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Recent Tendencies in Virtual Reality and Augmented Reality

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Abstract

Two of the most thrilling pioneers in the whirlwind of rapidly evolving technology are changing the game when it comes to interaction, immersion, and innovation, making the world as we know it feel outdated. Virtual Reality, or VR for short, transports us to a whole new dimension by crafting a computer-generated artificial environment. It allows users to plunge into a simulated three-dimensional world, immersing them in an experience where our usual physical reality is swapped out for a virtual one. What's truly remarkable about VR is that it can whisk you away to an entirely different place without you having to move an inch. On the other hand, Augmented Reality (AR) enhances us on top of it, effectively 'augmenting' our reality. Unlike VR, which replaces our surroundings, AR enriches and modifies our current reality by superimposing virtual elements. It creates a "mixed reality" experience by bridging the gap between the actual and virtual worlds. In this age of digital transformation, VR and AR have become integral to how industries operate today. They've opened up new avenues for interactive, engaging, and efficient solutions across various fields—from Medicine to Automotive, Education to Retail, Construction to Entertainment, and beyond. Their utility and popularity have skyrocketed, making them not just fleeting tech trends, but the forefront of technology immersion and interactivity.

Keywords: Virtual Reality (VR), Augmented Reality (AR), Recent Tendencies.

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Introduction

This technology works by showing a series of digital images that allow users to interact with a virtual setting, mimicking real-life situations or environments. With virtual reality, you get to immerse yourself in a 3D world that feels incredibly real, so you can explore wherever your interests lie. It's a simulated experience that's used in gaming, entertainment, education, and even professional settings, allowing people to have experiences that might be risky or completely impossible in real life (Al-Azawi & Shakkah, 2018). Since Ivan Sutherland developed the Sword of Damocles headset in 1968, virtual reality technology has advanced significantly. That large gadget provided a crude preview of what virtual reality might develop into. Just a year later, Myron Krueger took things further with the VIDEOPLACE program. By 1985, the pioneers at VPL Research were the first to sell VR headsets and gloves. In the late '80s, NASA also got in on the action, using VR technology to train astronauts (Zhan et al., 2020).

This method uses a virtual environment to expose a person to traumatic stimuli in a controlled way. VR has the potential to improve telehealth encounters and the doctor-patient relationship. Doctors can provide a detailed yet understandable explanation of a medical concern by using virtual reality technology. With virtual reality (VR), medical students may learn in a secure environment and obtain real-world experience without putting live patients in danger. Burn victims, laboring mothers, and other patients can benefit from the many therapeutic tools and approaches that virtual reality technology offers. This will help them through a difficult recuperation. VR is being used by therapists to aid in stroke, Parkinson's disease, and injury rehabilitation (Martín-Gutiérrez et al., 2017).



Fig. 1: Explanation of AR and VR

When it comes to VR-based physical therapy and rehabilitation, clinicians can select software that targets unique issues and helps the patient develop particular abilities (Kim et al., 2018). Patients receive prompt feedback on their exercise performance. Together with VR's immersive experience, all of this could inspire patients to go beyond their current limits. We can experience the real world around us with a digital augmentation superimposed on it thanks to augmented reality (AR). It functions by instantly incorporating digital content or information into the user's surroundings.

Methodology

The research focused on how immersive virtual reality can trick the brain into changing self-perception. Specifically, it looked at how an embodied avatar can affect motor cortical excitability and the initiation of actions. This study took place in the motor learning and neuro-rehabilitation lab at the University of Bern in Switzerland. The primary objective was to determine whether multimodal feedback that modifies an avatar's physical attributes could affect control and motor brain networks. Ten non-neurological subjects were placed in a completely virtual environment and exposed to a variety of stimuli, including feedforward kinematics, cortical excitability, embodiment, the stone illusion, movement in the direction of a sphere, and motor shooting. For the study, a male and a female avatar were created so that participants may sit at a table and observe a gender-matched avatar in the first person (Cipresso et al., 2018).

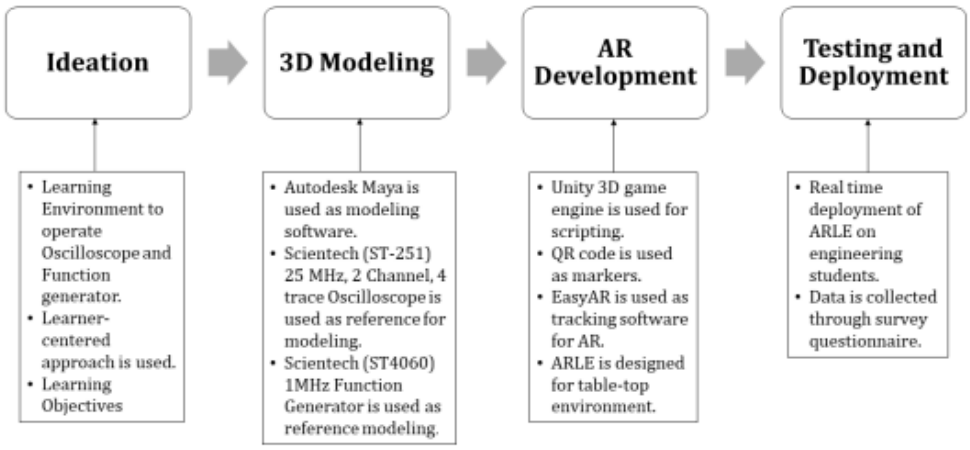


Fig. 2: Development Process of AR Learning System

Additionally, the stone arm illusion was used, in which participants heard a sound that changed from a human to a stone-like impact as a virtual hammer struck either their real arm or the avatar's arm. Because of the multimodal feedback in the immersive VR environment, participants stated that their arm felt colder, heavier, stiffer, and less sensitive when they had the illusion of owning the stone avatar as opposed to the human one (Mekni & Lemieux, 2014).

