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Virtual Reality – The Future?

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Abstract:
Many of us associate Virtual Reality (VR) with science fiction films. However, the reality is that this technology is now completely integrated into our daily lives. Virtual reality is here to stay, whether in video games, healthcare, or education. But what exactly is it?
When many people consider the future of advanced technologies, one of the first stuff that comes to mind is virtual reality. In a nutshell, virtual reality is an interactive computer-generated experience through a simulated environment. Let's learn more about virtual reality:

1. INTRODUCTION:

WHAT IS VIRTUAL REALITY?

Virtual Reality (VR) is a computer-generated environment that contains scenes and objects that appear to be real, giving the user the perception that they are immersed in their surroundings.

This environment is accessed via a Virtual Reality headset or helmet. We can use virtual reality to immerse ourselves in video games as if we were one of the characters. It also aids in learning how to perform heart surgery or improving the quality of sports training in order to achieve peak performance.

Virtual reality uses computers to trick the mind into experiencing and, more interestingly, interacting with a 3D world. This is made possible by wearing a head-mounted display that sends input tracking data. The display is divided between the eyes, resulting in a stereoscopic 3D effect with stereo sound to provide you with a graphic experience. The technology feeds in images of objects taken from slightly different angles, creating the illusion of depth and solidity. The internal LCD/OLED panels are refracted by lenses to completely fill the field of vision with what is to be displayed and experienced. It creates an immersive and exciting believable world that the computer generates when combined with technology and input tracking.

VR, as we understand it today, has been around for decades. Taking you back to when 360° paintings astounded the world by adding a virtual element. VR is simply "The Wise Guy" of the digital world. It creates a world that does not function according to you or respond to your actions. It provides you with first-hand experience with even the aftereffects of an event, as well as the ability to interact and interact with the world created.

This technology has enormous potential for providing insights into the workings of the human brain. VRs, according to researchers and medical specialists, can diagnose medical conditions ranging from social anxiety to chronic pain. Though the use of virtual reality to train the brain is still in its early stages. While most people were preoccupied with its advancements and leaps in gaming and exploring the industry, many people were unaware of its achievements in the health sector. Since the 1990s, VRs have successfully treated post-traumatic stress disorder; the new programmes thus address a much broader range of conditions. The VR content immerses patients in a virtual, safe, and controlled environment in which they can explore and eventually learn that the threats they are concerned about can be dealt with patiently through time, thought, and analysis.

VR displays come in a variety of shapes and sizes. From those that already have the display and split the feed for each eye using a cable to transfer the feed to the console, to those that are more affordable and rely on the VR mode and applications on Smartphones. This setup is used by a number of head-mounts, including the HTC Vive, Oculus Rift, and Sony PlayStation VR. At home, one can build one's own Virtual Reality Box, as well as a smartphone that supports the VR mode. Regardless of its application, virtual reality generates a set of data that can be used to develop models, communication, training methods, and interaction. Simply put, the possibilities are limitless.

Although it appears to be very far in the future, its origins are not as recent as you might think. Many people believe that one of the first Virtual Reality devices was called Sensorama, and it was a machine with a built-in seat that played 3D movies, emitted odours, and generated vibrations to make the experience as immersive as possible.

The invention first appeared in the mid-1950s. Subsequent technological and software advancements in the years that followed brought about a gradual evolution in both devices and interface design.

2. Literature review:

The recent appearance of low-cost virtual reality (VR) technologies – such as the Oculus Rift, HTC Vive, and Sony PlayStation VR – and Mixed Reality Interfaces (MRITF) – such as the Hololens – is attracting users and researchers, implying that it may be the next stepping stone in technological innovation.

However, VR technology has a much longer history than it appears: the concept of VR was developed in the 1960s, while the first commercial VR tools appeared in the late 1980s. As a result, hundreds of researchers have investigated the processes, effects,

and applications of this technology over the last 20 years, resulting in thousands of research papers.The concept of virtual reality can be traced back to the mid-1960s, when Ivan Sutherland attempted to describe VR in a pivotal manuscript as a window through which a user perceives the virtual world as if it looked, felt, and sounded real, and in which the user could act realistically (Sutherland, 1965).

Since then, several definitions have been proposed. For example, Fuchs and Bishop (1992) defined VR as "real-time interactive graphics with 3D models, combined with a display technology that allows the user immersion in the model world and direct manipulation."

