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Immersion and identity in video games

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For my brother

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ABSTRACT

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The video gaming industry is an ever-expanding one. According to Reuters, the global net worth of the industry in 2011 was US$65 billion (Reuters, 2011). Every year developers race to deliver the best game ever produced. There are various factors, which render a game successful and a successful formulation of those factors means a satisfying game experience for the players. Immersion, the mental involvement between the game and the player, is one of the broader phenomena, which includes most of the game design elements as its determinants. Understanding the impact of a game's immersiveness and how to form a strong immersive structure is relevant to the development of a successful video game.

Every video game player, as they play video games, connects their real life identity with a virtual identity, which serves as a visual and substantial representation. The real life identity, with every aspect, is reflected on to the virtual identity and the latter is reflected on to the former as an outcome of being exposed to video games. James Paul Gee (2004) has suggested that a third type of identity is formed during this process of exchange: "the Projective Identity" (p. 56). Understanding the relationship between identity and videogames through this idea of triple identities (real life, projective and virtual) and the interaction between players' real-world self and the avatar they are controlling inside the virtual space is crucial towards analyzing video game elements such as "Immersion" and "Presence".

This thesis investigates different video game elements and the impact they have in terms of immersion and the relevance of these elements based on the Space Simulation Genre, to create a model that would be applicable to other genres.

CHAPTER 1. INTRODUCTION

1.1 introduction

I grew up playing video games and one of the main reasons why they fascinated me was their ability to "pull" me in, regardless of their genre or type. I had my share of poorly designed games as well, which didn't have the same effect that the "good" games had. Mind you, I played games that belonged to different genres, even the genres that I wasn't quite fond of. My opinions were almost always supported by different game critics and their evaluation of the game, which meant that the dislike of such "poor" games was not created by my subjectivity alone. The follow-up question to my revelation was the simple question of: Why? Why are some games so good that I can't stop playing and why are some games so poor that I get bored / irritated / disenchanted? What are the factors and elements that create such phenomena that make me forget about my real-world identity and care about this virtual, alternative identity? These questions forced me to *think* about games as well, besides playing them. To understand what makes a game successful, I wanted to focus on the elements that make a game immersive, an experience that makes the players forget about all of their real life endeavors and be one with the game without interruptions.

The issue of identity is a very complex concept. Throughout ages, philosophers, psychologists and even individuals tried to answer the question of who we really are. In this thesis, I will approach theories of identity from the perspective of video games. The investigation will be about how different game elements affect the experience between the player and the game in terms of creating a successful *immersive realm,* which would make it easier for the player to assume the identity of his/her avatar. These elements will be discussed further in the context of "Immersion", a term that was coined to describe the "sucking in" effect of not just the virtual realities of video games, but also books movies and other form of narratives. These elements and factors and their effects on video games that belong to a specific genre will be analyzed through series of surveys and tests with the help of previous research. The conclusions to the analysis will be used to determine a research model/method, applicable to any game from any genre that would point out the most important immersion elements that take part in different genres and video game types. The conclusions will also be used in terms of figuring out the flaws of the study and how the study can be improved.

CHAPTER 2. CONCEPTS AND LITERATURE REVIEW

2.1 Immersion:

Immersion is a version of concentration, which is applicable to the narratives, stories and environments that exist within an alternative, pseudo reality.

Immersion plays an active role and is in relationship with our psyche, environment and means of interaction every time we step into an alternative, virtual reality that is crafted and embedded into different media like a book, a movie or a video game. Immersion, in the scope of these happenings and narratives within the alternative realities, affect the way we interact with them, it affects the time we spend on them and most importantly, determines the satisfaction and pleasure we get from them. The most common definition of Immersion is by Janet Murray (1997) in her book, "Hamlet on Holodeck":

> A stirring narrative in any medium can be experienced as a virtual reality because our brains are programmed to tune into stories with an intensity that can obliterate the world around us. . . .The experience of being transported to an elaborately simulated place is pleasurable in itself, regardless of the fantasy content. We refer to this experience as immersion. Immersion is a metaphorical term derived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience that we do from a plunge in the ocean or swimming pool: 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 . . . in a participatory medium, immersion implies learning to swim, to do the things that the new environment

> makes possible . . . the enjoyment of immersion as a participatory activity.(pg. 98-99)

Immersion is most critical in video games, as video games combine two elements that exist within books and motion pictures: The narrative and the visual stimuli. Most importantly, it adds another dimension and a layer that serves as a critical determinant to the levels of immersion: non-trivial interaction[1]. The combination of these three elements—narrative, visual stimuli and non-trivial interaction—forms a virtual environment that is both genuine and responsive. This is a new form of interaction, a new dimension that embraces and houses new forms of identities of the players'.

Immersion is a very hot topic in terms of video game design research as it is the most important indicator of the interaction between a game and the player. Previous papers and research almost always investigates the phenomena of immersion in comparison to other extremely similar elements such as "*Engagement, Flow and Presence* that either affect or become the outcome of the overall experience. This is due to the fact that most definitions for such terms have blurry lines that make them very hard to differentiate from each other.

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[1] Non-trivial Interaction: any sort of interaction between the player and the game should have an impact on the game itself; a unique reaction given by the game, based on the players' actions. Simply put, every action should have a reaction, which should be observable by the player.

[2] McMahon quotes this term referring to Lomard and Ditton's (2000) study about

While investigating methods for "Analyzing 3-D Video Games", Alison McMahan (2003) starts with a brief explanation of what immersion is and immediately mentions *presence*, "a term often used synonymously with immersion", as a result of the lack of definitive descriptions for each term. Further on, McMahan delves deeper into the inner workings of presence, mentioning Matthew Lombard and Theresa Ditton's (2000) "At the Heart of it All: The Concept of Presence" study by referring to Presence "as the result of a combination of one or all of six different factors: quality of social interaction, realism in the environment (graphics, sound, etc.), the effect of "transportation[2]", from the degree of immersiveness generated by the interface, the user's ability to accomplish significant actions within the environment and the social impact of what occurs in the environment, and users responding to the computer itself as an intelligent, social agent."(2003) This definition is important as it renders *Presence* as an outcome of the immersion of the player which, makes the difference between immersion and presence much more understandable and approachable. She concludes by saying that "Lombard and Ditton's conceptualization of *Presence* enables critics and analysts to conduct an

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[2] McMahon quotes this term referring to Lomard and Ditton's (2000) study about transportation/telepresence and the three different forms of it: (1) "You are there," in which the user is transported to another place, the oldest version of presence; (2) "It is here," in which another place and the objects within it are transported to the user—the example given is of how television "brings the objects and people from another place to the media user's environment"; and (3) "We are together," in which two or more communicators are transported to a common space, such as in immersive video conferencing. (2003)

aesthetic analysis of various types of games"(2003) as different factors alter the immersion of the player. This ultimately changes the players' presence within the virtual environment and the overall identity one assumes.

As one of the most cited papers on the subject of immersion, what it is and what it consists of, *A Grounded Investigation of Immersion in Games* by Emily Brown and Paul Cairns (2004), an interview-based study about video game players' thoughts on what immersion is, is probably the best written paper about immersion and its complex structure. Brown and Cairns dissect immersion into 3 parts:

> (1)"Engagement, the lowest initial level of immersion", which consists of the access, and the time the player invests in the game.
> (2)"Engrossment or the emotional attachment of the player to the game determined by the construction of the game."
> (3)"Total Immersion or presence, where the players are cut off from reality as a result of their empathy level and the atmosphere of the overall design."

Most modern views of immersion are based on this simple approach and it is the one that this thesis will adopt.

Laura Ermi and Frans Mäyrä collaborated for a study called the "Fundamental Components of the Gameplay Experience: Analysing Immersion" on 2005. The study was conducted to identify how video games that belong to different genres provide different types of immersion. This study is critical if one wants to focus on immersion and diversify it based on different types of experiences and gameplay structures. Ermi and Mäyrä created the "SCI-model", a model that divides immersion into 3 categories: 1. *Sensory Immersion*, 2. *Challenge-based immersion* and 3. *Imaginative immersion*. *Sensory immersion* is the "audiovisual execution of games"(2005), the one that is easily

recognizable as it is the *physical* parts of the digital realm and the layer that has the fastest response rate in terms of sensory data from the players. *The Challenge-based Immersion*, as the name indicates, relies on problem solving and *strategical thinking*, which ties in with the "flow" theory of Mihalyi Csikszentmihalyi (1975). Like the Flow theory this type of immersion occurs when there is a certain balance between the problems being solved, the experience of the player and the number/severity of the challenges being faced. The third type; *Imaginative Immersion* is based on the narrative, lore and the culture of the game and how the player transfers his identity in to the game world to form a bond between his/her virtual identity.

