AR & VR - An Approach towards a Smarter and Better Education System

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Abstract

Education is one of the most important components of social infrastructure in India. Despite of our best efforts in the educational system, developments still remain at an unexceptionally depressing level. Financial Crisis is one among the main problems. University, professional and technical education have become beyond the reach of a common man in India. Even now 35 percent people remain illiterate being quite at a dismal position. Most students leave the college before even completing the course which leads to a lot of waste of resource. Lack of educational and technological resources in rural areas also leads to illiteracy. Centralisation of education can also be blamed for this as it causes a lot of distraction to students and does not provide much points and factors of interests to put an urge and excitement in the mind of the students for education. Augmented Reality (AR) and Virtual Reality (VR) can bridge the gap between the digital and physical worlds. One can imagine oneself being transported into an immersing world that shuts out all kinds of distraction, free of any kind of limitations where your imaginations are the possibilities.

Keywords: AR; VR; Cost-effective; Education; Comfortable.

Introduction

Nelson Mandela once said that Education is one of the most powerful weapon one can use to change the world.[1]

Why emphasis on a centralized system of education when it can be all around us? The purpose of our research is to show feasible uses of the splendid technology of AR and VR for Education. India is a developing country and requires a lot of developments in major fields, education being one of them.

Augmented reality, more often known as AR is an interactive experience for users in a real world where the objects that are present are enhanced by digitally generated perceptual information, sometimes across more than one sensory modalities like haptic, auditory, visual, olfactory and somatosensory[2][3]. Augmented reality is used to enhance the environment around the user or situations to offer enriched experiences. In more advanced AR technologies such as adding computer vision, integrating AR and object recognition into smart phone cameras and applications, the information about the user's surroundings becomes interactive and digitally manipulated. One of the first fully functional AR systems with deep mixed reality experiences was first invented in the early 1990s, starting with the Virtual Fixtures system developed in the U.S. Air Force's Armstrong Laboratory in the year 1992.[4]

Virtual reality, also known as VR is an imitated reality that can be completely different or almost similar to the real world. Applications of virtual reality include entertainment and education. Other different types of VR related technology include mixed reality and augmented reality[5]. A person using a virtual reality headset can look around the artificial world, move around in it and interact with the virtual items and object in it.[6][7] The effect is generally created by VR headsets consisting of a head-mounted display with two or one small screen in front of the eyes and headset itself tracking the

movements of the head using more than one types of motion sensors. This effect may also be created by specially designed rooms with more than one large displays. The first virtual reality headset was invented in the year of 1968 by an American scientist Ivan Sutherland and his student, Bob Sproull.[7][8][9][10]

It is clear that these technologies were found a long time ago but are sparsely used in fields of education in India. If we start harnessing these technologies for our general education systems, we may notice a significant amount of improvement in quantity of education provided all around India and rise of student's interests and performance in their core subjects.

Literature Summary

While researching on this particular topic of emerging trends in modern education, we came across numerous research papers out of which we would like to discuss about the one mentioned below : Noureddine Elmqaddem- "Augmented and Virtual Reality in Education a Myth or Reality?". In the above paper, the author has clearly mentioned about the history of emerging AR and VR technology and how helpful it can be in fields of education.[11]

The AR and VR technology has been out of the reach of normal people because of its expensive hardware and software in its emerging phase, but nowadays more and more cost-effective hardwares and softwares are coming up with great compatibility for technologies which can help a lot in education.[12]

The usage of VR can help in better understanding of a topic. One can imagine a working principle of a pulley, which has been easier to understand when we saw its implementation rather than studying it in our textbooks. The human mind remembers things more when it sees and hears in comparison to reading plain words. Pictures or videos help in better understanding. So, if education is provided to students and to whoever it may concern with help of VR, it will generate the interest to study the subject or topic.

The usage of AR technology was tough in the beginning but when the AR Tool Kit was released to the open-source community, things started changing. [13]. Using the technology did not seem tough. AR can be widely used in the education fields where students can get hands on experience and clearly understand the mechanism of the tools they are working with. As a typical example, HoloLens is a tool used by medical students to experience real like environment.

VR and AR technologies are continuously being developed and becoming affordable and reachable to the general public. Thus making it's use in education would be really profitable.

Findings and Analysis

Education, especially technical and professional education in India is very costly. It is beyond the reach of common man [1]. Even if the students are interested in certain subjects, they cannot carry it on in their future mostly because of financial crisis which is a very valid point for lack of education and increasing rate of unemployment and illiteracy in India.

Language also acts as a barrier as the medium of language used for education especially for science subjects is English [14] and this leads to less understanding and loss of interest in the subject. Real life

experiences are a good way to learn and understand topics better. The mechanisms are crystal clear when one can get a feedback of the surroundings and the objects in them, but it is not always possible to get everything in hand to experience. So for this purpose, VR and AR can be used efficiently to fill in the gaps. Books or flashcards may contain "triggers" which when scanned by an AR device can produce supplementary information [15].

As the VR and AR hardwares and softwares are getting cheaper, it is coming within the reach of common man. The problem of expensive education can be easily solved by using this technology plus it makes studies much more interesting and comfortable. Even in classrooms and laboratories, if students are taken to real like interactive environments , they will be interested to learn and keep them excited towards their educational subjects. Ar and Vr technologies are generally used in the gaming and entertainment field and we can see, how a person gets glued to their gaming headsets as the whole setup becomes very interesting. Using the same approach for education will be extremely helpful to make students interested in their subject and the whole setup can become a lot cheaper than the actual education expenses spent in Universities, Schools and Colleges. More and more students can come up and get their graduation done and finally have a good job. Microsoft's HoloLens, a Mixed Reality (AR and VR combined) hardware is used by the US military to train their army with the real life environment with lesser life risk. Expenses spent in schools and colleges for having a laboratory with various requirements and instruments in all types of laboratories, be it in domain of Physics or Biology or Chemistry or Computer, can be saved. These expenses can be reduced in school tuition fees to give the opportunity of getting quality education to more number of children. In addition, the risk of children burning their hands or causing any kind of accidents especially in chemistry and physics laboratories can be lessened by using the AR, VR technologies. It can give students the real life experience and understanding in a much more safer and confined environment. Education is not just about job but about a person's knowledge about their day to day behaviour and their justified decisions about a certain situation.

