

Virtual Reality and Its Practical Application in Modern Medicine



IT technologies are actively developing and opening up a wide range of opportunities for the entertainment industry. Virtual Reality is perhaps the most sparkling example. And although this technology is currently used primarily for entertainment, it has broad prospects for use in the development of medicine. Together with experts from the Healthcare IT industry, we reviewed the latest VR [trends in medicine](#).

History of VR with its start from gaming

The announcement of Microsoft's Project X-Ray prototype caused a flurry of emotions among gamers around the world. The first game was released in the form of a demo, where users wearing

VR glasses and holding a special manipulator in their hands were supposed to destroy hostile robots breaking through the walls.

In March 2020, Valve Corporation released Half-Life: Alyx for VR, which has seriously altered ideas about the future of VR technology. In this game, together with realistic graphics, producers introduced a drawing function – this feature has become a small breakthrough.

The history of VR in games dates back to 1990. At that time, no one could have imagined that this technology would be applied anywhere outside gaming. Today, VR and AR are applied in education, scientific and military research, sports, transport, and medicine. The last option will be discussed here.

VR in studying medicine

A significant event in the world of medicine was a surgical operation, during which a cancerous tumor was removed. The operation was performed at the Royal London Hospital and was observed by 13,000 students. The surgeon used Google Glass and streamed the event on the Internet with a one-minute delay.

Why this event was so remarkable:

1. The audience watched the operation through the eyes of the surgeon.
2. Viewers could ask questions online.
3. The broadcast of the operation could be viewed on any device.

The surgeon received questions during the operation – they were displayed as text off to one side, and he could answer them vocally without stopping the process.

Although students could enjoy a full view, they still were passive viewers in the process. This was the main reason why

3D simulations, not only accurately reproducing all details but also intended for students to practice their skills, started appearing.

Medical Simulation Corp offers a product called Simantha that educates future cardiologists. The product is a 3D manikin with a cardiovascular system, which is designed for training for all operations known to cardiologists. Students can inject contrast agents, study the insides of the heart, see the patient's reaction to certain medical manipulations, etc.

There are more traditional teaching methods as well. HumanSim offers a simulator for learning the basics of communication with patients, first aid (including that in tactical conditions), lung ventilation, etc. Here users can create unique simulations on their own.

Advantages of learning with 3D simulators

An artificial manikin doesn't provide the same experience of interacting with a patient as simulations do. The virtual simulator reproduces all the anatomical features of the human body, while standard manikins are not able to contain and display all the necessary information. In the case of using a 3D model, a student can even assess the consequences of their mistake, for example, if a blood vessel is damaged. Stanford University has a simulator that even allows for the tactile sensations of conducting an operation.

By polishing up their surgical skills, future doctors **gain experience** that will allow them to work more delicately and accurately. This will help to improve the qualifications of graduates, and from a practical perspective, this will reduce the number of errors and post-surgery complications. Such simulators are especially useful for microsurgeons and

telesurgeons.

Caring for patients

VR technologies can be useful not only for training future doctors but also for managing various mental disorders. For example, using VR, phantom-limb pains and various forms of phobias can be treated. According to experiments carried out at the Chalmers University of Technology, thanks to the use of VR technologies, it was possible to reduce phantom pain by up to 22% through restructuring the neural networks of the patients' brains. By simulating the presence of a hand, this technology relieved patients of the obsessive thoughts of a missing limb.

VR can also be used in the treatment of autistic people by helping them practice behaving in a society where patients are not ready to act. Provided that technologies are rapidly developing and becoming more accessible, there is hope that, in the near future, we will receive a qualitatively new level of medical care in all areas.

Finally, VR technology may soon be used for diagnosing and monitoring [Alzheimer's disease](#). About two years ago, scientists from Cambridge University and University College London conducted research where they used VR headsets to detect Alzheimer's disease in its early stages. Those who participated in the experiment (both with mild cognitive impairment that often develops into Alzheimer's disease and without it) were asked to walk within an artificial environment. The technology helped to detect navigation problems in those participants who previously tested positive for MCI. Such a method for diagnosing Alzheimer's disease may soon prove itself to be better than the tests we have today.

Conclusion

VR is a promising technology in healthcare. The simulated environments that it creates are already used for transferring valuable knowledge in the field of surgery, and it soon might prove itself helpful for diagnosing and monitoring various diseases. This, in turn, leads to significant improvement of the quality of patients' lives, lifts medicine up to a new level, and opens the potential for the development of innovative healthcare software solutions.