A New Medium for Animation – Stereo Virtual Reality

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Abstract: This paper demonstrates how the medium of animation can be dramatically enhanced when stereo virtual reality is employed. The animation discussed in this paper combines the cinematic aesthetic of film, the interactivity of video gaming and the immersion of virtual reality to create a compelling and unique visual experience. The extra dimension of virtual reality creates a heightened sense of involvement and presence, a state where more senses are engaged by the virtual environment. This virtual-physical experience also enhances the sense of emotional immersion, pulling the viewer into the narrative with greater intensity. As a prototype this project suggests an exciting development to how viewers can explore, discover and engage with virtual reality worlds, presenting an innovative approach to cinematic experience.

Keywords: Virtual Reality, Animation, Narrative, Game, Interactive Movie

*Areas: □ Film, □ Media Art, ✓ Animation, □ Imaging Science

Figure 1: Player follows eagle over the ice in this Virtual Reality environment

1. Why 3D Virtual Reality?

At the 2015 Sundance Film Festival, the New Frontier program featured at least 10 Virtual Reality (VR) installations [1] The Oculus Rift in particular featured in 2013 presenting a VR spectator's view of a space battle from the online game Eve Online: Valkyrie. VR has been widely presented at other popular international media events such as Comic-Con and E3. The Oculus Rift is unique in that it represents a breakthrough in ease of use, compatibility with other technology, and low cost. With its US $350 price tag the Oculus brings VR to the consumer. The Oculus Rift, and other similar 3D headsets, are not only making a significant impact as a VR gaming headset and virtual environment (VE) interface, but are also offering new possibilities in interactive cinema.

The movie format at first glance may not seem an obvious place for VR interactivity. However, even though physical interaction is limited, a movie viewer too can experience heightened involvement and immersion – depending on how well they are engaged with the movie. Furthermore, audience participation through this immersion and the subsequent discovery can create a strong and lasting learning experience. [2] Movie formats also usually have a fixed story line, whereas in games, and game VR, there are multiple routes, sometimes to multiple outcomes. However, game interactivity is often faked – there can be an appearance of choice, but in fact the player is usually along a single pathway with a pre-determined outcome. Interestingly, the actual entertainment experience of a fake interactive story does not differ from the experience of real interaction. When users feel that they have some kind of agency, they enjoy this agency, whether the agency is real or not [3]. This implies that illusion of interactivity via VR within a movie may be sufficient to satisfy the illusion of choice.

Interactive movies are not a new concept. This format was popular in the 1990's, encouraged by the arrival of laser disc technology, that, in theory, provided fast enough response to provide pick a path movie storylines. But as discussed by Marsh in "The rise and fall of the interactive movie", [4], " …interactive movies were stuck between two audiences: too much like games for moviegoers, too much like movies for gamers." At that time, the technology was underwhelming. But now, with 3D VR headsets and internet based interactivity, several forms of interactive movies are available. YouTube also offers 360 degree video, where the viewer can freely rotate their view as the video plays. Most of these forms use real-world material, making use of non-linear video databases and 360 degree cameras. This project places itself into the constructed world, and therefore creates a juncture between animation and computer gaming. Also, while this project is built on many narrative structures taken from film, it also uses several game mechanic principles from computer game design. However, the designers were content to remain in the interactive animation space, rather than move into the pick-a-path games space. Therefore, this remains an "experienced" animated movie, rather than a game.

There is another observation about this style of rendering that warrants brief mention. Even though all elements of this movie are built and animated, the intention is to provide maximum realism. This opens up a question about the medium; is it animation or special effects? This is an active topic of discussion today, and for the purpose

of this paper, the focus will be on the processes explored, rather than this question of medium type .

2. Presence and Immersion

The term “presence” is discussed by a wide field of research, but generally refers to the sensation of “being there”. For the purpose of this project, we will focus on the physical and emotional experience created thorough VR immersion. Lombard and Dittion [5] describe immersion as “the extent to which the senses are engaged by the mediated environment”.

Slater and Wilbur separate immersion and presence as:

Immersion: an objective description of aspects of the system such as field of view and display resolution.

Presence: a subjective phenomenon such as the sensation of being in a virtual environment.

Witmer and Singer [6] include the concept of involvement, “a psychological state experienced as a consequence of focusing one’s attention on a coherent set of stimuli or related activities and events.” In this way, involvement and immersion are closely related, and both are necessary to create the higher sense of presence. With VR, this greater involvement is generated by removing distraction and forcing focus into a single experience. Therefore, by creating an immersive and involved experience, the sense of presence is heightened.

From a story-telling point of view, this description is appropriate, as immersion alone, while experiential, will not transport the participant along a narrative path.

