

# Definition

Virtual reality is an artificial environment that is created with software and presented to the user in such a way that the user suspends belief and accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound. The simplest form of virtual reality is a [3-D](#) image that can be explored interactively at a personal computer, usually by manipulating keys or the mouse so that the content of the image moves in some direction or zooms in or out. More sophisticated efforts involve such approaches as wrap-around display screens, actual rooms augmented with wearable computers, and [haptics](#) devices that let you feel the display images.

Virtual Reality: A computer system used to create an artificial world in which the user has the impression of being in that world and with the ability to navigate through the world and manipulate objects in the world.

Virtual Reality allows you to explore a computer generated world by actually being in it

Virtual reality can be divided into:

- The simulation of a real environment for training and education.
- The development of an imagined environment for a game or interactive story.

Virtual Reality (VR), also known as 'artificial reality', 'artificial worlds', 'virtual worlds', 'virtualities', is a fully-immersive, absorbing, interactive experience of an alternate reality through the use of a computer structure in which a person perceives a synthetic (i.e., simulated) environment by means of special human-computer interface equipment and interacts with simulated objects in that environment as if they were real. Several persons can see one another and interact in a shared synthetic environment.

VR can be considered as a visual form of [cyberspace](#).

VR represents computer interface technology that is designed to leverage our natural human capabilities. Today's familiar interfaces - the keyboard, mouse, monitor, and GUI - force us to adapt to working within tight, unnatural, two-dimensional constraints. VR changes that. VR technologies let you interact with real-time 3D graphics in a more intuitive, natural manner. This approach enhances your ability to understand, analyze, create and communicate.

A VR system lets you experience data directly. For example, today's advanced interfaces let you look and move around inside a virtual model or environment, drive through it, lift items, hear things, feel things, and in other ways experience graphical objects and scenes much as you might experience objects and places in the physical world.

As a result, VR serves as a problem-solving tool that lets us accomplish what was previously impossible. It's also a communications medium, and, ultimately, an artistic tool/medium.

The concept of VR has become in many ways a repository for our culture's dreams of disembodiment, of escape from the limitations of the material body. VR may one day make possible the long list of physically impracticable dreams including: "experiencing an expansion of our physical and sensory powers; getting out of the body and seeing ourselves from the outside; adopting a new identity; apprehending immaterial objects... being able to modify the environment through either verbal commands or physical gestures; seeing creative thoughts instantly realized." While the actual technology has not yet been able to fulfill these desires, the dreamed of possibilities have clearly established a life of their own within our present cultural imagination.

We may not use the phrase "virtual reality" in ten years, but by then, everybody working with 3D graphics will do so with these intuitive interfaces.

*"Used today in architecture, engineering and design, tomorrow in mass-market entertainment, surrogate travel, virtual surgery and cybersex, by the next century 'VR' will have transformed our lives."*  
-- Howard Rheingold (in Virtual Reality , 1991).

*"Virtual Reality won't merely replace TV. It will eat it alive."*  
-- Arthur C. Clarke

## Impact

There has been increasing interest in the potential social impact of new technologies, such as virtual reality (as may be seen in utopian literature, within the social sciences, and in popular culture). Mychilo S. Cline, in his book, *Power, Madness, and Immortality: The Future of Virtual Reality*, argues that virtual reality will lead to a number of important changes in human life and activity. He argues that:

- Virtual reality will be integrated into daily life and activity and will be used in various human ways.
- Techniques will be developed to influence [human behavior](#), [interpersonal communication](#), and [cognition](#) (i.e., virtual genetics).<sup>[7]</sup>
- As we spend more and more time in [virtual](#) space, there will be a gradual "migration to virtual space," resulting in important changes in economics, worldview, and culture.<sup>[citation needed]</sup>
- The design of virtual environments may be used to extend basic human rights into virtual space, to promote human freedom and well-being, and to promote social stability as we move from one stage in socio-political development to the next.<sup>[</sup>

# Types of Virtual Reality

## Immersive

**Immersive virtual reality** is a hypothetical future technology that exists today as [virtual reality](#) art projects, for the most part. It consists of [immersion](#) in an [artificial](#) environment where the user feels just as immersed as they usually feel in [consensus reality](#)

## Non immersive, Desktop VR

### Non-Immersive (Desktop) Systems

Non-immersive systems, as the name suggests, are the least immersive implementation of VR techniques. Using the desktop system, the virtual environment is viewed through a portal or window by utilising a standard high resolution monitor. Interaction with the virtual environment can occur by conventional means such as keyboards, mice and trackballs or may be enhanced by using 3D interaction devices such as a SpaceBall™ ; or DataGlove; .

The non-immersive system has advantages in that they do not require the highest level of graphics performance, no special hardware and can be implemented on high specification PC clones. This means that these systems can be regarded as the lowest cost VR solution which can be used for many applications..

## Virtual Reality

Virtual reality (VR) is a technology that allows you to enter and interact with a world that is generated by a [computer](#). Special graphics, video images and stereo sound make this pretend world seem real.

The uses for virtual reality are wide ranging and cover everything from games where you can drive a [car](#), fly a [plane](#), ski down a mountain or track a dinosaur - to helping train doctors in the art of surgery or teaching pilots to fly aircraft safely. These computer generated worlds can be any size - as vast as the universe or as microscopically small as atoms and molecules.

## Uses Of Virtual Reality

The uses for virtual reality are infinite. It can be used for air traffic control, medicine, entertainment, office work and industrial design. However, along with the good comes the bad. Virtual reality could also be used for destructive purposes, such as war and crime.

