EduXR – Education of The Future Powered By Extended Reality

Abhishek Bandivadekar*, Krunal Bharat Gediya, Kashmira Golatkar, Mahendra Patil

abhishekbandivadekar@gmail.com, kgediya0898@gmail.com, kashmira92golatkar@gmail.com, mahendrapatil@atharvacoe.ac.in

Publication Info

Article history:
Received : 14 February 2020
Accepted : 23 May 2020

Keywords:
Augmented Reality, Educational Technology, Image Processing, Machine Vision, Virtual Reality.

Corresponding author:
Abhishek Bandivadekar
e-mail: *abhishekbandivadekar@gmail.com*

Abstract

It is imperative to consciously use technology to make teaching and learning effectively in our education system. EduMR allows us to see the real world with virtual elements. The objective of this research is "Betterment of practical education delivered to engineering students." We are implementing it so that it can be accepted worldwide and can be implemented in engineering colleges at a reasonable cost. EduMR is an all-in-one Mixed Reality platform application for various education fields. It is based on the mobile collaborative ARVR system powered by 'Vuforia' Library. EduMR has an easy to interact UI, backed by powerful technologies such as 'Unity, Computer Vision, 3D computation'.

1. INTRODUCTION

One of the reasons for the lack of staff in the field of innovative engineering is the conservatism of the university academic community. It is unable to make changes to meet the challenges from the external environment, and at the same time, it keeps the will to preserve the passive learning methods. As a rule, the content of engineering curricula and educational technologies that are used today do not allow to develop those key competencies required by future engineers to be competitive on a global scale.[1] If integrated into the education system and implemented with a proper plan, current technologies can better understand the students, which can assist in the better development of the students. In the paper, we describe our efforts to develop one such system to enhance the learning process and make students future-ready. The mixed reality learning application described here is a teaching aid supplementing teachers' work in practical labs and lectures. It proposes to make the learning process in these subjects easy and interactive while cutting down the cost of actual machines/ apparatus/chemicals etc., making it easily accessible for many institutions. It also ensures students' safety while performing the same as compared to performing on real risky equipment. The students will learn fast and at the same time, they will enjoy it. Currently, the system being used in these fields is not involving and lacks users' active participation. Using the power of mixed reality, we can open doors to whole new learning experiences. Augmented reality could elevate the teaching experience by allowing a physical exploration of objects that in reality are not accessible, helping the learners to understand and memorize them better.[2] Research has shown that t for certain topics, AR is more effective at teaching students than compared to other media such as books, videos, or PC desktop experiences.[3]

2. REVIEW OF LITERATURE

AR has seen many developments. From earlier being used only to train pilots by providing them with simulations to make it available for the common user to aid in learning and understanding better. Not only has it made remarkable progress in the field of education but also in Medicine and Entertainment. Doctors are taught various surgeries virtually before they can perform it to get them acquainted with the system. There have been numerous video games developed under this technology.

Sports have also taken a dig into AR by coming up with a photo booth and takes pictures of the user with their favorite sports star as if they were present with them in real life. AR has been used to help special needs students by implementing a tabletop version of it.[4]

It has also made progress in the health sector as there has been an application wherein children suffering from diabetes are made aware of their condition and what measures they are supposed to take to get better. This done with the help of a game that helps them visualize the carb contents of various foods.[5]

Students are given demo field trip game modules to make them accustomed to the geosciences curriculum, increasing their interest in learning geoscience. Thus, AR can be used as a marketing tool too as it gives the user a more personal and lively touch about the experience.[6]

As AR is an ever-growing technology. It can be integrated with various other concepts and technologies thus improving the experience and learning structure multifold. For instance, it can be used together with concept maps to promote efficient learning. Students find it easy and gain much more clarity about the subject if done it with concept map AR.[7,8]

Studies show that using a Mixed Reality environment to perform laboratory-based experiments helps students understand students and help them perform experiments with greater ease and efficiency.[9]

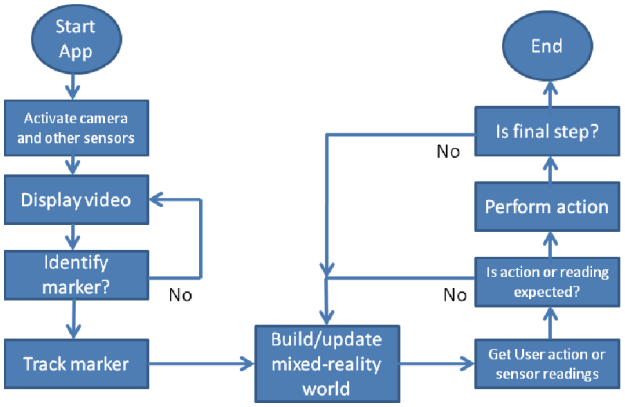
With helping the students visualize better, Mixed Reality also assists in increasing the emotional growth and connection of students with a particular topic. By providing the learner with proper messages, they can be made aware of certain facts that normal human-based teaching cannot achieve, thus making the learners acquainted with more information than what can be learned by reading through a book.[10]

Adaptive learning results in a personal touch that can be added to a syllabus to ensure that students partaking in the learning experience can develop their thinking and grasp the topics presented to them in their own pace and manner. Thus, designing an adaptive learning experience concludes in a learner with more curiosity to learn and develop.[11]

Using AR, VR and MR, teaching can be made as personalized as possible, making sure that the learner gets the best experience they can according to their liking.

