What creates the sense of immersion and how important is fidelity for creating immersive experiences?

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Immersion is often discussed during the topic of virtual reality rather like biscuits and tea, but what is immersion and why is it important? To put it simply, immersion is about being immersed within the context of the setting. To be immersed is to feel surrounded, completely, and utterly involved and to feel like you are really experiencing something whether it be there or not.

''Immersion is basically a unique experience that is connected with the world of virtual reality. Over here the user whole exploring the three-dimensional world of virtual reality will simply immerse into this make-believe world as the real world. It is basically a feeling of involvement of the user in the virtual world intelligently designed by experts.''

(Virtual Reality Immersion - Virtual Reality Society, 2020)

Virtual reality, or rather its concept has potentially been around for a long time.

''The exact origins of virtual reality are disputed, partly because of how difficult it has been to formulate a definition for the concept of an alternative existence.[5] The development of perspective in Renaissance Europe created convincing depictions of spaces that did not exist, in what has been referred to as the "multiplying of artificial worlds".[6] Other elements of virtual reality appeared as early as the 1860s. Antonin Artaud took the view that illusion was not distinct from reality, advocating that spectators at a play should suspend disbelief and regard the drama on stage as reality.[3] The first references to the more modern concept of virtual reality came from science fiction.'''

(Baltrušaitis and Strachan, 1977)

However despite this, it is depicted as a relatively new toy due to the headsets that have been released at a more affordable consumer price. For the first time ever, virtual reality has become an accessible tool for artists and designers alike. These new headsets currently offer a wide range of interaction within the virtual world in the form screens and controllers allowing the player to look around and participate in the digital domain.

''They have the power to interact with this world. This unique combination where the user can immerse as well interact with the simulations is known as Telepresence. This is devised by the famous computer scientist Jonathan Steuer. Thus, the user forgets about his real world scenario, forgets his present identity, situation and life and immerses him in a world of imagination, adventure and exploration. He gets more focused about his newly created identity inside the Virtual Reality world.'''

(Virtual Reality Immersion - Virtual Reality Society, 2020)

''To make it easier, you can separate the types of gesture controls into two main groups: semantic

and responsive. Semantic gestures are common movements we're familiar with in real reality: walking, craning your neck to see, nodding for "yes," etc. Responsive gestures are how we interact with our environment: picking things up, throwing them, pushing buttons, etc. Designing responsive gestures is harder because you also have to account for the specifics of an object, like weight or maybe aerodynamics.''

''For the most part, your goal is to duplicate reality, so try to rely on as many natural gestures as possible. The less "controls" your user has to learn, the easier it will be to immerse themselves.''

(How to design for virtual reality: basics and best practices for VR design - 99designs, 2020)

Immersion itself can be broken down into different elements. It is important to understand the differences as to create the appropriate experience for the target audience.

- **Tactical immersion**: Tactical immersion is experienced when performing tactical operations that involve skill. Players feel "in the zone" while perfecting actions that result in success.
- **Strategic immersion**: Strategic immersion is more cerebral and is associated with mental challenge. Chess players experience strategic immersion when choosing a correct solution among a broad array of possibilities.
- **Narrative immersion**: Narrative immersion occurs when players become invested in a story and is similar to what is experienced while reading a book or watching a movie.

''Staffan Björk and Jussi Holopainen, in Patterns in Game Design, divide immersion into similar categories, but call them sensory-motoric immersion, cognitive immersion and emotional immersion, respectively. In addition to these, they add a new category: spatial immersion, which occurs when a player feels the simulated world is perceptually convincing. The player feels that he or she is really "there" and that a simulated world looks and feels "real".''

(Björk and Holopainen, 2006)

Whilst this describes different types of immersion, it is also important to understand that there can also be different types of data to create different types of immersive experiences, thus affecting the overall level of immersion and impacting the final experience. The two classifications I will cover are Depth of information and Breadth of information.

''Depth of information can necessarily include anything and everything starting from the resolution of the display unit, the graphics quality, the effectiveness of the audio and video etc.''

''Jonathan Steuer also defines breadth of information as a number of sensory dimensions presented simultaneously. Any virtual environment can be designated as having a wider breadth of information whenever it stimulates all the human senses. The user should get fully focused onto the new identity and world he explores. The audio and visual effects are the mostly researched area in creating a good virtual environment. These are considered as the main factors that can stimulate user's all sensory organs. The sense of touch has been given more and more priority as it has become the dominating factor to stimulate a human. Those systems that allow the users to interact through touch are known

as Haptic Systems.''

