

Improving the Quality of Online Education through Virtual and Augmented Reality

K. Dinakaran, K. D. Thirumal, P. Valarmathie, M. Suresh

Article Info

Volume 82

Page Number: 3113 - 3118

Publication Issue:

January-February 2020

Abstract

Make education as an easier and powerful, the government and other organizations are taking so much of initiatives and devising new methods. Among this, online education is a powerful mode of study irrespective of the field of education ranging from engineering and science to medicine. Institutions started offering online education through e-learning and mobile learning but still it requires some powerful platform in order to entice the students to take part in these kinds of online education. It is found that virtual reality and augmented reality are the two major technologies that will certainly help the institutions to achieve their goal. These two technologies are not devised for this purpose initially but later found that they will definitely play a major role in the field of technical education. In this paper, it was discussed all about the virtual reality and augmented reality and its applications in the education sector.

Article History

Article Received: 14 March 2019

Revised: 27 May 2019

Accepted: 16 October 2019

Publication: 19 January 2020

Keywords: Virtual Reality, Augmented Reality, e-learning, mobile learning, pedagogical approach.

I. INTRODUCTION

Online education is getting powerful and popular now a day's irrespective of the field of education ranging from engineering and science to medicine. There are universities and educational institutions across the world that are started offering online education through web technology and mobile technology. It is also referred to as e-learning and mobile learning.

In India particularly institutions like IIT's are offering online courses for students studying in schools and higher education institutions named NPTEL in order to improve their educational quality and accessibility. In addition to that, Govt. of India is offering online courses in the name of SWAYAM in which the students can enroll to the courses offered by SWAYAM and the certificate will be given after the successful completion of the registered course. This helps the aspirants of students and public those who are not able to spend money for their study for example in regular mode so as to fulfill their educational requirements. Students studying in schools from 9th standards to plus two education can choose the course and can

use the grade score obtained from SWAYAM in their regular study that means the credits will be considered for their promotion to the next class without appearing for the same course in the examinations conducted by the institutions.

Learning Off-Campus

Which is very flexible, easy accessible and inexpensive one, there are different kinds of off-campus learning modes available in our country. They are distance learning, online learning and e-learning. Nowadays, online education is as popular as on-campus education and more students are preferring to this mode of education because of easy access and cost effective.

II. ONLINE LEARNING

It is an innovative learning approach which facilitates learning as open, flexible and distributed environment. In conventional education system, the students are listening to the teacher by physically sitting in a class room and it is a time specific one whereas in online, the students can be anywhere in

the world and received the same high quality education.[1][2].

Proliferation of Information and Communication Technology and its impact on higher education gained significant attention [3]. An advent of digital technology has resulted escalated the use of e-learning in higher education. [4]

Since we are focusing on modern trends like mobile learning, on-line learning and e-book learning so as to provide students increased access to learning resources and the experts to assess their capacities and extend the learning beyond the limitations [5]. Exposing students to rich knowledge helps them to develop deep knowledge and skill sets such as communication, collaboration, critical thinking and creativity.

III. VIRTUAL CLASS ROOMS

Virtual Reality (VR)

Virtual reality, earlier it was used mainly in video game industry, later it was found that it can be used in education and training, as it gives way to immersive learning. VR enables the users and developers to enter a 360° video shot or created 3D immersive environment. Also, it is very useful in education learning languages, to get connecting to many learners in the same virtual space [10].

Fig. 1 shows the availability of different reality techniques that can be used to enhance the comprehensive power of learners. In this digital world, we are focusing on and analyzing huge volume of data for improvement of learning methodology, VR provides an opportunity to break the routine practice of conventional learning and discover a new pedagogical approach and revolutionize the classroom.

