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Use of AR & VR in Teaching Aids

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ABSTRACT

In the past few years, there is a huge growth in technology which affect us directly or indirectly. During the pandemic we've learned that how we can use technology in better way. Currently technology is also being used in education, which is changing the traditional teaching approach with the newer one that makes teaching even more enhanced and effective. Augmented Reality and Virtual Reality technologies are a new method of study. Augmented Reality is a computer-generated superimpose technique which generates a 3D object layer over the user's physical environment appearance. VR is just opposite of AR; it is a virtual simulation of the computer-generated situation or scene. Learning is so interesting with AR and VR; they are using the 3D object and computer-generated virtual simulation which really feels us that we are in under that simulation. Generally, AR is available major common available smart phones, but for VR we need a special glasses & VR Headsets. Just guess what happens when you can see a live view of any place without going anywhere. Analyse the structure of DNA, and chemical compounds bonding's in the front of your eyes. It is quite easy and simple to use. It increases the interaction of learners and to learn by effectively, making the learning process more interesting, meaningful, and exciting. These technologies can be customized according to different age group and educational group to give them better experience. AR & VR can provide many advantages when they are used together in education and provides educational gains. It provides features like project visualization, Experiencing another location, virtual lab and many more. AR and VR are cost-effective so educators and institutions can make use of them. The advantage of these technologies after implementing Is A faster and more effective learning process, more interaction, safety and cost-effective. This will also improve the learning student's achievements, skills, and abilities. Through this engaging and immerse technology method of learning and the education system will move to the next level.

Keywords: Augmented reality & Virtual reality, educational implementation, interaction, visualization, virtual.

1. INTRODUCTION

Technology is changing every day for making our life easier and more reliable. As for now educational technologies continue to grow, institutions and educators are looking for a new way of integrating digital solution in their system. E-learning is also a modern type of education which is enhancing traditional types of study model with new online learning system, A new technology called virtual learning is integrated with our education system. AR and VR are the new technology approaches being used for the learning system. Computer-generated the virtual simulation, objects, and 3D models are more convenient to learn. In future advanced version will be used in education. Virtual learning system will increase the level of understanding in students and makes learning too easy and effective. These technology does not act as replacement to traditional type real-life learning but enhance the learning process.

2. What is AR & VR

Augmented reality (AR): Augmented reality was first introduced by a cinematographer called Morton Heilig in 1957. Augmented Reality (AR) is an enhanced version of virtual reality which combines the virtual objects with physical world sceneries. This technology merges the digital objects with the user's physical environment in real time. AR creates a layer of digital objects over the real-world scenes.

Virtual reality (VR): The first VR headset was created and introduced by American computer scientist Ivan Sutherland and his student, Bob Sproull in 1968. Virtual Reality (VR) is an Artificial simulation of environment or the situation which provides a seamless realistic experience and feels to the user.

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3. Working of AR and VR

3.1.1. Working of AR:

Augmented reality works simultaneously with many devices like tablets, Smartphones, and even PC's. In these devices already contain software, sensor and a digital object projector that implements the digital data on to the physical appearance.

There are three main key components in the AR system,

- Hardware
- Software
- Remote server

Hardware: Hardware of AR devices consist of Processors, Input devices, Display and sensors like Camera is capturing a physical object, the sensor is measuring distance and screen is showing results.

