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RESEARCH ARTICLE

Contrasting Virtual Reality and Augmented Reality in the Health Care System - Briefing

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Abstract – Virtual reality (VR) technology has the ability to create a simulated environment that can be experienced through sensory stimuli such as sight, sound, and touch. VR has the potential to revolutionize various industries and fields, gaming and entertainment, Education and training, Healthcare, Architecture and design, Tourism and hospitality, Real estate, Sports. Overall, VR technology has the potential to enhance and transform many industries by providing new and innovative ways to interact with the world. Augmented reality (AR) is a technology that overlays digital information onto the real world, allowing users to experience and interact with digital content in a more immersive and interactive way. The role of AR is to enhance our perception of the physical world by adding contextual information, visualizations, and interactivity to it. AR has a wide range of potential applications, including entertainment, gaming, education, training, marketing, and more. It can also be used in healthcare for medical training, surgery planning, and patient education. Overall, AR has the potential to revolutionize the way we interact with digital content, making it more intuitive, engaging, and personalized.

Index Terms – Augmented reality, Virtual reality, HealthCare

I. INTRODUCTION

Virtual Reality (VR) and Augmented Reality (AR) Virtual reality (VR) and augmented reality (AR) are reality technologies that create interactive experiences by adding digital elements to the real or simulated world. VR uses a headset to place you in a computer-generated world that you can explore, while AR uses the camera on a smartphone or a head-mounted display to overlay parts and pieces of the real world with imagined ones. VR is designed to take you away from your physical space, while AR blurs the lines between reality and the imagined world. Both technologies are used in many fields, such as education, e-commerce, marketing, gaming, entertainment, training, and remote diagnosis.

The Difference Between AR and VR

Virtual reality and augmented reality accomplish two very different things in two very different ways, despite their devices' similar designs. VR replaces reality, taking you somewhere else. AR adds to reality, projecting information on top of what you're already seeing. They're both powerful technologies that have yet to make their mark with consumers, but show a lot of promise. They can completely change how we use computers in the future.

Virtual Reality

- It is a very important and interesting term. The terms 'Virtual' refers to something conceptual that does not have its physical existence, and the word 'reality refers to the state of being real. So, virtual reality means something that is almost real. It is defined as the creation of a simulated environment by using computer technology. Viewing virtual reality means viewing a completely different reality than the one in front of you. It can be artificial, like an animated scene or a place which is photographed and integrated in a virtual reality app. It enables us to move around and look in every direction - up, down, sideways, and behind, as we are present there actually.

Fig. 1: Augmented vs Virtual Reality

Fig. 2: Virtual Reality

- Virtual reality apps allow us to explore the places that we have never been to, such as the Mars surface, the top of Mt. Everest, areas deep under the sea, and many more things that we can imagine only. It uses three of our senses: hearing, touching, seeing, to trick the brain into thinking that we are at a different place.

Advantages of Virtual Reality

- It creates an interactive environment.
- It helps us to explore the world by creating a realistic world using computer technology.
- It makes education comfortable and easy.
- It allows users to do an experiment in an artificial environment.
- It increases the work capabilities.
- Virtual reality is helpful for medical students to do practice well. It will be helpful for patients, too, as it offers a safe environment to them by which a patient can come into contact with the things they fear.
- Virtual reality helps to measure the performance of sportsperson and analyze their techniques.

Disadvantages of Virtual Reality

The limitations of virtual reality are listed as follows -

- Using VR, people start ignoring the real world. They started living in the virtual world instead of dealing with the issues of the real world.
- Training in the virtual environment does not have the same result as training in the actual world.
- It is not guaranteed that a person has done a task well in the real world if he/she has performed that task well in the virtual world.

Augmented Reality

- The word "Augmented" means to add. It is created by using the technology by adding digital information to an image or something. Augmented reality is an important concept and impacts our lives deeply. It provides an improved version of reality as it uses different tools to make the environment existing and real. Augmented reality gives you an interactive experience of the real-world environment. It keeps you in your place and superimposes the technology in the form of text, sounds, and images.

Fig. 3: Augumented Reality

- Augmented reality merges the physical world with computer-generated virtual elements. It is accessed using common equipment such as mobile phones. There are nearly uncountable possibilities with the Augmented Reality. With the smartphone's camera, AR adds the digital elements to a live view. It uses the smartphone's camera to present the real world's view in front of us and then put a layer of information that includes the text or images on the top of that view. Some of the examples of Augmented Reality are the Pokemon Go game, Snapchat lenses.

Advantages of Augmented Reality

The advantages of Augmented Reality are listed as follows -

- It increases accuracy.
- It offers innovation, continuous improvement, and individualized learning.
- It helps developers to build games that offer real experiences.
- It enhances the knowledge and information of the user.

Disadvantages of Augmented Reality

- The limitations of Augmented Reality are listed as follows -
- Projects based on AR technology are expensive to implement and develop.
- Excessive use of augmented reality technology can lead to eye problems, obesity, etc.
- It can cause mental health issues.