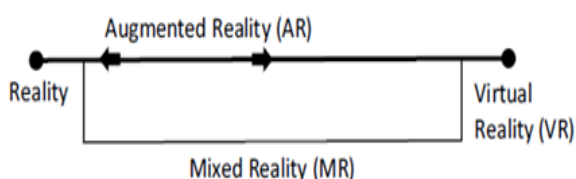


Fig. 1 shows the flow of Reality, Augmented reality and Virtual Reality

Console, Mobile and Standalone VR

A VR Console is designed in such a way equipped with motion sensors compatible for better gaming and visual experience. Virtual reality gives a realistic experience than gaming consoles though it was equipped with advanced technology. Mobile Virtual reality which is aims to offer users ubiquitous and high-fidelity experiences. This will pay a way for the users to access VR anytime and anywhere, regardless of whether they roam or remain static in indoor/outdoor settings if happened [6],[7].

Another type of VR called standalone VR sits in the middle of these two virtual reality and augmented reality services and possible with a good quality and low cost. There is a special quality which makes it differ from other two technologies is it does need a mobile phone or any computer devices for its operation, they work out of the box.

Advantages of VR technology

Which provides visual representation of an object and do close examinations on it to understand the features. In addition to that which breaks the barriers of education is difficult for disabled people and enhance the real life experience.

Augmented Reality (AR)

AR is being used in apps for smart phones and tablets. AR applications use our phone's camera to show us a view of the real world in front of us. These can be used for fun, such as the game Pokémon GO, or for information, such as the application view. Application layer will show the interesting things we visit. It also helps us to find money machines, get details of real estate for sale, find entertainment in all aspects.

IV. VR AND AR IN THE EDUCATIONAL INSTITUTES& RESULTS

Education is an essential element of our society which gives us knowledge. It is important to take advantage of modern technologies which helps us to achieve the goals. Virtual Reality (VR) and Augmented Reality (AR) are the two such suitable technologies to find out the better ways for present educational system. Now days, Technology is

growing fast, but the limited availability of educational resources and lack of trainers led to some issues. In addition to this, people have limited physical abilities not able to reach out the technologies. In order to overcome these kinds of problems, implementing AR/VR technology into education will make a difference.

Current education system requires new technologies which is a powerful and relevant one to face the ever-changing world and be effective at realizing its mission. VR and AR are found to be technologies that give logical steps in the evolution of the Education System. Since, everything is transforming to digital, developing educational content in the form of digital is a much more difficult process that requires tight collaboration and flexibility, that too when you deal with school kids. Here the accuracy of the content and the audience to be targeted both are important [9].

Another main challenge in the development of conventional VR education application is that you have to create many of the elements from scratch. However, it is possible to create apps that give teachers the ability to construct AR / VR applications for educational purposes from building blocks, using accessible toolboxes and templates [11].

Impact in Medical Science

There is a rapid changes in surgical training over the past years, as a result, it concerns about the development of future surgeons. Changes take place in the structure of cancer services, working hour restrictions and a commitment to patient safety has led to a reduction in training opportunities. Virtual reality (VR) simulation has been a sign as an effective adjunct to surgical training. Advances in VR technology has allowed learners to practice in real time with safe and controlled environment. It encourages mistakes that are permitted and can be used as learning points. It is found that considerable evidence to demonstrate the VR that can be used to enhance technical skills and improve operating room performance.

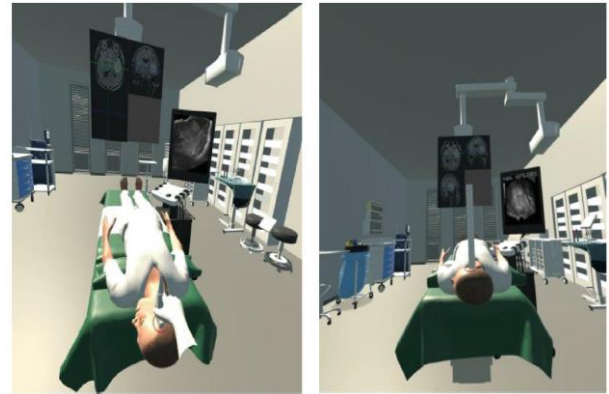


Fig. 3.1 Usage of navigation system and ultrasound

Virtual hospital will help students to learn and find solutions for variety of clinical problems at their own pace. This situation focusing on pre-operative neurosurgical procedural training was developed and tested. Fig. 3.1 shows the procedural training has been enhanced with real world medical data (MRI and ultrasound). The feedbacks from the tests have been generally positive, both in terms of general user experience and expected learning outcomes.

