UNIVERSITY OF
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Virtual Reality and Augmented Reality in Education

1. Purpose

Technology is improving at a rapid pace, as many things emerging today can only exist in human being's imagination before. Some of the impossible things rising to the occasion are the Virtual Reality and Augmented Reality. Although they are very similar in terms of creating virtual objects, they are different in creating immersive environments for the audience. Recently, virtual reality and augmented Reality are not only used for gaming, but also there are companies explore their usage in education. Virtual reality and augmented reality provide a completely new way to engage with students and increases their retention. In this report, we will first overview the concept, differences and similarities of the virtual reality and augmented reality. Then we will introduce the top companies working on education in virtual reality and augmented reality. In conclusion, Virtual Reality and Augmented Reality are the next big step forward in education.

2. Virtual Reality and Augmented Reality

2.1 What is Virtual Reality?

Virtual reality (VR) is all about the creation of a virtual world that users can interact with. This virtual world should be designed in such a way that users would find it difficult to tell the difference from what is real and what is not. Furthermore, VR is usually achieved by the wearing of a VR helmet or goggles similar to the Oculus Rift.

2.2 What is Augmented Reality?

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data [ref 1]. AR is the blending of virtual reality and real life, as developers can create images within applications that blend in with the contents in the real world. With AR, users are able to interact with virtual contents in the real world, and are able to distinguish between the two.

2.3 Difference and Similarities in VR and AR

Both virtual reality and augmented reality are similar in the goal of immersing the user, though both systems to this in different ways. With AR, users continue to be in touch with the real world while interacting with virtual objects around them. With VR, the user is isolated from the real world while immersed in a world that is completely fabricated.
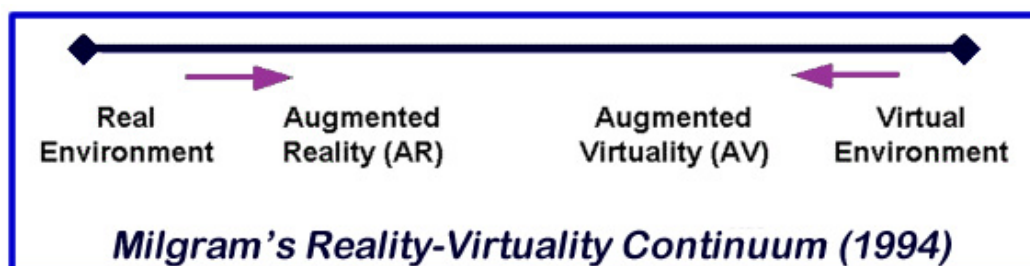

Figure 1 Migram's Reality-Virtualty Continuum (1994)

AR and VR are inverse reflections of one to another with what each technology seeks to accomplish and deliver to the user. AR delivers virtual elements as an overlay to the real world, while VR offers a digital recreation of a real life setting. As it stands, VR might work better for video games and social networking in a virtual environment, such as Second Life, or even PlayStation Home.

3. VR and AR in Education

In this section, we will list and give a brief introduction of the companies which are pioneering in developing technology in VR and AR in Education [i].

3.1 Immersive VR Education

Lecture VR is a VR app by Immersive VR Education (http://immersivevreducation.com/) which simulates a lecture hall in virtual reality, while adding special effects which can't be utilized in a traditional classroom setting. Lectures are accompanied by images, videos, and immersive experiences which enhance the lesson. Imagine learning about Apollo 11 and while the instructor is lecturing, they can transform the classroom to be inside the space shuttle which they're lecturing about; adding much more to the lecture than would be traditionally possible. Another major asset of this type of learning is that students and professors can remote in from anywhere in the world, which makes education more accessible on a global level.

3.2 Unimersiv

Unimersiv (https://unimersiv.com/) is a VR learning platform which releases educational content on a monthly basis. The content in Unimersiv's app is more individualized and immersive, and at the moment the 3 educational experiences available on the app are: Explore the International Space Station, Anatomy VR, and Learn about Stonehenge in Virtual Reality. The diversity in this content shows the true potential in the range of things we can learn by using VR in education; and it also shows that Unimersiv is dedicated to creating educational content on a wide range of topics, which makes their potential truly unlimited.

3.3 Google Expeditions Pioneer Program

Google is also making waves in the space of VR education with their exciting Expeditions Pioneer Program (https://www.google.com/edu/expeditions/). The purpose of the program is for Expeditions teams from Google to visit schools around the world and provide everything teachers need to take their students on a journey anywhere; the team will also assist the teachers in setting up and utilizing this technology. The VR experiences are meant to be like a really cool field trip which teachers would ordinarily never be able to take their students on; whether it's to an underwater coral reef, or into a city like Barcelona, the potential is truly limitless here. The way the app works is that the students and the teacher will see the same things and be in the same session, but the teacher will be able to lecture and highlight certain things which are relevant to the lesson.

3.4 Alchemy VR

Alchemy VR (http://www.alchemyvr.com/) is creating immersive educational experiences on an impressive scale. The experiences on Alchemy VR are like a narrative being told to the user where they will get to see and experience a myriad of different things; one such example is exploring the Great Barrier Reef. What makes Alchemy VR standout in this space is their partnerships which contribute to the level of content they produce. Alchemy VR has partnered with Samsung, Google Expeditions, Sony, HTC, the Natural History Museum in London, and the Australian Museum in Sydney. Alchemy VR has actually done several projects for Google Expeditions and is set to release experiences on pyramids and the human body soon.

