Sp19 - Virtual Environments (27580)

Final Paper

Build Your World

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Introduction

As we move deeper into the era of technology, mental health is becoming increasingly important. As students, we are stuck behind a computer screen all day doing school work. Even after the school work is complete, we seek refreshment from some other devices, or most likely, the computer again. It is important to take time out of busy schedules to and participate in activities that allow us to disengage from our work. Our initial idea was of an environment where users could kick back and learn to paint from Bob Ross in a setting inspired by his videos. However, after a thorough Literature Review, we decided on a simple and calming environment where audiences can build their own world in a natural environment with peaceful music.

Literature Review

Our literature review was guided by two main principles: Presence and Immersion. We were looking for studies that helped us understand the effect of our ideated elements on presence and technological aspects would increase immersion.

For our original idea, we considered the typical human behaviour in dark spaces since, in his videos, Bob Ross usually appears in front of a dark backdrop. Mühlberger, A.(2008) uses an experimental approach to determine the effect of sudden stimuli in a dark environment on human reflexes while performing a dedicated task. So if we were to recreate a similar environment, we would need to be mindful of typical human behavior in dark spaces. The insights from this paper encouraged us to rethink our design due to safety concerns and lead us to change our idea in favor of a more bright and colorful environment.

According to Annerstedt, M.(2013), forest noises are very calming even on their own. This paper presents the results of a pilot study that gives a virtual environment representing

nature with and without the sounds of the forest. All participants have presented a stress-inducing scene, and then presented one of the two scenarios with or without the noises of the forest. It seems that sounds of the forest are a big help to make audiences calm in virtual environment. In addition, through the paper from Valtchanov, D. (2010), even though the virtual environment was obviously just graphical representations, the user still found it calming to walk through that digital forest. This paper goes over the calming effects of a nature representative Virtual Environment. Our application, Build Your World, is trying to create an environment with an element of calming nature and this study will guide us in designing the suite of elements that the user can use to build their world.

According to Cummings & Bailenson (2015), the nature elements and the headset itself were immersive enough that people still wanted to interact and look around for an extended period of time. This paper goes over methods of making virtual environments more immersive. Even though our application is simple, we aim at providing the user a sense of calm and peace. In order to achieve this, we need to ensure that the user is immersed completely into the environment.

The intent of our Virtual Environment is to provide users a space where they can kick back and temporarily forget about the ongoing stress in their life. According to Nilsson, S.(2009), virtual Reality interactive environments are now being used to distract children from pain during painful procedures. The environments used in this study were an amusement park and a Ferris wheel, but they were helpful in lowering the child's heart rate during the procedure and at keeping them calm. This directly applies to our application because adults could use scenes of nature to help them calm down and distract them from their worries.

In their paper, Scaife (2001), mainly describes methods to build a virtual environment from a design perspective. Several design methods like user-centered design and research methods like usability testing have been introduced and applied to a case study to illustrate how they are used in a practical project. These process and thinking process can direct us on how to build our virtual environment in the design phase.

Among the features we did not achieve in the demo, we intended to include a virtual agent, Bob Ross, to communicate and interact with audiences. In their paper Cassell, J., & Thorisson, K. R. (1999) talk about the power of nonverbal communication and the effect of cues like blinking, nodding, and hand gestures. Even if the user is not able to illicit intelligent verbal responses from the agent, incorporating these non-verbal cues would increase social presence. Also, in their paper, Nowak, K. L., & Biocca, F. (2003) run a 2 x 3 experiment to study the effects of anthropomorphism based on six hypothesis. They observe that medium anthropomorphism has higher influence on presence than low and high anthropomorphism. By following their experimental design, we can design a medium fidelity social agent that will ensure higher social presence.

Design Considerations

The original purpose of our idea of Bob Ross teaching the user how to paint or create their own world in a virtual environment was intended to be calming. The research behind that idea was based on several elements of research done in and outside a virtual environment.

We intended to have a dark background surrounding Bob Ross and our user for when they paint on their canvas to give a sense of focus and calmness on their task (Mühlberger, Wieser, & Pauli, 2008). We thought emulating the environment would strike a similarity with the

users' mental model created while watching Bob Ross paint on PBS. However, we had to reconsider the background in order to ensure user safety.

Bob Ross was the central idea of our application and calming and his soothing voice was the main mode of provide the users with a sense of calm. However, finding an embodied agent or avatar that looked like Bob Ross was even more challenging than we expected. The models that we found were creepy. We had to conclude that finding the ideal agent might be nearly impossible outside of trying to create one ourselves. Thus, we decided to think outside the box and focus on the elements of Bob Ross's words and the calming world that he created.

