themselves. The interviews and the discussion were conducted in a highly analytic manner. Hence, the results should be treated as explorative expert-user feedback suitable for inspiration rather than proof of a hypothesis. It is also important to notice that during these user studies, the theme of immersion was outspoken, in contrast to the last user tests in which the notions of immersion and engrossment was never explained or even mentioned to the users.

Selecting User Test Strategy

For the final user studies conducted in order to prove the second iteration hypothesis, a number of strategies were discussed. In order to gather feedback more unbiased than the information uncovered in the first round of user studies (see above), it was decided to let the participants experience game play from existing games, and interview them around this experience rather than pose questions with too much demand on reflection and introspection. While this proved to be a strategy fitting the purpose of the study, there were a number of alternative strategies that could have been chosen in order to generate results possibly better and more qualitative.

The obvious advantage of selecting existing games showcasing certain UI elements in a way suitable for the purpose for the study was the fact that the authors of the report didn't have to spend any time prototyping functional UI solutions themselves. This was especially convenient since none of the authors was skilled enough with using open-source 3D engines to realize own ideas regarding user information for FPS games (unfortunately, there were no resources available at EA DICE for prototyping ideas independently of the projects in development at the company). However, the use of existing games also limited the range of possibilities regarding what could be tested (the advantages and disadvantages of others' ideas), and also to a certain extent limited the control over how the UI solutions was presented to the test participants.

Another option discussed was to prototype ideas by superimposing UI elements on pre-recorded game play footage. This would enable testing ideas independently of what had been done in other games, nevertheless the disadvantages was judged to be greater than the advantages, as the prototypes would not be interactive, which would most certainly affect the opinions of the participants. Additionally, the strategy would limit the tested solutions to overlay elements, as the only reasonable approach to prototype informative elements with spatial properties this way would be to pause the movie and put the elements into the game space.

A third alternative was to use some sort of application for developing FPS games without writing other code than simple scripting. One application of this type (FPS Creator, http://www.fpscreator.com) was tried out, indeed providing possibilities to customize the

HUD to a wide extent. While this might sound like a reasonable strategy in theory, customizing the HUD was cumbersome and presenting UI elements spatially was simply not possible in a desirable way.

In addition to the argumentation above, using existing games in the tests was done because of the importance of fidelity regarding how the UI elements are presented. While fidelity of prototypes might be of minor importance when conducting user tests with focus on usability, the situation is not the same when immersion in games is considered, as presentation and surface is believed to be more central to an immersive user experience.

User Test Method

Considering the user tests in general, it has to be taken into account that the players only experienced a small part of the games tested, and each for a quite small period of time. The results might be different if the test participants had experienced several hours of game play rather than the first 15-30 minutes of the game. However, it might also be argued that these initial 15-30 minutes is the time a game has to convince the player to explore the game further and keep on playing.

The small extent to which the participants experienced the games included in the study is believed to have affected the second set of user tests the most. In these tests, four games were included, with the player experiencing no more than about 10 minutes of each game. When the tests were carried out, this was deemed to be enough time to give the player a feeling for how the games communicated the feeling of being damaged, however the results from the individual tests were quite diverse and different from each other. Among other things, some participants tended to not have an open-minded attitude towards UI approaches not familiar to them.

Due to the abstract nature of the concepts of health and damage, the interview questions demanded a higher level of introspection from the participants than in the first and third set of user tests, which is believed to have affected the second set of user tests negatively. Besides of formulating the questions in more direct way, the order in which the games was played could have been randomized for each test to further improve the results of the tests from a scientific standpoint.

In the last set of user tests, both of the two games were played from a third-person perspective, hence none of the two (Dead Space and Resident Evil 5) were FPS games. While this might of course have affected the result of the tests slightly, this effect was judged to be a minor issue. The purpose of the tests was to generate feedback on how agency and affordances are connected to immersion and user interfaces, deemed to be equally important in both games played from a first-person perspective as well as a third-person perspective.

11.2 Results

First of all, it is important to point out that while user interface design choices clearly affects immersion as showed in this report, the aspect maybe most influential on immersion in games is what Jesper Juul calls the coherence of the game world. According to Juul, incoherent world games are games in which events in the game cannot be explained by the game fiction or contradicts the fiction itself (why does Mario have three lives in Donkey Kong?), while games with coherent worlds are games in which "nothing prevents us from imagining the world in any detail". There is little doubt that an incoherent game world weakens player immersion (to what extent perhaps depends on whether the game is of competitive nature or not), however this is not a problem for UI designers alone to address – world coherence is more of a collaborative issue, perhaps with the game designer and art director as most responsible.

