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## Multimedia and virtual reality: Its applications in the real world

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### Abstract

Although new visual technologies like VR and multimedia have been associated with "fringe applications" in art and entertainment, there are a number of legitimate engineering and manufacturing applications that are still developing. Computer systems that provide integrated access to a wide variety of data via the stimulation of human senses utilising digital technologies are referred to as multimedia systems. The capacity of computer systems to merge real-world events with computer-generated content to create a stimulating environment is known as virtual reality (VR). VR social media is opening up intriguing new avenues for multi-media communication. Video games, movies, and other kinds of media may now be interacted with by means of this new technology. Using virtual reality, surgeons and pilots will be able to practise surgery in an atmosphere similar to a hospital, which will help them become more comfortable in the cockpit. Virtual reality may be used to teach and learn more effectively if it is accompanied with multimedia. Forecasters believe that the VR and multimedia applications in manufacturing and engineering will account for approximately 1/3 of the \$11.1B revenues generated in 1994. This paper will help you understand what's happening in the virtual world and what applications are being used in the field.

**Keywords:** multimedia, virtual reality, applications, education, military

### 1. Introduction

By definition multimedia is a type of technology that is used to represent information in an attractive and interactive way by the use of audio, video, graphics and animation. From the name itself we can understand that it is a combination of 'Multi' and 'Media' which is different types of software or hardwares are used to communicate a particular information <sup>[1]</sup>.

#### 1.1 Components of Multimedia

**1.1.1. Text:** All kinds of multimedia use texts to convey their information and they use different types of fonts and sizes according to their requirement.

**1.1.2. Graphics:** In our present world people do not want to read large types of documents that are filled with only texts and these kinds of documents don't help people to keep their attention on the information that is present in the document. This is where graphics comes in as it helps to make it look more attractive.

**1.1.3. Audio:** When using a multimedia application the use of speeches, music and other sound effects become a much easier and more efficient way to convey any information. There are two types of Audios:

**1.1.3.1 Analog Audio:** It refers to the original part of the sound signal.

**1.1.3.2 Digital Audio:** The analog audio that is produced is stored in a digital form by the computer is digital audio.

**1.1.4. Video:** This element of multimedia allows us to explain a lot of information in a short period of time as there is moving pictures which help us to depict real life applications. Digital video files are mostly used and they can be easily stored in computers and their quality can still be maintained. These videos can also be transferred via a computer network allowing people to access them wherever and whenever they want to.

**1.1.5. Animation:** It is mostly just static images being displayed in a continuous sequence and this can be effectively used in attracting attention especially among younger generations.

## 1.2. Terminology

The term multimedia was first used by Bob Goldstein to promote his July 1966 show at the L'Oursin Gallery in Southampton, Long Island [2]. Back then, Richard Wagner believed that total artwork could be created by combining various art forms. For him, the Grand Opera was the ultimate stage show, as it emphasized individual talents instead of the complete work. As a comedy writer and producer, Bob Goldstein's work was described as "multimedia" by Variety's Richard Albarino in August 1966. In a multimedia presentation, a variety of material are combined in an interactive manner that may be used on a variety of devices. During the 1990s, CD-ROM drives were common on many computers. It was possible to transmit huge volumes of visual and audio data because to this technology.

## 1.3. Main Features

People may watch multimedia presentations on stage, in theatres, or with a media player. During a live broadcast, it is possible to perform or record the broadcast [2]. Multiple players may participate in a virtual reality game or simulation using a computer or tablet. Various forms of digital multimedia are often designed to enhance the user's experience. Experiencing multiple forms of media content combined with a personalized view is becoming increasingly common. Web content creators are now able to create interactive experiences through the combination of various forms of media content. This includes interactive video clips and images, as well as interactive text and events.

## 1.4. Usage/Application

[2] Multimedia can be used in various places and is not limited to advertisements, education, engineering, business, etc. Some of the examples are:

### 1.4.1. Commercial Uses

Many creative business companies use multimedia in everyday office life as well as use it for artistic products. This is mostly seen in film, music and gaming industries [3]. With the release of new hardware and software the development of multimedia has helped these companies to develop better applications or products. The biggest use of multimedia that has helped the business sector is the introduction of the presentation. The use of CGI in movies and animation developers using computers to create 3D models that are given texture and with the help of all these they are able to create a movie for their audience. Some video games allow the incorporation of multimedia by allowing the players to actively participate in the story [4]. This allows genres such as mysteries and crime investigations much more interesting and immersive. In art galleries, the visitors can see different types of media blended together to gain attraction. For example, Peter Greenaway melds the digital arts with opera music and physical film. In doing this he has the full attention of the visitors and also this makes the visitors to tell other people about it. Since art through multimedia uses digital formats

the work can be easily reproduced as many times as the person wants. In some cases, the art work is digitally enhanced to make the artwork much better. Multimedia can also be used in advertising a product easily and effectively. Not only does this help marketing it also allows it to create new products by interacting with their customers [17].