Gigante (1993) defines VR as "the illusion of participation in a synthetic environment rather than the external observation of such an environment." Three-dimensional, stereoscopic head-tracker displays, hand/body tracking, and binaural sound are the foundations of virtual reality. VR is an immersive, multi-sensory experience.

" According to Cruz-Neira, "virtual reality refers to immersive, interactive, multi-sensory, viewer-centered, 3D computer generated environments and the combination of technologies required to build environments." As we can see, despite their differences, these definitions highlight three common characteristics of VR systems: immersion, the perception of being present in an environment, and interaction with that environment.

3. Types of VR:

3.1 Fully Immersive Virtual Reality

Immersive virtual reality (VR) is the presentation of an artificial environment that convincingly replaces users' real-world surroundings, allowing them to suspend disbelief and fully engage with the created environment.

A realistic virtual experience is ensured by fully immersive virtual reality. It will feel as if you are physically present in the virtual world and the things happening there are actually happening to you.

To provide a realistic virtual experience, special equipment such as VR glasses, gloves, and body detectors equipped with sense detectors is required. The computer uses the data from these sensors, and the virtual world responds in real-time to provide users with a realistic virtual experience.

Although it is a future technology possibility, it feels overdue at this point. However, while human imagination has allowed us to imagine what such an experience might be like, the technology to achieve full-dive VR still has some catching up to do.

A Virtual Gaming Zone is an example of this, in which you and other players can interact with the virtual environment at the same time, using special gear, and play with or against each other.

3.2 Non-immersive Virtual Reality

Non-immersive virtual reality is a type of virtual reality in which you interact with a virtual environment, typically through a computer, and control some characters or activities within the experience, but the virtual environment does not interact with you directly.

Non-immersive virtual reality is the polar opposite of immersive virtual reality. It is a type of virtual reality in which you interact with a virtual environment, usually through a computer, and control some characters or activities within the experience, but here the virtual environment is not directly interacting with you.

A computer game such as Dota 2 is a good example of non-immersive virtual reality. Controlling aspects of your character will have an effect on the game's virtual environment. You are technically interacting with a virtual environment, but not directly. That is actually that your in game character does.Semi-immersive Virtual Reality

3.3 Semi-immersive Virtual Reality

Semi-immersive virtual experiences immerse users in a partially virtual environment. When users focus on the digital image, they will still have the impression that they are in a different reality, but they will also remain connected to their physical surroundings.

Semi-immersive technology, also known as vertical reality depth, provides realism through 3D graphics. More detailed graphics create a more immersive experience. This type of virtual reality is frequently used for educational or training purposes, and it is based on high-resolution displays, powerful computers, projectors, or hard simulators that partially replicate the design and functionality of functional real-world mechanisms.

A flight simulator is an example of semi-immersive virtual reality. This is similar to the large screen experiences seen at IMAX cinemas and typically consists of a large, concave screen, projection system, and monitor. They also use advanced computer graphics.

4. Virtual Reality Technologies

The devices used in virtual environments, from a technological standpoint, play an important role in the creation of successful virtual experiences. According to the literature, input and output devices can be differentiated (Burdea et al., 1996; Burdea and Coiffet, 2003).

Input devices, which can range from a simple joystick or keyboard to a glove capable of capturing finger movements or a tracker capable of capturing postures, allow the user to communicate with the virtual environment. More specifically, the keyboard, mouse, trackball, and joystick are simple desktop input devices that allow the user to launch continuous and discrete commands or movements into the environment. Other input devices can be represented by tracking devices such as bend-sensing gloves that capture hand movements, postures, and gestures, or pinch gloves that detect finger movements, and trackers that can follow the user's movements in the physical realm and translate them in the simulated environment.

The output devices, on the other hand, enable the user to see, hear, smell, or touch everything that occurs in the virtual environment. As previously stated, among the visual devices are a wide range of possibilities, ranging from the most basic or least immersive (computer monitor) to the most immersive (VR glasses, helmets, HMD, or CAVE systems). Furthermore, auditory, speaker, and haptic output devices can stimulate body senses, resulting in a more realistic virtual experience. Haptic devices, for example, can stimulate the user's touch sensation and force models.

