**Submission : FYP Research Summaries (1 to 5)**

**By Qaisar Al Shah - 11601**

**The Role of Virtual Reality in Built Environment Education**

Margaret Horne &Emine M. Thompson

This research paper focuses on the particular issues that can possibly emerge while adding 3d VR, how can a VR aided system of learning can be merged with the current system and puts light on the analysis of such a system within an academic education system.

**Objectives**

▪ To justify and reason the need for 3D modeling and VR technology in the field of education.

▪ Integrating 3D and VR technology in already built learning environments.

▪ Cost-benefit analysis and issues in integrating the technology.

**Achievements.**

Research suggests that 3d modeling and VR demonstrations can be useful in education to the better understanding of design, visualizing features and processes, motivation in learning experience, and create a sense of immersive-ness in the learning process. Northumbria Univesity is an example of a 3D and VR based education platform which introduced and commissioned a VR facility called “Virtual environment”, in 2005. A basic procedure to introduce VR aided systems to tutors is to familiarize them with characteristics of VR systems, provided with an overview of types of VR, include VR in curriculum development and assistance in hands-on developments.

**Virtual reality systems enhance students’ achievements in engineering education**

Wadee Alhalabi

The various applications and advantages are thoroughly discussed in this paper which can go from VR’s use in medicine, entertainment, and different trainings. However, this paper specifically discusses the use of VR in engineering education and how useful this technology can prove to be compared to the traditional methods of teaching and learning. Three systems, Corner Cave System(CCS), Head Mounted Display (HMD) and HMD-Standalone have been put to a comparison. The study examines the effect of these systems on a total of 48 students with respect to their educational performance in comparison to those students using no as such VR aided system.

**Outcomes**

The study explains a small experiment where a number of students participated and their performance was measured by giving a few quizzes. The results showed that VR based learning significantly improved student performances. Out of all the systems, CCS, HMD, HMD-SA, No-VR, Head Mounted Display(HMD) had shown better results compared to the other two VR systems. The research also aims to compare between different topics under study, like arts, mathematics vs physics or chemistry. To conclude, results have shown that VR vs No-VR shows a quantitative advantage as more students involved in the environment.

**Assessment of STEM e-Learning in an Immersive Virtual Reality (VR) Environment**

Christian B. Rogers, Hazim El-Mounaryi, Tamer Wasfy, and Jesse Satterwhite

The following paper discusses the early finding from two research papers where using VR as an educational tool, computerized numerical control(CNC) as a grinding machine. The project was to create a virtual environment where students can be able to test and learn a CNC machine eradicating the need to sit physically inside a lab. Standard I/O devices like mouse and keyboard were also used to specify input instructions. The primary goal of the research was to test the immersiveness of such technology particularly in STEM fields of education.

Results based on the research showed that for organizations who cannot physically afford a CNC machine, a virtual environment can help and better fit as a training tool. Any institution that aims to better train their trainees with large scale equipment should consider VR as an emerging technology for their growth. Although there may be some physical teaching implications, it is important to consider the valuable interface and input with which students will train on. Both augmented and virtual reality tools can be used such as Oculus Touch or HTC Vive wands.

**Design and implementation of 3D Web-based interactive medical devices for educational purposes**

Maria Grazia Violante

The article discusses the use of medical devices and their integrated support with 3D web-based technology to create learning applications that will provide helpful background and practical training to medical devices. Devices like sphygmomanometer, electrocardiogram, and defibrillator are mentioned in the study which has been taken together as an e-learning package aiming to teach all elements of interactivity with these devices.

The training will help to benefit medical, healthcare, nursing professionals and will adapt to any community based healthcare and private health care settings/environments.

3D medical service applications have found to be highly interactive which can enable users to perform any task as if they were already familiar with it. This paper explains a student's measure to understand the perspective gained from 3D objects for learning. Results indicated that using such devices can ease and better help in terms of interaction even without any prior medical education. The use of such devices transcends to possibly all those people of any age who have different computer expertise. The paper concluded in favor of 3D devices to positively benefit students both in learning and practice.

**Virtual Reality Simulations in Physics Education**

Jong-Heon Kim, Kongju National University

This paper aims to develop an educational tool by building an interface which combines a 3D model of real laboratory tools and virtually visualizing physical situations in an immersive learning manner. VR physics simulation can enhance a learner’s understanding by a significant degree which is unattainable compared to a 2-dimensional non-VR interface. The paper, particularly in physics, aims for students to grasp concepts such as wave, optics, electromagnetic fields, relative velocity at high school and college levels using computer based VR simulation.

Possible outcomes from this research paper shows VR-physics simulations for distance and regular learning classrooms. It is evident from research that visualization of invisible quantities, hazardous and highly costly experiments can be replaced using VRPS. After assessment of one of the VRPS programs on topics such as ray optics, wave propagation, etc, it was found that students achieved higher in VR-learner groups. A survey result shown in the research paper substantiates that VR group students were more satisfied and experienced comprehensive learning thereby enhancing their interest compared to other teaching materials.