With VR comes a certain level of technology, and the success of immersion comes when “ … the individual can indicate correctly that s/he is using the technology, but at *some level* and to *some degree,* her/his perceptions overlook that knowledge and objects, events, entities, and environments are perceived as if the technology was not involved in the experience.” [5] This is very similar in some ways the “suspension of disbelief” that a movie viewer will engage in. The viewer knows that the experience is not real, but willingly engages, letting many senses and emotions be guided by the experience. The more that the “Exclusive presence” [7] can be increased by reducing sensory input of the real world, the more immersive the VR experience will be. Furthermore, if appropriate sensory stimulation is then applied, such as wind, motion, temperature, this could further reinforce the immersed experience. However, while the ultimate “holo deck” is interesting to entertain, this is not the scope of this project.

From the background research of presence, the project team developed key principles that would need to be managed in order to maintain optimal experience for the user.

(1) Control factors: the amount of control the user had on events in the VE:

If it is apparent that the user should have control, e.g over a vehicle, then they should have it. Otherwise control needs to be reduced, e.g. be locked inside the vehicle.

(2) Sensory factors:, the quality and consistency of displays:

The early version of the Oculus had a low resolution display, with visible pixelation. While users still experienced various motion effects, this was more to do with deception of balance, as opposed to a real sense of immersion. A similar vertigo can be achieved by sitting up close to a monitor. With Oculus 2 the resolution is much higher, with no visible pixelation, and so is visually more convincing. Another significant hardware consideration is constant high frame rate. This reduces the stop-motion effects and replicates the “frame rate” of real life more closely.

(3) Distraction factors: the degree of distraction by objects and events in the real world:

At this prototype level, there is no intention to control the user’s actual environment, apart from providing a comfortable seat. The relationship between the physical and the visual experience is a topic for further study.

(4) Realism factors: the degree of realism of the portrayed virtual environment:

Realism can be of different types, but needs to match the expectation of the user. In this project, the user experiences a realistic landscape, and so attention needs to given to modelling, texturing, animation and effects. Visual effects can be introduced to further reinforce this world, such as snow, wind, and appropriate surround sound.

The project team also analysed various conventions and techniques of film making as well as mechanics of VR camera work and how this affects the participant. Of particular importance was the understanding of long duration camera shots, as seen in films such as Alfonso Cauron’s Gravity and HBO’s True Detective. This is recognised as a key consideration of designing for headset viewing. Based on early play-test results, it was revealed that typical editing cuts disorientate a viewer far more than a normal cinema viewer. It appeared that this was due to there being no frame of reference such as a theatre or living room. The viewer’s entire experience and illusion of control is abruptly interrupted with a cut. Furthermore, with the viewer being in control of camera direction, it is more difficult to anticipate exactly when the cut is about to take place.

3. The project

The aim of the project is for the viewer to follow the action as a spectator, essentially an invisible camera following a flying eagle. The viewer path will be predetermined, although they can look in any direction they wish. This combines the narrative pathway of the story with the freedom of the VR interaction. There was some initial concern that this approach would diminish the immersion of the viewer, as they have no control of where they were going. However, upon testing it was revealed that the viewers were quite comfortable being “taken for a ride”. Once this notion was accepted, this was no different

to any other ride, be it on a roller-coaster or watching a movie.

The pre-determined viewer path also informed the environment. Effort could now be concentrated on giving maximum quality to the aspects that the viewer could see. An entire environment was not required, just that visible along the viewer's pathway. Although viewers tended to focus mainly ahead, they also frequently looked up, down, to the side, and occasionally directly behind. This meant that the landscape needed to completely surround the viewer at all times, in convincing detail.

Figure 2: Concept development

4 The Narrative

The narrative takes place in a fantastical mountainous icy world, and explores themes of solitude, danger, fear, beauty and survival.

The experience begins as the viewer emerges into a scene of cold air, snow and cloud, high over a detailed majestic landscape. An animated eagle appears from above and begins to slowly fly in front of the viewer. This establishes the mode of the first chapter – that of following an eagle through the landscape. The eagle companion serves as a visual anchor giving the viewer a focus in order to reduce motion sickness. As the focal point it occasionally falls behind the viewer encouraging movement of the head and reminding the viewer to look around for themselves. Movement is at first gentle, to allow the viewer to become accustomed to the experience, but soon speeds up, as the both the eagle and viewer swoop up and down over the complex mountainous landscape.