Another thing to keep in mind, once again drawing on the previous work of Jesper Juul, is that the fiction of a game is subjective from a player's point of view. Hence, the placement of an UI element into one of the squares of the proposed design space can actually differ depending on how the representation is interpreted. With this knowledge, UI designers should strive to convey the user interface and its fictional qualities in an as clear way as possible, attempting to avoid ambiguity regarding the connection between an UI element and the game fiction.

Regarding the design space, it is questionable whether haptic representations can be truly spatial (in three dimensions), given the physical limitations of the rumble technology in contemporary video game controllers. Featuring only two vibrating motors, controllers can convey haptic information with no greater fidelity than distinguishing left vibrations from right and intensive vibrations from subtle. The fact that the hands holding the controller are the only body parts through which the vibrations are channeled, makes it hard for the player to separate different sources causing haptic information within the game world.

Looking at immersion as defined in this master thesis report, both emotional investment and the concept of flow are acknowledged as factors contributing to an immersive experience, however none of these factors are part of the guidelines. Emotional immersion is considered to be beyond the scope of this thesis, and if it is the responsibility of anyone involved in a game development project it would be the art director or story author rather than the UI designer. Similarly, flow is considered to be a concept mostly affected by game design. While these immersion factors could have been excluded from the report due to their weak relation to the user interface, they were kept to maintain an as complete understanding of immersion as possible.

Another possible aspect of games that is not covered in this thesis is the social aspect and its relation to immersion. FPS games have been played in multiplayer modes since the years after the genre itself was defined, and as cooperative games gain popularity among mainstream game consumers the social experience of these games feels more interesting to study. However, it is questionable whether the social aspect is directly related to

immersion, and if this should be the case it is still limited to games played with or against other human players. Hence, this question has not been addressed in this thesis.

11.3 Project Generalization Possibilities

As the arguments and theories presented in this thesis builds on general ludology and game studies not specific to any genre of games, the possibilities to expand the design space and the design guide lines suggested beyond the realm of FPS games are deemed as very good. The notion of agency, a major aspect of an immersive experience as defined in this thesis, should be equally important in games played from a third-person-perspective as it is in a FPS game. In fact, agency is a major component in every game in which the player takes control of an avatar inhabiting a world in which the he or she has a certain liberty in making choices and decisions within said game world. While strengthening the perceptual link between the player and the player-controlled avatar might be especially important in FPS games considering that the information conveyed to the player is conveyed through the eyes of this avatar, this aspect should also be relevant in games played from a third-person perspective. In fact, meta-perception, as defined here, can be found in for example racing games (blurring the edges of the screen to simulate motion blur and tunnel vision) and third-person action games (blood splatter to indicate damage).

Apart from expanding the guidelines and the design space to other game genres, the design space proposed could be explored from a non-immersion perspective. For instance, how can UI designers exploit signifiers, geometric elements and meta-perception from a usability point-of-view?

Furthermore, there is an opportunity to explore the design space and its expanded version (see 7.2) from a perspective different than the UI designer's point-of-view. For example, there are possibilities to make use of the design space as an art director or level designer.

11.4 Future Work

For future work, the guidelines and definition of immersion would gain from being verified with additional user tests – while the guidelines and the definition of immersion proposed in this report builds on the result of the three sets of user tests conducted and literature studies, they are actually the unverified result of the last iteration of the idea generation phase. As the user tests conducted in this master's thesis project may have suffered from the lack of resources regarding prototyping own ideas (as discussed above), conducting new user tests should preferably be done using user interfaces specifically implemented for the purpose of the tests rather than letting the users experience already existing games.

As previously discussed, the social aspect of games might play a role in immersion in competitive games. As EA DICE is a developer with a relatively large focus on competitive games, there might be interest to investigate this connection further as it is not covered in this report.

12 CONCLUSION

Looking back on the main question formulated in the beginning of the project, it can be determined if this project has fulfilled its purpose. Starting out by looking at the different questions in the sub-query, it can eventually be concluded whether the project has succeeded or not.