### 1.4.2. Education

Multimedia application may sound simple when we talk about it but when it comes to its implementation it can be complicated. For educators, students and lecturers alike, multimedia apps combine previously existing aspects to produce a new and more effective teaching and learning tool. Multimedia applications for education have the potential to enhance student performance. Texts, music, photos, videos, animations, and user control are the six basic components of instructional multimedia programmes [5, 16]. Firstly, text is a very important element for multimedia applications, it can be used for providing information or for emphasizing a point. Imaging helps to have a more significant impact than reading as it is easier to catch the viewer's attention [6, 7]. Audio can be used to help teachers or lecturers to present a lot of information at once rather than wasting time printing sheets for their students to read. Video can be used to present information that cannot be presented in a lecture room like a medical operation. It helps teachers or lecturers to highlight parts of the video and emphasize about it and also helps students understand the real life situation. Animation is used to illustrate something that is not available in the real world. Lastly, user control allows the students to skip certain parts of their programs and navigate to different areas of their program. All of these elements allow multimedia to be used in the education sector. It has a lot of advantages like helping students understand different complex topics, boost interest of students in studying, and improves the student's attitude towards learning.

## 2. Virtual Reality

### What is Virtual Reality?

It's a feeling that's close to, or identical to, what you'd get if you were in the actual world. Virtual reality may be used for entertainment, education, and commercial purposes [2, 3, 7, 8, 9, 10]. Extending the concept of virtual reality to include augmented reality and mixed reality is another term for this sort of technology.

Immersive VR and text-based VR are the two forms of virtual reality that may be distinguished. When it comes to distant learning, text-based virtual reality is a better option than immersive VR.

VR headsets or multi-projected environments are the current standard virtual system for creating realistic visuals, sounds and other sensations to make a person in virtual reality feel as though they are really there. VR environments allow a user to roam about and explore the virtual world around them. Either a room full of monitors or a pair of headphones may provide the desired impression. In addition to audio and visual feedback, haptic technology may be used to provide various sorts of feedback (It is a term that describes technologies that a person can feel with their sense of touch).

### 2.1 History of VR

Morton Heilig wrote in the 20th century about a form of

virtual reality experience known as the "Feel Theatre" that might effectively incorporate all the senses, enabling the user to experience the onscreen activities <sup>[4]</sup>. A prototype called the Sensorama was developed in 1962, along with a few short films for the audience to see. In the absence of computers, the Sensorama was mechanical. They provide realism to the viewer.

For immersive applications, Ivan Sutherland and one of his students in 1968 developed the first head-mounted display device. The technology was so rudimentary that the user's helmet had to be mounted from the ceiling because it was so heavy.

Palmer Luckey created the first Oculus Rift in the twenty-first century. Only rotational tracking was possible since it was designed around the shell of an existing VR headset. Software rectified all the distortion concerns that were present in a 90-degree field of view that had never been seen previously in the market.

## 2.2 Applications of Virtual Reality

### 2.2.1. VR in Military

In today's world, a country has to keep up with the technological advances for its military effectiveness. Massive researches into new military technologies can provide countries with qualitatively better armed capabilities <sup>[9]</sup>. For this reason, the military sector in many countries has started the implementation of VR in training. This has allowed the VR sector to promote their use in different fields as well. The use of VR in military training has several benefits. Firstly, it provides a cost-effective and viable option. Unlike real life training, VR does not require the use of actual ammunition and other resources. VR can simulate any kind of training, re-creating different kinds of environment allowing the military to provide specific training to be done thanks to detailed reconstruction and high number of different combinations. VR can simulate situations like a glacial environment or jungle conditions in doing so they have less risk in losing human life. Virtual reality simulation is widely utilised in military training and depends heavily on it. As an example, sophisticated ground vehicles may be simulated, allowing troops to feel the form and mobility of any kind of vehicle <sup>[11, 12, 13, 14]</sup>.

Although virtual training will not completely replace the need for live training, its position in military training is expected to grow in importance over time. Training costs are reduced and the training environment is made safer by the use of this technology.