(Virtual Reality Immersion - Virtual Reality Society, 2020)

Psychology can also play an important role in how much a user can be immersed. Despite covering everything discussed prior, some users are just more susceptible to accepting virtual reality as a new reality than others.

''Of course, players have some say in how immersed they get in a game. Some people just have more spatial ability and can build those mental models of game worlds more readily and make them more vibrant. And researchers have found that people have an "absorption trait" which means that they are quicker to get fascinated by something and drawn into it -something I like to think of this as "the fanboy gene."

(Virtual Reality Immersion - Virtual Reality Society, 2020)

When creating virtual reality experiences, we are asking the viewer to accept a lot of sensory information that may not make any sense. Whether this be story, setting, or simply the fact that the player can still walk around despite the user being stood perfectly still or even be sitting down.

''Other times the player takes a more active role. Some players simply want to believe in the illusion and will induce their own bias towards accepting the "I am there" hypothesis. In this state, they will require less confirmatory information to accept that hypothesis and less disconfirming information to reject it. This is also similar to the idea of "suspension of disbelief" where players wilfully ignore stuff that doesn't make sense (like thunderous explosions in space or the fact that enemy soldiers can soak up a dozen of gunshots without going down) in order to just have a good time.''

(Virtual Reality Immersion - Virtual Reality Society, 2020)

Some users willingly accept this fantasy purely down to a personal desire to be as far away from reality as possible. They do not search for realism but instead believability so that they may live, for a moment, in a world not their own with the freedom to make their own decisions.

''A concept they call "involvement" which is a media user's desire to act in the make-believe world, to draw parallels between it and his life, and to effect changes in it according to their own design. To me, this seems like an overly fancy way of saying "some people like to role-play" which leads directly to greater immersion.''

(Virtual Reality Immersion - Virtual Reality Society, 2020)

For my own personal exploration into virtual reality and to discover for myself what creates immersion, I decided to study two games; *Half Life: Alyx (Half-Life: Alyx, 2020) and The Elder Scrolls: Skyrim VR.(The Elder Scrolls: Skyrim VR, 2017)*

I chose to compare these two games as within the huge variety of VR games available I wanted to select two that were rather similar to one another. I felt these games were both trying to achieve the

same thing; deliver an ultimate immersive experience by having the player feel like they are within a new world. One aims for a futuristic dystopia and the other a historical fantasy. Both try to give the player freedom by providing plenty to interact with as they progress through the story attacking enemies with a variety of weapons. Both games also utilize large, beautiful levels that feel immense and endless from the point of view of the player. One game I feel manages to create an immersive experience, while the other I feel falls just short. This will enable me to also explore the importance of fidelity in games and whether or not it directly affects the immersive experience as a whole.

I recently had the opportunity to experience *'Half Life: Alyx'* (Half-Life: Alyx, 2020) in an Oculus Rift headset. The headset included two controllers, connecting my hands to the in game virtual hands. The experience was nothing short than breath taking. The game began with me standing on a balcony in a futuristic city looking out over rooftops as spaceships and advanced drones flew around. Pedestrians and robots alike walking around below and the mother of all alien ships on the horizon in front of me. The view was overwhelming with so much to take in.

After being overwhelmed with the view, my next instinct was to test the interactive capabilities. The controls of the Oculus were so intuitive that I didn't have to think about what buttons to press, I simply made the gesture and the controller understood what I wanted to do. I started by touching the radio as it was making noise next to me, drawing my attention to it. I could turn the dial and pull the antenna. I went about the scene picking everything up, cans, boxes, bottles and taking great pleasure in throwing them off the balcony.

What made this experience so unique is how much it surprised me. I hadn't expected to feel as immersed as I did. It felt like I was there, *really* there. I was no longer in my flat in my hometown, I was in a futuristic city surrounded by aliens and robots. Being able to look around was something I had expected, so despite the beautiful view that wasn't what did it. What made it immersive was the fact I could pick up anything. To be able to reach down and grab things, to hold them, inspect them, then launch them into the air as if they were right in front of me. As if they were really in my hands. That was unexpected.

