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THE USE OF VIRTUAL REALITY IN EDUCATION

WYKORZYSTANIE WIRTUALNEJ RZECZYWISTOŚCI W EDUKACJI

Summary

Recent technological developments in the field of teaching have brought significant changes in the daily practice of teaching. Due to the great development of computer resources, we must adapt the old and traditional teaching methods to the new technological conditions existing in our social environment. One of the latest developments in the field of education are the virtual reality techniques, which will change the course of our educational systems in few years. This transformation is currently present in the technologically advanced countries.

Keywords: virtual reality, education, learning, simulation.

Streszczenie

Dokonujący się rozwój technologiczny przyniósł znaczne zmiany w codziennej praktyce edukacyjnej. Z powodu ogromnego postępu w zakresie zasobów komputerowych, jesteśmy zmuszeni do zaadaptowania dotychczasowych, tradycyjnych metod nauczania do nowych warunków technologicznych, występujących w środowisku społecznym. Jednym z ostatnich osiągnięć w dziedzinie edukacji są techniki wirtualnej rzeczywistości, które w ciągu kilku lat wymuszają dalsze zmiany naszych systemów edukacyjnych. Z technikami tymi mamy już dziś do czynienia w zaawansowanych technologicznie krajach.

Słowa kluczowe: wirtualna rzeczywistość, edukacja, nauka, symulacja.

Introduction

Within the changing and prevailing world of technology, change and innovation are constant; this is where virtual reality comes into being, a subject which is not far from being a novelty, but which is quite striking, different and particularly didactic. The term "reality", as defined by the dictionary of the Real Academia de la Lengua Española, is each of the facts that make up the fabric of our existence, that is, everything that exists or has existed. On the other hand, the word "virtual" reflects it as something implicit, tacit, that has apparent and not real existence. In this way we can define virtual reality as something developed in an apparent way but perceived in a real way.

Although the term virtual reality dates back many decades, with Ivan Southland being the first to define it in 1965, the definitive impulse came from Wil-

liarn Gibson in 1985 with his novel *Neuromante*, in which he introduced the concept of cyberspace, an imaginary place on the other side of the computer where one can visualise programmes, data and the lines of interconnection of an infinite network of computer elements¹.

From flight simulators to virtual maps, virtual reality has had a great boom in industrialised countries as an alternative for leisure and entertainment; but it is only now that its educational possibilities are beginning to be exploited. We can define virtual reality as an environment of scenes or objects of real appearance that creates in the user the perception of being immersed in it, being complemented through glasses or helmets.

Palmer Luckey, a pioneering developer of virtual reality glasses tells us that the challenge of virtual reality is to make that virtual world look as realistic as possible, sound real and feel real. There are many applications based on the theory that knowledge is retained much better when it is experienced directly than when it is simply seen or heard. The basis of this theory is the concept of first-person knowledge, whereby an individual acquires most of the knowledge of his or her daily life through natural, direct, non-reflective and subjective experiences. Experiences of this kind are often characterized by the absence of deliberate reflection, as action arises directly from our perception of the world.

The concept of first-person learning is opposed to that of third-person learning, used in traditional educational methodologies, where the student acquires a more passive role as a mere recipient of knowledge, and where the abuse of the expository method has been frequent, ignoring the degree of motivation of the student.

On the other hand, with the advance of new technologies it has been common to use teaching systems through telematic means such as the computer, where they are increasingly versatile and varied, integrating audio and video for teaching purposes. These systems allow adaptability to almost any subject of knowledge, and are also reliable and safe, with an increasingly friendly and motivating environment, which clearly facilitates the teaching/learning process.

Virtual reality and its educational use

Without a doubt, the incorporation of virtual reality meant a very important qualitative leap in the learning of disciplines or areas of knowledge, especially in those in which it is difficult to visualize the processes studied. The use of virtual models makes it possible to obtain a sense of 3D space that any other system of graphic representation lacks. Moreover, it is a fairly intuitive tech-

¹ D. Zapatero, *La realidad virtual como recurso y herramienta útil para la docencia y la investigación*, "Revista Iberoamericana De Tecnología En Educación Y Educación En Tecnología" 2011, no. 6, pp. 17–23.

nology in terms of its use and it manages to facilitate the explanation of complex or abstract concepts².

On the other hand, the use of virtual reality mechanisms will imply an added motivation for the student, since they will encourage him/her to learn and continue exploring the virtual world, while observing and listening at the same time. Some experiments carried out by researchers have shown that the learning curve with virtual aids is faster and achieves greater and better assimilation of content than traditional teaching tools, mainly because students use almost all their senses in the process of learning a subject.



Google Cardboard. Image: Google cardboard official page

The concept of immersion has been present since the first developments of virtual reality technology. Its origins go back to the development of virtual reality devices, such as helmets or glasses, which were used by combat pilots and for computer-aided design [16]. The aim of these early projects was to place participants in environments that would provide them with the information they required and in which they could interact as naturally as they would in the real world. This required virtual reality devices to have both a wide visual field so that objects could be detected by peripheral vision, a position locator of the participant's body, and translators who interpreted the participant's natural behavior, such as looking or pointing. As a result of immersion in a virtual world, partici-

² M.A. Poveda & Thous, M. C., *Mundos virtuales y avatares como nuevas formas educativas*, "Historia y Comunicación Social" 2013, no Especial Noviembre, pp. 469–479.

pants had a fairly real sense of being elsewhere, as well as a conviction that a virtual world is a valid and practical, if different, form of reality³.

