УДК 004.946:811.111

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Virtual and Augmented Reality

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The industry of virtual and augmented reality is one of the most trending nowadays. Numerous companies and startups develop complex devices that can create detailed virtual worlds and enhance our understanding of ordinary objects.

Virtual reality (VR) is a term that can describe non-existent world that was created with the help of electronic devices and the entire industry. Such devices create an illusion that you interact with real objects in the real world, but virtual environment is only generated by a computer and simulated with the help of a VR system.

Its history began in the 1960s when the definition of artificial reality was introduced by Myron Krueger. The first VR device was called *Sensorama* and the first computer-generated virtual space was named *Aspen's Movie Map*. Augmented reality (AR) is a result of combining real-world environment with computer-generated one. It alters one's natural perception and vision, while virtual reality fully simulates it. AR enhances our vision by bringing virtual elements into the real world.

The history of AR started in 1990s. First commercial devices were used for entertainment purposes, but huge modern companies are mostly interested in professional gadgets.

VR is usually organized in the form of glasses or helmet. Fully simulated environment needs to be rendered with the help of powerful computer and require a lot of wires. A

complete environment is obtained with the help of adjustable lenses. They make the picture similar to human vision and increase the viewing angle. AR is represented in the form of HUDs (head-up displays) or smartphone applications. Unlike VR devices, AR ones are independent, i.e. they do not require a computer to work. HUDs put augmented environment directly in front of your face. The device can exist in the form of a helmet or glasses.

The main idea of augmented reality is to decrease the amount of hardware for comfortable wearing and using. Applications should be installed on your smartphone before you can use them. Your phone must have a camera to provide the app with raw data. Advanced AR devices also have sensors and multiple cameras on them to define the state and the position of physical objects more correctly. We can find numerous applications of artificial reality.

Nowadays, mixed reality is ready to be used in marketing. VR experience is much stronger than traditional one. The experience gained after using VR and AR devices contributes to the formation of company's image and attracts investments, mass media and clients. Although computer-generated reality is mostly used for entertainment and marketing purposes nowadays, VR/AR devices can find applications in numerous professional spheres. Education is one of the most perspective fields to apply VR/AR products in. Other prospective fields are design, engineering and architecture. Three-dimensional models are much more visually attractive than the projections on blueprints.

The usage of VR/AR devices in Belarus is a prospective branch, but nowadays it is poorly developed. It started in 2015, when MSQRD application was developed. Nowadays numerous exhibitions and museums (for example, Belarusian National Historical Museum) use VR and AR devices to complete the event with cutting-edge interactive elements.

Mixed reality has some disadvantages. Firstly, good VR/AR devices are quite expensive. Secondly, most AR glasses and helmets need a lot of space for some electronic components, and VR devices need powerful PCs and wires. Thirdly, scientists and psychologists have an ambiguous opinion about the impact of virtual reality on human health. Specialists think that long-term immersion in virtual reality has a very strong influence on our minds. Another group of specialists think that frequent using of VR devices can affect social behavior and make the person addicted to the virtual world.

However, VR/AR devices can help people with limited abilities. Microsoft HoloLens is mixed reality eyeglasses by Microsoft. The target audience of Microsoft HoloLens is business, but Microsoft plans to make it widespread in the future. HoloLens is represented in the form of a headband with a head-mounted display. We can control the glasses by some gestures, voice, special clicker or by pressing buttons. HoloLens follow the direction of the user's eyes to highlight holograms the user is looking at. Software developers can use different APIs and 3D engines to create applications and virtual environment. Oculus Rift is one of the first modern commercial VR kits. It is mostly used to play VR-supported computer games.

However, Facebook (current owner of Oculus VR company) will make a version for professional applications too. There are also some analogs of Oculus Rift, e.g., PlayStation VR, HTC Vive, Samsung Gear VR etc. VR box is one of the examples of cheap virtual reality products. It is a good variant to start your acquaintance with VR. You can buy it for about $20-$50. The cheapest device made from cardboard is called Google Cardboard ($1-$5). VR Box looks like ordinary VR glasses, but it doesn't have a screen. You have to use your smartphone as a screen and as a computer. Google

Glass is represented as an optical head-mounted display in the shape of eyeglasses. The device combines the opportunities of AR and Internet communication. It runs Android OS. Software developers are provided with Android API and powerful Google services like Google Maps.

Virtual reality gives a lot of possibilities in numerous fields from entertainment and marketing to engineering and education, though it requires a lot of time and resources to create comfortable, relatively cheap and user-friendly devices.