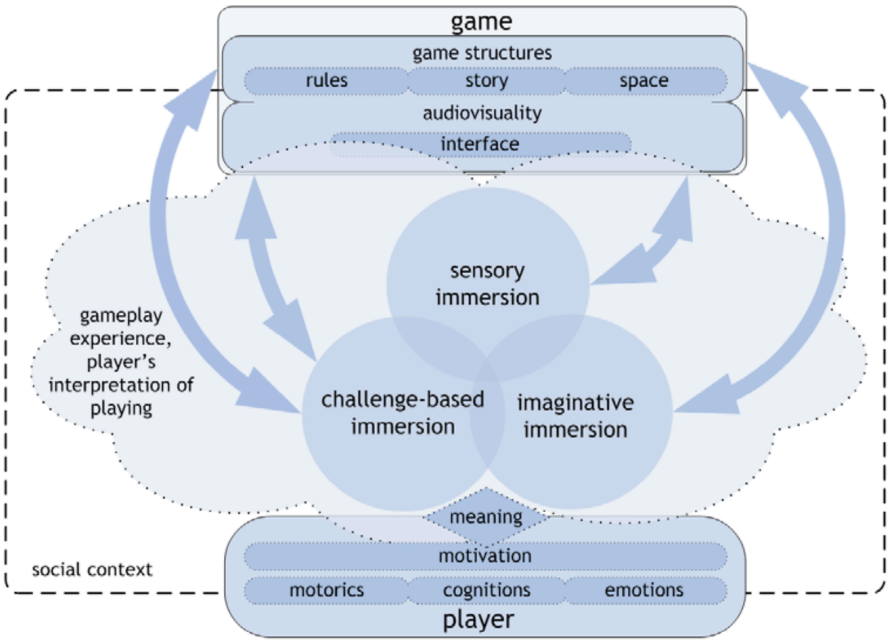

Figure 1: The SCI model and the interaction between different gameplay elements, types of immersion and outcomes. From: Ermi and Mäyrä. *Fundamental Components of the Gameplay Experience: Analyzing Immersion*. Finland. 2005. Page 8.

One might argue that the elements of the *imaginative immersion* might bleed in to the first one, *the sensory immersion* as these ludology and conceptual elements determine the *shape* of the physical aspect of the game and this will be partially right. However, the main difference between the sensory and imaginative immersion is the response type/rate and how they make the player feel immersed.

Overall, this fits perfectly to the study shown in this thesis as the gameplay elements the study investigates refer to the SCI model and each individual immersion type mentioned. The structure of the study is created so that each experiment group tests different types of immersion.

Based on Ermi and Mäyrä's model, Lennart Nacke and Craig Lindley (2010) conducted a study to measure three different game level designs that target three different experiences during a gameplay of a First Person Shooter (FPS) in order to "find the correlation between psychological effects and physiological responses"(2010). The levels tailored for the study were *the boredom level*, *the immersion level* and *the flow level*. What makes these levels unique were the different gameplay elements that were included for each level. For example, for the *Boredom Level,* a linear path (one beginning, one end, one path between each other), non-challenging adversaries, dull environments and high number of supplements (health boosts, ammo etc.) were included. *The Immersion Level* allowed player exploration, had average adversaries and excellent atmosphere that triggered *Sensory Immersion. The Flow Level* focused on series of challenges rather than a narrative and exploratory system and an adversary system that get harder progressively based on time spent playing. This type of approach

is beneficial in terms of comparing different gameplay mechanics and elements in terms of figuring out the best combination of said elements. The results were analyzed in the scope of seven different factors: immersion, tension, competence, flow, negative effect, positive effect and challenge and four different measurement types (Facial EMGs[3], Electrodermal Activity, Video Recordings and Questionnaires) were used for comparison. The study concluded that physiological indicators and findings could be used as proof for psychological events one experiences. This finding is important for the study the study also uses a physiological measurement to test immersion on different scenarios.

Even though the study used for this thesis is not using progressive challenges, the concept of *Flow* by Mihaly Csikszentmihalyi (1975) is highly relevant to the phenomena of immersion. Flow can be described as a sweet spot or an area between the challenges given to the person that carries out the task and their experience level. Csikszentmihalyi theorized and proved that as individuals' experience level increases, he/she should be given higher forms of challenges to keep him/her interested, engaged and immersed in the task. If the level of challenge is high and experience is low, the individual gets anxious. If it is the other way around, the player is bored.

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[3] EMGs are tools that are used to measure muscular activity.

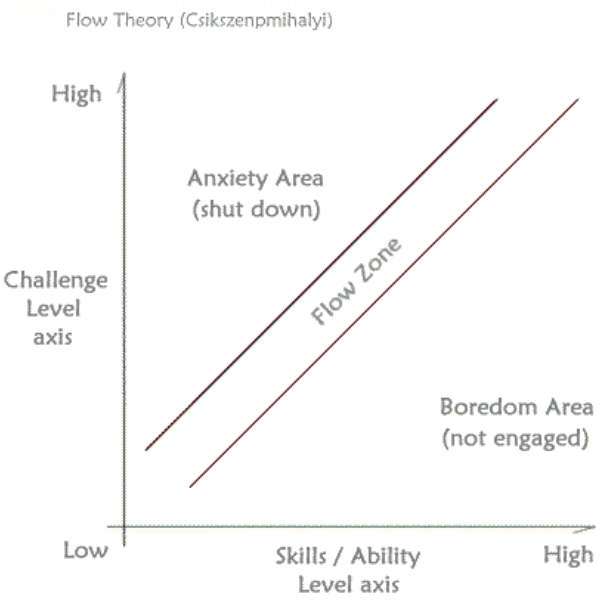

Figure 2: Flow Theory of Mihayl Csikszentmihalyi. From: The Psychology of Immersive Learning Simulations (Part 4): Flow Theory, https://beacon.wharton.upenn.edu (accessed January 15, 2015).

As mentioned earlier, Nacke and Lindey's study (2010) tests this theory by comparing *The Boredom Level* with *The Flow Level* and their results prove this theory is in fact true in the scope of Video Games. This is also tied to the immersion sub-type *Challenge-based Immersion* by Ermi and Mäyrä (2005). This type of interaction between the player and the game is ever-important as it is one of the determinants that shows how long the player will be invested in the game.

The study "Measuring and Defining the Experience of Immersion in Games" (Jennett et al. 2008) provides useful methods to measure immersion. The paper investigated how immersion can be quantified using three different methods of measurement. The first experiment made the participants either play a game or carry out a mundane, repetitive task (clicking on the boxes that appear on the screen) and then asked to complete a real-life task, which was a tangram puzzle. The hypothesis was

that it would be harder for the participants whom played the game to complete the puzzle compared to the participants that were carrying out the boring task, due to the immersiveness of the game making it harder to get back to real world. The first experiment was successful in that regard. The second experiment used eye-tracking data between two groups of participants whom either played the immersive game or interacted with the non-immersive task. Their hypothesis was that the participants whom played immersive game would have lower number of fixations (the gaze being fixated on one point on the monitor) as the immersive task would make them more focused. This hypothesis was supported by the results of the experiment.

Both experiments used surveys or questionnaires as subjective methods of determining the participants' reactions to the experiment. This study is a very important resource to base my own study on as it displayed different methods of measuring immersion and highlights the strengths and the weaknesses of these methods. The study used for this thesis will be based on these research and measurement methods.