Impact in Engineering and Technology

Engineering programs began expanding to both synchronous and asynchronous online course delivery in the late 1990s, but this medium could also be viewed as a new technology advancing tele-conferencing and video-conferencing that were in already used for at least a decade prior.

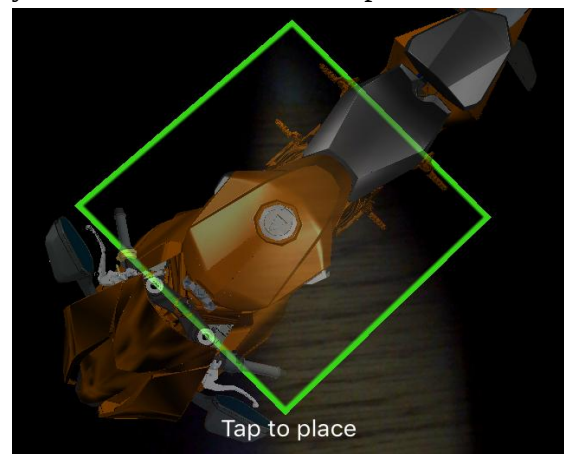


Fig. 3.2a – Initialization of Spatial tracking to project a motor cycle model.

However, as a field, engineering has generally been much slower to move online than many others.

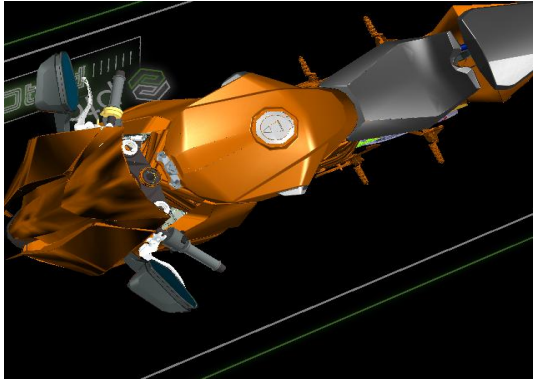


Fig. 3.2b – Full view of motor cycle during spatial tracking

Due to complicity involved in the engineering education, the online learning becoming a little bit tougher comparatively, in the field of automobile engineering all the equipment needs to depict with proper dimensions with all the three X, Y, Z axis. Once the engineering components are design in 3D module, the same can expanded, without needing to carry any added costs of attaining additional faculty, space, and equipment. Most important the wastage and the damage made to the environment also getting reduced. With the help of spatial tracking experience in AR, details about the engineering components can be educated more efficiently.

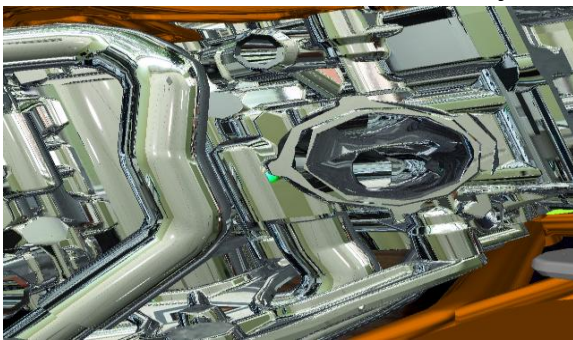


Fig. 3.2c – Zoomed in view of motor cycle engine

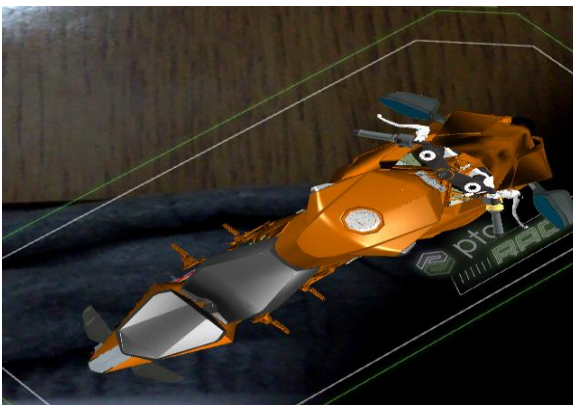


Fig. 3.2d – Rotated full view of motor cycle

To start with we need to find a plane area to initial an engineering component as show in figure 3.2a, once the initialization is done then we can able to project the full view of the object on top of the plane as shown in 3.2b. With the help of gesture or tapping the objects can viewed in detail as shown in 3.2c and also the same can used to rotate the object as shown in 3.2d.