5. Applications of VR:

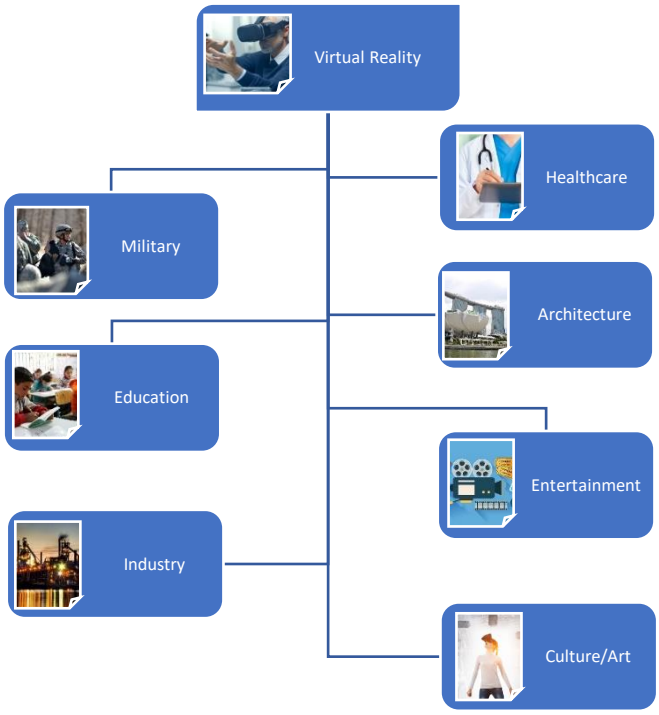

Fig.1. Applications of Virtual Reality

5.1 Healthcare

Training is the most important way VR is modernising healthcare. VR creates an environment in which people can learn and grow in real-world situations.

Specialists who need to perform extremely precise operations can practise in VR without putting themselves in danger. And practitioners who need to familiarise themselves with the hospital environment can do so without added stress.

The technology is also being used in cognitive behaviour therapy, which allows patients with phobias and anxieties to work through their issues in a safe environment.

VR can lessen the intense agony people experience when receiving burn injury wound care when combined with medicine. People who have constant discomfort can also benefit from it. VR lessened suffering by more than 30% in a research on fibromyalgia and low back pain.

You can show patients the surgical plan for their procedure using a 360º reconstruction of the anatomy developed exclusively for them using virtual reality (VR). With this strategy, you may ensure patients' trust while also enhancing their comprehension of the treatment.

Surgeons can use a virtual reality headset to fully immerse themselves in a digital simulation of the patient's body by constructing 3D virtual reality patient models utilising CT, PET, and MRI scans. Patients, particularly small children, are being prepared for surgery using virtual reality as well.

Medicine- The Spanish National Research Council has successfully reduced the effects of Parkinson's disease in several patients by using a VR-based treatment.

Examples:

- Surgery with Virtual Reality.
- Virtual reality for rehabilitation.
- Virtual Reality in Medical Education
- Virtual reality for stroke rehabilitation.
- Virtual Reality for Pain Management
- Virtual reality for physical therapy.

5.2Military

Given that this industry must operate in dangerous environments that are not easily accessible, VR provides conditions for making things as close to reality as possible for training.

VR allows trainees to go through training with minimal risk, and it even aids soldiers suffering from battlefield trauma in overcoming these conditions and preparing for new or unexpected situations.

Moreover, VR can be used more passively to treat PTSD or provide new members a virtual "boot camp" experience to help

them adapt into military life more swiftly and with less fear. Medical professionals can watch front-line triage and field surgery to better comprehend and sympathise with injured patients.

The Ministry of Defence in the United Kingdom employs virtual reality (VR) for training in simulated combat environments.

One of the first VR projects was developed in the 1960's by the US military system. Virtual Reality has always played an important role in the military and has been embraced by all services: the military, the navy, and the air force.

Examples:

- Flight training.
- Simulation of a battleground.
- Medical education (battlefield)
- Simulation of a vehicle.
- Virtual Boot camp.

5.3 Education

Virtual reality enables teachers to adapt learning to technology and increase students' engagement on a consistent basis. It is critical that educators inspire and encourage students to explore new opportunities and learn new ways to solve problems.

Education In the classroom, the use of VR helps students retain knowledge and assists students with learning disabilities.

