

Chapter XXV

Virtual Reality in Education

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Abstract

This chapter introduces the technology of virtual reality as an educational tool. It argues that virtual reality, combined with multimedia technologies and in support of different learning styles, offers potential help in teaching environments. The authors describe different examples of applications of virtual reality in different kinds of schools (primary schools, high schools, and universities) and in different countries (USA, Italy, Morocco, Romania, and Switzerland). They hope that by understanding the characteristics of this technology and its use in the education field, teachers will be able to use virtual reality in future teaching endeavors.

Introduction

Virtual reality (VR) is a modern technology that gives to its users the illusion of being immersed in a computer-generated virtual world with the ability to interact with it. A virtual reality system has the following three primary requirements (Rosemblum & Cross, 1997):

- 1) immersion (which requires physically involving the user, both by capturing exclusive visual attention and by transparently responding to three-dimensional input);
- 2) interaction (through the three-dimensional control device to investigate and control the virtual environment);
- 3) visual realism (that is an accurate representation of the virtual world using computer graphics techniques).

The interface hardware components consist of a visual display apparatus, some sort of input device, and a position sensor. Input devices can comprise a keyboard, a mouse (2-D or 3-D), a head-mounted display (HMD), and motion-sensing data gloves. The purpose of the input device is to permit the human participant to give electrical signals to the computer which can be transformed as specific commands. Of virtual reality, Derrick de Kerckhove states:

“Like any interactive medium with a cursor present inside the spectrum of the screen, virtual reality is a ‘total surround’ effect, an actual replacement of reality, its substitution, foundation for the values of the new environments. We are no longer operating with only two spaces, physical space and mental space, but have added a third zone of exploration: digital space, cyberspace, virtual space, call it what you like.” (Barzon, 2003, pp. 38-39)

The types of VR are usually classified according to their method of display; there is immersive VR and non-immersive VR. In particular, low-cost non-immersive VR is used in the educational field. Several research institutes around the world have demonstrated the potential of virtual reality systems as a visualization tool, and as technology continues to improve, VR systems will become pervasive instrumentation for research in education. This work describes some examples of virtual reality in educational fields and intends to answer to the following question: “Is an active use of virtual reality possible in schools?”

The chapter presents some applications of this technology in different kinds of schools, for example, in primary schools to create a collaborative learning environment, in high schools, in universities, and in different countries. All experiences emphasize VR’s strong impact in educational environments.

Background

The potential of VR in education is recognized and supported by interesting results (Winn, 1993; Pantelidis, 1995; Byrne, 1996; Youngblut, 1998; Gerval, Popovici, & Tisseau, 2003). Many researchers believe that virtual reality offers benefits that can

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