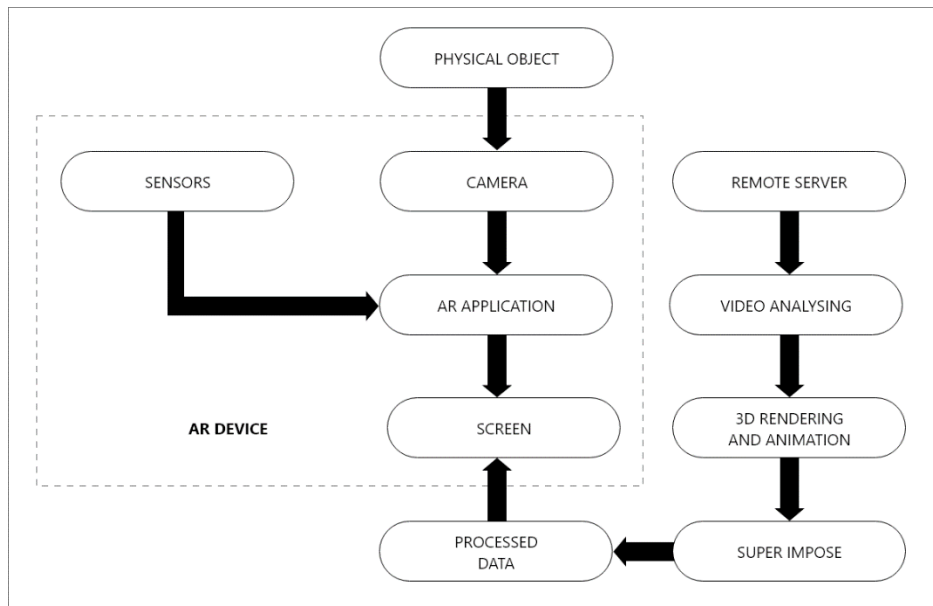
Display: HMD (Head Mounted Display), Screen

Input Devices: Camera, Webcam

Sensor: Gyroscope, Accelerometer

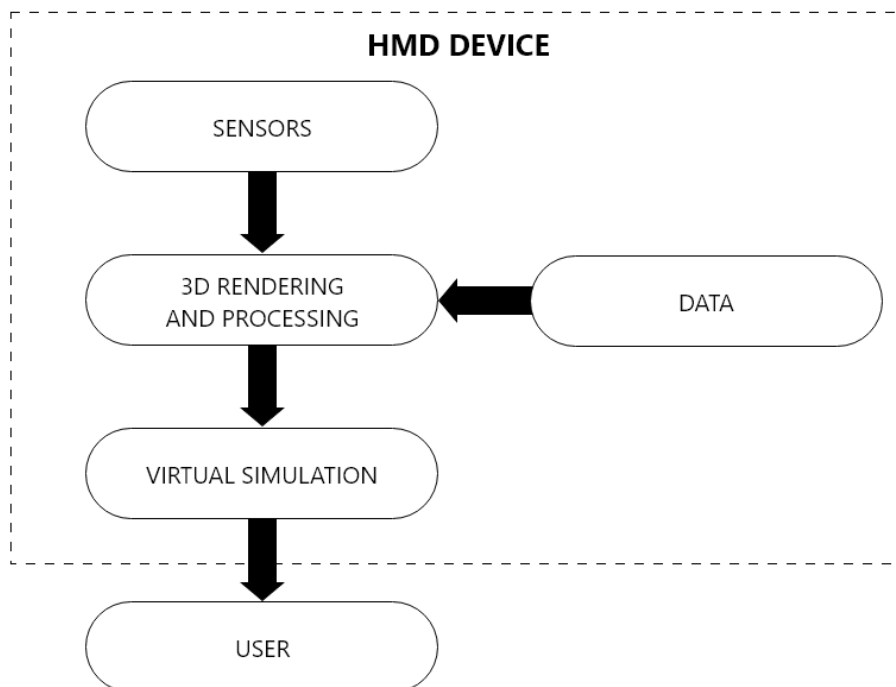
Software: Software plays an important role in gathering information and generating digital data, it maps the 3D object over the physical environment .AR core, AR kit, Wikitude& Vuforia are the example of Augment reality software.

Remote Server: Use of Cloud server provides adds some extra feature and functionalities to AR application. In order to store the virtual 3D object, it's more convenient to use a central cloud server as compared to the device storage, AR application can send the image of the physical object over the network to cloud server after server will process the data for the applications request.



