

VIRTUAL REALITY IN THE WORLD OF HEALTHCARE AND THERAPY

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Abstract- Virtual reality technologies offer different forms for human exploration and support by providing users a safe setting in which they can interact and develop goal-oriented activities within virtual environments, especially to treat cognitive, behavioral or motor disabilities. The paradigms built from these technologies reduce patient's' boundaries of activity and participation by promoting the recovery of capabilities. This paper highlights the applications of virtual reality in the fields of therapy and healthcare.

1. INTRODUCTION

Virtual reality (VR) was originally conceived as a digitally created space that people could access by mounting on computer equipment so that they could be transported to a substitute reality in which one could interact with people, objects and environments; Futurists acclaimed VR as a transition in the ways humans would communicate with one another, experience media, study psychological phenomena and even perform mundane tasks. In subsequent years, VR has continued to capture the imagination of scientists, artists and philosophers for its ability to substitute our physical environment and our sensory experiences – what we understand as reality – with digital creations

“Virtual Reality is about creating acceptable reproductions of real objects or environments for training, entertainment or design purposes. Virtual reality uses computers to create 3D environments in which one can navigate and interact. Navigation implies the ability to move around and explore the features of a 3D scene such as walking through a forest. Interaction means the ability to select and manipulate objects in the scene, for instance, grabbing and examining a flower found in the forest.”^[1]

VR in its most “classical” form requires real time graphics, a stereoscopic display, used to produce the illusion of 3D, and a tracking system to acquire head and hand motion. An important application of VR is the therapeutic approach to fighting common phobias in a person.

“This form of therapy was introduced in the 1990s by Barbara O. Rothbaum of Emory University and Larry F. Hodges, now at the University of North Carolina at Charlotte, for treating fear of heights, fear of flying in airplanes, fear of public speaking, and chronic post-traumatic stress disorder in Vietnam War veterans therapeutic application of virtual reality is combating phobias by exposing patients to graphic simulations of their greatest fears.”^[2]

2. VIRTUAL REALITY THERAPY

Virtual reality therapy(VRT) is a new paradigm that delivers innovative modality of therapy, allowing users to enter a computer generated world of virtual reality in order to be exposed to their fears, provoking stimuli similar to that of real world experiences. Virtual reality therapy uses visual immersion devices, computers that are specially programmed along with artificial environments to give the patient a simulated experience^[3] that can be used to diagnose and treat psychological conditions.

In many environmental phobias, reaction to the perceived hazards, such as heights, speaking in public, flying, close spaces, are usually triggered by visual and auditory stimuli. VR therapies makes use of virtual world as a means of providing artificially controlled stimuli for the purpose of treatment while the therapist can monitor the patient’s reaction.

Unlike traditional cognitive behavior therapy, VR-based treatment may involve adjusting the virtual environment, such as for example adding controlled intensity smells or adding and adjusting vibrations, and allow the clinician to determine the triggers and triggering levels for each patient's reaction

DIFFERENT PHOBIAS THAT ARE TACKLED USING VRT-

Various phobias can be tackled with the help of immersive virtual reality games that puts users in a place where they are allowed to challenge their phobias.

Acrophobia is a fear of heights is a condition in which virtual reality may have a role. Rothbaum et al^[4] performed a controlled trial of graded exposure to heights using virtual reality. Sufferers were randomly assigned either to treatment. The treatment group had seven weekly 35-45 minute sessions on virtual balconies, high bridges or in the glass elevator of a skyscraper. A therapist watched and commented on the exposure, during which the patient’s subjective discomfort was monitored. Before and after treatment, anxiety, avoidance, distress and attitudes were measured using standard questionnaires. The results were comparable to those of standard therapy with stepwise exposure to real, frightening but sustainable stimuli.

VR offers treatment for people with a fear of driving and for those needing to relearn driving skills after a vehicle accident. Accidents like those may cause patients to experience post-traumatic stress disorder(PTSD) developed after witnessing a life threatening event. Clients can practice driving on small or large streets, in varying degrees of traffic and different weather conditions. All of these variables can be altered as the therapist and client agree upon.

Clients with Agoraphobia which is an anxiety disorder are treated with a combination of relaxation training, physiological feedback and virtual reality graded exposure therapy. The client and therapist work to create a list of situations that become increasingly more anxiety provoking. Then, the client is exposed to these situations in virtual reality in progressive stages.

There are many environments available for those afraid of open spaces, including beaches, grocery stores, plazas, streets and landscapes. The user can exit these virtual worlds at any time if the situation becomes too frightening.