2.2 Identity

Before analyzing immersion in video games, it is imperative to introduce some essential video game elements and talk about the reasoning behind the medium this thesis focuses on. As mentioned earlier, the reason why I was fascinated by video games and why they were chosen as a medium in terms of investigating identity and immersion is based on a single characteristic: *interactivity.* One of the most important factors, which have an impact on identity, is the way the player interacts with the

narrative. In most cases, say a book or a movie, the audience is at a safe distance from the narrative and events that are happening throughout the narrative. There are no "virtual" consequences that he/she will face because there are no points within the narrative the audience chooses or decides on something. The whole nature of the narrative is linear, or passively non-linear (i.e the viewer has no control of the outcome). Video games differ from the former examples in terms of its narrative: There are countless instances where a player interacts or interferes with the narrative of the game, countless opportunities that can be accepted or declined. These interactions with the narrative are what make the video gaming genre unique. Causality plays an essential role in video games. In contrast to linear, non-interactive narratives, players take risks and suffer consequences based on their decisions. As Janet Murray (1997) stated in her book "Hamlet on Holodeck", "[A game] needs to find ways of drawing a player so deeply into the situated point of view of a character that a change of position will raise important *moral questions*" (p. 147), a game needs to refer to real life concerns such as ethics and moral decisions, in order to enable a transfer process between real world and virtual identities. This transfer process is important because a solid connection between these two identities enhances the immersiveness of a video game, as the player is "sucked in" further with the tasks, endeavors and the "reality" of the virtual identity.

Mark Wolf (2001) indicated in his book "The Medium of the Video Game" that video games are "the first medium to combine real-time game play with a navigable, onscreen diegetic space and the first to feature avatars and player-controlled surrogates that could influence onscreen events: real-time user interaction in one machine" (11, 5).

Wolf referred to the characters that the players are controlling as “surrogates”. The common and popular term that is being used for surrogates in the scope of virtual embodiment today is “avatar”. The term “surrogate” indeed is a very accurate one to use in order to define what an avatar is. Through this avatar or “surrogate”, the player is enabled to interact with the virtual space and its contents. This invokes the question of the nature of an avatar and how is the player related to her avatar? Zach Waggoner (2009),in his book “My Avatar, My Self”, interpreted Katherine Hayles’ (p. 38, 1999) thoughts on avatars in this way:

> A relationship between user and avatar that is filled with tension: the avatar is part user but at the same time remains separate, and the user makes decisions as to the nature of the avatar but the avatar also exists independent from the user (statically, frozen until the user returns to the game) (p. 11).

In his analysis, Waggoner suggests that the player both exists and non-exists within the avatar as the avatar mimics this behavior within the player, referring to J.P Gee’s (2003) idea of projective identity, which is neither the player nor the avatar but an identity which surfaces while the other two identities negotiate. Building on his thoughts, Waggoner quotes Marie Ryan’s (2001) question:

> The user has control over how she relates to her avatar: Will she be like an actor playing a role, innerly distanciated from her character and simulating emotions she does not really have, or will she experience her character in first-person mode, actually feeling the emotions that motivate the character’s behavior or that may result from her actions? (p. 5).

Ryan emphasized the issue of “choice”. The choices a player makes in order to shape her avatar plays a crucial role for defining the projective identity and how that identity

interacts with the game. This is important because those choices will have a huge impact on the narrative of the game and also how the game, as an almost living being, will treat the player through her avatar, especially during conversations between the avatar and Non Player Characters (NPCs). This also creates an environment that mimics real life. As in real life; one's choices define her real life identity.

2.2.1 Theories of Identity

In order to understand the relationship between identity, immersion and video games, focusing on theories about identity is essential. Gee's theory and statement about three types of identity in the context of video games were previously mentioned however, introducing the core description of a theory on identity is also necessary. In his book, Zach Waggoner investigates two types of theories concerning identity. First, he focuses on the Modern definition of identity and drawing from the work of Anthony Giddens. Waggoner (2009) summarizes Giddens' views by stating that:

> [Giddens] believes in a single self-identity rather than multiple self-identities for an individual. This identity is determined by a person's life narrative (again singular) that is created through the individual's self-awareness. In other words, each person becomes aware of their own identity by constructing a narrative about themselves: who they are and what they have done (p. 22, 23).

The modern approach to identity is based on a core self, and is highly related to self-awareness. The emphasis is put on the relationship between one's mind and his identity and his ability to judge. Based on this view, there is only one, true, core identity one has, nothing more, nothing less. It might be a challenge to relate the modernist theory with the nature of identity in gaming, as each game enables players to reflect

their real world identity in a virtual environment, on a different level, forming multiple projective identities. One might argue that those identities are just superficial, meaningless representations of players but as most game theorists also do, this theory contradicts the very essence of video games.

Post-modern theories on the other hand, approach the issue of identity in video games from a more relatable point of view. Diana Fuss (1995) refers to the individual identity as "[something] rarely identical to itself but instead has multiple and sometimes contradictory meanings" (p. 98). The notions "multiple" and contradictory" are highly important when identity is considered in terms of video gaming. The "multi" nature of identity can be mentioned while referring to an objective point of view, while Gee's theory of 3 identities is relevant from a more personal point of view; as each character or play-through might surface different identities. The nature of these identities might also conflict with each other, especially for virtual versus real-life identities and also again, from a subjective point of view. This postmodernist idea of a fragmented, interchanging identity serves a basis for Gee's "triple" identity theory.

Each type of identity might consist of different roles or sub-identities. Waggoner (2009) summarizes this notion by saying that "these multiple aspects of our identities are accessed by us as necessary as we encounter and react to stimuli" (p. 14). One's interaction with his children makes him assume the role of a father, helping a friend would identify one as a caring, supportive friend and so on and in this case, we are referring to our real-world identities, of course. It is absolutely possible to acquire multiple identities for virtual identities too.

There is a type of negotiation, an interaction between virtual and real identities and that space in between them, which can be referred as “limbo”, which is one’s state and lack of belonging. This endless, boundless realm might be referred to as the space and place where the projective identity surfaces. It is for the best to refer to Gee’s (2004) own words on projective identity to clarify the term:

> The kind of person I want Bead Bead [his avatar] to be, the kind of history I want her to have, the kind of person and history I am trying to build in and through her is what I mean by projective identity. Since these aspirations are my desires for Bead Bead, the projective identity is both mine and hers, and it is a space in which I can transcend both her limitations and my own... In this identity, the stress is on the interface between – the interactions between – the real-world person and the virtual character (p. 56).

The balance between two realities and identities is a necessity in terms of acquiring a projective identity, which serves as a gateway towards both the real world and the virtual identity. One must include both identities in projective identity and at the same time disregard some aspects of each. It is by this process, one is able to form a projective identity, which includes some essence of being from both the real-world identity and the virtual identity. There is no strict or rigid definition or formula of a successful projective identity and that is the whole nature of it. This is what makes it applicable to video games as projective identity values choices, both of the real world identity and the virtual identity. As the 2 identities collide and connect with each other, neglecting the physical existence of the computer or the interface, the projective identity is assembled.

CHAPTER 3. VIDEO GAME ELEMENTS IN SPACE SIMULATION GENRE

3.1 Space Simulation Genre

Genres in video games are numerous and ever growing. There are at least 11-12 main genres according to most respected gaming review companies[4] and each main category almost has four sub-categories. The genre space simulation is a 2nd level sub category of the simulation genre, which includes all games that shares realistic, real life-like rules for the interaction between the player and the game. Games that belong to the simulation genre are divided into three sub-categories:

- Construction and Management Simulation
- Life Simulation
- Vehicle Simulation

Construction and management games are where the player is given the role of a planner and a leader, where he/she creates and expands societies or communities using different goods and allocating resources. Life simulation games give the player the opportunity to control one or multiple beings, and guide them through life itself. Dealing with their characters' needs, progress and ambitions are the main goals of the

[4] Some of these are: Gamespot, IGN, Metacritic, Rock Paper Shotgun, all respected websites.

genre. The vehicle simulation games, as the name suggests, consist of the interaction between the player and the vehicle he/she is controlling. Racing games, flight simulators and space simulations are all subgenres of the vehicle simulation genre.

