Virtual Reality Essay, Research Paper

Virtual Reality

What is Virtual Reality? The term Virtual Reality (VR) is used by many different people and currently has many meanings. There are some people to whom VR is a specific collection of technologies, that is a Head Mounted Display, Glove Input Device and Audio. However, the general concept of the systems goes way beyond that. “Virtual Reality is a way for humans to visualize, manipulate and interact with computers and extremely complex data”

The visualization part refers to the computer generating visual, auditory or other sensual inputs. The images are graphical renderings of a world within the computer. This world may be a CAD model, a scientific simulation, or a view into a database. The user can interact with the world and directly manipulate objects within the world. Some worlds are animated by other processes, perhaps physical simulations, or simple animation scripts.

Some people object to the term “Virtual Reality”, saying it is an oxymoron. Other terms that have been used are Synthetic Environments, Cyberspace, Artificial Reality, Simulator Technology, etc. VR is the most common and sexiest. It has caught the attention of the media.

The applications being developed for VR run a wide spectrum, from games to building and business planning. Many applications are worlds that are very similar to our own, like CAD or architectural modeling. Some applications provide ways of viewing from an advantageous perspective not possible with the real world, like scientific simulators and telepresense systems, air traffic control systems. Other applications are much different from anything we have ever directly experienced before. These latter applications may be the hardest, and most interesting systems. Visualizing the ebb and flow of the world’s financial markets. Navigating a large corporate information base, etc.

A major distinction of VR systems is the mode with which they interface to the user. There are some non-technologically mediated methods that some people stretch to include in VR, such as books, plays, movies or pure imagination. The above mentioned taxonomy can include these, but we wish to restrict VR to technology mediated systems.

Some systems use a conventional computer monitor to display the visual world. This sometimes called desktop VR or a Window on a World (WoW). This concept traces its lineage back through the entire history of computer graphics. In 1965, Ivan Sutherland laid out a research program for computer graphics in a paper called “The Ultimate Display” that has driven the field for the past nearly thirty years.

One must look at a display screen, he said, as a window through which one beholds a virtual world. The challenge to computer graphics is to make the picture in the window look real, sound real and the objects act real. [quoted from Computer Graphics V26#3]

A variation of the WoW approach merges a video input of the user’s silhouette with a 2D computer graphic. The user watches a monitor that shows his body’s interaction with the world. Myron Kruger has been a champion of this form of VR since the late 60’s. He has published two books on the subject: “Artificial Reality” and “Artificial Reality II”. At least one commercial system uses this approach, the Mandala system. This system is based on a Commodore Amiga with some added hardware and software. A version of the Mandala is used by the cable TV channel Nickelodeon for a game show (Nick Arcade) to put the contestants into what appears to be a large video game.

Immersive Systems is the ultimate VR systems, completely immerse the user’s personal viewpoint inside the virtual world. These “immersive” VR systems are often equipped with a Head Mounted Display. This is a helmet or a face mask that holds the visual and auditory displays. The helmet may be free ranging, or it might be attached to some sort of a boom armature. A nice variation of the immersive systems use multiple large projection displays to create a ‘Cave’. An early implementation was called “The Closet Cathedral” for the ability to create the impression of an immense environment. within a small physical space. The Holodeck used in the television series “Star Trek: The Next Generation” is an extrapolation of this technology.

A variation on visualizing complete computer generated worlds is “Telepresence”. This is a technology that links remote sensors in the real world with the senses of a human operator. The remote sensors might be located on a robot, or they might be on the ends of WALDO like tools. Fire fighters use remotely operated vehicles to handle some dangerous conditions. Surgeons are using very small instruments on cables to do surgery without cutting a major hole in their patients. The instruments have a small video camera at the business end.

Mixed Reality Merging the Telepresence and Virtual Reality systems gives the Mixed Reality or Seamless Simulation systems. Here the computer generated inputs are merged with telepresence inputs and the users view of the real world. A surgeon’s view of a brain surgery is overlaid with images from earlier CAT scans and real-time ultrasound. A fighter pilot sees computer generated maps and data displays inside his fancy helmet visor.

Bibliography

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