International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 02 | Feb 2020 www.irjet.net p-ISSN: 2395-0072

Application of AR in Education

Gokul Kombath[1], Kiran Patil[2], Sachin Hake[3]

[1,2,3]*Student, Dept. of Information Technology, Atharva College of Engineering, Malad, Mumbai, Maharashtra*

Abstract - *Computer-based training is developing rapidly nowadays. Visual education is quite common now in higher education as well as in primary and secondary education. Students have been learning from books and videos but with AR they can see objects right in front of them and thus can learn in a more interesting and intriguing way. Visual education also reduces the use of paper work which has been the traditional method of education for centuries.*

Studies show that augmented reality (AR) and virtual reality (VR) have strong potential in various fields of education. This paper presents an introduction and explores the potential of augmented reality in education which helps the students understand the difficult concepts or hard to imagine concepts with ease. AR technology offers a highly interactive, immersive virtual experience. At the same time it also presents some platform-specific challenges. In future, it might be possible to remove those challenges and further advancements in the field of Augmented Reality.

Key Words: Augmented Reality, Virtual Reality, Unity 3d, 3d models, Education.

1. INTRODUCTION

In recent years, there has been a huge impact of technology on education. Education as we all know is the most important thing in the world. It helps people to understand the world around them and also makes them independent. There are imperfections and challenges in current education systems such as accessibility, funding, autonomy, one-size-fits-all approach and big changes in future jobs indicate teachers need to employ new methods for improving education. If education can be augmented with the help of technology then it can help to achieve new heights and even create new to achieve.

The introduction of such new technologies is to motivate young minds and also to engage them in to the learning process. The use of many important emerging and advanced technologies such as Artificial Intelligence (AI), Cloud Computing, Augmented Reality (AR) etc. can obtain effective results in the field of education. One of the most important features of augmented reality is that it gives the sense of reality. Today, augmented reality is used in the fields of medicine, military, engineering and education. The use of visual technology in the process of learning and teaching in education ensures the effective presentation of practical expressions in traditional courses.

In this paper, we address Augmented Reality technology for improvement of learning process. According to Dale's Cone of Experience, learning by doing direct experiments (bottom of the cone) is more effective than being just the spectators at the abstract level (top of the cone). At the bottom, learners have opportunities to sense and understand their new knowledge in real life with learning contexts. AR technology can be embedded at the bottom level of the cone which will help to enrich the environments where students can learn with the help of all five senses.

Augmented Reality

There are two widely known technologies AR and VR which are similar to each other. Augmented Reality (AR) is the technique of adding virtual objects on top of real objects. Users will get an amazing view of 3d models getting mixed with real environment to produce a stunning visual. This can be experienced by using AR glasses.

Virtual Reality

In Virtual Reality (VR) the entire environment is created virtually and the user can experience the virtual objects with the help of a special glasses.

Unity 3d

Unity3D is a powerful cross-platform 3D engine and a user-friendly development environment. It is used to develop 3d games and applications for mobile, desktop, the web, and consoles. It is easy enough for beginners and powerful enough for experts.

1.1 Aim

The aim of the paper is to present the potential of augmented reality in the field of education by developing a system which will help students to understand the difficult concepts in education easily.

1.2 Objectives

The objectives of this system are to:

- Improve collaborative capabilities.
- Improve effective learning process.
- Make learning engaging and effortless.
- Provide opportunities for more authentic learning and appeals to multiple learning styles.

- Provide each student with his / her own unique discovery path.

1.3 Scope

It is highly likely that AR can make educational environments more productive, pleasurable, and interactive than ever before. AR not only has the power to engage a learner in a variety of interactive ways that have never been possible before but also can provide each individual with one's unique discovery path with rich content from computer-generated three-dimensional environments and models. AR applications can become the backbone of the education industry. Apps are being developed which embed text, images, and videos, as well as real–world curriculums. Printing and advertising industries are developing apps to display digital content on top of real-world magazines. With help of AR, travelers can access real-time information of historical places just by pointing their camera viewfinder to subjects. AR is helpful in development of translation apps that can interpret text in other languages for you. Location based AR apps are major forms of AR apps. Users can access information about nearest places relative to current location. They can get information about places and choose based on user reviews. With the help of Unity 3d Engine, AR is being used to develop real-time 3D Games.