First of all, due to the lack of previous work and studies regarding user interfaces in FPS games, the following question had to be answered:

- *What is the design space of user interfaces for FPS games?*

Not only have a design space suitable for user interfaces of FPS games been founded, but the authors of the report have also constructed a previously non-existing terminology for the tools available for UI designers of FPS games. Meta-perception and meta-representations, signifiers, geometric elements, affordance amplifiers, demonstrated affordances; by gathering different phenomena under terms like these, a tool-set is unveiled for the UI designers of FPS games. This should ease not only the design of user interfaces, but also communication both internally between UI designers *and* with other members of a game development project.

As the definition of the term immersion differs quite drastically depending on when and by whom it is used, the second question formulated regarded the notion of immersion:

- *What is immersion and how is it related to the game experience?*

By looking at ludology and other previous work related to the experience of playing a FPS game, and by conducting user studies of various nature, this question has been answered to the extent possible given the time and resources available for the project. While the authors are confident that the definition of immersion as proposed in this report is close to the essence of what makes up a strongly engrossing game experience, it is also believed that this has to be evaluated further, especially the concept of *strengthening the player-avatar perceptual link.*

With a suitable definition of immersion, this concept could be connected to the proposed design space by answering the following question:

- *How is immersion connected to user interfaces of FPS games?*

As with the previous question, this has been answered by analyzing the results of user studies conducted and to a certain extent by looking at literature. As the authors felt that the user tests suffered from not being able to test specifically developed UI solutions, it is believed that the guidelines delivered as a part of the result of this thesis should be evaluated using specifically designed prototypes, and possibly refined further.

Finaly, the project can be concluded by looking at if the main question addressed in this thesis report is answered or not:

How is immersion related to the experience of playing a FPS game, and how can this knowledge be of use when designing the user interface?

By looking at the result of the project (the definition of immersion and the guidelines), one can conclude that this question has been answered. Consequently, the purpose of the project has been met. For future work, the guidelines might gain from being further evaluated, using resources not available during this project.

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APPENDIX 1: GAME LIST

Group 1 (Metacritic score 35-41)
Hour of Victory [37]

Group 2 (42-47)
America's Army: True Soldiers [43]; Turning Point [43]

Group 3 (48-52)
Legendary [49], Conflict: Denied Ops [52]

Group 4 (53-58)
Haze [55]

Group 5 (59-64)
Clive Barker's Jericho [63], BlackSite: Area 51[62]

Group 6 (65-70)
Turok [69], TimeShift [70]

Group 7 (71-76)
Call of Juarez [71]

Group 8 (77-83)
Mirror's Edge [79], The Darkness [82], F.E.A.R.2 [79]

Group 9 (84-89)
Tom Clancy's Ghost Recon Advanced Warfighter 2 [86], Resistance 2 [87]

Group 10 (90-96)
Left 4 Dead [90], Bioshock [96], Killzone 2 [92]

APPENDIX 2: OBJECTIVE STUDY HEAT MAPS

Information about Internal States

	2D overlay (Permanent)	2D overlay (Pop-in)	2D Overlay (Dynamic)	Image Filter	Projected on Environment	Character Model	Camera Possession	Dynamic Audio Tracks	Audio Queues	Rumble
Aim Accuracy	4									
Ammo count	12	3				1			1	
Availabe objects/weapons	7	7								
Health Level	5	2		10					3	
Centre of View	16				1					
Taking hit / Hit Direction			11	5			1		17	13
Current Stance	4	3				1				
Special State		3		6		3			1	6
Picked up item		6		1						
Using weapon/Combat						17		5	17	9
Total nr of uses:	48	24	11	22	1	22	1	5	39	28

Information about External States

	2D overlay (Permanent)	2D overlay (Pop-in)	2D Overlay (Dynamic)	In Pause Menu	Character Model	Informational Objects	Object/NPC Effects	Audio Queues	Dialogue	Rumble
Is target hostile or friendly	14									
Position of team mates	4		5	2		1				
State of team mates	3	2	2			1	1		1	
Proximity of Enemies	4		2	3				2	3	2
Enemy Health		1					3			
Object is Interactive		13	2			1	6			
Object is "Pickupable"		5	2		1		5			
Object of interest (Danger)			2						1	
Total nr of uses:	**25**	21	15	5	1	3	15	2	5	2

Goal Oriented Information

	2D overlay (Permanent)	2D overlay (Pop-in)	2D Overlay (Dynamic)	In Pause Menu	Informational Objects	Camera Possession	Dialogue
What is the current objective		6		11			1
Direction of Current Objective	5		4	2	3	1	
Total nr of uses:	**5**	6	4	13	3	1	1

Game System Information

	2D overlay (Permanent)	2D overlay (Pop-in)	2D Overlay (Dynamic)	In Pause Menu
Instructions to player		13		
Information to Player	1	5	1	5
Total nr of uses	1	18	1	5

Legend

Permanent 2D Overlay
What is it: A 2D object (icon, text, animation etc.) that is displayed permanently and is static on the screen.

