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VIRTUAL REALITY AND ITS APPLICATIONS

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Анотація

В даній статті розглянуто поняття віртуальної реальності, а також розглянуті перспективи її застосування в спорті, науці, освіті та інженерії.

Ключові слова: віртуальна реальність; програмне забезпечення; інформаційні технології, інженерія.

Annotation

In this article, the concepts of virtual reality are considered as well as prospects of its application in sports, science, education and engineering.

Key words: virtual reality; software development; information technology, engineering.

The definition of virtual reality

The definition of virtual reality comes, naturally, from the definitions for both 'virtual' and 'reality'. The definition of 'virtual' is near and reality is what we experience as human beings. Therefore, the term 'virtual reality' means 'near-reality'. This could mean anything but it usually refers to a specific type of reality emulation.

We know the world through our senses and perception systems. At school, we all learned that we have five senses: taste, touch, smell, sight and hearing. These are however only our most obvious sense organs. The truth is that humans have many more senses than this, such as a sense of balance for example. These other sensory inputs, plus some special processing of sensory information by our brains ensures that we have a rich flow of information from the environment to our minds.

Everything that we know about our reality comes by way of our senses. In other words, our entire experience of reality is simply a combination of sensory information and our brains sense-making mechanisms for that information. It stands to reason then, that if you can present your senses with made-up information; your perception of reality would also change in response to it. You would be presented with a version of reality that is not there but from your perspective, it would be perceived as real. Something we would refer to as a virtual reality.

Therefore, in summary, virtual reality entails presenting our senses with a computer generated virtual environment that we can explore in some fashion.

Today virtual reality is usually implemented using computer technology. There are a range of systems that are used for this purpose, such as headsets, omni-directional treadmills and special gloves. These are used to actually stimulate our senses together in order to create the illusion of reality.

This is more difficult than it sounds, since our senses and brains are evolved to provide us with a finely synchronized and mediated experience. If anything is even a little off, we can usually tell. This is where you will hear terms such as immersiveness and realism enter the conversation. These issues that divide convincing or enjoyable virtual reality experiences from jarring or unpleasant ones are partly technical and conceptual. Virtual reality technology needs to consider our physiology. For example, the human visual field does not look like a video frame. We have (more or less) 180 degrees of vision and although you are not always consciously aware of your peripheral vision, if it were gone you would notice. Similarly, when your eyes and the vestibular system in your ears are in conflict, it can cause motion sickness. That happens to some people on boats or in a car.

If an implementation of virtual reality manages to get the combination of hardware, software and sensory synchronicity just right it achieves something known as a sense of presence. Where the subject really feels like they are present in that environment.

Virtual reality in sports

Virtual reality is used as a training aid in many sports such as golf, athletics, skiing, cycling etc. It is used as an aid to measuring athletic performance as well as analyzing technique and is designed to help with both of these. It also used in clothing/equipment design and as part of the drive to improve the audience's experience.

Another popular use is sports manufacture: virtual reality is used in the design of sporting clothes and equipment, e.g. running shoe design. Innovation is a key factor in this industry as the bar is raised higher and higher in terms of sporting achievement.

Sports people are constantly looking at ways of gaining them that edge which can mean being faster, stronger, better endurance etc. They are constantly pushing boundaries as regards what their bodies can do which drives the sports clothing and equipment industry. This industry has to keep pace with this constant drive for sporting perfection and uses the very latest technology to do so.

Virtual reality in engineering

Virtual reality engineering includes the use of 3D modelling tools and visualization techniques as part of the design process. This technology enables engineers to view their project in 3D and gain a greater understanding of how it works. Moreover, they can spot any flaws or potential risks before implementation.

This also allows the design team to observe their project within a safe environment and make changes as and where necessary. This saves both time and money.

What is important is the ability of virtual reality to depict fine-grained details of an engineering product to maintain the illusion. This means high-end graphics, video with a fast refresh rate and realistic sound and movement.

Car manufacturers use virtual reality for prototyping purposes during the design process. This enables them to produce several versions that are then tested and changed as per the results. This removes the need to build a physical prototype and speeds up the development stage. The result is a cost effective streamlined process.

Virtual reality in education

Education is another area that has adopted virtual reality for teaching and learning situations. The advantage of this is that it enables large groups of students to interact with each other as well as within a three dimensional environment.

It is able to present complex data in an accessible way to students that is both fun and easy to learn. In addition, these students can interact with the objects in that environment in order to discover more about them.

Then there is the fact that children today are familiar with all forms of technology and use these at school as well as at home. They have grown up with technology from a very early age and unlike adults, do not have any fear or hesitation in using it.

Moreover, we live in a technological society. So it makes sense to implement virtual reality as one of several forms of technology in order to educate tomorrow's technological elite. Education has moved on from books, pencils and pens to the use of interactive technologies to help impart knowledge and understanding.

Virtual reality in scientific visualization

Virtual reality is being increasingly used in the field of scientific visualization. This field is based upon using computer graphics to express complex ideas and scientific concepts, for example molecular models or statistical results.

Scientific visualization is used as a means of communicating abstract concepts to an audience that also aids with understanding. The audience can interact with these images, for example, viewing a molecular structure at different angles or as a means of problem solving.

Virtual reality enables scientists to demonstrate a method or convey complex ideas in a visual format. This includes semi-immersive and full immersive environments in which they visualize research theories or discuss large data sets.

This is used in the following scientific disciplines: Physics, Chemistry, Biology, Medicine, Astronomy and Engineering.

This technology raises possibilities for collaboration between different disciplines or new forms of research and development.

Virtual reality is considered alongside other forms of visualization technology such as computer simulation, animation and information visualization. All of these are designed to show a visual model of a live system, e.g. human body, complex data set or a large collection of numerical information.

Summary

Virtual reality is the creation of a virtual environment presented to our senses in such a way that we experience it as if we were there. It uses a host of technologies to achieve this goal and is a technically complex feat that has to account for our perception and cognition. It has both entertainment and serious uses. The technology is becoming cheaper and more widespread. We can expect to see many more innovative uses for the technology in the future and perhaps a fundamental way in which we communicate and work thanks to the possibilities of virtual reality.

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