Neurosurgical virtual reality training: Review of current practise and potential future uses.

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Abstract

Years of tradition and legal and ethical considerations about patient safety, work hour limitations, and the price of operating room time have changed surgical training over time. Before using them on patients, sophisticated methods can be taught and practised through surgical simulation and skill training. The manipulation of artificial "tissue" in a box trainer using real tools and video equipment can serve as a simple kind of simulation training. Virtual reality simulators that are more sophisticated are now accessible and prepared for mass use. Early computer systems have shown to be efficient and discriminating. Newer systems make it possible to create thorough curriculum and complete procedural simulations.

Keywords: VR-Virtual reality, Stimulation, Neurosurgery, Endoscopic surgery, OR-Operating room.

Introduction

For more than a century, observational learning has been a cornerstone of surgical education in the United States. The cost of Operating Room (OR) time, constraints on residents working 80 hours per week, and legal and ethical issues for patient safety have all recently become more of a burden for this practise. Neurosurgical treatments can be taught and practised outside of the operating room thanks to the developing fields of surgical simulation and virtual training. With more effective and efficient training techniques, it is possible to solve issues with patient safety, risk management, OR management, and work hour needs. Simulator training's present objective is to assist students in developing the abilities necessary to carry out difficult surgical procedures before they are practised on actual patients. In their current state, Virtual Reality (VR) simulators have been shown to enhance surgical resident's performance in the Operating Room (OR) in some specialties like laparoscopic and endovascular surgery training. In this article, we'll talk about the development of VR simulators for neurosurgical training, different types of simulators, and existing and potential uses for this technology [1].

Virtual environments are referred to by a variety of names, including artificial reality, cyberspace, VR, virtual worlds, and synthetic environment. All of these words apply to an application that enables the user to view and interact with three-dimensional settings that are far away, expensive, dangerous, or otherwise inaccessible. The sensory and interactive user experience should be as close to a convincing simulation of the actual as possible. This is a key objective in the creation of these virtual systems. Full immersion into a virtual world, augmentations of the real world, or "through-the-window" worlds is all possibilities in a VR computer-generated 3D spatial environment. While interactive 3D computer graphics and the technology for interacting are still developing and have a wide range of applications, the technology for seeing is real-time [2].

In VR, these two concepts are intertwined. Immersion describes the sensation of being completely engulfed in a virtual environment. It refers to how much the user believes that one or more experience components are a compelling part of reality. The user's interactions with the virtual world are best characterised as presence. When an activity or series of tasks are carried out remotely in a networked virtual environment, the term "telepresence" is frequently used to describe it. Real-time and delayed telepresence are the two types. In the former, interactions are represented in how real-world items move and a robotic hand is also moved when a data glove is moved. Neurosurgeons must frequently hone their abilities. Giving performers the chance to practise in a safe setting allows them to make mistakes without suffering the consequences, but doing so comes with a number of difficulties. Surgery blunders can have disastrous repercussions, and educating during surgery lengthens operating hours and raises the patient's overall risk. Every time, every patient deserves to be treated by a skilled doctor. Additionally, one-on-one teaching is necessary for mastering new skills. However, there are frequently a finite amount of teachers, cases, and hours available [3].

The computer-based surgical planning systems by neurosurgeons, which enable them to view and quantify the three-dimensional data present in the form of medical imaging, are growing in popularity. Computer-based visualisation and planning tools have the potential to save healthcare costs, boost surgical team morale, and enhance patient outcomes by providing the surgeon with quick and simple access to

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this three-dimensional data. Inherently three-dimensional, neurosurgery deals with intricate, overlapping structures in the brain and spine that are difficult to visualise. The surgeon must be able to envision these structures and comprehend the effects of a suggested surgical intervention on both the desired surgical targets and the surrounding, live tissues in order to create the most effective surgical strategy [4].

Instead of simulating the actual surgery, the primary goal of pre-operative planning is to comprehensively explore the patient data and assess potential intervention techniques in light of that data. This is done by first generating 3D images using the patient's own diagnostic imaging, like computed tomography scans and magnetic resonance images. Virtual reality manipulation has put a lot of emphasis on visual feedback methods and universal input devices. Many characteristics of physically manipulating objects in the real world that consumers would anticipate or implicitly depend on are absent from such virtual manipulations. Consequently, immersive VR is required, where the system offers the most primary sensory input and output, encompassing tactile and kinaesthetic modalities as well as cognitive engagement and assessment [5].

Conclusion

A crucial first step in improving the experience of performing and learning neurosurgical procedures is the use of virtual environments. Currently, virtual technologies are utilised to instruct surgeons, get the surgical team ready for operations, and give priceless intraoperative data. Users have reacted favourably to these systems and are hopeful about the potential uses for these technologies in the future. The hypothesis that tactile input improves the realism of virtual hand-object interactions is supported by fMRI experiments employing a tactile virtual reality interface with a data glove. These investigations revealed activation maps in the anticipated modulations in motor, somatosensory, and parietal cortex. Therefore, user input is crucial both in the design of these systems and in the actual field testing of potential applications. The field of neurosurgery is beginning to use fully immersive technology. The training of neurosurgeons will soon include comprehensive VR neurosurgery modules as a necessary component of the curriculum.

References

1. Acosta E, Muniz G, Armonda R, et al. Collaborative voxel-based surgical virtual environments. Stud Health Technol Inform. 2008;132:1-3.

2. Aggarwal R, Black SA, Hance JR, et al. Virtual reality simulation training can improve inexperienced surgeons′ endovascular skills. Eur J Vasc Endovasc Surg. 2006;31(6):588-93.

3. Aggarwal R, Darzi A. Organising a surgical skills centre. Minim Invasive Ther Allied Technol. 2005;14(4-5):275-79.

4. Aggarwal R, Hance J, Darzi A. The development of a surgical education program. Cir Esp. 2005;77(1):1-2.

5. Albani JM, Lee DI. Virtual reality-assisted robotic surgery simulation. J Endourol. 2007;21(3):285-87.

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