Used when: A piece of information (often a game state) is considered crucial to the player and always needs to be on-screen.

Example: In Doom all player information is permanent and static.

Pop-in 2D Overlay
What is it: A 2D object (icon, text, animation etc.) that is only displayed when relevant or triggered by the player's actions.

Used when: A piece of information (often a game state or a direct instruction) that is relevant only in some specific contexts or during certain interactions.

Example: In Turok the HUD changes as you equip different weapons, only showing the relevant info.

Dynamic 2D Overlay
What is it: A 2D object (icon, text, animation etc.) that do not have a fixed position on the screen and is free to “float about” or move across the screen.´

Used when: A 2D icon or object refers to an entity existing in the 3D geometry, or a specific point in the geometry, and therefore has a position that change relative to the player-view.

Example: In Left 4 Dead the names of characters, threat directions and locations of items are conveyed by dynamic overlays.

Image Filter
What is it: An effect on the game's camera, usually a color or blur filter. The same phenomenon is common in cinematography and usually represents an internal state of the character, like having the screen tainted red to illustrate rage or anger. It could also be an attempt to illustrate physiological states such as tunnel vision or loss of color vision experienced when blood flow to the brain is cut off.

Used when: conveying an internal state experienced by the player character. A filter effect could also be flashed for a brief moment to convey being hit by an enemy or picking up an object.

Example: F.E.A.R 2 uses a lot of filter effects both to set the mood and to convey information to the player.

Projection
What is it: Information that is projected on the terrain of the game world itself and behaves much like a real-world projection would.

Used when: marking an object or location in the game world either from the players perspective, from above or from an angle.

Example: Warhammer online projects a circles around the player that conveys lots of information about different game states.

Player Model
What is it: The hands, weapons or body of the player avatar displays information through animation/behavior.

Used when: the information is supposed to be fully diegetic and seen by the player character.

Example: In Halo the ammunition counter is displayed on the character model itself.

Informational Objects
What is it: Objects that exists in the 3D world of the game, but are non-diegetic and often non-intractable. These objects sometimes serve the same functions as *Dynamic 2D overlay*.

Used when: indicating a location or object in the world using a three axis coordinate system rather than a two axis (as with Dynamic 2D overlay).

Example: The way points beacons in Mirror's Edge are examples of informational objects.

Object/character effects

What is it: Graphical effects (usually a shader effects) on objects or characters in the game world, made to highlight them in some way.

Used when: Making an object contrast against the environment to either mark it as interactable or important or for denoting a specific state of an object.

Example: Ghost Recon Advanced Warfighter uses object effects to highlight both allies (green) and enemies (red) in firefights.

Camera Possession
What is it: The game takes control of the camera for a short while, changing the players view of the world.

Used when: The player-controlled camera needs to witness a specific event, object or location in the world.

Example: In Mirror□s Edge players can make the game take possession of the camera to point it in the direction of the next objective.

Dynamic Audio Track
What is it: A musical or ambient sound track that starts or changes in accordance to some specific trigger effect.

Used when: indicating to the player that the game has entered a specific mode (like combat or stealth-mode).

Example: When Mario gets a star in Super Mario Bros. the soundtrack change to indicate the change in game mode.

Audio Queues
What is it: Sound effects (both diegetic and non-diegetic) that conveys information to the player.

Used when: unloading the players visual perception or for providing a more atmospheric experience, forcing the player to listen for specific sounds in the environment.

Example: the state of the players shield in the Halo series is largely conveyed by a series of distinct sound effects.

Dialogue
What is it: Giving the player instructions through spoken dialog from an in-game character (embodied or disembodied).

Used when: giving the player diegetic information, often relating to current states, occurring events or immediate objectives.