The idea of virtual reality emerged in the 1930s when scientists created the first flight simulator for the training of pilots. They wanted to put the pilot in a real situation before letting him fly.

In 1965, an American, called Ivan Sutherland, hit on a new idea and published his findings in a document called 'The Ultimate Display'. His idea was to create a portable, or personal, virtual world using two tiny television sets, one for each eye. In order to realise this, he also designed a head mounted display. Although his invention worked, and he did create a sort of a virtual world, the images were very crude and basic. Another problem was the helmet - it was extremely heavy and cumbersome and needed to be supported from the ceiling. It was also very expensive. In the following years, scientists continued to work on Sutherland's initial idea and great improvements were made. Then in 1985, Michael McGreevey of NASA/AMES developed a much cheaper and lighter version of the helmet. He used a motorcycle helmet and fitted it with mini display screens, and special sensors which were designed to track movement and were linked to powerful, but sensitive computers.

The final piece of equipment for a complete virtual reality kit was a glove. One had been designed in the early 1980s, but modern virtual reality was born in 1986 when a computer games programmer, called Jaron Lanier, designed a new glove. This brought the VR helmet and glove kit into existence for the first time. It was Lanier who gave this new technology the name Virtual Reality.

## **Types of Virtual Realities**

There are three main forms of virtual reality:

The first is perhaps the most familiar. It consists of a helmet which has small TV screens and earphones fitted into it, and a glove (some systems use a joystick or wand instead of a glove). The helmet and glove are linked to computers which are programmed with special sounds and graphics.

The second form of virtual reality uses video cameras to track the image of the user in a virtual world where you can also pick up or move objects. Both these VR systems allow more than one person to take part at the same time.

The final type of VR is where three- dimensional images are played on a large, curved screen. The shape of the screen helps to give you a greater sense of being in the virtual world. By wearing special 3-D glasses, this effect can be greatly improved.

## **Advantages Of Virtual Reality**

VR has a lot of positive benefits. It gives disabled people the opportunity to join in activities not usually available to them. In virtual worlds, people in wheelchairs, for example, can have a freedom of movement that they do not have in the real world. At the moment very few people can afford to buy a VR system. But as the technology advances, lightweight helmets and more powerful computers will take VR into ordinary homes.

Virtual reality has very important uses in all types of architecture and industrial design. Computer Aided Design, or CAD, has been an important design tool since the mid 1970s, because it allows the user to draw three- dimensional images on a computer screen. However, unless you have a VR helmet and glove to project the images on to, you will not be immersed in your virtual world.

## **Applications of virtual reality**

Building aircraft

Virtual reality has been a huge boost in the aviation business as it avoids the need to build several different prototypes (models built to the correct size). Every time an engineer designs a new aircraft or helicopter, a prototype has to be built to ensure that it works, whether it will fly fast enough and whether it is safe for the crew and the passengers. If the prototype is wrong, the designers have to go back to the drawing board, make the changes and then build another one. This is a very expensive and time-consuming business.

By using VR, designers can design, build and test their aircraft in a virtual environment without having to build a real aircraft. It also allows the designers to try out different ideas - all the ideas can be looked at in detail and they can then select the best one. NASA has used virtual reality to design a helicopter and Boeing have used it to design their latest aircraft.

Using virtual reality, doctors have already been 'inside' a body. At the University of North Carolina, USA, virtual reality allowed doctors to enter a cancer patient's thorax (part of the chest) to make sure that radiation beams needed to treat the cancer were in the right place. Doctors will soon be able to look at and study tumours at first hand and in 3-D rather than from scans and x-rays.

### **A virtual body**

In the USA, a murderer who was executed on the electric chair donated his body to science. His corpse was sliced into very thin sections from top to bottom and used to create an entire virtual body for medical research. Soon all medical students will be able to train using virtual bodies instead of real patients.

On a microscopic level, virtual reality is being used in drug research. Scientists at the University of North Carolina are able to create the molecules and then visualize and 'feel' how they react with each other. Before the use of virtual reality, this process was very slow and complicated. Therefore, it is likely that virtual reality will have a strong impact on the speed with which new drugs and remedies are developed and become available in the future.

Virtual reality is also important because it can visualize the unknown or the unpredictable. This might lead to virtual reality operators carrying out repairs in space, with the help of a robot. In a technique called virtual puppetry a robot is controlled by a skilled operator and mimics all the operator's movements.

The possibilities for virtual reality are enormous. Future residents of new towns will be able to walk around virtual streets, shops, houses and parks before a single brick has been laid. There are already plans to redesign the whole of the city of Berlin, the capital of Germany, using virtual reality.

### **Working of virtual reality:**

#### **Head Mounted Displays (HMDs)**

An HMD uses small monitors placed in front of each eye which can provide stereo, binocular or monocular images. Stereo images are provided in a similar way to shutter glasses, in that a slightly different image is presented to each eye. The major difference is that the two screens are placed very close (50-70mm) to the eye, although the image, which the wearer focuses on, will be much further away because of the HMD optical

system. Bi-ocular images can be provided by displaying identical images on each screen and monocular images by using only one display screen.

The most commonly used displays are small Liquid Crystal Display (LCD) panels but more expensive HMDs use Cathode Ray Tubes (CRT) which increase the resolution of the image. The HMD design may partially or fully exclude the users view of the real world and enhances the field of view of the computer generated world. The advantage of this method is that the user is provided with a 360°, field of regard meaning that the user will receive a visual image if they turn their head to look in ANY direction.

All fully immersive systems will give a sense of presence that cannot be equalled by the other approaches discussed earlier, but the sense of immersion depends of several parameters including the field of view of the HMD, the resolution, the update rate, and contrast and illumination of the display.