Future Scope

In order to make online education more innovative, interesting, cost efficient and interactive, we have an idea of implementation of VR schools (a school inside a Virtual World) where everything will be virtual but functional like in real world. By implementing this idea, we can provide both teachers as well as students the privilege to virtually interact with each other as in human form. We also have an idea to provide the virtual reality environment to everyone in a very cost-efficient form. A normal full-fledged VR system would cost around 28,000 INR but with our idea we can provide a VR desktop + mobile environment with a cost as low as 200 INR. This VR system can not only provide all types of virtual entertainment both for PC's and smart phones but can also be used for implementing educational purposes such as a Virtual School as well where all students can attend live interactive virtual classes and laboratories of their choice. This technology would not only help in employment of people as teachers who would like to teach in these virtual school but would also help students of all ages to get closer to their field of studies. This Virtual system would also be compatible with all virtual games by converting the image to side by side mode and tracking the movement of the user's head. We can provide all the resources required for real laboratories and classrooms as those are pieces of codes which would represent objects with attributes similar to the real world. Hence this is a very cost-efficient way to implement education and entertainment for everyone.

At initial stage, this idea needs to be crowd funded and in a stable phase it will generate revenue from personalised advertisements and subscription. The user will have two options- either to subscribe to a

classroom by paying an amount or by watching advertisements before attending a class. If the user buys a subscription, he/she will not be shown any advertisement and will be provided with some additional features. The advertisement mechanism will not be irritating and repetitive but subtle and effective. An advertisement will only be shown during entering or leaving a classroom and during breaks if any in order to prevent any type of disturbance during classes.

Conclusion

AR and VR technologies are not new in the market but its implementation in the field of education is still in the nascent state. Using it for education purpose will be helpful in numerous ways such as:

- Better understanding: Students can get hands-on experience in a real like environment without actually being there.

- Cost-friendly approach: It is pretty much cost efficient compared to the other general mainlined education systems.

By using the technologies mentioned above, it will make education much more interesting. Thus it will increase the rate of literacy as we have faced a problem while researching that loss of interest is a reason for rate of decreasing literacy is India. We hope that the VR and AR technologies can be implemented in the field of education more widely as soon as possible to let education grow because "Padhega India, tabhi toh Badhega India".

References

[1] Nelson Mandela Quotes. (n.d.). BrainyQuote.com. Retrieved March 13, 2020, from BrainyQuote.com Web site: https://www.brainyquote.com/quotes/nelson_mandela_157855

[2] "The Lengthy History of Augmented Reality" Huffington Post 15 May 2016.

[3] Schueffel, Patrick (2017). The Concise Fintech Compendium. Fribourg: School of Management Fribourg/Switzerland. Archived from the original on 24 October 2017. Retrieved 31 October 2017.

[4] The Use of Virtual Fixtures as Perceptual Overlays to Enhance Operator Performance in Remote Environments, Louis Rosenberg(September,1992)

[5]Virtual Reality, Retrieved from https://en.m.wikipedia.org/wiki/Virtual_reality

[6] The Theater and Its Double, Antonin Artaud ,Translated from the French by Mary Caroline Richards ,GROVE PRESS NEW YORK.

[7] Seeing is Believing: The State of Virtual Reality . Matthew Schnipper Retrieved 7 March 2017.

[8]Baltrušaitis, Jurgis; Strachan, W.J. (1977). Anamorphic art. New York: Harry N. Abrams. p. 4. ISBN 9780810906624.

[9] Holly Brockwell (3 April 2016).Forgotten genius: the man who made a working VR machine in 1957. Tech Radar. m is associated with Department of Document Engineering, Strategic Intelligence and Records Management (IDVSRM) at Ecole des Sciences de l'information (ESI) in Rabat, Morocco.ArticleRetrieved 7 March 2017.

[10]National Center for Supercomputing Applications: History. The Board of Trustees of the University of Illinois. Archived from the original on 21 August 2015.

[11] Augmented Reality and Virtual Reality in Education. Myth or Reality ?, Noureddine Elmqadde submitted 28 July 2018. Resubmitted 22 October 2018. Final acceptance 24 October 2018.

[12] Virtual Reality, Training's Future?: R. J. Seidel and P. R. Chatelier, Perspectives on Virtual Reality and Related Emerging Technologies, Berlin: Springer Science & Business Media, 1997. Available on https://doi.org/10.1007/978-1-4899-0038-8

[13]Marker Tracking and HMD Calibration for a video-based Augmented Reality Conferencing System, H. Kato and M. Billinghurst, in Proceedings of the 2nd International Workshop on Augmented Reality (IWAR 99), San Francisco, USA, 1999.

[14] M. Dunleavy, C. Dede and R. Mitchell, "Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning," Journal of Science Education and Technology, vol. 18, no. 1, pp. 7-22., 2009. Available on https://doi.org/10.1007/s10956-008-9119-1

[15] Augmented reality, an evolution of the application of mobile devices" (PDF). Archived from the original (PDF) on 17 April 2015. Retrieved 19 June 2014