Example: In Battlefield: Bad Company the player is accompanied by three other soldiers who shares information with the player of what is currently happening in the game world through context sensitive dialogue.

Rumble
What is it: The game controller vibrates to convey information to the player.

Used when: Diegetically conveying a sense of something causing vibrations in the game world or non-diegetically as a symbolic indication of something else.

Examples: The heavy footfalls of the "Big Daddy" enemy in Bioshok causes the controller to vibrate. The second-by-second countdown of a bomb in Conflict: Denied Ops is conveyed by vibrating the controller in short pulses.

Pause Menu
What is it: A pop in menu appearing as an effect of player action and that pauses the rest of the game when in use.

Used when: There is information (usually text instructions or a complex map) that needs to be studied without being interrupted by events occurring in the game world.

Example: The map in Battlefield: Bad Company can be studied in greater detail by accessing it in a pause menu.

APPENDIX 3: INTERVIEW HIGHLIGHTS

The following is a series of quotes from the interviews and focus group conducted. They are presented here, translated to English and in some cases abbreviated, since they touch on subjects of specific interest to the thesis as a whole.

Highlights from Personal Interviews

I1: "This (referring to the HUDs in Team Fortress 2 and Left 4 Dead) are more common in multiplayer games becase in those games you need more of an overview, Like how much life you have left, in order to help with decition making. You need all this in front of you, ammo and so on. In a singel player game it's not as important."

I1: "[The outlines used in Left 4 Dead are] very good, I don't think that the fact that they are unrealistic affect my opinion of them in any way. In real life you would have a better sense of were your friends were in a building. The game is not realistic to start with and the outlines contribute to the gameplay in that you really need to stay together as a team and never wander off somewhere and be unable to get back to the others."

I5: "The outlines in Left 4 Dead feel more like a part of the game. It's more like a trait that my character possesses. The same goes for runner's vision in Mirror's Edge. When it comes to these things I don't feel like they have to be explicitly explained in the story, they just kind of make more sense compared to a 2D HUD."

I4: "Team Fortress 2, and other multiplayer games, are so absurd .. you're playing them as a game rather than an experience" … "Left 4 Dead is a different experience, in that I am more engrossed in the experience because its not really you vs someone else but rather you as a character plus three other characters versus hordes of zombies."

I5: "One of the things I liked with Mirror's Edge was that it was just you and the game and not a lot of other stuff you had to look at. I think that you should strive for as little of a HUD as possible, but in some games you really need to know stuff like how much ammo you got. The HUD does not help immerse you into the game and sometimes it even disturbs the experience"

I2: "I don't believe that the HUD design effects my engrossment in a game, I can be sucked into a game even though the HUD is bad."

I2: "If I have no interest in the story I just want to go on a rampage and then this kind of cumbersome map solution (Referring to the map in Farcry 2) is an obstruction. Instead, give me everything I need on-screen so I can just go to the next location."

I3: "I like games like Operation Flash Point, here you have to take up the map or the watch instead of them being on screen all the time. I prefer this type of tactical play."

I3: "Lack of realism breaks the experience for me - I like it when there is not a lot of stuff on the screen (ie. Hudless or near hudless)"

I4: "Always being in control and in first person would be more interesting (than cut-scenes). I don't like just watching things happen, I want to always be in control of my character."

I4: "In these kinds of games (competitive multiplayer) I appreciate that information, I want that (the HUD) since I am playing a game rather than experiencing something, I want to know exactly how exactly much health I have…" "Since it is there (a specific HUD element) I do use it as a too, I know that the sentry gun has been take out and I can go through".

I4: "In some games there is the assumption that you know where you are supposed to be going, like, the character might know, but you might not. In other games it does not seem like anyone would know where they are supposed to be going, yet the game tells you exactly where you are going"

I4: "I hate this kinds of Hey-Go-This-Way stuff like in BioShock, I turn that off" – "It was kinda' ruining the experience"

I4: "I like this in Mirror's Edge (Runner's vision), It just looks like kinda' the way you are supposed to go" – "Its not like - Hey Idiot, go that way!"

I5: "In multiplayer I like the feeling of being better than other and competing, but if the other player are much better then its no fun at all. Single player games I play for the story and the environments, you want to know what will happen next. When there are AI characters on your side that are believable, like in Half-Life 2 that makes the game interesting."