3.1.2. Working of VR:

Virtual Reality uses HMD (Head Mounted display) for and Reality engine which generates simulated environment. Gyroscope and accelerometer sensors are used for detecting each movement like rotation, tilt and flip for change scene according to movement.

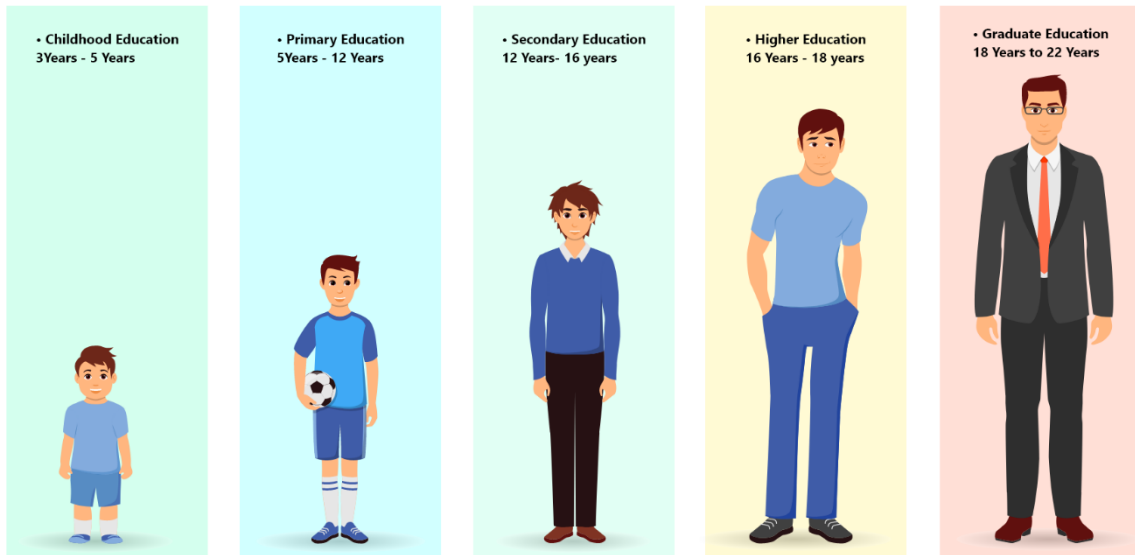


4. Implementation of AR and VR in education

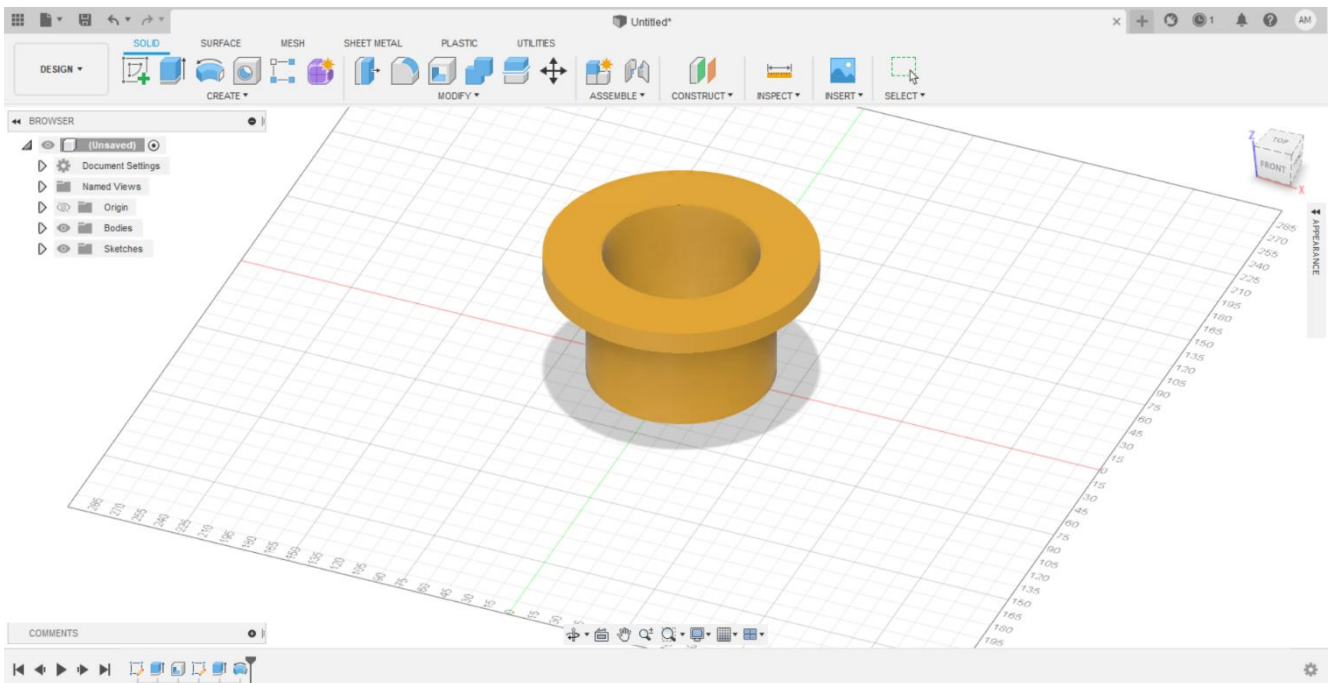
AR and VR are the most future learning technologies using these technologies will improve student's achievements, knowledge, and skills. These technologies will be used with different age group and as per different levels of education.