3. PROPOSED SOLUTION

To aid in developing the AR engineering drawing application, current technologies such as machine vision and model targets can be used. There are two ways to carry out the rendering of the models: - (1) Maintaining a database of possible models that could be included in the curriculum. (2) Rendering the models on the fly. The first implementation is easy to develop but would be static and would not be useful in scenarios where the drawings are out of the curriculum. Therefore, implementing the later would be more feasible and future-ready. This AR-based application would use the student's drawings as model targets. Model target is a new target tracking technology included in the Unity game engine. Students would be prompted to scan all the views prepared by them on their drawing sheets. Upon doing so, the app would accept the various views provided as input and using machine vision would process them to output a 3D Model of the provided drawing. The machine vision would be working on a remote machine that would be running the Blender software. Using Python, the recognized image would be processed, and a model would be formed. This model would then be fetched by the application from the server and presented to the student. Our AR application would be running on *mobile device name* and could also run on any of the new devices consisting of AR Core. Augmented reality is a complicated field with its main credibility lying in the models used and the user's environment. The user interface playing a major role in making the user understand what is being taught has to be of the finest quality. The target images would be the example image shown in the question paper. Upon scanning it, the rendering algorithm works in the database after taking the readings from the question paper and generates the model to display. The model is sent to the AR application and it is displayed onto the mobile device, which helps the user visualize the 3D model of the diagram, therefore, helping them understand it better. The default way Vuforia works is with Image Recognition. Image Recognition, also called Tracker Recognition or Image Tracking, is the process by which the camera detects a predetermined image and knows what to do with it, such as rendering some content on top of it. This works best when the tracking image matches the content in some way; for example, floorplans to render a building might work well on top of a picture of a building. It's critical to select a good tracking image. When using Vuforia, you can upload your chosen image to the developer portal to see how well it'll track, which is something you should do before you start development. The developer portal gives your image a rating, but more importantly, it'll show you



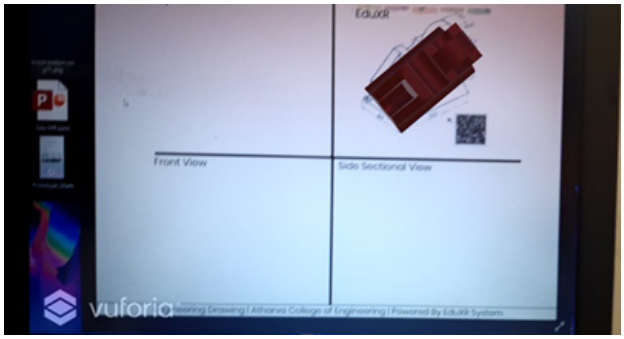


Figure 1: The top view of the model to be drawn.

2010-2019 S-JPSET : Vol. 12, Issue Supplementary-1, ISSN : 2229-7111 (Print) and ISSN : 2454-5767 (Online)

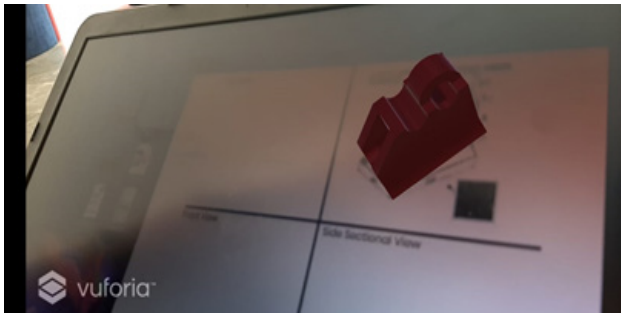


Figure 2: The side view of the object.

Figure 3: The front view of the object.

the "feature points." These feature points should be densely spread around the image with no repeating patterns for a good tracker. At runtime, the camera looks for these feature points to help calculate where to position itself in relation to the image.

4. RESULTS

Using this, a student can derive a better idea of the object that has to be drawn. Therefore, it helps them to draw it better.

5. ACKNOWLEDGMENTS

This work is carried under Professor Mahendra Patil, Computer Engineering Department's guidance and supported by Atharva College of Engineering.

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