Educational Simulations and Visualizations in 3D Immersive Virtual Environments: Visionair project report, part 2.

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This is the report presenting the results from the 2nd and 3rd part of my Visionair visit. It was suitable to divide the stay into several smaller parts due to the adjustments that were needed to be done to the original project.

In the original project, I wanted to explore the advantages and limitations of Virtual Reality technologies (such as CAVE) as medical learning environments, as well as possibilities for practical realization and implementation. Another goal of my visit was to follow up the existing research initiatives between NTNU and UCL (2 earlier Visionair applications), aligning and combining the ideas in a joint research proposal.

Our team at the Norwegian University of Science and Technology works primarily on 3D virtual worlds for learning. So far we have predominantly worked with desktop-based applications such as Second Life and vAcademia, but started recently to work with Unity 3D. The visit allowed me to explore alternative ways of displaying our projects, especially in educational settings. During the 1st part of my stay, I mostly focused on trying different technology solutions to make our existing projects in Second Life and vAcademia environments to work with the CAVE. (I would like to express deep gratitude to Dr. David Swapp for his help with that). We have tried different solutions to make Second Life projects including our medical visualizations (Virtual Operating Room) working with the CAVE. Not all of these attempts have been successful, also because we did not receive the updated files from University of South California with whom we tried to collaborate on the project.

The technical problems we experienced with Second Life integration with the CAVE motivated us to focus on 2 other projects during my 2nd and 3rd visits, Aquaculture simulator (Figs. 1-2) and Granåsen ski jumping simulator (Fig. 3), both Unity 3D based. These projects are done in cooperation with Trondheim tourist authorities, Olympiatoppen (an organization that is a part of the Norwegian Olympic and Paralympic Committee with the responsibility for training Norwegian top athletes) and local salmon industry (Måsøval AS). Both projects have a goal of promoting Norwegian tourism, especially in the Trondheim area, and have already been previously tested with Oculus Rift at the Trondheim tourist office. The aquaculture simulator will primarily be used for training of future aquaculture workers, and for promoting Norwegian salmon industry, both in Norway and abroad. Granåsen ski jumping simulator is primarily targeted at general public and novices in ski-jumping who will have an opportunity to try out jumping from the famous Granåsen hill (a venue for several World Cups) in a safe and immersive environment. At the same time, with some modifications, the simulator could be used in some aspects of top-athletes training, as follows from the feedbacks from Olympiatoppen experts.

Following successful evaluation of these simulators with Oculus Rift, I wanted to explore the potentials of these demos in a CAVE environment. There are a number of reasons for that: the salmon farm company in question, Måsøval, plans to create a showroom with CAVE-like

technologies and is generally interested in different possibilities for visualizing and promoting salmon industry to different population groups. Also, many existing sports simulators use CAVE-like technologies (e.g. golfing simulators in Trondheim golf club) so it would be useful to explore similar possibilities for a ski jump simulator as well. Both simulators in a CAVE version have been evaluated with a subject who was also given access to the Oculus Rift version of the simulators. The results are currently being reported to the salmon farm and Trondheim tourist authorities. The experiences will be used for further development of the simulators.

To conclude, though due to some technical problems I was not fully able to explore medical visualizations, on the overall my visit has been very useful and has expanded my understanding, both conceptually and practically, of the potentials of using Virtual Reality for educational simulations and visualizations. I also got and tried out ideas for using Virtual Reality/CAVE-based visualizations in relation to other projects we are working on such as Virtual Afghan village for cultural awareness training, Area planning in government agencies, Virtual Aquaculture simulator and Granåsen ski jump simulator. Some preliminary ideas resulted in a demo paper "Simulating Extreme Environments with Virtual Reality" and had been be presented at the Military e-Learning & Smart Devices conference where I appeared as an invited speaker (http://www.militarysmartdevices.com/). The discussions during the visit also gave me some new ideas about preparing a Horizon proposal.