Targeting Age Group: Age group is the most important factor here, children, and adults from different age group should be targeted for AR and VR contents. Contents should be valid and appropriate for targeted age group.

- **Childhood Education:** At the age of childhood, education children will be observing the education from seeing people and nearby environment at this level AR can be used for displaying stories and animated 3D object.
- **Primary Education:** In this level, children will become a student and started learning through books. Now AR and VR can be used for understanding books with interesting and exciting and different environments, places and many more.
- **Secondary Education:** In Secondary education level They can use AR graphic book which helps them to learn with a more interesting style. AR graphic book provided a practical way to learn the lesson. Students will enjoy the book and preferred it. Students can use VR for reading history books with the virtual historical environment.
- **Higher Education:** With AR apps students can learn Chemical bonding's & structures and structure of the human body in Biology. With class VR, Labster and many other apps they can improve and test their skills.
- **Graduate Education:** Students in the experimental group used AR technology with a mobile application. AR and VR technologies will be used with their courses to make better learning and increasing achievements & performance.



3D Content creations: For providing better experience to we need to create a subject base 3d contents for AR and VR devices. There are already many 3d content providers already in the market so we can purchase from them like Next Education, Toolbox Studio.



5. Educational applications of AR and VR

- **Project Visualization:** it plays role in the visualization of a 3d object that can be placed in real physical space to give the virtual presentation of the object.
- **Measurement:** One of the main aspects of AR applications is the ability to accurately measure spaces using only a phone camera. AR Applications are capable of measuring the distance of the object by using the AR ruler function, which is mostly used by students, decorators, and designers. It is used in floor designs, virtual photo walls, architecture, and Home Decoration.
- **Experiencing another location:** The World has so many beautiful and interesting places to visit. One of the interested applications of VR is Google Earth VR with this from the thousands of kilometre's far you can experience any location in the world without traveling.
- **Virtual Lab Simulation:** virtual Lab offers student's a highly immersive learning experience. Here students can perform all the lab practical's and research by simulation where all necessary equipment is present.
- **Labster:** Labster has created a set of 30 undergraduate biology virtual reality lab experiences covering the subjects of the cell and molecular biology, ecology, and physiology. Labster is able to make 3D virtual lab students can virtually do Lab practical's with virtual results.
- **V-Learning:** from VR learning students are able to better understand the structure and bonds of chemical compounds, human body visualization, physics motion laws, and many more things.
- **ClassVR:** ClassVR has been designed to provide an exciting, interesting, yet simple to use interface to allow teachers and students to easily and quickly access educational content and applications with minimal fuss and no distractions, keeping them focused on the task at hand.
- **AR Graphic Books:** After E-books AR Graphic books can help students learn with 3d Models after scanning in the Application. We have been developing our own AR Graphic book Application from which we can and understand concepts, diagrams, and structure for better learning. Currently, it has a limited collection of books.
- **Ocean Rift:** It is a world's first VR aquatic safari park. Where student can explore underwater life of various animals and mammals.
- **Anatomy 4D:** Anatomy is the app for human body visualization. All we need to scan the parts of the human body and it will turn them into a live virtual object.
- **Mondly:** Its's an app for learning languages. The best way to learn languages is to speak in real conditions. It provides instant feedback on their pronunciation and suggestion that will enhance their vocabulary.
- **Star Walk:** This app follows the user's movement in real-time and allows them to explore the night sky. Students can discover constellations, stars, and other sky objects. They will learn more about space, the solar system in the most interesting way.