Space simulations are somewhat different compared to the other vehicle simulations in terms of additional elements they contain that belong to other game genres. At its core, it is about taking control of a spaceship or a craft that navigates across space. However, most video games, especially the more recent ones, combine elements from first person shooters where the player controls an avatar through first person perspective and fight enemies with various weapons. Another element that bleeds into space simulation games is from construction and management simulations. The developers of the most recent space simulation games implement living, breathing and self-evolving and self-governing economical structures in to their games. These structures are used by NPCs, non-player characters controlled by the game's algorithms, to simulate a working economical system in which, the player can also take part in or interact with. Some games include space station management and resource production as well as ship optimization, customization and fleet management, where the player has the ability to take control of NPC ships and instruct them to carry out specific tasks. Aside from these additional genres, the space simulation is about accurate physics, navigational methods for players to wander around the environment created by the developers. Most games use slightly simplified control mechanics and physics to render the game more accessible and fun to play while others implement fully realistic physics where the player is expected to hone their skills through multiple gameplay instances.

Two case studies are provided below to understand two space simulation games that differ vastly from each other in terms of their core gameplay elements. These cases are analyzed in respect to their relationship with the space simulation genre as well as their immersive elements.

3.2 Case Study

3.2.1 Case 1: Kerbal Space Program

Year Published: 2011

Genre: Space Simulation / Space Engineering / Sandbox

Developed by: Squad

Publisher: Squad

KSP in short, is a space simulation game where the player is in control of an imaginary space exploration program that is set in the imaginary planet of Kerbin, which houses “Kerbals” as the main species of the Kerbol System. The main goal is open-ended as there are no conflicts and narratives to follow. What drive the players to play the game are the challenges it introduces. The game uses real life Newtonian physics and initially challenges players to create spaceships, rockets and spacecraft that would beat the gravity in order to form a successful orbit around the planet of Kerbin. Because it uses laws of physics that are observable in Earth, it requires a fair number of tries to build a spaceship that would have the necessary fuel, thrust and weight ratio to make it out of the atmosphere and create an orbit around the planet without crashing. It is a very open ended game where the player has total freedom as he/she can build his/her

ship in any way he/she wants by using parts among hundreds of parts, and direct that rocket in any way he/she wants. There are multiple planets to explore like our solar system and they all have different attributes that would pose different challenges to the players. The aesthetics of the game are fairly basic and realistic (apart from the Kerbals) as the game is a simulation at its core. The second reason behind this certain aesthetical approach is a technical one. Because the player is free to create any design with infinite number of parts, the textures need to be optimized and should enable the hardware to render as many objects as possible.

The immersive elements of the game are hidden in its gameplay features as the game provides the players certain challenges for them to complete. These sets of challenges are progressive in nature, meaning that in order to move on to a bigger objective, the player first needs to overcome the first, smaller objective. An example to this would be the need to craft a spaceship that has a good fuel-to-weight ratio that would enable it to exit atmosphere. Once the player overcomes this objective, he/she determines what to do next, more simply, set his/her own objective. This new objective can be to create an orbit around the planet or extend its reach so that the spaceship has enough velocity to reach other planets. To achieve these objectives, the spaceship designed by the player needs to have additional fuel to increase its velocity. At this point, if the ship lacks the necessary amount, the player has the ability to go back to the design process and do changes until he/she is able to complete the second, bigger objective. This objective-based structure is similar to Mihaly Csikszentmihalyi's "Flow Theory" (1975) where immersion is acquired by challenging the player while increasing

the player's experience level to keep the game interesting and engaging all the time. The only difference is that the challenge is not dictated by the game but rather by the player, to reach and discover new areas within the game.

The player also assumes different roles that reflect as different identities to the players during gameplay. At first, the player assumes the role of an engineer, who designs the spaceship from scratch in a huge, busy hanger, trying to foresee the challenges and needs ahead for the pilot. Also, the player has the ability to come back to this staging area whenever he/she wants to make improvements to the ship. However, doing so will result with the reset of the previous progress done with the spaceship.

The second role the player assumes is the role of a pilot, who is responsible of guiding the ship in order to complete the objective. This part is rather straightforward in terms of controls however; the player needs to understand the mechanics and physics of gravity and what is necessary to break free from the gravitational force of the planet. He/she needs to calculate how much fuel is to be reserved for the second objective and the staging in terms of what parts to get rid of during flight to make the spaceship lighter.

The transition between these two roles is what makes this game unique in terms of the concept of identity. The player is given two very different tasks but the game manages to keep these roles and tasks highly connected with each other. The seamless transition between these two roles is created because of the very nature of the two processes: As the engineer, the player needs to think about the obstacles the pilot will face and plan accordingly and as the pilot, he/she needs to consider the changes he/she

needs to make if they fail to reach the objective. Even though this transition from engineer to pilot happens really rapidly and over and over again, the player is never confused as he/she is forced to think as both while playing the game.

Case 2: X3: Albion Prelude

Year: 2011

Genre: Space Simulation / Sandbox

Developed by: Egosoft

Publisher: Deep Silver

The X series is popular for it's impressive graphics and immersive universe structure that grants players total freedom from the start of the game. This installment of the series follows the same successful formula of the previous installments, granting total freedom to players within a carefully constructed, alive, self sustaining universe made out of sectors of space areas. The main challenge/conflict is left to the player to decide as the player is given the choice to be whom he/she wants within the universe. The game offers a very basic, poorly written narrative/story. However, what is appealing is the fact that the player can ditch the main storyline and create his/her own challenges and work towards achieving it. For example, in one play through, the player can play as a pirate that roams the low security sectors to hunt for transport ships and their goods that must go through that sector. In another play through they can play as a humble merchant, looking for good and cheap deals across the universe with their trade ships scouting the best deals for them. In another play thorough, they can enlist in the army,

seeking glory and fame through continuous battles towards their Alliance's enemies. This freedom is what makes X series unique. The universe crafted in a way that it allows these different play styles. Compared to KSP, the game is semi-realistic. The physics and space faring mechanics are streamlined towards enabling a much more smoother play style as the game focuses on space battles between ships. The aesthetics of the game are very well done as each space station; ship or planet looks highly realistic and detailed. The graphics follow the same mentality. Each sector is carefully crafted to form a huge galaxy system.

The immersive nature of the game is supplied by various elements. The sandbox[5] nature of the game allows players to create their own objectives, much similar to Kerbal Space Program however; the player can also carry out different missions given to him by NPCs. These missions can range from escorting a politician through dangerous parts of the universe to providing security detail for a space station to delivering goods as a transport to assassinating targets. These mini-narratives and missions keep the game fresh at all times and makes it engaging if the player is bored of figuring out their next move. They are also a good source of income. The customization aspect is equally important as it lets players to personalize their spaceship in order to form a bond between the player and the ship. The game lets the players customize their weapons,

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[5] Sandbox games: where the players are given a large environment to interact with without any boundaries or restrictions. They are free to do whatever they want, wherever they want. They can use any tools provided to them to achieve their personal goals within the virtual reality.

systems, engines and many more parts of their ship. This aspect also makes the player to see their ship as a part of their identity or who they are in this virtual environment and what their roles are. When combined together, the ability to create personal narratives that are unique to each and every player is what makes X3: Albion Prelude unique and successful in terms of creating a formula to make the game highly immersive.

Tied to the immersion aspect of the game, the freedom to assume any role within the universe is very essential to the game and the concept of identity. Allowing the player to have his/her own concerns and objectives lets them create these personal narratives mentioned earlier. This enables the players to get away from their real life concerns and get involved in this alternative narrative that lives in the virtual space. There is no linear progression within this structure, which renders the player free of constraints, and the narrative structure becomes similar to Umberto Eco's "Rhyzomatic" labyrinths[6] (1984).

Understanding the space simulation genre and how it differs from other genres was essential to look at the more detailed workings. The next chapter focuses on

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[6] A rhizomatic text would be the one that does not privilege any order of reading. "Walking through a rhizome one enacts a story of wandering, of being enticed in conflicting directions, of feeling helpless to orient oneself, but is oddly reassuring. In rhizome, one is constantly threatened but also continuously enclosed."

different game elements and their use in space simulation games. Almost all of the elements introduced are used in the *immersion study.*

CHAPTER 4. VIDEO GAME ELEMENTS IN SPACE SIMULATION GAMES

4.1 Physical Interaction Methods

The physical interaction between the game and the player is done via hardware that translates what the player wants his/her avatar to do in the game environment. Researchers and developers are constantly looking for ways to create more transparent methods of interaction, where the player interacts with the game just like he/she does in the real world, without a translator. While the search for better equipment and tools is underway, the most conventional methods for gaming are the combination of keyboard and mouse, joysticks and controllers. In terms of space simulation games and the game that is used for the study, the two former methods are very common. Controllers are not favorable due to the complex nature of space simulation games and controllers having limited number of buttons.

