Abstract

Augmented Reality (AR) is the technology of adding virtual objects to real scenes through enabling the addition of missing information in real life. AR is an emerging technology which will grow from about $6 million in 2008 to more than $350 million in 2014. As the lack of resources is a problem that can be solved through AR, this thesis presents and explains the usage of AR technology for the education field. The thesis shows the different AR components for creating any AR solution. Through the thesis detailed study was conducted on the AR technology: the available display types, tracking techniques and the AR libraries which can be used for further researches. This thesis offers a close look on the technology stability, showing all the stages the AR technology went through. We introduce Augmented Reality Student Card (ARSC) as an application of AR in the field of education. ARSC uses single static markers combined in one card for assigning different objects, while leaving the choice to the computer application for minimizing the tracking process, which leads to lesson visualization and decrease the number of markers (package size). ARSC is designed to be a useful low cost solution for serving the education field, as compressing all the controls in one card notably minimizes the costs without sacrificing the educational benefits. ARSC can represent any lesson in a 3D format that helps students to visualize different learning objects, interact with theories and deal with the information in a totally new, effective, and interactive way. ARSC can be used in offline, online and game applications with seven markers, four of them are used as a joystick game controller. One of the novelties in this thesis is that during the ARSC research, a full dataset for the ARTag 1,001 markers tested regarding the efficiency value, and sorted according to their efficiency. The results of those tests are used in this research to choose the most efficient markers for ARSC, and can be used for further research. The experimental work in this research also shows the constraints for marker creation for an AR application. As we need to work in both online and offline application, merging of toolkits and libraries has been made, to give the ability to render 3D models with multiple texture types and enable the solution to render the non-uniform 3D objects without any shape deformation. ARSC was examined by a number of students of both genders with average age between 10-17 years and it found great acceptance among them.