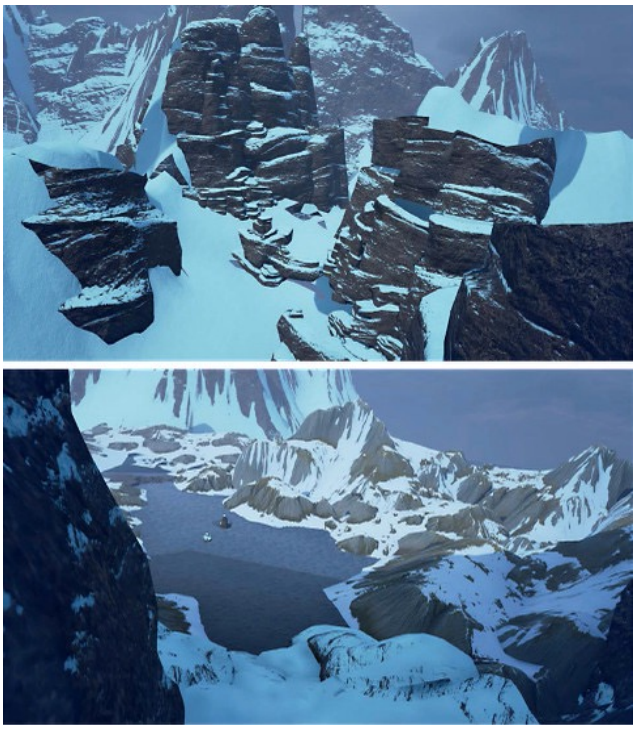

Figure 3: Landscape design using Autodesk Maya and UnReal Engine 4.

5 Changing Perspectives

After the landscape fly-through, the eagle descends to the forest and perches above a lone deer. The viewer's viewpoint now changes to a static observer on the ground near a deer. An arrow appears from the woods and kills the deer. As the viewer watches, a shadowy figure of a hunter appears, walks over the deer, and removes the arrow. At this time wolves howl, the hunter takes fright, and runs off. This use of the camera cut is potentially jarring, and some techniques with fades and transitions goes some way to alleviate this. This scene is very different from the previous, and has a strong sense of observer/voyeur. The viewer is witness to an event of some drama. What the VR context brings to this scene is a heightened sense of "being there" – even just as an observer, there is a strong sensation of standing just by the deer. This is quite different from watching a movie screen from a distance – it is more like being a floating "ghost", standing close by, invisibly observing. It is concluded that moments of drama have a different emotive affect when experienced with VR.

Figure 4. The hunter character is introduced

As the viewer watches the hunter, it is intended that identification and allegiance switches to this new character. It is subtly revealed that the hunter is a woman, she is alone, and even though she has killed the deer, she has respect for the creature in the way that she removes the arrow. Finally, she flees the scene upon hearing the wolves approaching. The unfinished subsequent chapter would have the viewer following the huntress's flight from the wolves in a way similar to the earlier eagle flight..

Figure 5. Motion Capture for the hunter

6 The Oculus Rift and Unreal Engine

Design software used included Autodesk Maya, World Machine, Vicon Motion Capture, and final assembly inside Unreal Engine 4. Unreal Engine 4 also provided atmospheric effects and allowed for final editing of world components, such as the strategic positioning of 3D assets to direct the eye towards specific areas of interest and to mask certain areas such as seams in the landscape. Unreal's blueprinting node-based system provided a designer-friendly visual coding system, bypassing the need to rapidly learn complex code-based programming. The environment design makes strategic use of ambient cloud effects to lower the viewing distance, thereby reducing processor demand and maintaining high frame rate and visual quality. This is a technique used for many years in computer game design.

7 Viewer reaction and comments

The gentleness of the introduction was appreciated by all participants. This was also the time when conversations about the VR would take place, with questions such as "Can I look behind?", "How far can I see?", "What's that over there?". Once the action sped up, the conversation turned more into vocal reaction, especially as the viewer swooped down over an icy lake. More than one viewer made the comment "I want to reach down and touch the ice". The use of particle effects such as snow and cloud was also recognised by viewers as providing visual cues of movement through the landscape. Some viewers commented that the immersion made them feel cold, whereas others commented that it was odd that they did *not* feel cold.

Figure 6: User testing.

In regards to the narrative, viewers readily accepted the role of the eagle, but had many questions about the huntress. While answers would be provided in a second chapter, it nonetheless highlighted some limitations of a silent observer paradigm. Equally interesting, once key characters were introduced, such as the eagle and the huntress, viewers would generally reduce their attention on the surrounding environmental. These environmental details tended to be accepted and move into the background as focus was shifted onto the key characters.

8 Summary

As a prototype to test the cinematic aesthetic of film, the interactivity of video gaming and the immersion of virtual reality this project has been very successful. Viewer participation was high and provided positive and useful feedback. The "silent observer" status of the viewer was readily accepted, as was the limited movement and interactivity. Once the mode of engagement was presented to the viewer they engaged and participated. The realism offered by the technology and the skills of the creators was very convincing. Further questions remain as to what kind of medium this experience belongs to: is it an interactive animation, and interactive movie, a game, or a unique medium that is defined by the virtual reality experience?

Overall this project suggests an exciting development to how viewers can explore, discover and engage with virtual realty worlds, presenting an innovative approach to cinematic experience.

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Acknowledgments

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Biography

Gray Hodgkinson is an animator and academic from Massey University, Wellington, New Zealand. Gray has been developing animation education for 17 years, and has been instrumental in creating links between tertiary institutes and industry in New Zealand and internationally. He has also given presentations on animation research and pedagogy at Melbourne, Japan, Germany, Taiwan, Australia and the U.K. Gray has sought to use media technology to explore creative opportunities. Together with his education career, Gray continues to produce original works that deal with meaningful topics and convey stories of significance.