Impact inoff-campus learning paradigm for differently abled persons

All new recent year technological developments will provide the ability to make use of all the innovative tools and technologies in the field of education for differently abled peoples. Number of learners with different-abilities or learner with disabilities is growing in a significant number across globally in online education but the conventions system haven't provided their specific needs to create all-inclusive learning experience for education.

Virtual Reality versus Augmented Reality

Both the concepts are seems to be similar but different in reality. VR take us to the different environment and create a feeling of being in a virtual world whereas AR adds something to the present state and does not take us to anywhere. It will augment something like clear visors [12].

For instance, in VR you can play with tiger but in AR you can watch the tiger come out of your business card.

Virtual Reality

In virtual reality technology , we can create virtual environment. VR may be artificial that means an animated scene. With the help of VR, it is possible to move around and look in all directions around the environment. An important application related to virtual reality is Oculus Rift than Google Cardboard or Daydream View. VR can explore places you have never been, such as the surface of Mars, the top of Mt. Everest, or areas deep under the sea.

The method of immersive learning help students can immerse themselves in a seabed environment to learn marine biology. It works with a tablet in which the teacher activates scenarios that students will see

through virtual reality glasses. The teacher knows who are seeing what appears on the screen using this technique. It is possible to know what animals are vertebrates and invertebrates, and children should point them by looking at them. In addition to that, the teacher can know who has seen it and who has not, who is mistaken and who is not [10].

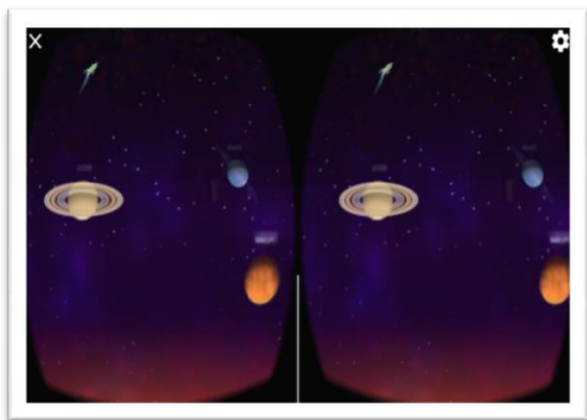


Fig 3.3 Virtual image taken from the Solar System Video on Youtube



Fig 3.4 Virtual Reality image of the Game GTAV

There are also many videos available on YouTube rather than games or applications we use for our educational purposes. The videos with Binocular symbols on their bottom help us to turn to the VR mode and avail the features of a virtual world. ie. If we watch a solar system video in YouTube with the VR mode and set the quality to 1080p, you will definitely feel greater than on apps or games as shown in the fig 3.4. This will enable the Learners to learn the concepts quickly and easily.

V. CONCLUSION

In this paper, we have discussed about developing an enhanced online learning environment designed for procedural training in VR. Initial development deployment of VR could be more time consuming.

However, with a well designed user interface, and wary guidance, it is achievable to have novice users interacting with the virtual world with some degree of proficiency after minutes. Designing of educational applications is a complex task and this can be done based on set of tasks where each one brings educational value, preferably in collaboration with an expert. That is why the application in this project is centered on scenarios with a clear structure and learning goals.

If we see the speed of the development of virtual reality technologies and the possibilities of their use, it can be argued that it is necessary in the educational process. Cost effectiveness and predictive validity of VR can be considered as future work as it would increase the use of VR and enhance education and training.