3. GAMING AS A PLATFORM FOR THERAPY

The approach of treatment through gaming-

The vision of people running eagerly each day to participate in undirected, self-motivated physical therapy guided by a low-cost video game system is indeed alluring. Add to this the ability to remotely monitor progress and to foster social play with friends and siblings or through online companions, and it is easy to be swept away by the potential of video game-assisted rehabilitation. With the growing popularity of movement-based or 'active' video gaming systems, there is now the potential to use mainstream equipment to facilitate widespread access to low-cost, home-based VR therapies. This widespread availability and use is reviving and accelerating interest in video games for physical rehabilitation.

Although scaling a mountain is probably not something a lot of people ever experience in real life, doing it from the safety of a home is appealing. Maybe the thought of climbing a ladder becomes more comforting often after spending a few anxious hours in-game. That's precisely the idea behind softwares like these. Nestled within the field of health and psychology, these apps offer to help those dealing with an unhealthy fear by simulating a type of exposure therapy; a technique that gradually introduces a patient to something they fear in hopes of desensitizing it. Playing Video games is often considered to have more ill effects than the good. Little do people know that video games or simulation can bring about so many positive changes in a community?

4. VR IN HEALTH SCIENCES

Virtual reality provides a platform for advanced medical education by allowing specialists and students to master their field through practice before engaging with patients. Apps such as EyeSim, which is a medical training app for Ophthalmology where VR ophthalmic training sim is designed for educators to provide mastery learning through deliberate practice in the classroom.

Surgery- Virtual surgery allows physicians to practice and improve their skills in a virtual world, performing surgery on patients before entering the operating room^[1]. The requirements for surgery simulation are haptic interfaces and real time computer graphics. The main aim of this surgery system is to accurately simulate the behavior of tissues (muscles, internal organs, bones, skin) under cutting operations. Simulating cutting operations requires surface deformation and other geometrical operations. With force-feedback technology combined with visual simulation, the surgeon can experience visual and physical feedback when practicing a procedure.

Rehabilitation- Physically disabled students are often excluded from participating from laboratory experiments because of their reduced mobility and manual capabilities or the risk that they might lose control when in a hazardous environment. When it comes to patients who have survived a stroke or traumatic brain injury, time is of the essence. The earlier they start rehabilitation, the better the chances for successful regaining of lost functions.

MindMotionPro is a simulation app produced by the Swiss Mindmaze that allows patients to "practice" how to lift their arms or move their fingers with the help of VR. Even though they may not be able to carry out the actual movement, the app enhances attention, motivation and engagement with visual and auditory feedback. The application makes the practice of repetitive movements entertaining for patients. The resulting mental effort helps their traumatized nervous systems to recover much faster than lying helplessly in bed. When it comes to preventative medicine, there are apps that strive to educate users on the effects of poor lifestyle choices, including smoking, overeating and consuming unhealthy foods.

The next application is akinesia or freezing gait in Parkinson's disease. This debilitating symptom is characterized by progressive shortening of the patient's stride and ultimately the inability to move forward at all. Treatment with drugs is marred by on-off effects and side effects such as dyskinesia. However, patients with akinesia can walk over objects or through doorways with little effort, an effect known as kinesia paradoxa. Using a virtual reality technique called augmented reality, Weghorst et al projected virtual objects onto the patient's physical world to give them the impression that they were walking over or through them, thereby restoring their mobility.^[5] They suggested various approaches to mimic steady objects on the ground while the patient is moving. However, existing visual displays are not bright enough to compete with ambient light, while severe akinesia demands the creation of a highly realistic and static representation of the obstacle. Dyskinesia, too, was found to respond to augmented reality, suggesting a more complex mechanism underlying kinesia paradoxa.

The applications mentioned above exemplify how virtual reality can help even differently abled people to contribute safely even in hazardous and complex tasks. For at least 20 years, VR simulations have been used to treat patients with conditions such as post-traumatic stress disorder (PTSD), severe pain in burn victims and phobias or fears. By using VR Exposure therapy that helps clinicians expose their patients gradually to stimuli that trigger their traumatic stress responses, allowing them to help the patients recover.

5. CONCLUSION

Virtual reality is no longer just about video gaming; it holds promise as nothing short of revolutionary for just about every other industry, as well. The industry is poised for disruption, and a shift toward patient-centric and individualized healthcare is already underway. Overall, virtual reality in healthcare is still in its early days in terms of breakthrough treatment paradigms and widespread clinical adoption and use. Smart, adaptive virtual simulations that learn as a patient interacts with it will revolutionize decentralized patient-focused care and fundamentally change the way healthcare is delivered.

6. ACKNOWLEDGEMENT

The work reported in this paper is supported by the college through the TECHNICAL EDUCATION QUALITY IMPROVEMENT PROGRAMME [TEQIP-II] of the MHRD, Government of India.

7. REFERENCES

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