Results and Discussion

Questionnaires were used to measure the sense of embodiment. The entire experiment was carried out in a single, roughly one-hour session.

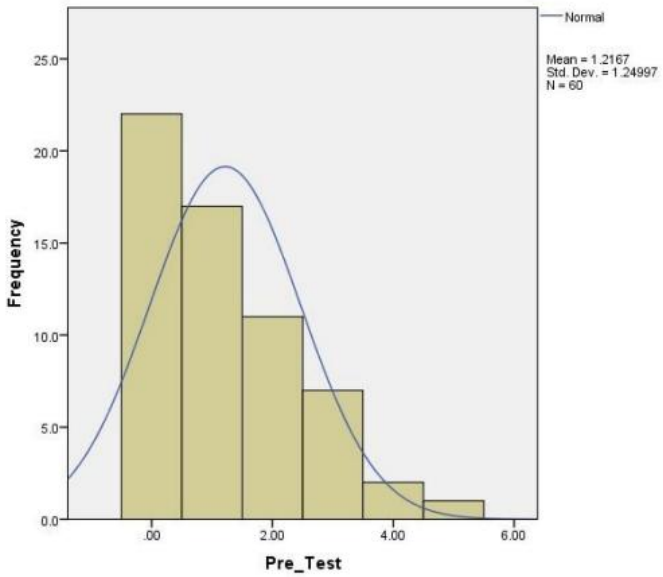


Fig. 3: Distribution of Pre-test scores for total sample

They discovered that it was improving motor recovery. When participants interacted with the avatar character during virtual reality training, their motor cortex became more excitable and they moved more quickly, which was associated with the illusion's power (He et al., 2018).

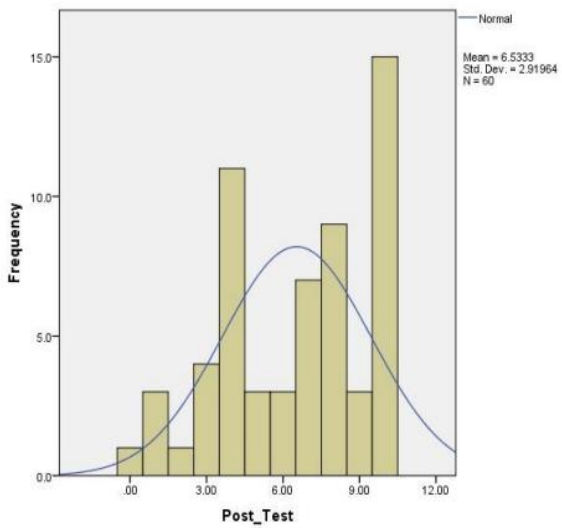


Fig. 4: Distribution of Post-test scores for total sample

The distinction between the virtual and physical worlds is becoming increasingly hazy as a result of technical advancements that have made virtual reality (VR) experiences more realistic. In order to provide genuine hands-on instruction in a variety of professions, both VR and AR are being used to create immersive and captivating learning experiences (Muñoz-Saavedra et al., 2020). The growing popularity of wireless VR headsets is giving users the freedom to move around, enhancing the immersive experience.

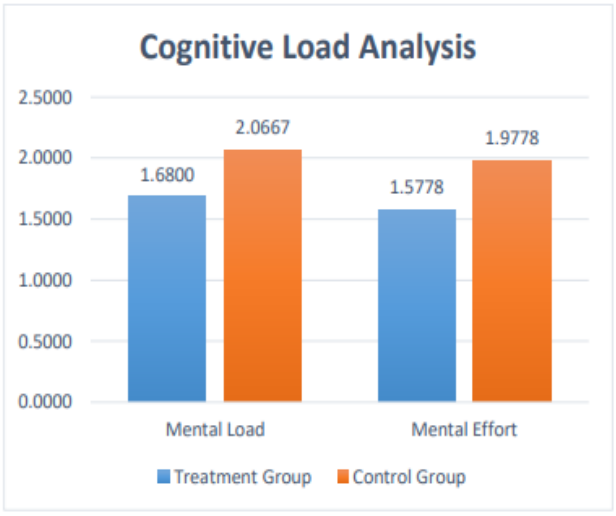


Fig. 5: Comparison of Mental-load and Mental-effort for the two groups

Cognitive load can be assessed through two key factors: mental load and mental effort. For the treatment group, the average mental load is 1.68, while the control group has a higher average of 2.06. This indicates that students in the treatment group experienced less mental load compared to their counterparts in the control group. Additionally, the average mental effort for the treatment group stands at 1.57, whereas the control group averages 1.97.

Conclusion

VR has the potential to improve motor recovery for people with neurological disorders by subtly switching between the sense of one's own body and the associated motor brain networks. This could have important implications for neurorehabilitation. However, no consistent impacts across different kinematic parameters were seen in this investigation. VR appears to play a significant role in accelerating the recovery of cognitive and motor abilities. By providing a secure environment for patients to practice their movements and concentrate on their exercises, AR offers

a novel, discrete approach to motor and cognitive rehabilitation intervention. This method enables caregivers to provide reasonably priced physiotherapy in the comfort of their own homes and tends to boost patient motivation. To improve the user experience, AR combines text, music, pictures, and touch feedback. Augmented reality allows people to examine abstract theories, occurrences, processes, and behaviors that are frequently difficult to understand in typical clinical settings by fusing the actual and virtual worlds. With this arrangement, patients may readily understand ideas in a practical setting

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