4.1.1 Keyboard

Probably the most used device between a player and a computer, the keyboard plays an essential role as a converter of will to action. Almost all PC games use the keyboard as their primary interaction tool, regardless of what genre the game belongs to. The fact that most PC users are mostly familiar with the interaction methods while using the keyboard is one of the main reasons what this tool is never seen as outdated.

In the context of space simulation games, the keyboard is much more efficient compared to games from other genres. This is due to the fact that most space simulation games have complex control schemes and many spaceship elements that can be controlled, toggled and altered with. The number of buttons supports this complex control scheme and enables the players to control their ship with precision. Usually, the keys W, S, D, A are used to move the ship horizontally or vertically along these two axes as other keys are used to increase the thrust of the ship, interact with objects, activate certain tools within the ship and etc. Even though it is highly efficient, the keyboard is nothing without its usual partner in crime, the mouse.

4.1.2 Mouse

Just like the keyboard, it is efficient, easy to use and most players are already experienced in terms of converting two-dimensional hand and mouse movements to the three-dimensional space. Like in most games that involve first person point of view, the space simulation games are also rely on the mouse to rotate the view of the ship around its center, allowing the player to face towards and navigate to the desired location around the environment. Most space simulation games use the mouse for two different tasks: to rotate the ship and to enable the player to navigate the menus in the game. The mouse is highly functional not because of its precision and ability to detect the smallest of inputs but also the buttons in contains. Most gaming mice have two main buttons that are usually used to fire weapons and interact with the menus. The mouse wheel located at the center of these two buttons is usually used like a slider, perfect for

fine-tuning the engine power, thrust or speed of the ship. Combined with the keyboard, they are the most used tools in video games and space simulation games.

4.1.3 Joystick

The joystick is a hardware device that was developed in the 80's, deriving from the rudder sticks of the aviation crafts. In the realm of two-dimensional games it made perfect sense to adopt this tool and convert it to the world of video games. This was due to the fact that it let the players control the motion of the avatar with ease as the joystick also had the ability to move along two axes, left and right, up and down. Today, much advanced models are being produced and there are almost different models available for different occasions. Space simulation games, along with any other aerial vehicle simulation games benefit from this tool. This is mostly because the real life counterparts of virtual vehicles use the rudder and the thruster stick to be controlled and the methods of control with a joystick feels more familiar and logical, letting the player to assume the identity of a pilot much quicker. Even though more enjoyable and realistic, the joystick has a steep learning curve and requires experience to benefit from it fully.

4.2 Sound Devices

Sound devices are the most underrated hardware tools that a game setup contains. Along with the actual sounds of the game, they are highly important for fully embracing the environment, atmosphere and certain moods. With the technological advancements of sound devices, the game developers are able to implement better

quality sounds and sound structures in the game that will be transferred to the player by a speaker or a headphone. Most games today have surround system support, meaning that they are able to detect where the sound is coming from and relay that information to the player through different devices. Both speakers and headphones were used in the study to see which one was more efficient in terms of creating more immersive experiences.

4.2.1 Speakers

The most common sound devices being used, speakers let the players hear the sounds of the game without any irritations to their ears compared to headphones. They vary in size and technology, as the most basic speaker lacks the ability to convert and reflect three-dimensional sound while the most advanced one will let the player pinpoint the origin of the sound with ease. For the study, the built in bi-directional speakers built in to the laptop were used.

4.2.2 Headphones

Gamers who are interested in isolating white noise prefer headphones as it lets them focus on the sounds of the game more effectively, without interruptions and from a much more closer distance (Kallinen and Ravaja 2007). It can be hypothesized that this lack of interruptions lets the player to get in the game even more, as well as granting accurate sound detection.

4.3 Virtual Interaction

What is being referred with the term virtual interaction is; the layer of user interface within the game ranging from menus to intractable cockpits to how players interact with virtual objects. The game used in the study had a very complex menu structure that works hand in hand with object interaction. Even though not tested in terms of immersion and identity, it is worth mentioning their user interface elements and interaction methods were highly effective in terms of creating a believable environment where the player had the ability to access detailed information about almost every single element that existed in the game. This creates the feeling that every single element has a purpose thus is a part of this complex structure where each one of these elements have an individual agenda.

4.4 Graphics

Often times, assessments of the quality the quality of the graphics are equated with the level of realism in the graphics. This is a misconception, as the quality of a game in terms of graphics is not determined by realism but aesthetics. A game that has very high quality object models might have a very poor color palette or lighting. Different variations were not tested in the study, as I didn't have the knowledge to make such changes in the source files of the game. However, the opinions of the participants were recorded in this regard of realism versus aesthetics.

4.4.1 Realism

As mentioned previously, realism is something different than the aesthetics of the game. It involves the more technical side of visual elements. The numbers of polygons or surfaces that create an object to make it as accurate as possible or the quality of the textures that are wrapped around these objects are related to the realism of the game. The more accurate the objects are, the more realistic the game gets.

4.4.2 Aesthetics

Aesthetics, on the other hand, is related to the overall visual and sonic choices the developers made. Color combinations and stylistic choices both improve or take away from the overall aesthetical quality of the game. The colors, intensity and the position of the lights in the game environment play a critical role for creating video games that excel in the aesthetics department.

4.4.3 Cockpit

The cockpit is included in this section as it is a graphical improvement to the game. The default version of the game lacks a cockpit view, which might make it harder for players to fully embrace the space theme and the realism of the game. The study tested this aspect of the game and third party modifications (mods) were used to implement cockpits for different ships into the game. Although not on par with the graphical quality of the game, most cockpits were highly detailed in terms of their design.

4.5 Sound Design

The sound design of a game, as mentioned earlier, is very important for creating moods and enhancing certain feelings during specific parts of the game. They are equally important for interactions between the player and the game as feedback systems that create sensory immersion.

4.5.1 Sound Effects

Most sound effects used in space simulation games are counterparts of their visual effects. These sounds can occur while interacting with the menus, firing your guns, boosting up your engines or crashing into a space station. Almost all of these sounds are used to enhance the visual effects the player sees. Most players disregard the fact that there is no sound in space as the satisfaction of these effects trump over the realism aspect of the game. Although sound effects were not tested in the study, their overall quality was measured.

4.5.2 Music

Considering other visual entertainment types such as motion pictures or T.V. series, one can argue that music included in these platforms are almost unfair elements to amplify the mood and ambiance in certain scenes. The combination of a good visual composition with an impressive music is enough to make the player fully experience and appreciate the mood being dictated by the game. The unfairness statement rises from the fact that no one in real life walks around with an orchestra that composes a score on the spot tailored for the situation however, no matter how unnatural, if done carefully

and tastefully, a musical score at the right moment will amplify the feelings of the player.

4.6 Game Modes

Every game usually has multiple game modes depending on their design. Space simulation games, especially X3, contain many different modes thanks to its size and structure. The game can be played free of objective, or with self-assigned objectives or following the narrative of the game will result with objectives given by the game. These elements are probably the most crucial ones in terms of immersion as they are related to both challenge-based immersion and also imaginative immersion.

4.6.1 Free Roam

In free roam, players are allowed to do as they please. They determine where to go, what to interact with or who to fight against. The danger of free roam is that it requires a certain amount of time for the player to understand the structure of the game to be able to choose what to focus on. Most new players feel lost with this mode as their first one and need a guiding hand that would explain how the game works. That is why most games have tutorials.

4.6.2 Objective / Narrative

These two concepts -objective and narrative- are combined in this thesis as the players who play with these elements both have an objective and a narrative. Giving a purpose to a player, especially if they have a limited time to play the game can be the

greatest of incentives. This is due to the fact that they assume a certain identity and follow a narrative to complete an objective; a process that affects both the challenge-based immersion and the imaginative immersion.

