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Opinion

The Metaverse and Future Prospects

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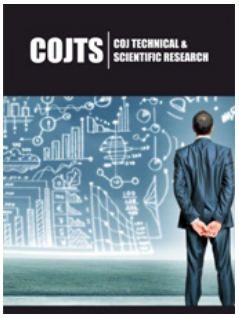
Abstract

The metaverse is the latest frontier of the human imagination, where everything that has a physical limit in the real world can be enhanced and exploited in a much more effective and interactive way. The aspects on which research will have to work will be mainly those related to input and output management technologies, improving the interaction between humans and the virtual environment, to try to overcome the physical barriers currently present and to succeed in realizing the world of possibilities.

Keywords: Virtual reality; Augmented reality; Metaverse

ISSN: 2643-7066



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Submission: August 19, 2022
Published: August 26, 2022

Volume 3 - Issue 5

How to cite this article: Damiano Perri*. The Metaverse and Future Prospects. COJ Tech Sci Res. 3(5). COJTS. 000574. 2022. DOI: 10.31031/COJTS.2022.03.000574

Introduction

The metaverse represents one of the latest frontiers of scientific research, where many scientists and scholars focus on exploiting its hidden potential more effectively. At the basis of the metaverse are well-established technologies such as virtual reality and augmented reality, which, thanks to the increased computational power of modern graphics cards and processors [1], make it possible to represent three-dimensional worlds rich in vertices and polygons with very high-resolution textures inside them that enable the recreation of faithful and photo-realistic environments. [2,3] These technologies are now used in many sectors such as entertainment, medicine, e-commerce, teaching, tourism, and so on [4]. We can say that they have now become technologies that most people can enjoy and use. This is certainly due to a great deal of work being done by developers to make the software that is produced easy and understandable. Still, it is also important to state that tools are available to facilitate the work of those who programme and develop these environments. Several open-source software packages enable the creation of interactive virtual environments. Among these, it is important to mention Blender and Unity. With the former programme, it is possible to realise models, three-dimensional objects, which can then be imported into scenes to be viewed and used in virtual worlds. On the other hand, Unity allows the creation of explorable scenarios, with the objects created with Blender inside them. Indeed, we can imagine reconstructing a real-world object with Blender, importing it into a virtual environment created with Unity so that we can experiment with the virtual object. Virtual objects that are faithfully replicated from real objects are often called Digital Twins. Some examples of Digital Twins can be public gathering places, which by means of virtual models can be used to simulate the most effective routes for people to escape in the event of danger, the virtual reproduction of a car engine that allows its operation to be tested under particular and extreme conditions of use. In its most popular conception, the metaverse is imagined as a public gathering place that takes up the idea launched many years ago by the software Second life. However, one must bear in mind that the success of a new metaverse can only be determined by certain characteristics. For example, let us ask ourselves what might prompt people to change their lifestyle and start a working relationship within the metaverse. Probably the feature that will revolutionize how these virtual worlds are enjoyed most of all will be overcoming the barriers of the physical world. Some of the most intuitive barriers are those given by input devices, such as the mouse

and keyboard, which limit the possibility of interaction with the machine. Within the metaverse, interaction through voice controls, or even in the future, through neural interfaces that can take input directly from our thoughts, will be increasingly important (Figure 1). Let us imagine that we are working in an office in the metaverse: Our workspace would not have to be limited by the area provided by the monitor of the laptop or computer we use daily, and we could imagine that the entire environment around us could be used, for example, by means of interactive virtual panels displaying information all around us without limits of space or interaction.

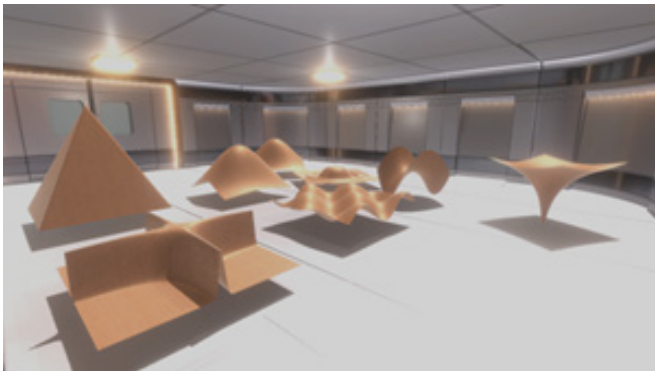

Figure 1a: Virtual world for the study of mathematics in high schools.

Figure 1b: Virtual reconstruction of foligno's central square.

In the past, our working group has tackled some of these issues with a view to improving the quality of teaching by recreating a virtual environment where students can visualize three-dimensional mathematical functions via virtual reality displays, and the results have been very promising [5]. Figure 1a shows a picture of the environment used by the students that can be explored through virtual reality visors. Figure 1b shows a reconstruction of the central square of the city of Foligno and shows one of the churches. This environment is also developed to be explored through virtual reality viewers [6].

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