I5: "When the game provides just the right amount of stress, I am the most focused on the game (experience). At some places there is too much stress and the game gets to hard and so you will have to try over and over again – then you loose that feeling. There is a kind of golden ratio - if the game is to simple (not enough stress) your mind starts to wander, you stop playing for the sake of the experience itself and play just to get past that part of the game."

I5: "I think these (fade-to-death filter effects) are much cooler (than life bars). For me this adds to the experience, especially if they add heartbeats and breathing and stuff like that."

Highlights from Focus Group

Regarding the high degree of embodiment in Mirror's Edge

P1: "In this game [Mirror's Edge] you definitely get a sense of being a physical object in the world, that you don't get in many other games." ... "She [Faith] seems like she's the right height, she's actually interacting in a plausible way."

Regarding navigation in games in general
P1: "Mirror's Edge did the thing where you could hit a button and it turns you to look in the right way. It was an elegant solution. Rather than putting something in the UI to show you where to go it just kind of turned you."

P2: "Yeah it doesn't really force you to use it."

Regarding an instance of self reference in Dead Space
P1: "If the game is gonna be a game and tell you to press A that's ok. But to put it in the game world that you need to press A seems ridiculous to me."

"Those thing always bother me, when the character seems aware of the game and telling you to do things."

Regarding the HUD in Bioshock
P1: "If you're gonna put the gamey things in the game... to me it seems better to make them clearly distinct from the game [world]" ... "Clearly the guy can't see his health and mana, they're separated to the user, what's supposed to be in the game world and what's supposed to be in real life" ... "so the separate [overlay] UI makes sense."

P4: "I don't like this: each element of the interface has its own style." ... "I like how it's done in Team Fortress, all the same style" ... "In this game it somehow doesn't blend with the environment."

Regarding the navigational aid in Bioshock
P1: "I hated it, it treated me like I was an idiot." ... "There's only one path, only one way to go."

P3: "I actually liked it in this game, when you run back and forth, at least when it's critical to get back to previous locations. If you saved recently and forgot where you were in the game world."

P6: "Wouldn't you prefer the Mirror's Edge version, than this obvious way?"

P3: "No, I prefer this because I want to proceed. I hate it when I manage to get to one of these points and you realize that it's where the map [Level] starts."

P1: "If I walked away for three weeks and then tried to play it again, I might have needed something like this."

Regarding the first impression of Call of Duty: World at War
P5: "I quit this game after 1 minute" ... "Realized that it was a console game, and then quit." (referring to the heavy use of instructions like "Press A to...") "Too many instructions are just annoying." … “I rather have a separate tutorial, than seeing instructions for the first five minutes of the game"

P2: "Maybe a more subtle indication that I can interact with the object, but I don't need a 'Press X' instruction" "Highlighting the object and have the characters hand reached out is a lot better."

Regarding Call of Duty 4: Modern Warfare
P4: "In this game, what I like is the multiplayer hardcore mode which removes all HUD."

P1: "Doesn't that ruin the game?"

P4: "What? No. Just try..."

Regarding the high degree of diegesis in Farcry 2
P4: “What I like in this game is that you can look down at the map while driving. It is really cool.”

P1: "It seems to have a cool interaction with the world, like that wrenching motion"

P5: "The problem is that it's the same motion for cars and boats all the time. It solves every problem you have?"

P1: "I didn't realize that."

Regarding having a "dispatcher" character telling you where to go and what to do (over the phone/radio).
P1: "I disliked it in Mirror's Edge, because it seemed like the guy [Merc] knew everything all the time." ... "That one didn't make sense, but I think in some games it does make sense [depending on fiction]"

Regarding Doom 3
P4: "The HUD in this game [Doom 3], it fits much better with the environment in the game than in Bioshock. It somehow blends with the rest of the game."

APPENDIX 4: PERSONAL INTERVIEW RESULTS

Dimitry prefers authentic and realistic war themed FPS games, and although he plays competitive multiplayer games to a high extent (stating Red Orchestra as one example) he seems to be playing for a mimicry experience rather than the competitive aspect. He does not want to be reminded that it is "just a game", hence he moves between the person and the character mimicry frames (taking his real-world knowledge into the game-world). Dimitry prefers diegetic UI solutions and no HUD at all, although he does think that the HUD-heaviness of games such as Team Fortress 2 is ok as the game does not aim for a realistic experience.