A little further into the game, I encountered some enemies. Men in suits pulled out their guns on me and ordered me to raise my hands where they could see them. I felt immediately obligated to do so. It was as if someone was really standing in front of me. They didn't feel like 3D models on a screen but living and breathing humans that were threatening me. I felt a thrill of adrenaline as though I were really in some kind of danger.

I poked the brick wall next to me for a while and felt as though I could cry. The emotions were overwhelming. I poked the brick wall next to me again and again purely because *I could.* It almost felt as though I could actually *feel* it. It felt like I should feel it. I could crouch down, peer over the edge of the balcony, jump, twist. Everything you could expect to do in real life, I could do in this game. I could even walk around instead of using the movement controls on the remote.

So, what makes *Half Life: Alyx (Half-Life: Alyx, 2020)* so immersive?

- Incredible graphics that make the environment look real.
- Beautiful sound design that surrounds you and gives you a sense of space.

- Advanced physics, giving objects some feeling of weight as you lift them and throw them.

- Large amounts of objects to interact with that allow the environment to behave as you would expect it to.

- Clever level design that allows the levels to feel dense and populated with no visible borders to better simulate the real world.

- Attention to detail within the textures and materials to aid the imagination into imagining what they would feel like.

- The game is made for VR, so the experience is catered for it (Not too much moving around, not too fast paced, plenty to see and pick up, detailed environments)

- Strong linear storytelling that drives each scene forward

What makes '*The Elder Scrolls: Skyrim VR' (The Elder Scrolls: Skyrim VR, 2017)* not as immersive?

- The game is not made for VR (lack of interactable objects, poor mechanics)

- Very limited interaction with the controllers (Can only hold a sword, shoot bow and arrow, cannot open doors etc.)

- Lower quality graphics detract from the realism and remind you constantly that you are in a game not the real world

- Poor sound design that doesn't give you a surround sound experience

- Poor storytelling (many characters and locations do not drive the story/plot forward in any way creating a feeling of disconnect) which is a common issue in open world games

- Many bugs and glitches

So, is fidelity important for immersive experiences? I feel the aim of these games is to create the most immersive experience possible. The personal touch of the headset, allowing players to look around and interact with their environment in such an individual way is in essence the goal. Fantastic games have been created for computers or video game consoles, the goal here is not to replicate what has been done prior but to reinvent a new way to participate within the context of a game. The current technology requires a certain amount of suspension of disbelief to be truly immersed, and the goal of fidelity is to aid in this. If the goal is to be immersive, the best way to start is to be realistic. If the headset creates the realistic feeling of standing within the virtual environment, then what better way to compliment that feeling than with realistic graphics. If the goal is to be immersed, then by making the environment as realistic and believable as possible adds to that experience as the player feels they are really there. I experienced this myself when playing 'Half Life: Alyx' as the high-quality textures and realistic environment gave me the most immersive experience I'd ever felt.

"Terra, Terra!" Project

After doing all this research it was time to put it to the test with one of our own projects, "Terra, Terra!" We wanted to see if we could create our own immersive experience combining all of our

skills together. My focus was on the 3D assets and my role involved helping to create some of the characters and setting up the scene in Unreal Engine. We used Unreal and Maya as these are industry standard software, with Unreal Engine especially becoming more and more popular due to its real time technology. Blender was also used for some tasks such as assigning materials due to its speed, efficiency, and easy compatibility with Unreal. We had put together an animatic for a teaser, and developed previz according to that animatic. We chose one scene from the teaser to demonstrate a proof of concept for how the VR experience would work.

My research into data types, such as depth of information and breadth of information proved to be invaluable as it demonstrated the need to provide as much interaction and stimulus as possible. To achieve this, the idea was to allow the player to switch views around the scene, so they can either observe from around the ship or in the perspective as one of the characters. Therefore, providing a slightly different experience each time and allowing the player a certain freedom to explore. As for fidelity, of course this project is not realistic in that it is set within a cartoon environment. However, we were able to introduce elements of believability by adding elements such as the surrounding planets and stars. In the future we also hope to texture the environment to make them feel like real surfaces to also add to the overall look and feel of the scene. So, the goal is not realism here, but to create an environment that is believable.

In our final product inside Unreal Engine, the player/user can look around and switch the view camera to see the scene from different points of view. We hope to develop this proof of concept in the future by adding further interactivity and educational elements to allow the user to learn about the planets through the characters.

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