Technion, the Virtual Reality and Neurocognition lab: Contribution to Euroversity

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Our mission is focused on the emerging novel technologies that allow a new experience of learning with virtual reality. It is expected that the novel technologies of virtual reality will become widely distributed and will extend the web from a symbolic 'flat' world into a conncted system of virtual worlds, especially with the new 3D inexpensive cameras.

In the spirit of Euroversity according to the goals of WP1 and WP2, we develop best-practice learning environments and design the technology to provide the tools for optimal learning. Our topics include science and technology teaching and learning content, with a special focus on physics, but practicing also enhancement of learning of general cognitive skills that are applicable across contexts. In an attempt to facilitate the transfer of core knowledge to new contexts, we developed a list of core principles, which are cross contexts, and of central importance for teaching in virtual reality independently of the context/content.in the following we provide a short description of our work, in the framework of the two main goals of Euroversity – 'good practice' and evaluation of learning. Then provide a list of core principles of transfer from specific virtual world teaching content to general.

Moodle: In addition to the above, which are based on novel emerging technologies, we also practice moodle for teaching and learning. The system is available to all teachers in the Technion, and all courses are based on the virtual tools of moodle. Moodle provides the content, the everyday changes, fine grain communication with individual students and with the group as a whole, collaboration between groups of students from remote locations,

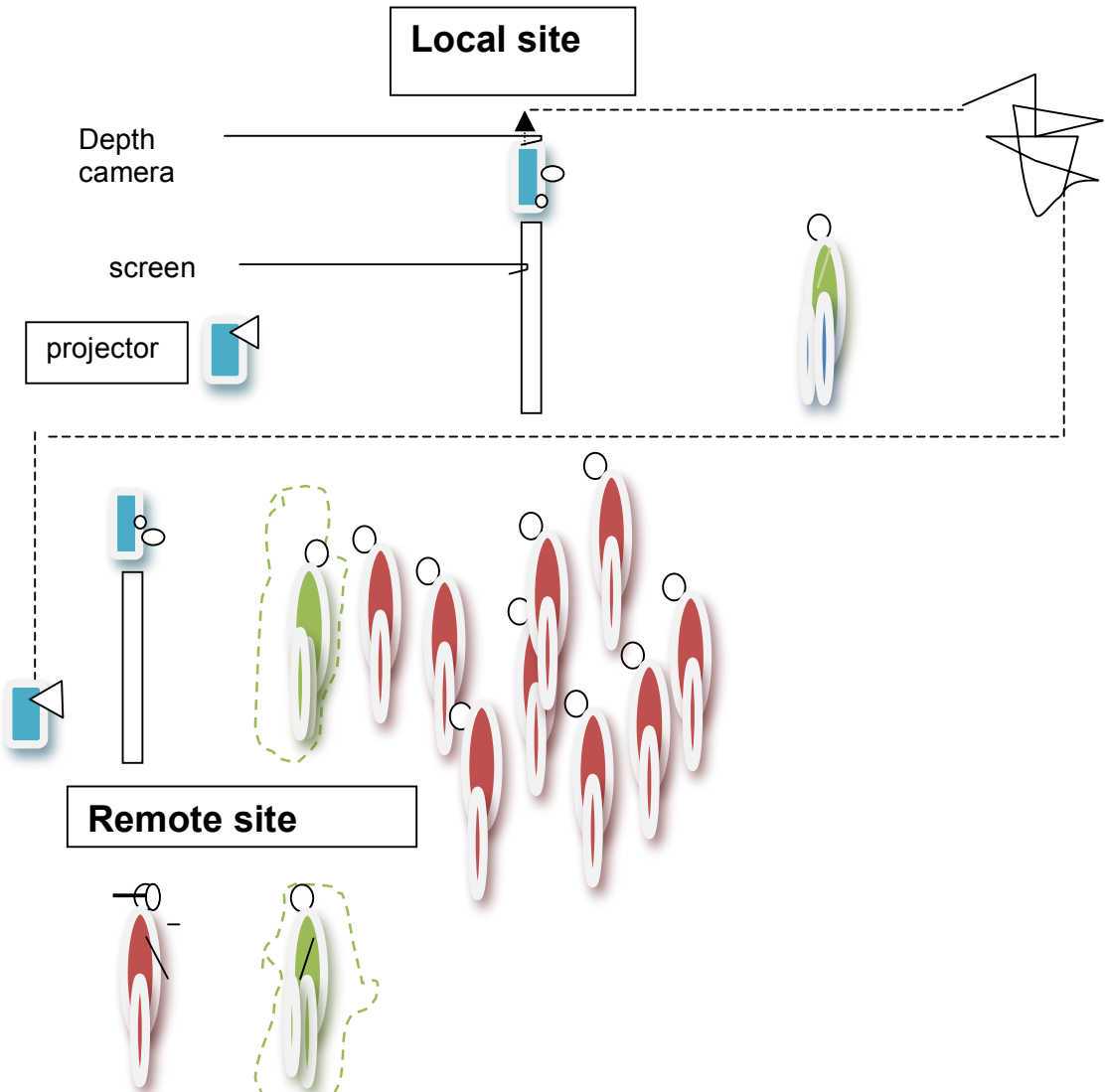
Courses: The novel virtual reality that allows 3D of realistic humans and objects, provides a new environments for teaching and learning. Students and teachers are extremely interested. In line with the Euroversity expected outcome to increase the community of experts on virtual reality in teaching and learning, we conducted several graduate courses in the Technion that focusses on the underlying mechanisms of learning in VR. There such courses, each a full semester were taught by Prof. Miriam Reiner: Design of learning environemnts in physics – with a special focus on virtual reality (#218132); Learning in the web: theory and practice (#218324); Imagery in