Figure 1. Aquaculture simulator in the CAVE, recreating Måsøval salmon farm at Frøya, Norway

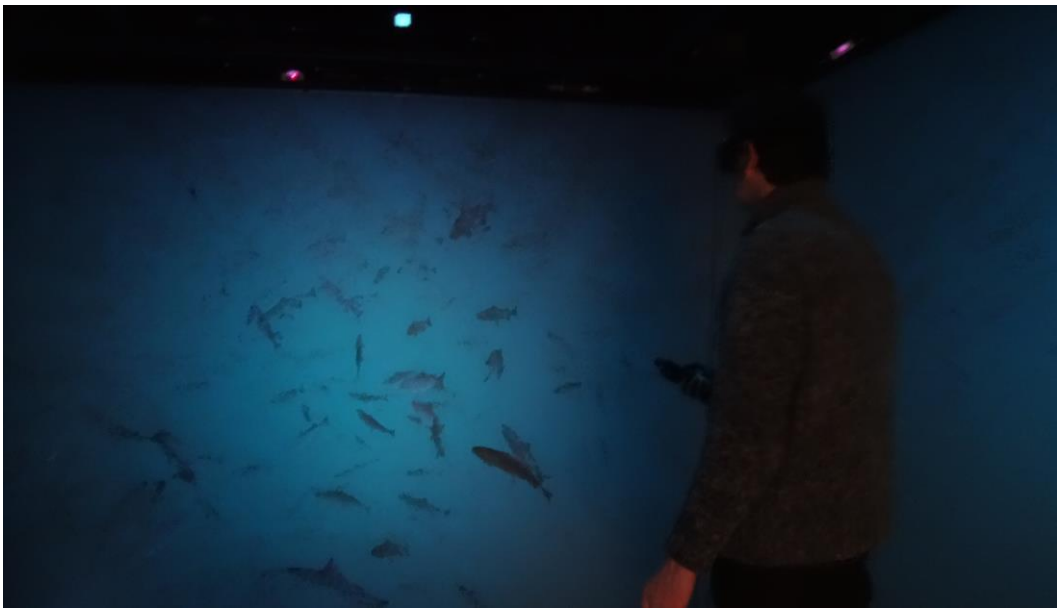

Figure 2. Aquaculture simulator in the CAVE: surrounded by salmon, view under the water

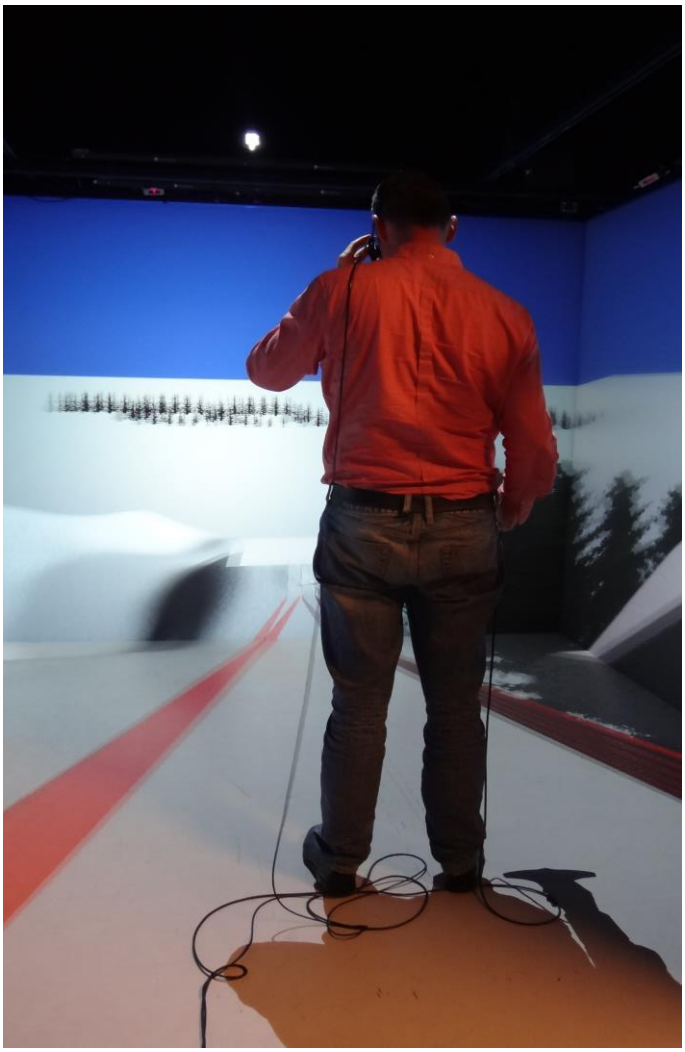

Figure 3. Ski jump simulator in the CAVE, recreating Granåsen ski jumping hill in Trondheim, Norway