Medical Educational Simulations and Visualizations in 3D Immersive Virtual Environments: Visionair project report, part 1.

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This is the report presenting, according to the original plan, the results from the 1st part of my Visionair visit. In this 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. 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 (Figs. 1-2). 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. We hope to solve the technical problems by the second part of my visit.

At the same time, the 1st part of my visit has expanded my understanding, both conceptually and practically, of the potentials of using Virtual Reality for educational simulations and visualizations, not only in relation to the core project (medical 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 (Fig. 3) and planned projects of Virtual Aquaculture simulator and Area planning in government agencies. The latter has synergies with another Visionair project. These preliminary ideas resulted in a demo paper "Simulating Extreme Environments with Virtual Reality" to appear in ACM Digital Library and will also be presented at the Military e-Learning & Smart Devices conference where I am an invited speaker (http://www.militarysmartdevices.com/). The discussions during the visit gave me also some new ideas about preparing a Horizon proposal. I plan to use the knowledge and the preliminary results obtained from the visit in future scientific talks and demos, but also as an input to a new Horizon proposal with the host laboratory.

During the 2nd part of my visit (September-October 2014), I plan to evaluate the medical projects visualizations we create in our Virtual Hospital in Second Life accessible in the CAVE either with medical experts or/and medical students at UCL to explore the learning potentials of the visualizations (especially in relation to Threshold concepts theoretical framework) and contribute to creation of a working demo for a joint Horizon 2020 proposal. I

will also continue exploring the possibilities of educational visualizations in a CAVE in relation to other projects we are working one, such as military e-learning, aquaculture simulation and area planning in public agencies.

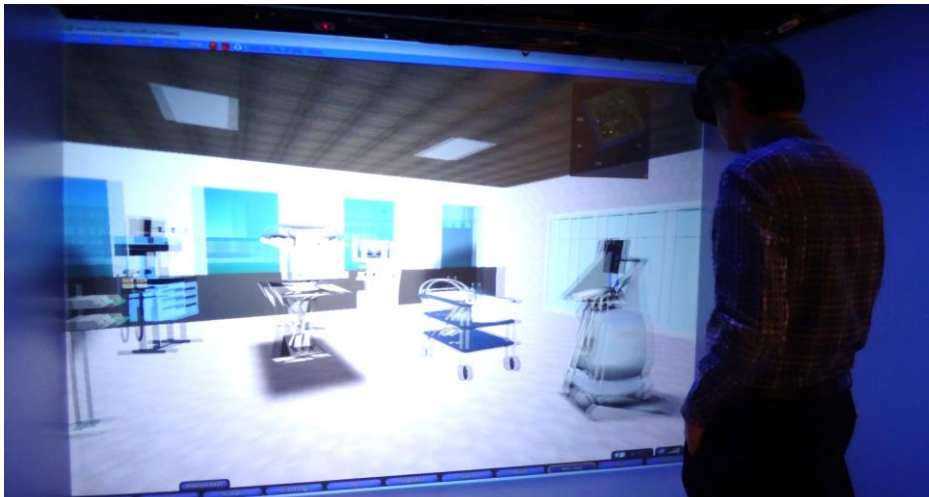**Figure 1. Virtual Operating Room in Second Life**

Figure 2. Virtual Operating Room in Second Life - stereoscopic mode with Dale's SL viewer

Figure 3. Virtual Afghan village in CAVE