While jumping into our idea we knew that recreating the feel of painting on an actual canvas might be hard in a virtual environment. However, we were banking on the effect of the agent to compensate for that. When we decided to not include the virtual agent, we also decided to move away from the 2D canvas on to 3D world.

The prospect of making a virtual environment in Unity with everything on our original wishlist was challenging to say the least. Our project will be closer to a proof of concept of what can be done to create a simple Virtual Environment with a team of people who don't know a lot about Unity. There is research to back up simple virtual environments of nature or even virtual environments without an embodied virtual agent, but in an ideal world, designers would expect that the sky's the limit with Unity.

The Application

Build Your World aims at providing a calming environment which will allow the user to escape their stressful life and get one with nature. The user will initially be placed in a meadow which itself is extremely calming with soothing background music. Then the user will be

presented with a suite of elements from which they can pick and choose. The user is allowed to place as many or as little elements as they want. They can use the hand controller to move the elements along the X-Z plane. As the user places more elements, the music will gradually decrease to include white noise associated with the element selected by the user. Instructions, within the environment, are narrated by the soft female voice of Amazon Polly.

There have been some other studies showing how pictures of nature and a virtual environment representative of nature is calming after a stress-inducing task (Valtchanov, Barton, & Ellard, 2010). There is also evidence to suggest that paring noises from the forest with the virtual environment representing nature is also pretty calming to the user (Annerstedt, et al., 2013). Researchers in Sweden in 2009 were also experimenting if Virtual Environments without an embodied agent to interact with would be calming to children experiencing painful procedures in hospitals (Nilsson, Finnström, Kokinsky, & Enskär, 2009). The research proved successful in distracting the children enough to lower their heart rate and keep them calm during the operation that they needed to be awake for.

What do all of these research papers have in common besides nature and virtual reality? The researchers were able to achieve a certain level of presence and immersion for the users in their virtual environments, even when they were experiencing pain at the same time (Nilsson, Finnström, Kokinsky, & Enskär, 2009). Thus, there is actually a lot of hope for a team of people trying to create a simple Virtual Reality Environment without much Unity knowledge.

The question we need to ask ourselves in creating a virtual environment of nature meant to be used in various settings is how immersive is immersive enough? During our user testing on the last day of class, we found that several factors already implicated in the headset we were

using made our environment more immersive. Those for the Oculus Rift are stereoscopic vision, a wide field of view, quality of visual and audio content, and decent head-tracking (Cummings & Bailenson, 2015). We were able to incorporate the stereoscopic vision through a Unity download of Oculus Rift code to make sure our program would work on the Oculus Rift. The wide field of view was an added bonus of the headset and our 3D virtual environment, that we created in Unity, working together. The quality of the video and audio content totally relied upon the quality of the nature prefabs and the voice of Amazon Polly that we downloaded online. The measurement of immersion seems to be a balancing act. Some of the students in our class that we tested seemed to be startled by the smooth voice of Amazon Polly, where as other students though that it was Elizabeth's voice.

User Experience Measurement

We actually do not need to do anything complicated to measure our user's experience. The researchers Neale and Nichols that establish the Theme-based Content Analysis system, it "is a qualitative method that provides useful, detailed information about user opinions or behavior, and can also provide general indications of results in the user population by the grouping of data into meaningful categories." They recommend using the data collection methods of a short interview, open-ended questions, and user observation. They also state that the researchers would be able to do a lot of troubleshooting if they were able to view what the user was seeing through their headset on the researcher's desktop. This trouble shooting method is most similar to what we have used in class.

In addition, according to our literature review on presence (Lee, K. M. 2004), the short definition of Presence is just being there in the moment completely, but the definition can get

much more complicated. Since our current application allows users to place elements into the environment which is not similar to how it occurs in the real world, we need to measure the realism of the environment after they build it and the feeling of calm while interacting in our environment. A survey with open-ended question can include this.

Outcome and Meaning

From the observation and oral communication with audiences who test our demo, there are several findings.

First, music actually helps a lot. When music is in accordance with the virtual environment, it provides more immersive experience which audiences can experience the natural forest just like they do in physical world.

Second, the physical movement like grass and tree swaying like the real world make people feel more connected to the present. As we discussed above, short definition of Presence is just being there in the moment completely. It will be more effective, if audiences are still and natural objects are swaying.

Third, immersive experience comes from combination. It means that only one way to promote immersive experience does not work. Only a combination from visual, audio and even haptic will provide a highly effective immersive experience.

The meaning of “Build Your World” is a just small step to the our world and it exceeds our expectation. It means that the exploration in the virtual environment to replace the experience in physical world will actually work. For people who has disabilities and cannot go far away, virtual environment device can provide them with the seamless experience that most of people experience in the natural forest.

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