Virtual Reality for learning construction surveying

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This paper proposes the use of Virtual Reality (VR) as the enabling tool for delivering and learning construction layout and surveying. VR is used to provide an interactive learning experience through real-time computer generated imagery (CGI). The students learn and apply the theoretical part of the class through the interaction with the virtual surveying equipment in a virtual environment (VE). Our hypothesis is that the students’ exposure to the virtual surveying equipment and the ability to practice at their own pace without worrying about making expensive mistakes will enhance the learning experience compared to current practices. In current practices, the students have limited access to equipment, they are constrained by the schedule and the learning pace of other team members, and are limited to the type of accessible terrain where they practice the skills learned in the class.

The motivation for this paper comes from the challenges of teaching the basics of Surveying and Construction layout in the construction management curriculum where angles, distances and elevations are used to set up the building footprint at the correct location, establish level elevations and plumb vertical surfaces. The students seem to understand and grasp the theoretical aspects. Surveying concepts are founded in the geometry and vectors principals. However, when it comes to the application in the settings of a real life scenario, the students are constantly challenged in following all the steps to achieve the accuracy and precision that are sought by the surveying practices. Accuracy and precision are detriment to the success of any surveying task.

From the students’ perspective, the students would benefit more if they are provided with:

- One to one mentoring and guidance in the learning process
- Additional time to practice with the equipment
- Less dependency on team members
- Instant response on accuracy of measurement
- Access to standardized equipment

It has been the observation of the professors that accurate documentation of the individual student effort is not accurate. Students have to work with team members to complete the simplest tasks. It is not uncommon for good students to get penalized for the mistake of another teammate or the opposite case scenario. Currently there is one professor working with a group of students. To achieve the one to one training, one would need to have one trainer for every student. For obvious reasons, this is not practical or feasible to achieve. Currently students can be penalized for the mistakes or inaccuracy of one of their team members, a mistake not of their own. Students have limited access to the equipment
especially with larger groups and limited surveying equipments in laboratories. Students’ time to practice is limited to when their teammates are available for practice as well.

This study proposes the use of Virtual Reality (VR) to provide an interactive learning experience through real-time computer generated imagery (CGI) as the enabling tool for delivering and learning construction layout and surveying. The students learn and apply the theoretical part of the class through the interaction with the virtual surveying equipment in a virtual environment (VE). This will offer the students the possibility to control the system and be fully responsible for the outcome and the results of the choices. The students’ exposure to the virtual surveying equipment and the ability to practice at their own pace will allow the student to have immediate feedback, complete independence of the team members, monitored by the computer the student’s effort is documented and accurate feedback is given to the student. The computer will offer various types of terrains for the student to practice the skills learned in the class.

References