It eliminates distractions through total immersion and stimulates the student's desire to learn more. It also encourages creative learning. VR is a powerful tool that is already being used in medicine, architectural design, and other fields.

Examples:

- Virtual field study
- Museum visits with guides from around the world
- Virtual Laboratory Environment
- Learn more by looking inside human body parts.

5.4 Entertainment

Virtual reality environments enable ordinary people to interact with exhibits, concerts, museums, galleries, and so on in previously unknown or forbidden ways. It allows the user to view 3D images that appear life-sized to the user, making the entertainment seem realistic but enjoyable. Users can enter a video game scene or engage in extreme sports without leaving their couch.

The entertainment industry was among the first to incorporate VR and continues to be one of the best examples of how it can be used. If you look at online and/or console gaming, you will notice that VR has a strong presence.

Similarly, virtual reality (VR) is being introduced into cinemas and theme parks in order to simulate movie-like adventures and allow people to experience their favourite cinematographic masterpieces.

AR has been used effectively in PR and marketing initiatives for motion picture, television, and other media promotional campaigns for entertainment purposes. These have typically included printed graphic or real-life object recognition, in which the software identifies a unique symbol via web cam or cell phone camera.

Almost half of all global investments in virtual reality are in the entertainment sector. The global VR gaming market alone was valued at $11.5 billion in 2019 and is expected to grow at a 30 percent annual rate from 2020 to 2027.

Examples:

- Video games
- Theatre
- Virtual Theme Parks
- Music VR Experience

5.5 Architecture

Virtual reality (VR) enables architects to experience and comprehend buildings before they are built. According to a 2017 survey, 70% of respondents were using VR and related technology for planning. Using VR technology could reduce the amount of time spent in client meetings and presentations.

VR allows architects to better visualise a space and present it to their clients.

Architects can use VR to not only see what they're building, but also feel how it feels. This allows them to test the space before it is built and make changes in real time to ensure customer satisfaction.

It is easier to communicate design intent when you have the immersive sensation of actually being inside a building. When clients are unable to understand spatial relationships and scale from a 2D rendering, VR, like physical architecture, can elicit a positive response.

For architects, virtual reality is already an important part of the design process. These devices enable architects and their clients to get a sense of the buildings before construction begins. It's safe to say that virtual reality technologies are here to stay, and they can only get better from here.

According to the AIA Firm Survey Repor 2018, 16 percent of architecture firms use virtual reality in their practise.

5.6 Industries

VR enables an open environment where actual product quality can match the rendered models from concept to detail design. This is

especially important in industries with little room for error. VR can be used in the design process to produce more accurate and immersive 3D models.

VR technology allows for the hyper-realistic simulation of environments that could occur in industrial processes (such as falls on slippery surfaces, cuts or fires). Thus, through virtual training, an operator can practise the emergency response protocol in a completely immersive environment.

Engineers can now predict and solve problems before they occur, thanks to virtual reality. This not only allows for a more streamlined manufacturing process, but it also reduces the cost and time required for design and production.

Examples:

- Retail
- Learning & Development
- Tourism
- Professional Learning
- Automotive
- Design
- Marketing
- Events and Conferencing

5.7 Culture/Art:

One of the most significant cultural effects on VR is the use of audio that contains language. Language is a clear expression of culture; it governs how different groups interact and communicate with one another. Language is determined by content creators in VR technologies and is an expression of culture.

There are several museums based entirely on VR, such as the Museum of Other Realities, a fully virtual museum, Google Arts & Culture, which has its own database of world sites, and Open Heritage, which uses aspects of VR to allow users to see the sites in 3D view. While the ethics of virtual reality are frequently debated, cultural heritage specialists have found a special place for it in site recreations, many of which are in danger of being destroyed in real life.

You're in luck if you've ever been so enthralled by a painting that you wish you could live inside every brush stroke. Creators today are pushing the limits of traditional artistic mediums, allowing fans to explore fantastical scenes through virtual reality art.

The virtual reality world is a blank canvas for illustrators, painters, architects, and other artists looking to add a new dimension to their work. Indeed, the potential of virtual reality is practically limitless—it can take the form of a street art mural, 3D sculpture, Fashion Week catwalk, or Broadway set. And, as headset sales continue to rise, it's clear that the trend isn't going away anytime soon.

