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Application of the Virtual Reality Technologies in Education

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ABSTRACT

Method of dialogue of person with computer is named interface and Virtual Reality (VR) is newest of row this interfaces. Applications of VR in area of computer games was first and in this time is rise need to exercise this technology in another areas: industry and education. Nowadays VR are used by many universities, education and industrial companies as well, because they offer lower operating costs than the real situation. In other disciplines where training is necessary, simulations have also offered big benefits. VR are established itself in many disciplines of human activities, as a medium that allows easier perception of data or natural phenomena appearance. Therefore the education purposes seem to be the most natural ones.

KEYWORDS: *Virtual reality, Virtual laboratories, Virtual reality in education*

INTRODUCTION

With the advent of high-resolution graphics, high-speed computing, and user interaction devices, virtual reality (VR) has emerged as a major new technology in recent years. An important new concept introduced by many VR systems is immersion, which refers to the feeling of complete immersion in a three-dimensional computer-generated environment by means of user-centered perspective achieved through tracking the user. This is a huge step forward compared to classical modeling and CAD/CAM packages, which inherently impose major imitations on intuitive user interaction. VR technology is currently used in a broad range of applications, the best known being flight simulators, walkthroughs, video games, and medicine (virtual surgery). From a manufacturing standpoint, some of the attractive applications include training, collaborative product and process design, facility monitoring, and management. Moreover, recent advances in broadband networks are also opening up new applications for telecollaborative virtual environments in these areas [7].

BASIC TERMINOLOGY IN VIRTUAL REALITY

At the beginning of 1990s the development in the field of virtual reality became much more stormy and the term Virtual Reality itself became extremely popular. We can hear about Virtual Reality nearly in all sort of media, people use this term very often and they misuse it in many cases too. The reason is that this new, promising and fascinating technology captures greater interest of people than

e.g., computer graphics. The consequence of this state is that nowadays the border between 3D computer graphics and Virtual Reality becomes fuzzy. Therefore in the following sections some definitions of Virtual Reality and its basic principles are presented.

Virtual Reality (VR) and Virtual Environments (VE) are used in computer community interchangeably. These terms are the most popular and most often used, but there are many other. Just to mention a few most important ones: Synthetic Experience, Virtual Worlds, Artificial Worlds or Artificial Reality. All these names mean the same [1]:

- "Real-time interactive graphics with three-dimensional models, combined with a display technology that gives the user the immersion in the model world and direct manipulation."
- "The illusion of participation in a synthetic environment rather than external observation of such an environment. VR relies on a three-dimensional, stereoscopic head-tracker displays, hand/body tracking and binaural sound. VR is an immersive, multi-sensory experience."
- "Computer simulations that use 3D graphics and devices such as the DataGlove to allow the user to interact with the simulation."
- "Virtual reality refers to immersive, interactive, multi-sensory, viewer-centered, threedimensional computer generated environments and the combination of technologies required to build these environments."
- "Virtual reality lets you navigate and view a world of three dimensions in real time, with six degrees of freedom. In essence, virtual reality is clone of physical reality."

Although there are some differences between these definitions, they are essentially equivalent. They all mean that VR is an interactive and immersive (with the feeling of presence) experience in a simulated (autonomous) world – and this measure we will use to determine the level of advance of VR systems.

VIRTUAL REALITY APPLICATIONS IN EDUCATION

For a long time people have been gathering a great amount of various data. The management of megabytes or even gigabytes of information is no easy task. In order to make the full use of it, special visualization techniques were developed. Their goal is to make the data perceptible and easily accessible for humans. Desktop computers equipped with visualization packages and simple interface devices are far from being an optimal solution for data presentation and manipulation. Virtual reality promises a more intuitive way of interaction [4].

The use of flight simulators has a long history and we can consider them as the precursors of today's VR. First such applications were reported in late 1950s, and were constantly improved in many research institutes mainly for the military purposes. Nowadays they are used by many civil companies as well, because they offer lower operating costs than the real aircraft flight training and they are much safer (see Fig. 1). In other disciplines where training is necessary, simulations have

also offered big benefits. Therefore they were prosperously applied for determining the efficiency of virtual reality training of astronauts by performing hazardous tasks in the space. Another applications that allow training of medicine students in performing endosurgery, operations of the eye and of the head were proposed in recent years (Fig. 2). And finally a virtual baseball coach has a big potential to be used in training and in entertainment as well.

Figure 1: *Advanced flight simulator of Boeing 777: (a) outside view, (b) inside view*

One can say that virtual reality established itself in many disciplines of human activities, as a medium that allows easier perception of data or natural phenomena appearance. Therefore the education purposes seem to be the most natural ones. The intuitive presentation of construction rules (virtual Lego-set), visiting a virtual museum, virtual painting studio or virtual music playing are just a few examples of possible applications. And finally thanks to the enhanced user interface with broader input and output channels, VR allows people with disabilities to use computers [6].

Figure 2: *VR in medicine: (a) eye surgery, (b) head surgery*

CONCLUSION

The combination of information technology (IT), virtual reality and education activities has greatly changed traditional education processes. Many education tasks have been carried out as information processing within computers. For example, students can design and evaluate a new part in a 3D CAD system with virtual reality presentation without constructing a real prototype. As many activities in education process can be carried out using computer systems, the concept of virtual education (VE) has now evolved. Cultural and Education Grant Agency (KEGA) of the Slovak Minister of Education supported this work, contract No. 3/5172/07.

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