1.4 Problem Statement

Many students find it difficult to understand the difficult concepts that are taught to them in school or college. The reason for that is students are never taught to learn with all their five senses. This system proposes a system using AR to overcome the challenges regarding education that students face commonly. AR technology has an ability to render objects that are hard to imagine and turn them into 3D models, thus making it easier to grasp the abstract and difficult content. This is especially good for visual learners and practically anyone to translate theoretical content into a real concept.

2. LITERATURE REVIEW

Virtual and augmented reality can be used as a game-based application so that students find it even more interesting while learning the concepts. Gaming scenarios and virtual environments have shown beneficiary results in Engineering Education [1]. Building Information Modelling (BIM), besides a modelling technology, is also an association of procedures to analyze buildings, develop and communicate information. Various aspects of BIM technology have been integrated and explored to enhance teaching and learning processes.

Many students in remote areas are not provided proper educational environment to complete their basic education [2]. They don't have basic elements which are required in any educational institutes to provide education. Such as enough qualified teachers, building or environment where they can learn etc. Various AR technology devices like Microsoft HoloLens, Meta 2 etc. can be used to overcome the challenges students face due to lack of educational resources.

In the fields of engineering, image processing can be used to improve images in visual courses in the fields such as Geology, Civil Mining engineering etc. In addition, it can be easily preferred and applied in the departments such as Chemistry, Biology and Geography in the field of Science. In this study, image processing - based approaches have been developed to ensure more effective learning of the courses in higher education [3].

Technology has been growing fast and noticeably influencing different aspects of life such as education. Studies have revealed that (AR) and virtual reality (VR) have strong potentials for helping students to improve their skills and knowledge [4]. In fact, bridging AR/VR and education can bring teaching and learning experiences in an attractive and effective way. The review paper initially presents an introduction to and definition of AR / VR. The ongoing research and latest products that have pedagogical values and potentials to improve educational systems is studied. Then the capabilities and limitations are highlighted to identify what AR / VR can provide for learners and teachers.

Mixture of both Augmented Reality and Virtual Reality can be used to develop a navigation system which use non-linguistic information such as symbols, marks and pictograms, and to support the tourist excursions by making it possible to collect, accumulate, share and utilize tourist spot information. The usefulness of this system, especially when used outdoors, can be summarized in the following three points: 1) Reduction of constraints of time and space: Because the system can provide non-linguistic information with or without a recommendation request using AR technology, users can acquire appropriate information anytime, anywhere. 2) Realization of a dynamic real-time situation: By taking account of each user's situation and the information that becomes a topic on Twitter, the system can provide users with information relevant to each situation in real time. 3) Reduction of the burden of information acquisition: Because the system can provide information relevant to the situation at any time using mixed AR/VR technologies, the occasions for users to acquire information via terminals are reduced, enabling them to engage in efficient tourist activities [5].

Professionalism and communication skills are important aspects of medical training, and virtual patient applications can offer cost effective, easily accessible platforms for communication practice which complement flexible, student driven medical school curriculum design [6]. This paper explores potential advantages and disadvantages Virtual and Augmented Reality (VR / AR) technologies offer to the development of a virtual patient application specifically for communication practice- the Emotive Virtual Patients - with a natural user interface. A potential virtual patient design framework is discussed, and the unique benefits and limitations of VR / AR devices are analyzed.

The placement of an external ventricular drain is one of the most commonly performed neurosurgical procedures, and consequently, is an essential skill to be mastered by neurosurgical trainees. This paper describes the development of a simulation environment to train residents on the acquisition of these targeting skills before attempting the placement on live patients [7]. The platform is coupled with an augmented reality image-guidance tool, developed in a lab, to help with the visualization of the ventricles in the patient's head.

3. PROPOSED SYSTEM DESIGN

We first explore a 3d model that is related to the subject. Then the appropriate Image Target is chosen. The Image Target is then scanned and stored in unity cloud. The target is then processed and we can add animations and other effects to the model. After rendering the module of the virtual object, the virtual model is displayed. We can also add voice and descriptions related to the model.