### 2.2.2. VR in Sports

Golf, athletics, ski racing, and cycling are just a few of the sports that have turned to virtual reality as a training tool in recent years <sup>[13, 14, 16, 17]</sup>. As a tool for measuring sports experience and examining technique, it was created with these two goals in mind. It is also employed in the design of clothes and equipment for the benefit of the audience. These tools help athletes improve certain parts of their game <sup>[7]</sup>. The use of three-dimensional systems may assist athletes identify and correct training-related problems.

#### 2.2.2.1 Driving equipment design and innovation

Virtual reality is also used in the development of sporting equipment and clothes like for the development of running shoes. Innovation is a key factor and the bar is raised every day in order to improve the equipment to help achieve their

customer's satisfaction. Sportspeople are always looking for ways to improve themselves to help them get over the edge by improving their speed, getting stronger, better endurance etc. They are constantly pushing themselves which helps drive the sports clothing and equipment industry. This industry has to keep up with the constant drive for perfection and they use the latest technology to achieve it.

#### 2.2.2.2 Bringing the sporting event closer

Virtual reality has also been shown to enhance the enjoyment of athletic events by those in attendance. In certain cases, the audience may wander around a stadium before they buy a ticket, allowing them to have a sense of what it's like to be there. A virtual reality-themed game enables the participant to participate in their own game.

#### 2.2.3. VR in Mental Health

A person who is dealing with post-traumatic stress disorder (PTSD) may be able to revisit a horrific incident in an effort to cope with the event and heal. Anxiety, phobias, and sadness have all been helped with this <sup>[15, 16, 17, 32]</sup>. Virtual reality (VR) meditation is more beneficial for those with anxiety since it is easier for them to lessen their stress levels. Virtual reality may also help individuals overcome their concerns in a safe environment.

#### 2.2.4. VR in Medical Training

Aside from merely being used by gamers, virtual reality technology has also shown to be useful in the medical profession. During their time in medical school, most medical students get extensive training via clinical rotations <sup>[10, 18, 19, 20]</sup>. For the most part, they do this via the use of various tools including mannequins, cadavers, and software. The usage of virtual reality (VR) technologies has been extremely beneficial to physicians since it matches the real-world environment. Medical schools are now using these tools in their curriculums since they are so sophisticated. Some of the ways in which it is being implemented are:

##### 2.2.4.1 Development of Medical Skills

Doctors must not only know how to do life-saving treatments, but they must also be able to do it efficiently when the situation calls for it. Medical students may practise these skills in a controlled setting while immersed in VR. Students will also be able to see how successfully they performed the steps.

##### 2.2.4.2 Trauma & Emergency Rooms

Doctors working in the emergency department face a stressful, fast-paced work environment that demands a high level of ability and quickness of thought. It will be possible for a doctor, via the use of virtual reality (VR), to practise skills necessary for diagnosing and treating patients in real time, making rapid judgments, and eventually saving the patients' lives.

##### 2.2.4.3 Surgical Training

First and second year medical students are confined to classrooms for the first two years of their training, and only clinical rotations and minor surgical rotations allow them to get real-world hospital experience. Students may see surgeries from a first-person perspective using virtual reality (VR) and learn about the subtleties and results that occur throughout the simulations <sup>[2]</sup>. This aids the student's

training in the surgical field. Early on, VR gives pupils a leg up on the competition.

### 2.2.5. VR in Fashion

This is a lesser known application in the world and it has had a profound impact on the fashion industry. Virtual Simulations can help retailers and designers to build their shops and products without fully committing to the project in real life. This also allows them to allocate appropriate time and resources in building their dreams. Some popular brands have started using VR in fashion shows which allows the viewers to have a 360-view of the show [18]. During this COVID pandemic retailers and fashion companies have taken a much deeper step into the world of VR. Some of the ways they did this are:

#### 2.2.5.1 Virtual Fitting

This concept was mainly introduced for the beauty industry and as a result almost all makeup brand brands have released their own filters on applications like Instagram and snapchat to make more people buy from their companies. Some shoe companies have taken advantage of this technology as well.

#### 2.2.5.2 Digital Fitting

Since the start of social media a lot of people have started to make their appearances on social media as a serious thing. This gave birth to the idea where people could generate different types of unique clothing outfits. Many designers now use this technology to sell their own version of digital clothing in 3D.

### 2.2.6. VR in Education

Virtual reality (VR) has the potential to enhance education by allowing students to have more memorable and immersive learning experiences. Most importantly, it can all be done in the classroom. When students are immersed in virtual reality, they become more engaged and inspired [11]. Students in the United Kingdom may already access curriculum-aligned material and lesson plans for virtual reality that have been produced [8, 32]. It is possible to use VR in the classroom in one of two ways.