Guy enjoys both pure gameplay and more immersed experiences; according to him, he plays story-heavy games like Bioshock for more of an experience, while (quote) ”TF2 [and other multiplayer games] are so absurd.. you’re playing them as a game rather than an experience”. Hence, we would say that in a mimicry situation Guy engrosses himself on a character frame level, while playing more competitive games in the player frame. Guy is one of the two interviewees that have played Mirror's Edge, in which he seeks an experience of being embodied as Faith in the game-world rather than enjoying the story told. HUD-wise, Guy feels that it is good to have more information in a competitive multiplayer situation, but finds it desirable to find alternative solutions to a traditional non-diegetic overlay HUD in single-player experiences.

Robert is as diverse as Guy, describing himself as a player both enjoying competitive multiplayer and story-based single player games. In single-player games, he is in it for the story and the game universe, while he plays competitive multi-player games for competing and feeling better than others. Robert has played Mirror's Edge as well, naming one of the reasons he enjoyed the game so much was because (quote) "it was just you and the game [no hud] and not a lot of other stuff you had to look at”. As with Guy, Robert playes competitive games by moving between the person and the player frame, while single player mimicry experiences is played largely in the character frame. Robert prefers games that strive for a fully transparent HUD because (quote) “the HUD does not help immerse you into the game and sometimes it even disturbs the experience”, however he also says that (quote) "in some games you really need to know stuff like how much ammo you got".

Mattias describes himself as a "classic gamer", having played a lot of Counterstrike in his past but have now moved on to more single player games. To him, an engrossing multiplayer experience is when he is really focused on what happens at the moment and what his teammates and rivals is doing, while he enjoys single-player games for the unexpected turns of the narrative and puzzle solving. This could be interpreted as that Mattias plays competitive games in the player frame, while in story-heavy games he moves between the character frame and the player frame. Mattias don't believe that the game experience is very dependent on the HUD strategy chosen by the developers - as he is a "classic gamer", he prefers explicit solutions such as overlay health bars as it helps him make in-game decisions, however he admits (when asked about it) that fully

transparent HUDs is more realistic and is probably suited for games aiming for a high level of realism.

Henke mostly play single-player games, though not for experiencing the story but more as playgrounds. He really enjoyed Halflife (1), and mentions the ability to play around with the physics as one reason. He does mention Bioshock as a game he enjoyed because of the thrilling game-world, however he found the non-varied nature of the gameplay to be irritating. This points at Henke playing mimicry games in the player frame. As Mattias, Henke does not believe that the HUD play a large role in the engrossment/immersion of a game, stating that (quote) "I can be sucked into a game no matter if it has a good HUD or not". When asked, he believes that more information makes sense in multiplayer games, hence a more HUD-heavy UI strategy might be of importance in those compared to single-player experiences.

APPENDIX 5: GAME TEST DESCRIPTIONS

Testing Significance of Navigation

The test was set-up to let the participants play through three Mirror's Edge sessions with different types of navigational aid (runner vision; time trial checkpoint beacons; no aid at all) and one Bioshock session experiencing the navigational aid of Bioshock (an overlay compasse arrow giving very detailed guidement). After each session, the participants answered questions regarding ease of navigation, immersion and diegesis, as well as ranking the four different UI solutions according to 1) usability (to what extent the navigational aid made it easier to navigate) and 2) immersion/engrossment (to what extent the navigational aid strengthened the game experience).

Selecting the games to use in the test was based on a number of facts. First of all, the navigational aid in both Mirror's Edge and Bioshock can be turned off, which makes it easy for the test participants to decide if they prefer or dislike the UI element without forcing them to mentally remove it from the game. Secondly, the navigational aid of Mirror's Edge is presented spatially while the Bioshock compasse arrow is presented non-diegetically in an overlay layer, enabling a comparison of the player attitude towards the two different types of information carrier.

Another advantage from a testing point of view was that the navigational aid of Bioshock provides the player with extremely short-term navigational information compared to Mirror's Edge. This was met with negative attitude during the focus group, with one participant explicitly saying that he felt that the game (Bioshock) treated him like an "idiot" by holding his hand and hence shut the feature off early in the game.

A requirement for the test participants was that they had not played Mirror's Edge or Bioshock previously, since this would most likely affect answers to questions regarding how much navigation was made easier with the navigational UI elements tested.