Table. 1: The Difference Between AR and VR

On the basis of	Augmented Reality	Virtual Reality
Involvement	In AR user is partially immersed with the real world, i.e. user is immersed with mix of real-world and virtual world.	In VR, the user is completely immersed in a virtual world.
Distinction	In augmented reality, it is easy to distinguish between both real-world and virtual world.	In Virtual reality, it is hard to distinguish between the virtual world and real world.
Devices used	In AR, there is a use of tablet, smartphones, or another mobile device.	In VR, there is a use of head-mounted display or glasses.
Reality and virtuality	Augmented reality is 75% real and 25% virtual.	Virtual reality is 75% virtual and 25% real.
Network data	Augmented reality requires upwards of 100Mbps bandwidth.	A virtual reality video with 720p requires a connection of atleast 50Mbps.
Revenue	The projected revenue share for augmented reality in 2020 is $120 million.	The projected revenue share for virtual reality in 2020 is $30 million.
Visual senses	In Augmented reality, a user always has a sense of presence in the real world.	Whereas, in virtual reality, the visual senses are under control of the system.

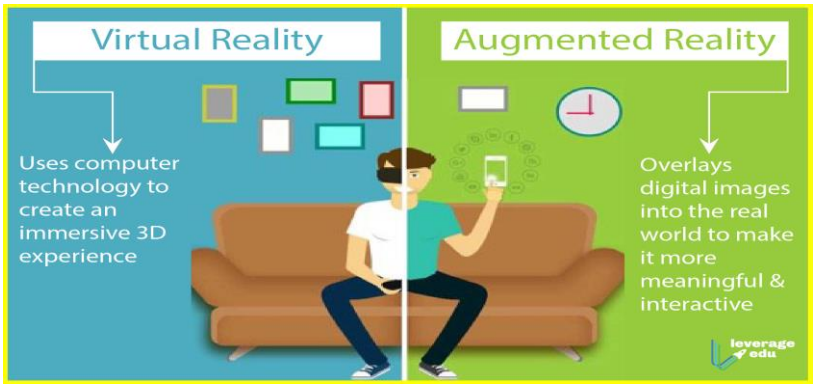

Fig. 5:Augmented vs Virtual

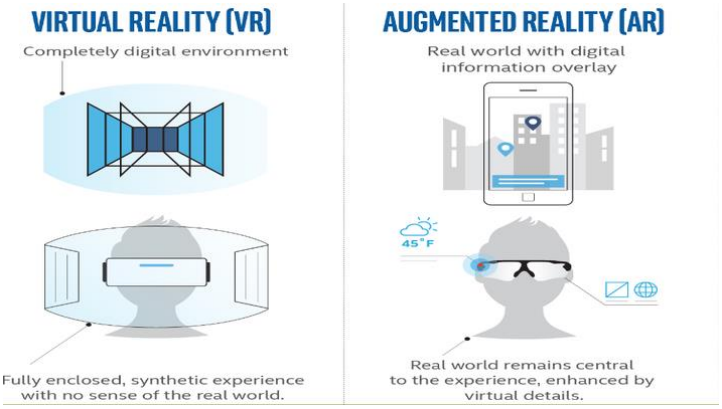

Fig. 6:AR vs VR

II. AR in Healthcare Applications

Augmented Reality (AR) is an emerging technology that has the potential to transform healthcare. Here are some examples of AR applications used in healthcare:

1. Medical Education: AR can be used in medical education to create immersive and interactive learning experiences. Medical students can use AR to visualize and interact with virtual anatomical models to learn about human anatomy and physiology.

Fig. 7:Medical Education

2. Surgery Planning: AR can be used to create 3D models of patient anatomy, which can be superimposed on the patient's body during surgery planning. Surgeons can use AR to visualize the patient's anatomy and plan the surgery more accurately.

Fig. 8:Surgery Planning

3. Medical Imaging: AR can be used to enhance medical imaging by providing additional information about the patient's anatomy. For example, AR can be used to overlay MRI or CT scan images on the patient's body during surgery to help guide the surgeons

Fig. 9:Medical Imaging

4. Rehabilitation: AR can be used in rehabilitation to create immersive and interactive exercises for patients. For example, AR can be used to create virtual reality environments for patients to practice mobility exercises and improve their balance and coordination.

5. Patient Education: AR can be used to educate patients about their conditions and treatment options. For example, AR can be used to show patients how to take medication or perform a medical procedure at home.

Fig. 10: Rehabilation

III. VR in Healthcare Applications

Pain Management: VR has been used to reduce pain and anxiety in patients undergoing medical procedures. It provides a distraction from the pain by immersing the patient in a virtual environment. Virtual Reality (VR) has shown great potential in healthcare as it can create immersive environments and simulations for training, therapy, and diagnosis. Here are some VR applications used in healthcare:

Rehabilitation: VR is used in physical and occupational therapy for stroke patients, traumatic brain injuries, and other conditions that require rehabilitation. VR simulations provide patients with exercises to improve their motor skills, coordination, and balance. Medical Training: VR can simulate real-life situations for medical students and professionals to practice surgical procedures, diagnose diseases, and learn about the human anatomy.

Exposure Therapy: VR is used to expose patients to stimuli that trigger anxiety or phobias in a safe and controlled environment. This helps patients gradually overcome their fears and anxieties. Mental Health: VR can be used to treat mental health disorders such as post-traumatic stress disorder (PTSD), anxiety, and depression. VR simulations provide a safe and controlled environment for patients to confront and process their fears and anxieties. Telemedicine: VR can be used for remote consultations and to provide virtual care to patients in remote or underserved areas. This can improve access to healthcare and reduce the need for travel.

IV. CONCLUSION

VR and AR are two promising technologies that have the potential to revolutionize the healthcare system. Each technology has its unique characteristics, benefits, and limitations. VR can provide an immersive and interactive experience for training and therapy, while AR can enhance visualization and provide patient education. As these technologies continue to evolve, they will undoubtedly have a significant impact on the healthcare system, improving patient outcomes and reducing healthcare costs

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