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Taking Animation Project Learning into the Virtual Environment

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

1. Abstract

This paper demonstrates how a team of honours-level students extended their learning to explore a new area of game interaction, supported by an academic structure that provided flexibility, opportunity and encouraged independent exploration. This project 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, at a production quality level equal to an industry prototype. The academic structure similarly was required to show great flexibility and respond to the students needs with agility. Along this journey the students gained skills with advanced 3D modelling techniques, motion-capture, the 3D goggles Oculus Rift, the game engine Unreal Engine 4, as well as many other supporting skills such as script writing and concept art.

2. The academic environment

Prior to their 4th year honours level of study at Massey University School of Design, the students were well prepared for independent team-based study. Integral to the learning philosophy at this school is “design thinking” – which essentially is the design process applied to any problem solving exercise, including the development of an original project. The students formed a group of three early in the academic year, and decided quickly to explore VR in a games environment. Two of the students were assigned to develop the story and scenario. The Design School runs a research methods paper that precedes the major project paper, and this paper is designed to give students the appropriate design and research methods to explore any topic and develop this into a major project. The students research various theories of presence and immersion, several theories associated with game play, and also analysed existing games examples they considered to be successful. The third student at this time conducted technical research associated with the Oculus Rift and its operation with various games engines, settling on Unreal Engine 4 as the most effective platform.

The three students also brought in four other colleagues to help with areas where they lacked expertise – a project director, a writer, a sound designer and a composer. It

showed maturity amongst the students that they appointed a colleague who was not initially involved in this project to be their project director – to be the time manager, maintain workloads and ensure deadlines are met. This allowed the students to focus more on their respective skill areas – concept design, modelling, motion and the various haptic and technical challenges. Communication and workbook development took place using a Facebook Project page, which included the academic supervisors. Facebook allowed for communication to the team members who were in industry, outside of the school system. The school has its own Moodle based system, but this is only available to enrolled students.

3. Why VR?

At the 2015 Sundance Film Festival, the New Frontier program featured at least 10 Virtual Reality (VR) installations (PCWorld 2015). 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 is not only making a significant impact as a VR gaming headset and virtual environment (VE) interface, but is 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 make a strong and lasting learning experience. (Hodgkinson 2013). What VR can bring to the overall experience is a stronger sensation of presence. 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 (Vosmeer 2014). This implies that illusion of interactivity via VR within a movie may be sufficient to satisfy the illusion of choice.

4. 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 (Schuemie p184) 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 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 recipient 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.” (Schuemie p185). 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” (Slater et al) can be increased by reducing sensory input of the real world, the more immersive the VR experience will be. This of course could be reversed, and real world sensations could be increased to reinforce the VR experience, such as motion, temperature and haptics. Although, while the ultimate “holo deck” is interesting to entertain, this is not the scope of this project.

From the background research around 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 VE:

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 be 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 student team also analysed various mechanics of camera work, and how this affects an audience.

It was crucial that we all familiarized ourselves with cinema conventions and techniques due to our experience functioning more like a cinematic than an actual video game, although it features strong elements from each. Of particular importance to our project was the understanding of long duration one-shot sequences of up to five minutes long, as seen in films such as director Alfonso Cauron's *Gravity* and HBO's *True Detective* in order to avoid frequent cuts between scenes with the headset on. Based on our research and play-test results these cuts can easily disorientate the user, as there is no way to anticipate exactly when the cut is about to take place.

Figure 2: *Concept development*

5. 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. As discussed earlier, 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 determined 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 perceived along the viewer's pathway. Although viewers tended to focus mainly ahead, they also frequently looked up, down, and to the side, and occasionally directly behind. This meant that the landscape needed to completely surround the viewer at all times, in convincing detail.

6. The Narrative

The narrative itself takes place in a fantastical mountainous icy world, and explores themes of solitude, danger, fear, beauty and survival. After an initial moment of darkness to allow the viewer to settle in, the viewer emerges into a scene of cold air, snow and cloud, looking out onto 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.*

7. 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 the 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 tests 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.

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.

Figure 4. The hunter character is introduced

Figure 5. Motion Capture for the hunter

8. The Oculus Rift and Unreal Engine

Design software used included Autodesk Maya, World Machine, Vicon Motion Capture, and final assembly inside Unreal Engine 4. Native to the Oculus Rift VR headset, Unreal Engine 4 provided atmospheric effects and allowed for the strategic positioning of the many 3D assets to mask certain areas such as seams in the landscape as well as direct the eye towards specific areas of interest. 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 also includes effects, such as several moments of dense cloud which as well as providing ambience, lowers the viewing distance, thereby reducing processor demand and maintaining high frame rate and visual quality.

9. Viewer reaction and comments

The gentleness of the introduction was appreciated by all participants, and was also the time when conversations about the VR would take place. "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 4: User testing.

In regards to the narrative, viewers 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, the supporting details such as rocks, snow and ice became readily accepted. These environmental details tended to be accepted, and move into the background consciousness. Focus was instead shifted onto the key characters.

10. Summary

While immediate employment was not the aim of this project, all three students were quickly employed by high level industry: the main environment modeller was employed as a

games modeller, the student in charge of motion was employed as an assistant technical director in motion capture, and the artist was employed as a conceptual artist for cinema production.

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, and the limitation of movement and interactivity was not an issue. Once the mode of engagement was presented to the viewer, this tended to be readily accepted. The realism offered by the technology and the skills of the creators was convincing and very engaging. Overall this project suggests an exciting development to how viewers can explore, discover and engage with VR worlds, presenting an innovative approach to cinematic experience.

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Credit

Project Panopticon

Jacob Barrow – Project Director
Reuben Smith – Project Manager / 3D Artist
Alex Baur – Concept Artist / 3D Artist
Jack Nesbit – Concept Artist / Publication
Andrew Cunningham – Writer
Chris Swan – Sound Designer
Sam Logan – Composer

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Author 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 and Australia. 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.