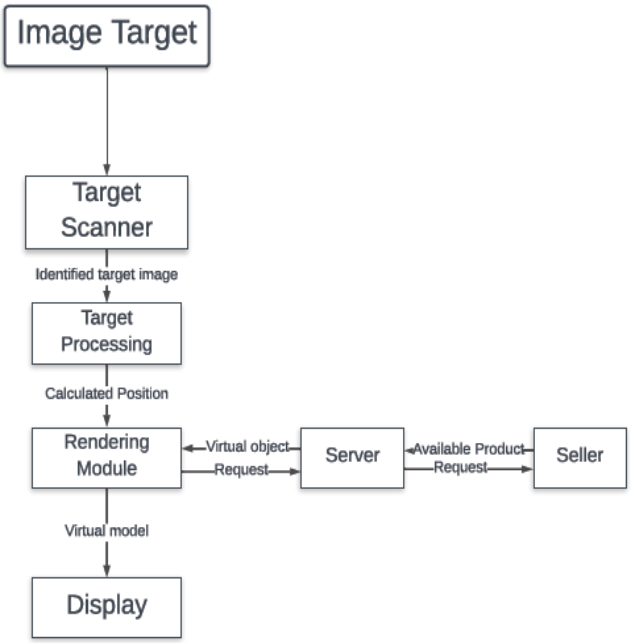

Fig -1: Proposed Design

4. HARDWARE AND SOFTWARE

1) Unity 3d

Unity3D is a powerful cross-platform 3D engine and a user-friendly development environment. It is used to develop 3d games and applications for mobile, desktop, the web, and consoles. It is easy enough for beginners and powerful enough for experts.

2) Microsoft Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code.

5. REQUIREMENT ANALYSIS

The basic requirement for a mobile based Augmented Reality Application for supporting education are as follows:

Students

Students are the ones who will be using the application based on Augmented Reality. They are the reason the application is being developed. They will use it to understand the concepts that are hard to imagine by scanning the Image Target. The scanned Image Target will then display the corresponding 3d model for which it was saved in the database. The Image is saved by Image Processing into the database.

Object (Image Target)

The Image Target plays a vital role in this application. The Image Target is saved in the database of the application along with its corresponding 3d model. When the image target is scanned using the application it will display the 3d model on top of it along with a user interface.

3D Model

The 3d models will be animated using c# scripts and audio and video can also be included within the models.

Application

The project is created in Unity 3d and then converted into an apk file. The converted files include all the assets, 3d models, image targets and all other resources which are imported into the apk file.

6. METHODOLOGY

The project progresses by the exploration of a 3d model. An Image Target is created manually or it can be chosen as an image, portion of a book or anything with a surface that is not plain. Plain Image Targets are not feasible as they are hard to detect. The 3d models are superimposed on the selected Image Target. The information of the 3d model and the Image Targets are stored in the database that has to be imported from the Vuforia Development Portal.

The 3d model can be projected on a user defined Image Target when the application is running or it can be set to a fixed Image Target. After projecting the 3d models on the Image Target, basic animation can be provided to the 3d models. The animations are provided using c# scripts. The scripts can also be used to include sound files and even video files.

7. CONCLUSION

In this paper, we have attempted to show the capabilities of Augmented Reality in the field of education to some extent. Technology is progressing at an incredible pace. It has impressed and influenced our lifestyle. It also has affected our education system. Furthermore, AR can motivate students to engage them more in the learning process. It also allows the students to have a virtual experience of the concepts.

REFERENCES

[1] Fabio Matoseiro Dinis, Ana Sofia Guimaraes, Barbara Rangel Carvalho, Joao Pedro Pocas Martins, "Virtual and Augmented Reality game-based applications to Civil Engineering Education," IEEE Global Engineering Education Conference (EDUCON), April 2017.

[2] Shafaque Zareen, Sumbul Ghulamani, "Educating Students In Remote Areas Using Augmnented Reality," International Conference on Computing, Mathematics and Engineering Technologies (iCoMET), 2018.

[3] Orhan Yaman, Mehmet Karakose, "Development of Image Processing Based Methods Using Augmented Reality in Higher Education," 2016.

[4] Hadi Ardiny, Esmaeel Khanmirza, "The Role of AR and VR Technologies in Education Developments: Opportunities nad Challenges," International Conference on Robotics and Mechatronics (IcRoM), October 2018.

[5] Marzieh Aliabadi Farahani, Kayoko Yamamoto, "Development of AR/VR Navigation System Using Non-Linguistic Information," The 11th International Conference on Computer Science & Education (ICCSE), August 2016.

[6] Marjorie A. Zielke, Djakhangir Zakhidov, Gary Hardee, Leonard Evans, Sean Lenox, Nick Orr, Dylan Fino and Gautham Mathialagan, "Developing Virtual Patients with AR/VR for a Natural User Interface in Medical Teaching," 2017.

[7] Sandrine de Ribaupierre, Ryan Armstrong, Dayna Noltie, Matt Kramers, Roy Eagleson, "VR and AR Simulator for Neurosurgical Training," IEEE Virtual Reality Conference, 2015.