4.7 Customization

Customization is one of the most important elements regarding the identity of the player and the personalization of the tools the player has access to. An assigned spaceship is not worth much, usually seen as a mere tool however, once the player has the ability to change its features, it becomes unique to the player, making it more valuable. The study broadens this concept by allowing the player to pick any type game mode they want as well as the spaceship, granting them freedom of choice.

With all the elements explained, the next chapter introduces the *immersion study* and the analysis of the data gathered.

CHAPTER 5. IMMERSION STUDY

5.1 Method:

5.1.1 Participants

Data was recorded from 40 participants whose ages varied from 18 to 31. Both male and female participants attended the study. All participants were university students at a large Midwestern public university, both undergraduate level and graduate level. All participants had played a video game in the previous month prior to the study.

5.1.2 Design

In order to test immersion in video games, the study follows the experiment that was carried out by University College London called “Measuring and Defining the Experience of Immersion in Games” (Jennett et al. 2008). The study uses data from eye tracking (objective method) during gameplay and combines them with a post-game immersion survey (subjective method) in order to figure out how immersion affects players and how immersion can be measured. In terms of the eye tracking data, fixations refer to each stop within the screen area where the gaze is fixated upon a

specific location for duration. Saccades are the links that connect each fixation, the eyes motion between each stop.

The study compares a standard video game setup (both in terms of hardware and software) with a setup that has altered game elements in order to find out how each element affect immersion with the combination of eye tracking the Immersion Survey and observation. The game that the participants played was X3: Albion Prelude, a space simulation game mentioned previously in the Case Study section.

The duration of the experiment is 25 minutes:

(5 Mins.) The participants were briefed about the genre of the game, how controls work and how equipment were to be used.

(5 Mins.) Calibration of the eye tracker, booting up the game.

(10 Mins.) Game play session.

(5 Mins.) Survey.

The participants will be divided into 4 groups.

Their placement is random.

1. Control Group
2. Experiment Group A
3. Experiment Group B
4. Experiment Group C

The Control Group played the video game as it is. Default graphics, default sound, speakers, a keyboard and a mouse, and no forced target or goal. The experiment groups

however, did have different modifiers both positive and negative depending on the type of the Experiment Group.

5.1.2.1 Control Group

The *Control Group* played the game with the basic control scheme with a keyboard and mouse. They had standard speakers for the sound and a single LCD display. The music was enabled for all participants in this group. They started with the tutorial part of the game however; they were given the chance to opt out of the tutorial part and free roam instead. If the participant decided to complete the tutorial and finished it early, they were given the ability to explore the universe freely. Cockpits were disabled for the *Control Group*.

5.1.2.2 Experiment Group A

The participants of the *Experiment Group A* were given a task to carry out within the time limit of the study. Because of nature of the study, five of the total six participants of this group played the game with headphones while the other one used speakers. Three of them had music enabled while the other three had it disabled.

Three of the participants were given the task to assume the role of a military courier and were asked to reach a specific location and relay a message to their military supervisors. This scenario was scripted and the participants were briefed about the narrative before the gameplay session started.

The other three participants had an objective of destroying 10 enemy ships in the sector where they started in the game. This scenario didn't have any narrative, just an objective. Cockpits were enabled for the *Experiment Group A*. Four of the participants used the HOTAS joystick while the other three used keyboard and mouse. The main goal for this group was to test the element of narrative and objectives as well as how different controller hardware has an impact on immersion.

5.1.2.3 Experiment Group B

The *Experiment Group B* played the game as a free-roam, meaning that they had the ability to do whatever they wanted to do within the virtual space. Seven participants were used for this experiment group. Five of the participants played the game with keyboard and mouse while the remaining two played it with a HOTAS joystick. Four had in game music disabled and three used headphones while the remaining three used speakers. The main goal of this group was to test the addition of a cockpit to the game, different controller hardware and the elements of sound and music.

5.1.2.4 Experiment Group C

Experiment Group C had the ability to pick a ship from a list created prior to the study that had ships ranging from fighters to larger cruisers. Two out of three of the participants used the HOTAS joystick and all of the participants were given the choice of picking their gameplay style. They were asked to choose one game mode among Tutorial level, Free Roam and the other two objective scenarios. They all played the

game with music. The main goal was to test how freedom of choice affected the immersion levels.

5.1.3 Materials and Measures

A 15-inch Macbook Retina with Windows 7 installed was used to play the game. The graphical settings were Medium-High, with anti-aliasing lowered. A 42 inch Samsung TV was used as a monitor rather than the 15-inch display of the Macbook. Separate keyboard and mouse peripherals were used to play the game. The joystick used was a Saitex X-52 HOTAS joystick with a throttle control.

Figure 3: Saitek X-52 HOTAS Joystick. From: Saitek, www.saitek.com (accessed March 11, 2015).

For speakers, the default speakers of the TV were used. Headpones were AudioTechnica ATH M50x.

The eye-tracking device was an EyeTribe eye tracking tool. It lists the number of fixations, the duration and the vectoral location of the fixation as well as the saccades between each fixation. It also records when the gaze is not on the monitor.

Figure 4: Eye Tribe Tracker. From: Eye Proof, www.eyeproof.net (accessed March 11, 2015).

5.2 Results

5.2.1 Hypothesis

The indicators for how immersed the player is expected to change depending on the modifiers and the changes that are being applied to the gameplay elements, both in terms of hardware and content.

The players with positive modifiers such as narratives, objectives and music will have lower number of fixations, longer fixation durations per each fixation and a more focused collection of fixations, meaning less saccades.

The players with negative modifiers, will be less immersed, resulting with distractions and disinterest in the game, that would show up as higher number of fixations, shorter duration for each fixation, more saccades and dispersed fixation areas. The subjective measuring tool; the immersion survey, will support the objective data gathered from eye tracking.

5.2.1 Overview

A total of 40 individuals participated in the study. The data of 12 participants were unusable due to accuracy issues with the eye tracker and the data gathered from them will not be included in the results. This is either due to poor calibration or the eye shape of the participant. The remaining participants and their data were accepted and analyzed. 18 of the participants were male and 14 of the participants were female. 20 of the participants were aged between 18 and 25 and the remaining 8 were aged between 26 and 31. 12 participants were in the *Control Group*, 6 were in *Experiment Group A*, 7 were in *Experiment Group B* and 3 were in *Experiment Group C.*

In the overview part, the average values from important factors that effect the overall immersion of the player will be displayed. These factors are from both the eye tracking data and the immersion survey. A total of six factors were selected as indicators of the interaction between the participant and the game: number of fixations, duration

of fixations from the eye tracking data and immersion level, focus level, effort level and pleasure level form the immersion survey.

Every value from this point for fixation numbers and durations from this point on will be rounded up, as the values after the decimal points are negligible.

For the survey, all of the answers to the questions, except the immersion question ranged from 1 to 5, 1 being the negative value (not likely, not agree) and 5 being the positive value (most likely, strongly agree).

The average fixation value in 10 minutes for the *Control Group* was 1272 counts, 1730 counts being the maximum and 1002 counts being the minimum. The average duration of the fixations in the *Control Group* was 368 milliseconds (ms) or 0.37 seconds, maximum individual average being 464ms and minimum individual average of 270ms. The average of the answer to the question "How immersed did you feel?" for the *Control Group* was 7.16 out of 10. The average of the answer to the question "To what extent did you feel you were focused on the game?" was 4 out of 5. The average of the answer to the question "Did you feel that you were trying your best?" was 3.3 out of 5. The average of the answer to the question "How much would you say you enjoyed playing the game?" was 3.5 out of 5.

The average fixation value in 10 minutes for the *Experiment Group A* was 1311 counts of fixations, 1888 counts being the maximum and 1110 counts being the minimum. The average duration of fixations in the *Experiment Group A* was 385 miliseconds (ms), or 0.39 seconds. The maximum individual average was 468ms and the minimum individual average was 249ms. The average of the answer to the question

"How immersed did you feel?" for the *Experiment Group A* was 7.5 out of 10. The average of the answer to the question "To what extent did you feel you were focused on the game?" was 3.8 out of 5. The average of the answer to the question "Did you feel that you were trying your best?" was 4.1 out of 5. The average of the answer to the question "How much would you say you enjoyed playing the game?" was 3.8 out of 5.