In more technologically advanced countries (USA, France, England), these revolutionary teaching methods are already being developed, with good results for their students. For example, at Stanford Medical School, a virtual system for learning Human Anatomy has been developed. A team of researchers from the University of Strasbourg has also started to apply virtual reality techniques to the field of surgery. For these researchers, these techniques represent a real revolution in the practices carried out by medical students.



Microsoft HoloLens. Image: Microsoft official page

The technological capacity to reproduce even the smallest details, the fictitious as if it were real, is beginning to become a reality applicable to all areas of educational experimentation. Without a doubt, this phenomenon known as virtual reality, será one of the panaceas in education systems in recent years, promises to change the course of our educational systems.

One of the great thinkers who has developed his research in the field of virtual reality and its didactics is Pantelidis⁴, who proposed a model to decide when

³ M. LaCruz, C. Bravo & M.A. Redondo, *Educación y nuevas tecnologías ante el siglo XXI*, “Revista Comunicación y Pedagogía” 2000, no 164, pp. 25–39.

⁴ V.S. Pantelidis, *Reasons to use Virtual Reality in education and training courses and a model to determine when to use Virtual Reality*, “Themes in Science and Technology Education” 2009, no. 2(1), pp. 59–70.

and how to incorporate virtual reality into the educational field. This model is very interesting and proposes ten steps to implement it in a didactic way:

1. Define the objectives for the course
2. Mark those who could use a simulation
3. Put unselected targets on file for future consideration as Virtual Reality Technology evolves
4. Inspect each chosen objective to determine which one could use a computer-generated simulation.
5. Examine the chosen objectives to determine which ones could use 3D simulations.
6. Decide on the level of realism, type of interaction, type of sensory input and output required, for the chosen objectives
7. Choose the most appropriate Virtual Reality software and hardware for the objectives.
8. Designing and building the Virtual Environment
9. Evaluate using a pilot group
10. Modify according to the results of the evaluation.

It would be desirable for the Pantelidis model to consider aspects depending on the characteristics of the student, his or her Learning Style, the level of depth and learning required and the most appropriate teaching techniques. It should be noted that the Pantelidis model would need further pedagogical analysis, where specific objectives of the students using 3-D simulations and the group profile are determined⁵.

Conclusions

Virtual Reality is a technology applicable to the educational field, mainly due to its ability to visualize the processes under study, regardless of the discipline to be dealt with. In this way, students can immerse themselves in artificial scenarios that show them processes that would otherwise be inaccessible. This is the enormous potential of this technology in the educational field, as an auxiliary tool or even as one of the basic ingredients of a new teaching methodology.

Furthermore, we cannot disregard the interest and motivation that virtual reality generates in the user, not only because of the use of new tools, but also because of the fact of learning by experimenting and interacting with an environment, instead of passively receiving the information to be assimilated.

Virtual reality is beginning to have sufficient technology to satisfy the demand for resources that characterizes it, and the integration of telecommunications and information technology in today's society is giving rise to new training

⁵ I. Aznar-Díaz, J.M. Romero-Rodríguez & A.M. Rodríguez-García, *La tecnología móvil de Realidad Virtual en educación: una revisión del estado de la literatura científica en España*, "EDMETIC, Revista de Educación Mediática y TIC" 2018, no. 7(1), pp. 256–274.

mechanisms through the new infrastructures. With the arrival of computers in the classroom, all that is needed is for this technology to become standardized and for the devices it uses to be made cheaper so that they can be used on a daily basis.⁶

Under these parameters, it is important to emphasize the great impact that this type of technology has within our society and it is also worth noting that it is precisely because of this access and availability that it can be allowed to elaborate future technological plans in which the use of virtual reality is constantly involved for strictly educational benefits.

Virtual reality has an enormous potential to simulate situations in various fields of the real world, particularly in the field of education, where its characteristics of immersion, first-person learning, non-symbolic interaction can be of great help to the teaching/learning process.

The characteristics of Virtual Reality make it an almost "natural" tool for the teaching/learning process; however, software applications must also consider technologies such as Teaching Techniques, Educational Objectives, and Learning Styles, in order to develop applications that are focused on the student and not only on the content⁷.

Any model that aims to help in the decision of when and how to incorporate virtual reality technology in the teaching-learning process, must consider the student as the central point. Virtual reality is one of the emerging technological tools and its trend is increasing in relation to its application in the educational field. In short, virtual reality is present in the educational field and its trend is increasing with technological development, the reduction in the cost of visual devices and the universalization of the smartphone, so its integration in education must be studied as it is a social reality and a new source of employment.

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⁶ A. De Antonio, M. Villalobos & E. Luna, *Cuándo y cómo usar la Realidad Virtual en la Enseñanza*, "Revista de Enseñanza y Tecnología" 2000, no.42, pp. 26–36.

⁷ J. Echeverría, *Avatares, realidad virtual y educación digital*, "Actas del primer congreso internacional de educación digital", Bilbao, España, 2000.

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