science and mathematics learning (#218327). Participants in all of the courses are Leading science and engineering teachers in Israel, with a major impact on future development.

Good practice in virtual worlds: this part will be divided into two: what is good practice from a technological point of view, and what is good practice from a teaching learning point of view. The first relates to appropriate technology for virtual world remote learning. The second relates to the application of such technologies: i.e. how do we use the virtual environment for teaching and learning.

Technological aspects of 'good practice':

Our technology consists of two units: a local unit and a remote unit. The local unit creates a model fo the teacher which is then transported to the remote location of the students. the model of the teacher is reconstructed in real time, so that the interaction between the students and the teacher are as if face to face. The units are described in figure 1 and 2. Figure one describes the technology of how a teacher is reconstructed to be transferred to the remote location.



Also possible with Google glasses, but with no 3D

Figure 1: virtual reality environment for teaching and learning, as if face to face.

<u>Good practice in virtual reality teaching-- optimal applications for teaching:</u>

We developed a teaching program on ‘measures and significance of blood pressure in the human system’ . the teacher actually shows the students through the system above how to use a system of blood pressure, how the system is build and what is the meaning of each part int eh system. The teacher discusses with the students as if face to face how the system functions, and the basic principles of measures of blood pressure. Being a vistual system,we are able to augment the visuals and insert the graphics of a virtual ‘heart’, which changes the bit and finction depending on the context. The relative position of the teacher and student are described in figure 2.

Figure 2: The teacher is in a remote place, and 'beamed' into the local site of the student. The teacher is presented and perceived in 3dimensions, i.e. the teacher is seen as if standing in front of the students. the students interact with the teacher directly.

Evaluation of learning in virtual reality

We developed two evaluation systems that are unique to virtual reality:

(1) we measure mental load due to sensory overload that might occur in virtual reality. The measure of the mental load is done by using questionnaires that were developed and repeatedly test in previous studies. The second is by using EEG systems that measures the mental load.

(2) we measure using standard systems the learning outcomes through tests and interaction levels of the students and teacher/s.

Within the context of advanced motor learning in virtual reality we looked at the mental load during performance and learning a new task in the virtual reality the relates to the abdomen (see figure 3). We are now in the process of analysis of the changes in mental load between 2D video style, and 3D virtual reality.

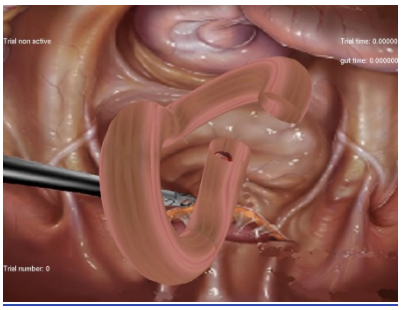


Figure 3. Virtual structure of the abdomen system for learning

Both of the above are still in a developments mode and are the focus of our efforts during the next few months for Euroversity.

Disseminations:

We have also presented the project in several talks: May 2013, IMI, Institute of Media Innovation, NTU – Nanyang Technological University, Singapore; SAN – Society of applied

Neuroscience, Telasoniki Greece 2011; Amdocs – the power of virtual reality for corporate tele-training;