The average fixation value in 10 minutes for the *Experiment Group B* was 1294 counts of fixations, 1668 counts being the maximum and 903 counts being the minimum. The average duration of fixations in the *Experiment Group B* was 380 miliseconds (ms), or 0.38 seconds. The maximum individual average was 585ms and the minimum individual average was 281ms. The average of the answer to the question "How immersed did you feel?" for the *Experiment Group B* was 6.2 out of 10. The average of the answer to the question "To what extent did you feel you were focused on the game?" was 3.7 out of 5. The average of the answer to the question "Did you feel that you were trying your best?" was 3.2 out of 5. The average of the answer to the question "How much would you say you enjoyed playing the game?" was 3.1 out of 5.

The average fixation value in 10 minutes for the *Experiment Group C* was 1270 counts of fixations, 1480 counts being the maximum and 1119 counts being the minimum. The average duration of fixations in the *Experiment Group C* was 375 miliseconds (ms), or 0.36 seconds. The maximum individual average was 397ms and the minimum individual average was 343ms. The average of the answer to the question "How immersed did you feel?" for the *Experiment Group C* was 7.7 out of 10. The average of the answer to the question "To what extent did you feel you were focused

on the game?" was 4.3 out of 5. The average of the answer to the question "Did you feel that you were trying your best?" was 2.6 out of 5. The average of the answer to the question "How much would you say you enjoyed playing the game?" was 4.3 out of 5.

Average	Control Group	Experiment Group A	Experiment Group B	Experiment Group C
Total Fixations	**1272**	**1311**	**1294**	**1270**
Duration of Fixations	**368ms**	**385ms**	**380ms**	**375ms**
Immersion level	**7.16/10**	**7.5/10**	**6.2/10**	**7.7/10**
Focus level	**4/5**	**3.8/5**	**3.7/5**	**4.3/5**
Effort level	**3.3/5**	**4.1/5**	**3.2/5**	**2.6/5**
Pleasure level	**3.5/5**	**3.8/5**	**3.1/5**	**4.3/5**

The first finding of the study becomes somewhat apparent in the overview. Experiment Group A, which played the game either with an objective or a narrative put a substantial amount of effort in the game compared to others. They enjoyed the game more and were more immersed in the game compared to the control group and the other experiment groups. Although this shows that objectives and narratives play a big part in terms of immersing players, the number of fixations was much higher than the other groups, creating a conflict with the hypothesis. Further analysis was required in

terms of understanding how individual data affected the average. The reason for this will be explained in the game modes section.

The experiment Group B on the other hand, scored much lower on all levels compared to the control group, which played the game as a free roam as well. As a group, they were less interested in the game even though they put equal amount of effort. Because the experiment group B is about testing the addition of cockpits, use of different hardware and music, individual data analysis is required to see the participants were affected.

The experiment Group C found the game enjoyable but put much less effort into the game. This might be due to the fact that they had the ability to pick up any ship they wanted and pick a scenario that suited them the most. The problem with group C is that the sample size was narrow and in order to come to definitive conclusions, a bigger sample size is needed.

5.2.2 Detailed Analysis

As the aim of this study was to figure out how each game element affects immersion and identity, the results and the analysis for every game element introduced in chapter 4 is being shown in the upcoming section. This was critical in regard to understanding which element had the biggest impact on the players' gameplay experience.

5.2.2.1 Physical Interaction

The comparison between the keyboard and mouse configuration and the joystick configuration was analyzed in this section based on the participants' immersion survey. 8 of the total 28 played the game with a joystick while the control group (12 in total) and 8 participants from the experiment groups played the game with the keyboard mouse configuration. The joystick users thought that the controls were easy to understand with an average of 4.3 out of 5, while the keyboard and mouse users found the configuration more confusing with an average of 3.6 out of 5. The joystick users thought that the controls were mostly aligning with the ships control positively with an average of 4.3 out of 5 while the keyboard and mouse users were indecisive with an average of 3.4 out of 5. The joystick users had access to the keyboard however most keys used in the keyboard setup were mapped on to their joysticks and those buttons didn't have any indicators to what function they represented. Although this was the fact, the joystick users felt that they had enough control over the ship with an average of 2.8 out of 5 as the keyboard users were indecisive with an average of 3.4 out of 5. Joystick users were indecisive about whether the controls became invisible at some point during the game while keyboard and mouse users mostly disagreed with this notion with an average of 2.5 out of 5. The last but the most important question regarding controlling devices was the question of whether they prefer the other device. Except for one participant, the joystick users were quite happy with their controlling device, all answering the question 1, "not at all". The keyboard and mouse users were

indecisive about the choice and their average was 3.3 out of 5. Both the eye tracking data and the survey data suggests that the joystick users were more immersed in the game compared to the Keyboard + Mouse users.

5.2.2.2 Sound Devices

The result for the question “Would you prefer headphones as the sound device for playing the game?” from the participants whom played the game with speakers were mostly positive with the average of 4.1, while surprisingly, the headphone users were divided in opinions 50-50 when asked if they preferred to use speakers rather than headphones. One really interesting finding is that the participants whom used headphones but would rather have speakers instead all had really high fixation numbers and average fixation durations. The correlation between the two is not clear from this study however the preliminary findings show that it is worth to investigate further. Possible reasons might be the intensity of the sound or physical annoyance while using headphones causing distractions.

5.2.2.3 Graphics

This part focused on the comparison between cockpit and non-cockpit playthroughs and what participants thought about the aesthetics and realism of both the game and the cockpit. Almost all of the participants found the visuals of the game realistic with an average of 4.5 out of 5. The results were almost the same for the aesthetical quality of the game. Due to this fact and the fact that there were no other games to compare, the impact of overall visual quality on immersion is impossible to

detect with this study. A more focused study that compares games that have similar playstyles but very different visual qualities will be beneficial towards understanding the relationship between visuals and immersion.

The results for the inclusion of the cockpit or the lack of it didn't have a significant impact on immersion however; an interesting analysis was that the participants of *Group A* (objective/narrative) disliked the cockpit more than the other participants. This is probably due to the fact that participants of group A focused at the center of the screen more than the other participants where the cockpit is located and had more time to analyze the quality of the cockpit.

5.2.2.4 Sound Design

The sound effects of the game were always on so the study focused mainly on the music aspect of the game. However, the players whom played the game with headphones were more appreciative of the sound effects overall, finding them slightly more satisfying then the players whom played the game with speakers. Looking at the data from all players, they thought that the sound effects were somewhat satisfying with an average score of 3.4 out of 5.

Regarding the music within the game, the *Control Group* was somewhat satisfied with the music with an average score of 3.5 out of 5. The players of the other control groups whom played the game without the music were mostly disappointed by the lack of music as the players whom played it with music enabled were on par with the results of the *Control Group*. They weren't distracted by the inclusion of the music as well.

While not having conclusive data on whether having music enabled or not played an important role in terms of immersion, the feedback from the participants suggest that the players certainly want the option of music in a game. The quality however, needs to be very good in order to make significant changes in the immersion of the player. Using other games with better music might create better results to figure out the importance of music in immersion.

5.2.2.5 Game Modes

This section investigates how different game modes affect the challenge-based immersion and imaginative immersion of the player. It was mentioned in the overview that the experiment group A, which played the game with objectives and narratives, higher immersion levels as well as higher focus and pleasure levels. The contradicting data was from the number of fixations, which threatened the integrity of the eye tracking data gathering method. Looking at the individual data, it was found that one participant had an extraordinary number of fixations. The participant A5 received the task of destroying targets and after going through the observations log; it was revealed that A5 was extremely nervous during the gameplay (sweat residue on the joystick and the thruster.) The survey data also shows that A5 found the game challenging and wanted to give up and was in great peril about not being able to complete the task. The combination of data gathered from the survey hinted that an uneven challenge to the players' skill level might create nervousness, causing the player to have an increased amount of eye movement. Of course, more samples are necessary to prove this claim

right however, based on the data, the only thing irregular seems to be task being too challenging for the participant. Another interesting result was the fact that all of the participants of experiment group A except A5 had very similar fixation numbers, highest being 1256, lowest being 1110. This result can be further investigated with a larger group of participants to figure out how having and objective or a specific narrative affects the eye-tracking data in terms of consistency between each participant's data.

