

Virtual Reality

1. What is Virtual Reality

Virtual Reality, in short VR, is a technology which allows a user to interact with a computer-simulated environment. This environment could be a computer simulated image of the real world or a computer generated fictive world (for example a comic world). Virtual reality combines computer graphics, human computer interfaces and simulation. In combination with virtual reality the term “augmented reality” is often mentioned. Augmented Reality is the combination of information and the real world. Examples are the head-up-displays of helmets for fighter-pilots or in cars. These displays display additional information, like speed or height, in the field of sight of the pilot or driver.



2. History

All began in 1962. Morton Heilig built his vision the “Sensorama”, along with five short films. During these films the visitor was confronted with sight, sound, smell and touch. In 1968 Ivan Sutherland and his Student Bob Spourell created, that what was widely considered to be the first Virtual Reality, a Head Mounted Display (HMD).

3. Technology

Virtual Reality Systems can be divided into two main categories:

- **Desktop Virtual Reality**
PC based virtual reality systems are usually classes as Desktop systems. With these systems the users interacts and views pictures produced by the virtual reality on a traditional computer screen. Examples are 3D-games or CAD-software
- **Immersive Virtual Reality**
At immersive virtual reality systems the computer screen is replaced with a head mounted display or a cave. The user should be surrounded by the virtual reality. The software and hardware for these systems are more expensive and more complex. Examples are flight simulators or caves for construction.

3.1. Data Glove

The data glove is a simple instrument to interact with the computer through gestures. For example, pointing up might zoom in and pointing down might zoom out. This input device is often used in combination with the cave. Designers use it to form and discover 3D models of there products (cars, buildings, lamps, etc.)

3.2. Cave

The cave is a little room with displays on all walls, the top and on the floor. The user only needs to wear special 3D glasses. The great advantage is that the viewer could move unrestricted and feels like in a real world and it is also possible that multiple people enjoy the experience at the same time. Caves are used for example to discover buildings or cities.



3.3. Head mounted display

Head mounted displays are similar to motorcycle helmets. It covers your head and eyes and provides a 3D viewing area inside the helmet. This is reached through a display in front of the eyes. A smaller version of the Helmet but with the same principle is BOOM (binocular omni orientation monitor). This system looks like glasses but instead of the glasses are displays mounted. These systems could be used for a wide range of applications like CAD, computer games, and nearly every virtual reality application.



4. Range of Application

The range of application for virtual reality is immense. The most important are listed below:

- **Medicine**

One of the most important sectors for virtual reality is medicine. Here virtual reality is used in many different ways and modern medicine could not be without.

- Diagnostic
3D view of computer tomographical pictures.
- Preoperative Planning
Surgeries are often planned and tested with computer models.
- Health Care education
Medical Students are able to learn different surgery scenarios without the use of dead bodies or real patients.
- Therapeutic Uses
Another range of application is therapeutic uses. For example a patient with fear of heights could look over the side of a cliff and is able to overcome his fear due to the fact that he knows that it is only a simulation.

- **Design**

Designers use virtual reality to design landscapes, interior or light arrangements. Also buildings, cars or even the skyline of a city could be previewed.

- **Construction**

Whole products or individual parts could be formed and viewed by constructors.

- **Training**

Virtual Reality and flight simulators are an essential part of a pilot training.

- **Games**

Almost every current game uses 3D worlds.

- **Cinema**

Especially in amusement parks are 3D cinemas and simulators the highlights, e.g. virtual rollercoaster drives where you see the coaster and feel the wind and the movement.

5. Future

Today and in future virtual reality is and will play a great role. Especially training simulators for airplanes, in medicine or even for cars are not remunerable. 3D games are standard and the virtual worlds and effects are getting more and more realistic. The newest trend is a virtual online world like second life. These are platforms where users could create their own

characters and meet other person in bars, schools, museums almost every place like in real life to talk and flirt. Even companies have virtual stores in this world where users could view 3D models of their products. Apropos products, products are nowadays designed with the help of CAD-software and in future it will get common to view and form them in caves with the help of data gloves. The only thing which is impossible is to feel. Many of you will have seen the film matrix. But the scenario to live in a virtual world which is created in your brain and to feel computer generated things or emotions is science fiction. And so virtual reality will limit to 3D views, sound and maybe smell.

6. References

- http://en.wikipedia.org/wiki/Virtual_reality
- <http://archive.ncsa.uiuc.edu/Cyberia/VETopLevels/VR.History.html>
- <http://ei.cs.vt.edu/~history/Mitchell.VR.html>
- <http://itc.fgg.uni-lj.si/bled96/papers/bouchlag.pdf>
- <http://www.bmj.com/cgi/content/full/319/7220/1305?view=full&pmid=10559057>