VR Technology to the Training of Paramedics

Subjects: Education, Special Contributor: Martin Boros

The virtual world has long been a focus not only of the gaming sphere, but also of the manufacturing and educational industries. The virtual world and its technology have many advantages, the basic ones being, for example, the use of experiential learning, with which the human brain can remember some things better and faster. It was due to the advantages of virtual reality technology that we decided to create an educational system on safety and health at work, and we focused on the healthcare segment due to the COVID-19 pandemic.

virtual reality

safety and health at work

education system

testing

1. Introduction

The virtual world and virtual space are names that represent unreal environments created by computers. the researchers can understand these terms from two perspectives, one of which the virtual space of social networking sites, such as online chat rooms, chat dating sites, and similar others. Within this group, the researchers can express the researchers opinions and attitude towards situations, persons, and the like without worrying about what others will think of us, since the researchers do not have to go by the researchers name but, for example, can use a nickname, i.e., impersonate anyone else. Many people use this method, which is why the notion that the researchers can do everything on the Internet has become popular. The second perspective is the virtual media space, which primarily refers to the gaming space, which can show a higher profit value on a long-term, year-on-year basis. Among other things, the virtual world can be understood as a communication medium within which it is very difficult to define the difference between the virtual and the real world [1]. On the contrary, several authors see the virtual world as a future or a new uprising for some industries, such as museums or galleries, thus supporting artists ^{[2][3]}. It is the virtual world that can provide us with a sense of everyday life, despite the current impact of the COVID-19 pandemic, when attendance at several social events or cultural events is limited or completely canceled ^{[3][4]}.

According to Newzoo ^[5], in 2022, the virtual reality industry should be worth \$196 trillion, and this amount includes all platforms that enable gaming, such as console, PC, mobile, tablet, and others. Games are a very popular way for many of us to relax, without even realizing that the researchers are being transported into a virtual world where the researchers could be a professional soldier, an athlete, or anyone else. Although the prevailing opinion in the past was that those who play a lot of games are gamers, the opposite is in fact true, at least in some cases, such that gamers are slowly becoming 'professional athletes', whom the researchers may one day see in the Olympics. With the gradual evolution of modern technology, gaming platforms have also evolved and gradually found popularity with most users; these are mainly the Xbox with Kinect, Nintendo Wii, and others, where some of the

controls can be defined by user gestures. The procedure described above is similar for virtual reality (hereafter VR), which is gradually finding an increasingly stable place in the technological equipment of the average user [6].

2. VR Technology to the Training of Paramedics

VR is an unrealistic, simulated environment created by a computer. This term is often misused, as many end-users consider even a classic video game to be VR, and the term is also often confused with the term *virtual world*. However, VR differs from classic games in its essence, and this is the complete immersion of the user in the action, using specialized devices such as goggles, controllers, projector arrays, and the like. When using VR, the researchers have a very intense visual sensation, and the researchers feel that the researchers are in a completely different sensory place. There is a certain disadvantage in the fact that the researchers can eliminate the surrounding environment, and in the case of not creating enough surrounding space, accidents can occur. In addition to the notion of VR in virtual space, the researchers distinguish two kinds of realities, namely Augmented Reality (hereafter AR) and Mixed Reality (hereafter MR). AR represents the combination of the real world with the addition of unrealistic 2D or 3D objects. The advantage of this kind of reality and the associated glasses is that several types are made for one eye only, as also shown in **Figure 1**, and can be conveniently slid up on the head and retracted again when needed. MR, or for some authors, hybrid reality or second-generation AR, exploits the capabilities of 3D objects applied to real-world environments. Undoubtedly, the advantages of MR include the ability to be controlled by gestures without the need for additional controllers, as is the case with VR. On the other hand, VR is several times cheaper than AR in terms of cost ^[ZII8].



Figure 1. The difference between the glasses of each type of reality \square .

As the researchers can see, in **Figure 1**, VR is the only type of reality that needs special elements for control joysticks, with which the user can confirm the session itself within another reality. The aforementioned elimination is both an advantage and a disadvantage of VR, since from the modeling point of view of environment creation, VR is the simplest compared to the others. VR is the most commonly commercialized of these technologies, as it has the greatest potential in terms of cost/use ratio ^{[9][10]}. MR and subsequently AR have been developed for much more specific uses and are still waiting for their permanent deployment within the commercial sphere. Applications of these realities include architectural design ^[11], learning to treat selected surgical procedures ^[12], and training of security forces ^{[13][14]}.