#### 2.2.6.1 Immersive Classroom

The term "immersive classroom" refers to a setting in which pictures are projected into the classroom walls, providing a sense of immersion for students. There is no need for students to leave their classes in order to go to a new location. This immersive experience does not need the use of virtual reality goggles. It's easier for kids to absorb the material in a more familiar setting [12, 32].

#### 2.2.6.2 VR headsets in the classrooms

To put virtual reality in the classroom, teachers often use VR headsets. Many schools are turning to virtual reality headsets since they are inexpensive and take up very little room. For a classroom of 30 pupils, there are typically 15 headsets that are independent devices that do not need a computer to be plugged in to. Even while they are a little more difficult to operate than immersive classrooms, they nonetheless deliver a more realistic experience [12].

Lack of material is the main reason virtual reality in education hasn't been a big hit yet. In addition to the cost of providing additional material, not every educational

institution has the money to employ a software development business to assist them in producing new content.

### 2.3. Challenges of Virtual Reality

#### ▪ Risks to Children

Virtual reality (VR) technology has been shown to have a negative impact on youngsters since it is readily accessible and may lead to confusion about what is real and what isn't [5]. It's harder for kids to restrain their impulses and not follow the avatar in virtual reality when they have a strong emotional connection to VR and find it more believable than the television version.

#### ▪ Virtual Reality Sickness

Motion sickness-like sensations may develop when someone is immersed in a virtual environment [5]. In general, headset-induced symptoms are more prevalent in women than males. Most people complain of general pain, headache, nausea, and other stomach-related symptoms. Disconnection between what is seen and what the body perceives are the primary causes of this illness. A person's internal balance system will be unable to comprehend the motion it perceives since it does not occur physically to the individual.

#### ▪ Privacy

The persistent tracking by the VR machine makes the technology useful but it also requires mass surveillance [5]. The expansion of this technology will allow the reduction of cost for information gathering of actions and responses. Data from eye tracking can also be obtained by using a VR headset which has the probability to reveal the user's ethnicity, personal traits, fears, emotions, interests, etc.

### 3. The Connection between Multimedia and Virtual Reality

Multimedia and Virtual Reality are connected due to the common technologies, uses and definition both the fields have. Virtual reality can be seen as a type of multimedia and multimedia can be seen as a vital component of a virtual reality system [2, 15]. When a person tries to create a system with visual, audio and physical models of the real world multimedia becomes a very important element for the success of the system. Emerging technologies like augmented reality have been used to combine multimedia and virtual reality in order to give the user a seamless experience. Virtual reality depends on many types of technologies and programs to create a virtual world and so it is also a form of multimedia. Multimedia and virtual reality not only increase performance but they are used to add content to the world and provide a whole new dynamic for the users. An example of how virtual reality and multimedia are connected is the concept of telepresence. Telepresence is the interaction between two or more people inside a virtual world. Each person could have a digital representation and might use special devices like VR goggles or a motion-sensitive camera. Within this virtual space, multimedia content like charts, videos or images along with sound are added to the environment. This integration of elements allows a flexible form of collaboration with no problems on physical distance. One humongous industry that connects multimedia and virtual reality is the gaming industry. Many games require the use of multimedia content to be present inside the virtual world. From the ambient sounds in the background to the animations that are used to make the

characters and the world to be more alive, all of these elements combine to make the virtual world more realistic. Special devices help the users to interact in the virtual world and also allowing them to manipulate elements that are present in the virtual world. Also, how VR/ AR will be helpful in near future for transportation sector<sup>[31]</sup>.

Hence, as summary researchers are recommended to refer articles<sup>[21-30]</sup> for different uses of AR/ VR in the smart era.

#### 4. Result and Discussion

After referring to all the websites and going through research papers written by different authors, we have come to the conclusion that multimedia and virtual reality co-exist in our present world and with the help of both the fields of technology it could be used for the betterment of the world.

#### 5. Conclusion

In conclusion, after reading different research papers and going through different websites it is clear that both multimedia and virtual reality play a vital role in this world and this role will increase over the coming years until we cannot live without it. In many sectors it seen that both multimedia and virtual reality have had a massive effect in helping them grow and therefore in the coming years these sectors will be using only these technologies. Both these technologies are only in their starting phase and in the coming years they will learn more about our world and adapt to it in order to improve its efficiency.

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