6. Advantage of AR and VR Learning

- **More effective and faster learning process:** AR in education helps students achieve better study through visualization and full immersion in the subject matter. A picture is worth a thousand words, right? So, instead of reading and learning theory about something, students can see it in action with their own eyes.
- **Safety:** AR and VR create cost-effective, safe environments for learning at low cost. Students can see environments that are completely different from real-world conditions, even possibly dangerous situations, while not being exposed to the actual risk factors. They can safely learn specific skills without any damage and risk.
- **Deeper Immersion:** AR Apps helps students to more accurate learning in any subject whether it to be History, Maths, Biology, geography and physics. As well as VR learning it can't be ignored, special VR glasses are providing virtual experience learning.
- **Cost-effective:** Virtual learning requires less maintenance and less cost as compared to other e-learning classes, from the past few years the cost of VR glasses is reduced by 70%. Now 80% of VR users use their smartphones for experiencing virtual reality.

- **Reduce Distraction:** It's easy for students to get distracted by the outer environment and won't be able to focus on studies, but in AR and VR learning it makes concepts more exciting and interesting. In VR also student will feel free in the virtual environment. so students won't be distracted by the outer environment.
- **Efficient Teamwork and Collaboration:** if any task needs teamwork, then students can share their virtual space from anywhere in the world and do the necessary task. This will also build a friendly relationship and improve teamwork skills.
- **Practical learning:** The theories are good, but a combination of practicals and theories are better. Apart from simple learning, students can learn and practice simultaneously, and AR & VR facilitates a deeper, improved educational process. The education field can benefit from these technologies.
- **No special equipment is required:** augmented reality doesn't require any expensive hardware. Because 53% of all teens currently own a smartphone, AR technologies are available for use for the majority of the students.
- **Distance learning:** Distance learning is another factor of AR and VR although it does not act as replacement of real-life learning, but can actually enhance it.
- **Improving Creativity:** Learn by doing improves the creativity of students, like they don't have to fear mixing different chemical elements and creating new compounds.

7. Conclusion

AR and VR are the advance learning technologies for moving the education system to the next level and redefining our existing educational system. Now it is not necessary teacher and students are in the same room for learning, with virtual reality they can be gathered in virtual space and do the study. In the future, more enhanced versions of virtual reality like Mixed Reality (MR) and Extended Reality (XR) will be used in education. These technologies will change the future of the education system. The immersive experience on a huge scale and cost effective is the key point of this technology which increases the demand of it. Using of this technology requires specialized software, hardware knowledge and an experience personnel. Most of Institutions and school are lacking of this. Third party vendors can come to the view to train and explain the system. In this paper I have presented working of AR, VR and How practically AR and VR applications are used, how it is implemented in the education system. I have focused on AR and VR education system because this is beneficial in every level of education. I would like to recommend that in future AR and VR will be implemented in the education system it will make lots of changes in the students learning system, educational growth, and achievements.

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