VI. REFERENCES

- [1] FezileOzdamli, CigdemHursen, An Emerging Technology: Augmented Reality to Promote Learning, International Journal of Emerging Technologies in Learning, Vol. 12, No. 11, 2017)
- [2] Francis, C. Larkin and S. D. Aslinia, "Interaction in Online Courses," Journal of Online Engineering Education, 1(1), 1-4, 2010.
- [3] KapilChalil Madathil1 and Kristin Frady et al, An Empirical Study Investigating the Effectiveness of Integrating Virtual Reality-based Case Studies into an Online Asynchronous Learning Environment, Computers in Education Journal, Volume 8, Issue 3, September 2017)
- [4] FezileOzdamli, CigdemHursen, An Emerging Technology: Augmented Reality to Promote Learning, International Journal of Emerging Technologies in Learning, Vol. 12, No. 11, 2017
- [5] KavitaChoudhary and Anuradha, A Proposed Model for Virtual Reality Based Smart Classes, International Journal of Information and Computation Technology, Vol. 3, No. 5, 2013, pp 439-444.

- [6] Billinghamurst, M., Clark, A. and Lee, G. (2015) 'A survey of Augmented Reality', Foundations and Trends in Human-Computer Interaction, Vol. 8, No. 2-3, pp.73-272.
- [7] Borsci, S., Lawson, G., & Broome, S. (2015). Empirical evidence, evaluation criteria and challenges for the effectiveness of virtual and mixed reality tools for training operators of car service maintenance. Computers in industry, 67, 17-26. <https://doi.org/10.1016/j.compind.2014.12.002>
- [8] Chen, P., Liu, X., Cheng, W., and Huang, R. (2017) 'A review of using Augmented Reality in education from 2011 to 2016', in Popescu, E., Kinshuk, Khribi, M.K., Huang, R., Jemni,
- [9] Phon, D. N. E., Ali, M. B., & Halim, N. D. A., Collaborative Augmented Reality in Education: A Review. International Conference on Teaching and Learning in Computing and Engineering. doi:10.1109/latice.2014.23, 2014.
- [10] <https://elearningindustry.com/virtual-reality-augmented-reality-education>.
- [11] <https://theappsolutions.com/blog/development/ar-vr-in-education>.
- [12] <https://www.cramer.com/story/the-difference-between-ar-and-vr>.
- [13] <https://learningenglish.voanews.com/a/augmented-reality-versus-virtual-reality/3844772.html>

AUTHORS PROFILE



Dr. K. Dinakaran received his M.E. Degree in Computer Science and Engineering and Ph.D. (ICE) Degree in Anna University Chennai, India. He was a Professor of Computer Science and Engineering at R.M.D. Engineering College, Chennai, India for 5 years. He worked as Principal of P.M.R. Engineering College, Chennai, India for three and half years. He is currently working as Professor in Information Technology at Saveetha Engineering College, Chennai. His research interests include Data Mining, Bio-Informatics and E-Learning with over 30 technical publications.



K. D. Thirumal is doing his schooling at DSAV School, Nerkundram, Chennai. He is very much interested in Computer Software Development using Android, Java and Python. He has completed certification

courses on Mobile Application Development offered by NPTEL and Simplilearn.



Dr. P. Valarmathie received Doctor of Philosophy in Data Mining from Anna University in the year 2013. She is currently working as Professor in Saveetha Engineering College, Chennai, India. Her main research area includes Data Mining, Big Data Analytics, Cloud Computing, Semantic Web Services and Network Security. She has 19 years of teaching experience including 6 years of research. She has published 26 research articles in reputed journals. She has coordinated in NPTEL Certification programs and DSIR Research Recognition. She has certified EMC Academic Associate in Data Science & BigData Analytics and also certified Programming for Everybody (Python), Python Data Structures from Coursera.



Dr. M. Suresh, obtained his Ph.D. in Computer Science at Anna University, Chennai in the year 2017. He has 17 and above years of experience in software developments and his interested areas are Machine Learning, Business Intelligence and Big Data. He has Hands on experience in developing applications using C#, ASPNET, WCF, MVC Web API, ReactJS and Azure DevOps.