5.2.2.6 Customization

The data gathered from *Experiment Group C* was smaller compared to the other groups as this group only had three participants. The study and the data gathered, which is how customization and freedom of choice effects immersion and enjoyment of the player can be used as a preliminary result to draw some early conclusions. Overall, the participants of *Experiment Group C,* all chose to play the game with the enemy fighting game mode. They all chose somewhat large ships with good firepower that would give them an edge in the battle. The results reflect this advantage: The participants were all focused to complete the task however; they all knew that they had an edge over the enemy so they didn't put too much effort. They enjoyed the game more then the others, which, contradicts the *flow theory*. This result is understandable in regards to the *flow theory* as all of the participants played the game for the first time and only played it for 10 minutes, creating a situation where they probably were still excited about the game. If they were to play the game for a while, being overpowered might get boring.

Because all players played the game with a specific scenario, comparing their data with the data from *Experiment Group A* (played the game with objectives and narrative as well) made sense. The customization element definitely brought more pleasure to the gaming experience as the average result for the pleasure level was 4.3 out of 5. The participants also answered the question “To what extent the ability to select your ship made the experience more personal?” with an average of 4.7 out of 5 and this showed that the ability to pick a spaceship of the players’ liking increases the imaginative immersion of the player. The answer to the immersion question was somewhat similar to the result of the *Experiment Group A* with an average of 7.7 out of 10. This showed that although not necessary, the ability to customize or to pick a certain game mode renders the game more enjoyable however, the developers must be cautious not to make upgrades too easy to acquire as it may critically reduce the challenge level.

5.3 Discussion

The overall outcome of the study showed that some game elements are much more important than the others in terms creating an immersive space simulation game. Providing an objective and a narrative dramatically increased the overall immersion levels of the players, kept them more focused and made them enjoy the game more. The customization elements and the freedom to choose which type of gameplay the players wanted to play had a similar impact on immersion and the quality of the gameplay experience. Although this is the case, a follow-up study with more participants

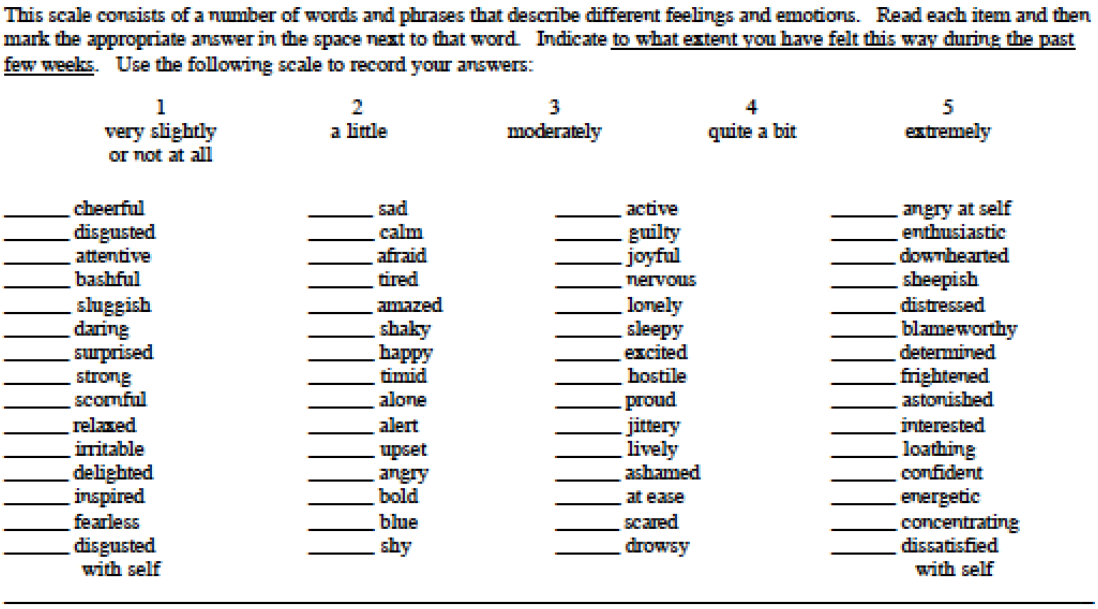
for the customization elements is necessary to gather more accurate and in depth data. The comparison between physical interaction elements showed that most the use of a joystick is much more preferable than the keyboard and mouse setup. Both methods can be considered decent ways to interact with the game.

The results for which sound device was more preferable was inconclusive as participants only used one sound device during their playthrough. This element can be tested more accurately if the participants were to test both of the options (speakers and headphones) in 2 sessions of playthrough to be able to compare them.

Regarding the sound design, players were mostly content with the quality of the sound effects and to test these more efficiently, the study can have a game version where the quality of the sound effects are much lower then the originals. This might allow the comparison to be more conclusive. The inclusion or the lack of music didn't have much of an impact on contrary to expectations however; this might be due to the rhyzomatic nature of the game and how the game progresses where the music wasn't responsive to the actions of the players in most cases. A video game that is much more linear in terms of progression might offer more responsive sound design, increasing the impact of music in terms of immersion.

Other aspects of the study that can be improved are mostly related to the accuracy of the eye tracking data. The results of the data were influenced by many factors such as motivation and experience and keeping these factors consistent among all participants is key for accurate data. Another method would be to include a PANAS-X

(Watson and Clark 1994) self -evaluation survey at the beginning of the study to find out about the psychological, emotional and physical status of the participant.



This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks. Use the following scale to record your answers:

1 very slightly or not at all	2 a little	3 moderately	4 quite a bit	5 extremely
_____ cheerful	_____ sad	_____ active		_____ angry at self
_____ disgusted	_____ calm	_____ guilty		_____ enthusiastic
_____ attentive	_____ afraid	_____ joyful		_____ downhearted
_____ bashful	_____ tired	_____ nervous		_____ sheepish
_____ sluggish	_____ amazed	_____ lonely		_____ distressed
_____ daring	_____ shaky	_____ sleepy		_____ blameworthy
_____ surprised	_____ happy	_____ excited		_____ determined
_____ strong	_____ timid	_____ hostile		_____ frightened
_____ scornful	_____ alone	_____ proud		_____ astonished
_____ relaxed	_____ alert	_____ jittery		_____ interested
_____ irritable	_____ upset	_____ lively		_____ loathing
_____ delighted	_____ angry	_____ ashamed		_____ confident
_____ inspired	_____ bold	_____ at ease		_____ energetic
_____ fearless	_____ blue	_____ scared		_____ concentrating
_____ disgusted with self	_____ shy	_____ drowsy		_____ dissatisfied with self

Figure 5: Sample PANAS-X schedule. From: Watson and Clark. The Manual for PANAS-X. Iowa. 1994

Based on the results of the PANAS-X, the impact of different statuses on the eye-tracking data might be found.

The survey used in the study was very beneficial in terms of measuring the reactions of the participants towards the game. Still, a revision to the questions is necessary to make the survey more consistent among all groups of participants. Each participant group used a unique survey that made sense in regards to the gameplay elements that were involved with the specific group, resulting with different questions being asked to the participants. Asking the same questions to all of the participants would make it easier for the researcher to compare the data gathered.

CHAPTER 6. CONCLUSION

As video games get more popular each day, understanding the charm of video games is essential towards creating better, more immersive games. This thesis focused on the immersion and the identity phenomena of video games and how different gameplay elements altered the immersion and identity of the players. The main goal was to understand what immersion is and how it is affected by different gameplay elements and to create the core of a methodology that would allow developers to measure immersion under the influence of different gameplay elements. The space simulation genre was selected as the first genre to be tested. The data gathered from the study and the analysis of the results conclude that the methodology displayed in this thesis can be used to measure immersion and identity however, it needs polishing in terms of gathering more accurate data that wouldn't be altered by each participant's subjective statuses. The analysis also concludes that there are certain gameplay elements that are more essential than others in terms of immersion such as the narrative, objectives and customization methods and these elements should have the highest priority when developing space simulation games.

The ultimate goal is to make this methodology applicable to other video game genres in order to test what elements are important to create a highly immersive game,

where players can assume the projective identity without interruptions. This thesis and study was a good first step towards perfecting that methodology.

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