3.5 Discovery VR

Discovery has been telling stories like no one else for over 30 years; and now they are entering the modern era with their Discovery VR app (http://www.discoveryvr.com/). Some of your favorite content is available on the Discovery VR app, so you can experience some of your favorite Discovery shows in a whole new way. Discovery bringing content to virtual reality is great for the space of education in virtual reality; Discovery has been creating educational content for years, they're a household name and when people hear you can watch Deadliest Catch or Mythbusters in Virtual Reality it might just get more people interested in the potential applications of virtual reality for education.

3.6 zSpace

zSpace(http://zspace.com/) is unique in the space of education in VR because of the technology they're using. zSpace feels that VR technology should not necessarily be so antisocial and one sided as everyone putting on their own headset. ZSpace has monitors, which are similar to the way 3D movies work, where a group of people use glasses which are similar in feel to 3D glasses; these glasses make the content come off the screen. Additionally zSpace users have a pen which they use in order to manipulate the stimulus as you can see below. zSpace currently has content available for STEM education, medical training, and more general math and science experiences.

3.7 Curiscope

Curiscope(http://www.curiscope.com/) is a startup company focusing on education in VR, and their Virtual Tee is already turning heads. The way it works is that one person wears a t-shirt while another person with a smartphone launches the app and is able to learn about the human body in a unique way. This is a unique way to utilize AR in education and it is surely a sign of good things to come from Curiscope.

3.8 WoofbertVR

Woofbert VR(http://woofbert.com/) is focusing on bringing art to VR technology, they are looking to reshape the landscape of storytelling and revolutionize the way we look at art and culture. WoofbertVR is a unique way to visit an art gallery, either individually or in a classroom setting giving students the opportunity to take a field trip which they would never normally get to experience. Exploring a gallery using WoffbertVR's app is nearly identical to how you would explore it in person; you can follow any path you choose, zoom in on paintings you are interested in, and listen to audio segments on certain exhibits. The only difference here is that you do not need to take an expensive trip in order to visit a gallery which has some of your favorite paintings or pieces, now it can be done from the comfort of your own home.

3.9 Nearpod

Nearpod(https://nearpod.com/nearpod-vr) is an organization which combines VR and AR technology with traditional lesson plans in a classroom for a more immersive technology driven approach to learning. Nearpod utilizes 360 degree photos and videos in lesson plans, and also has something akin to a PowerPoint for students to use alongside the 360 photos and videos. There are also options to have students answer questions by typing into their laptop or tablet. Nearpod VR is giving us an idea of what a classroom of the future is going to look like, with lesson plans being enhanced with VR and AR technology and students being more engaged by using this new technology.

3.10 EON Reality

EON Reality(http://www.eonreality.com/applications/education/) is looking to change how teachers utilize technology in the classroom. Students and teachers can create blended learning environments with the EON Creator, which is an interactive tool that allows users to combine 3D content with videos, sound effects, notes, PowerPoint, and more. EON also has an EON Experience Portal where teachers and students can upload their work and also explore the creations of other teachers and students. There is also the EON Coliseum, where students and teachers can meet virtually, which makes collaboration possible at any time and from nearly any location.

3.11 Schell Games

Schell Games (https://www.schellgames.com/) is one of the largest independent game development companies in the United States; with their forte being in what they refer to as transformation games, or games that change people for the better. Among the countless games they have developed includes Water Bears VR, which is a VR puzzle game aimed at kids that promotes systems thinking and spatial recognition. There has always been a challenge in education with engaging students, especially kids, and making learning fun has always been a practical solution to that challenge. With companies like Schell Games producing fun VR games for kids, which have the added bonus of being educational, we find a fun solution to the challenge of getting kids interested in learning.

3.12 Gamar

Gamar(http://gamar.com/) is a company who is attempting to make museum visits more modern through the use of Augmented Reality. The way that Gamar's content works is that they have interactive experiences and supplemental information which can be paired with certain locations to enhance museum visits. One of the chief rules of a museum is not to touch anything, but with Gamar's app museum attendees will be able to point their smartphone or tablet at an exhibit at one of their paired locations and get additional information on that exhibit. Museum visits can be tedious for kids when all they want to do is pull out their smartphones and play with them. Gamar has provided a solution to this problem by finding a way to engage kids in museums and doing it in a way that's interesting to them and on their level. AR and VR technology are great tools for education, but if we can't get kids to use them then it's all for not; which is why we need organizations like Gamar who find ways to get kids to utilize this technology in educational ways.

4. Conclusion

Virtual Reality and Augmented Reality are the next big step forward in education, and these technologies are good for educators and students alike.

- Educators will be able to capture the attention of their students like never before and get them more actively involved in the classroom.
- Students are always trying to do what's cool and what's new; utilizing VR and AR technology in classrooms will appeal to students because it's the latest and greatest thing and it's very cool to use.

Using VR and AR technology will not only make learning more interesting and exciting to students, but also it will also increase retention because it engages them in a way which textbooks simply cannot compete with. These technologies give us a window into the future of education, and it probably won't be long until it is standard for classrooms to come equipped with some form of VR or AR technology.

5. Future Work

IT Innovation Centre always keeps a high interest in the development of VR and AR technology. Back in 2014, IT Innovation Centre organized the "Teaching Lab of the Future" mini conference, which discussed the realities and potentials of the virtual lab. In the summer of 2016, IT Innovation Centre has also employed a student intern to work on the experiment of developing virtual lab prototypes using Oculus Rift and Leap motion. Currently, the experiment is prototyping a chemistry pre-lab within the virtual environment, the experiment will also extend to other scenarios for instance virtual museum etc.

References

[i] The Top 10 Companies working on education in virtual reality and augmented reality :
http://touchstoneresearch.com/the-top-10-companies-working-on-education-in-virtual-reality-and-augmented-reality/

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