Testing Level of Vertigo

In this test, the "feeling of being damaged" part of the in-game perception was tested, by letting the test participants experience the way FPS games communicate damage to the players. The participants once again experienced four gameplay sessions, but this time four different games; Battlefield: Bad Company, Call of Duty 4: Modern Warfare, Halo 3, and Killzone 2. After each session, questions were asked regarding how well the game communicates *the feeling* of being damaged, and how this affected the game experience. For the games containing an overlay health bar or digits indicating level of health (Halo 3, Battlefield: Bad Company) the test participants were asked about how the diegesis of the UI element affected the attitude to this information. As in the first test, the participants was asked to rank the four games solutions according to 1) how well the game communicates *the feeling* of being damaged, and 2) to what extent this strengthened the game experience.

The games selected for the test reflects different UI strategies to indicating damage or critical health. All games except for Battlefield: Bad Company features regenerative player health, meaning that the health is recharged if the player avoids being hit for a number of seconds.

Battlefield: Bad Company utilizes full-screen image overlays and image filtering to a relatively high extent, quickly fading the screen in and out when being hit, and narrowing down the field of view when being heavily damaged. A critical level of health is also communicated by distinctively muffling all audio when being heavily damaged, a technique that is also used when the player is near an explosion. Bad Company is the only game in the test using a persistent (non-regenerated) level of health, which is reflected by overlay HUD digits representing the level of health, turning red when health is low.

Call of Duty 4: Modern Warfare works with full-screen image overlays and image filtering in way similar to Bad Company, but in a slightly more intensive manner (the fading effect when being hit lasts longer, the overlay image communicating critical health level is clearly red with artifacts resembling blood veins reaching for the center of the screen). This is complemented by audio with heartbeat sounds to communicate a critical level of health as well, and a whistling bullet sound to indicate being hit.

The second game to feature a HUD element to indicate level of health (which is really not a level of health per se, but rather the shield energy of the player character) is Halo 3, which utilizes a 2D overlay health bar. This health bar is the main element for the players to use when estimating their level of health – full-screen image overlay used is to indicate being hit, but in a very subtle way with slightly visible overlay distortion effects. The game communicates critical health level by the health bar flashing red, as well as a beeping alarm sound. Audio is also used to indicate that the health bar is recharged, by a sweeping sound.

Killzone 2's way of communicating damage and level of health distinguishes itself aesthetically from the other games included in the text, relying heavily on blood stains splattered in an overlay manner to signify being hit, splattered from the direction fire. Consequently, being under fire for a longer period of time results in more blood stains splattered on-screen, as the blood stains stick for a small period of time. This, in combination with sepia/black-and-white filtering indicates that the health level is critical. Audio is used in a manner similar to Battlefield: Bad Company, muffling sounds when the player is heavily damaged.

Test ing Spatial Interaction

The third user test consisted of two gameplay sessions, in which the persons taking part in the test experienced the first ~20 minutes of Resident Evil 5 and Dead Space respectively. During these sessions, observations were made of what the participants interacted with in the environment. Both sessions were followed up with questions regarding the way the game eases player interaction with objects and the environment, if this is positive or negative for the game experience, and if the diegesis of the UI solutions

affects the game experience. As in the first test, the participants were asked to rank the two games according to 1) usability (how much the game eased interacting with the environment), and 2) immersion/engrossment (to what extent this strengthened the game experience).

The decision to use Resident Evil 5 and Dead Space for the test was based on the fact that the two games have distinctively different UI strategies for strengthening affordances within the game world. While Resident Evil 5 relies heavily of non-diegetic overlay button prompts to inform the player about what actions are possible, the Dead Space fiction allows a fully diegetic UI with information projected on in-game surfaces to convey the affordances of the game world. The two quite different UI approaches of these two games made them suitable when testing how amplifying the affordances of a game world affects immersion/engrossment of a game, since the games are quite similar in other aspects (both are horror/action games played from a third-person perspective with similar game controls).

The graphical user interface of Resident Evil 5 mostly resides in a layer on top of the actual 3D geometry. Environmental actions (opening doors, jumping through windows, investigating objects of interest, etc.) are communicated via non-diegetic overlay prompts, in the shape of a graphical button representing the controller button shown together with a textual message. To some extent, spatial information is also used to indicate pickupable objects (light beacons rises from some objects, while others have shiny surfaces to make them pop out of the surrounding geometry).