Volodymyr Solonenko
S.M. Gapeev, research supervisor
I.I. Zuyenok, language adviser
National Mining University, Dnipro, Ukraine

## Virtual Reality in Construction

Virtual Reality (VR) has a long history of its development, but it was popularized in 2016 with a boom of various VR-rigs (headsets, glasses, controllers). The work of VR is to create the illusion of being present in an environment that is virtual, i.e. computer generated. When transmitting information to various human senses, VR can simulate a stay in a certain environment, room or location, which allows the user to see, hear and interact with the environment through the use of a VR headset, headphones and controllers.

Innovations in IT are introduced into life very fast: innovation changes the innovations. Thus, after the presentation of the VR's capabilities, it has been massively integrated into all spheres of human life. Many industries, such as art, medicine, treatment and tourism, want to use its functionality, and construction is no exception.

In the construction industry, the winning tenders have a great impact on the reputation of companies, where, in addition to the economic component, the visualization of the project is also important, especially in the design of buildings and their interiors.

Currently, the process of designing and modeling buildings and structures is using BIM technologies. Drawings of projects are provided in the form of flat pictures and three-dimensional models: computer and real layouts. The design process itself does not exclude the possibility of errors arising from misunderstanding of customer requests, which lead to high costs for their correction. Experts believe that the feedback from the client speeds up and optimizes the work that allows designers to make more informed project decisions at the earliest stages (Fig 1).

To reduce the efforts put into design and simplify the process of integrating VR into an existing software package, this technology is used with new BIM models - architects, designers, where designers create an information model of the object - the BIM model, and the client, using a special headset or simply a mobile phone, can "walk inside an object not yet constructed". This allows you to move and even interact with the building before construction begins.

In addition to directly introducing new technology into the designing process, it is also possible to combine it with the other devices in order to improve productivity and optimize labour costs on the objects which are already in production.

The advent of 3D laser scanning and unmanned aerial vehicles (UAVs) in construction gives new opportunities for using VR. For example, 3D laser scanning of the area around the construction site with the help of UAV and loading the 3D model onto the VR-headsets of the construction process participants.

Fig 1.

Virtual reality systems have been widely used in the field of strategic design of urban development and development of a master plan for development, too. In fact, the VR system is a dynamically changing model of the city, and working with such a mock-up of interdisciplinary teams of experts from different fields of knowledge allows to create qualitative and really working strategic plans for the organization of the city's living space.

Virtual reality is already making revolutionary changes to existing technologies for planning, designing and building industrial, military and civilian facilities. The broader application of VR technologies and tools, combined with modern advanced information technologies in the construction industry (BIM-design) will significantly improve the convenience, efficiency, accuracy and reliability of the work of designers, architects, builders and real estate developers. And this is not the future, it is the reality of today.

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