Some museums and galleries provide virtual visits or immersive experiences to help visitors understand the history and culture surrounding each work.

6. Research:

MeganeX

To fully appreciate the metaverse, immersive virtual reality equipment is required, and such implements are currently very large, heavy, and uncomfortable.

That is why Panasonic decided to contribute to the metaverse by creating the Megane X.

That is why Panasonic decided to contribute to the metaverse by creating the Megane X.

The Megane X virtual reality glasses are much lighter and more compact. Each lens has two 5.2k HDR 10-bit OLED displays with a refresh rate of 120 Hz.

Their 6DoF head position detection and Snapdragon XR1 adaptability allow these glasses to be completely independent of a PC and are compatible with SteamVR mode from the popular Steam platform.

Although they are not yet available for purchase, they are undeniably the lightest virtual reality glasses on the market, weighing only 250 grammes.

Metaverse

Here's an exercise to help you understand how ambiguous and complex the term "the metaverse" can be: In a sentence, mentally replace the phrase "the metaverse" with "cyberspace." The meaning will not change significantly 90% of the time. That's because the term doesn't really refer to any one specific type of technology, but rather to a broad (and frequently speculative) shift in how we interact with technology. And it's entirely possible that the term itself will become obsolete as the technology it once described becomes more commonplace.

In general, the technologies that companies refer to when they talk about "the metaverse" can include virtual reality (characterised by persistent virtual worlds that exist even when you're not playing) and augmented reality (which combines aspects of the digital and physical worlds). It does not, however, require that those spaces be accessed solely through VR or AR. Virtual worlds, such as Fortnite elements accessible via PCs, game consoles, and even phones, have begun to refer to themselves as "the metaverse."

Worldwide Virtual Reality Market

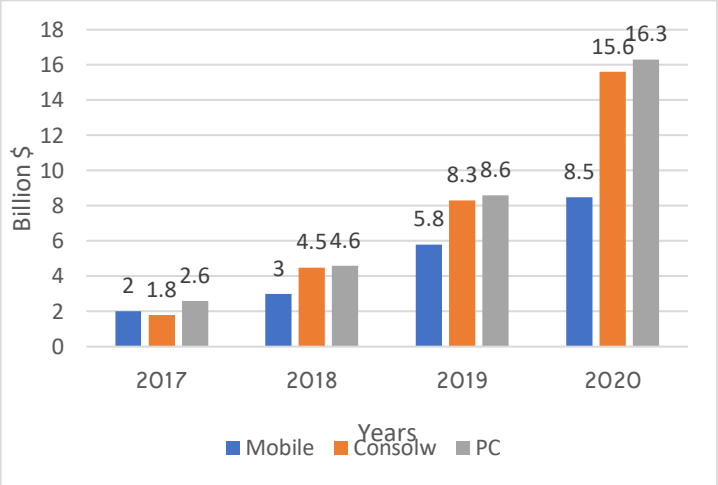

Fig.2. Forecasted Market Side of Virtual Reality Hardware from 2017 - 2020

7. Conclusion:

Virtual reality is among the technologies with the maximum estimated growth potential. According to IDC Research (2018), investment in VR technology nearly doubled in the next four years, attempting to reach 15.5 billion euros by 2022.

Virtual reality will enrich and revolutionise our world in a variety of ways. It opens up new ways of understanding and experiencing history, cities, and landscapes. There are numerous fascinating VR solutions in marketing and public relations that will inspire your customers. The sales and commerce industries have gained modernity and space as a result of virtual reality. Thus, virtual reality not only advances the games industry, but also positively impresses us in all aspects.

All of this means that Virtual Reality is no longer a sci-fi concept. It is a part of our present, and it will lead to advances that will shape the future in the coming years.

There is a technology that defines each generation. It was the internet for our parents. It was the iPhone for us. It will be virtual reality for the next generation — our children and grandchildren.

The next generation will be immersed in virtual reality in all aspects of their lives from infancy. Virtual environments will be used in schools to teach biology, space, history, civics, and other subjects. Virtual environments will be used to keep people entertained at home (the cinema might disappear all together).

Despite numerous obstacles to mass-market adoption of VR, the immersive presence of the VR experience is so compelling that it will succeed – even in the mainstream. (After all, with VR, you can now climb Mt. Everest, swim with whales, and explore outer space).

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