Unlike MR and AR, VR has a relatively wide range of applicability, e.g., video games, live events, virtual parks, cinema movies, modern gadgets, and education. With the gradual transformation of needs, VR, especially from the gaming sphere, has moved into commercial use, where its essence and the use of experiential learning has been applied. According to Gran view's research ^[15], the global market size was estimated to be worth \$15.6 trillion in 2020, and it is estimated that this value will increase by 18% by 2028. The demand for VR is particularly felt in the instructional training of new workers, or in the recurrent training of mechanics, pilots, soldiers, or oil industry workers, industries where, from the point of view of the importance of the work activity, it is worth investing in the development of a tool that will show the worker the consequences of its possible failure.

According to ^[16], the virtual market value in the healthcare segment is projected to be \$2.4 trillion in 2026, approximately 14% of the total expected value. It can be assumed that, given the current situation caused by COVID-19, this value could increase even more. COVID-19 increased interest in VR, especially in real estate, with real estate agents using VR to virtually tour a property, using, for example, a mobile app. In this case, the researchers are talking about VR in 2D. Such use of VR is very simple and convenient for the end user, as they can become familiar with the basic parts of the virtual or even real space using a web browser or a special application. Google Maps also uses a similar principle ^[17]. On the other hand, the second option is a fully mobile VR in which it is also necessary to acquire technical equipment—helmets and controllers. After this initial investment, there is no need to invest further, only to charge or change the batteries powering the system.

As has been suggested, the essence of the virtual world is the possibility of being and doing something completely different from who the researchers are or what the researchers actually do. Over time, however, some scholars have come to see this space from a different perspective, namely experiential. If someone wants to try a roller-coaster ride but is afraid, they can go first to the one in the virtual world and then to the real one. The same is true for promising pilots who learn how to land an airplane in complicated situations; they will not risk their lives or the lives of their passengers or cause material damage while, but they will learn how to do it in the virtual space. It is scientifically proven that experiential learning is far more effective than classical learning, and students are able to remember more, so the effect of education is obvious. The human brain can better remember what to do in a given situation by means of an experiential situation. Gradually, teachers and schools have understood this and have

started to use the virtual world to teach financially demanding subjects ^{[18][19]} but also to prepare future teachers for online teaching due to the impact of COVID-19 or other emergency situations ^[20].

the researchers concern is the observance of safety precautions, habits aimed at the protection of persons. A typical example of the researchers interest is the computer game *Zero Hour: America's Medic* ^[21], in which the user acts as a paramedic whose task is to rescue people and give them first aid after a car accident, a bomb explosion, etc. Thus, the user can use the virtual environment to test whether they are administering proper mouth-to-mouth breathing or other initial actions to save a life. This game should undoubtedly be played by anyone going through any first aid course, such as driving school. For the researchers research, the researchers focused on a similar approach described above but applied it to building a system for safety and health at work (OHS) for different industries in the context ofCOVID-19, from the point of view of the possibility of full-fledged limb control, while the OHS deployment itself is performed only visually ^[22]. According to the analysis of the applicability of VR in OHS ^[23], the researchers could reach approximately 84% of the working population in the Czech Republic with such a system. In addition to the OHS system created by us, the researchers could increase and make more attractive the training of OHS legislation, which every employee must attend at regular intervals. Further, ^[23] provides a categorization of work sectors with an expression of the expected value of a given area, as shown in **Table 1**.

Categorisation for VR	Estimated Segment Value (mil. EUR)
Manufacturing and processing enterprises	1.54
Technical and Economic workers	1.09
Retail	0.91
Healthcare	0.41
Construction industry	0.40

Table 1. Profitability of industries in Czech Republic ^[23].

Considering the current COVID-19 situation, the researchers decided to focus primarily on healthcare workers, as they work on the front line and the need for OHS compliance is highly desirable for them at this time.

The current situation in the healthcare sector is very risky due to COVID-19, and the researchers could even call the work in this segment the riskiest. It is also because of this incentive that the idea to create such an oriented project aimed at educating health personnel in OHS, through VR, was born. This is an effective and flexible way of retraining workers, which can be offered to workers at the present time and thus increase their knowledge and experience in OHS. Specifically, it is a training software that, in the form of plausible situations/procedures in the environment of health care facilities, will ensure the acquisition of OHS knowledge and skills, thanks to which health care workers increase their knowledge and skills in the subject, and this is associated with an equally

important reduction in the number of occupational injuries and other negative impacts related to lack of experience and knowledge.

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