ISSN 2319-2720
Volume 7, No.2, April – June 2018
International Journal of Computing, Communications and Networking
Available Online at http://www.warse.org/ijccn/static/pdf/file/ijccn02722018.pdf
https://doi.org/10.30534/ijccn/2018/02722018

Role of Virtual Reality in Medical Diagnosis

Dr .M .Mohamed Sathik
Prof & Principal, P. G and Research Department of Computer Science,
Sadakathullah Appa College, Tirunelveli, Tamil Nadu, India

Abstract— Virtual reality associated research has been progressing for some time in the medicinal world. Actually it commenced to elevate in the middle of late 90s, promptly at the time of initial strive made for marketing VR headsets to the public. The new generation having minimal cost and super performing headsets may not only hasten the field's detailed trend of proliferating research. Virtual reality is utilized in medical and also dentistry fields in which it holds several benefits over typical systems. Virtual environments are greatly adaptable and programmable. They facilitate the therapist to proffer a huge kind of restrained stimuli of a dreadful condition and to calculate and observe a huge variety of answers provided by the user. Hence, this study's target was to evaluate the virtual learning studies in medical detection and the techniques utilized for diagnosing the several diseases applying the technique of virtual reality.

Keywords— virtual reality, virtual reality headsets, flexible, dentistry, therapist

1. INTRODUCTION

Presently, many types of training are made already in virtual reality (VR) environ. In these ambient users can undergo tasks involving human risks or else critical, like military combat strategies or else surgeries. Some authors recommend the training simulators usage in the medicinal field for enhancing physician training with assessment, that could provide more security for patients and also in the health care method [4].In such case, the scientific literature evidenced that training based on VR enhances individual medical talents [6].Thus, environments of realistic virtual reality have been built by training objectives for immersing the user within a virtual world in which simulations of actual situations can be done.[2] For several health care professionals, VR has first place among all technology. The VR is demonstrated as an accumulation of the technological devices: a computer having the ability of interactive 3D visualization, a head-mounted display plus data gloves supplied with one or more position trackers. Here, the trackers assume the position, the sense and orientation of the user and inform that information of the computer renovates the images to display. Anyhow, the variant VR applications analysis vividly presents that the aim on technological devices is variant based on health care provider development [7,9]. Though there is a few proof presenting such simulators, it can proffer the required training quality and verifying prior to a clinical emprise for residents, their profile of cost makes them inappropriate for usage by student populations who are outside of their facility of training [10]. We should reassess the VR role in surgical training plus planning due to rapid enhancement of virtual reality and due to rapid moving of the new technology into the operating room. the virtual [3,8] reality system utilizing computer picture of the past, the maturity of hardware level , the appropriate originals have been fixed, the developers desire make original of your own is very tough, if foreign purchases of words, dozens s image, it will have cost a few million, and hence, it is for preparing the corresponding spot of a different typed of hardware, Hence it is very tough and very costly. Moreover, big -performance equipment delivery also needs distinctive technical knowledge [1,5]. Hence, Systems of virtual reality systems for the Neuro computer graphics packages are having no cost, fixed equipment is tiny, unique requirements of the patient are minimized greatly, there is no

need addressing many computer graphics expertise virtual reality system requirements is not required as it augments constantly [9,11].

2. VR EXPOSURE THERAPY (VRET) AND ITS APPLICATIONS

Virtual reality exposure therapy (VRET) has been growingly general treatment for particular phobias and anxiety. Lacking has been a quantitative meta-evaluation that improves comprehending of the variability plus clinical importance of anxiety minimization results after VRET. Electronic databases exploration proffered 52 studies, among these, 21 studies (300 subjects) are in inclusion criteria., Moderator evaluation were constrained because of incongruous reporting of the VRET literature, though meta-analysis exhibited huge break down in anxiety symptoms proceeding VRET [12].

2.1 ACROPHOBIA RESEARCH AND TREATMENT

Assessment on printed authoritative journals present that the universal incidence ratio in acrophobia from 2014 Frdrikson is 6.3% for males and then 8.6% for females, signifying that acrophobia becomes universally considered disorder disease. Particular phobia treatment is a significant tool in the treatment of acrophobia including heights [13]. Particularly, the exposure therapy is effectual in the real scenes in terror down for minimizing the horrors. We apply the virtual reality system's computer image for the exposure therapy for reproducing the scene of the height of suspension bridge plus virtual reality exposure impact of the transparent elevator. Acrophobia, or fright of heights, is a ubiquitous and also debilitating perturbation disorder impacting probably 1 in 20 adults. Since 1995, Virtual reality (VR) technology is utilized in the acrophobia psychological treatment, and also applied in several anxiety disorders treatment. Now, it is called that virtual reality exposure therapy (VRET) regimens are largely effectual for acrophobia treatment. The theoretical realization of acrophobia and its common treatments evolution from the conventional revelation therapies to the most present virtually leading ones. Specifically, the present innovations in VR technology usage and explains the advantageous it proffer for evaluating the hidden reasons of the disorder, permitting for the organized assessment of interrelated components of the vestibular, visual and postural control systems [14,16].

2.2 VIRTUAL REALITY AND TRAINING

Virtual Reality denotes to actual-time systems represented by computer graphics which permit the user interaction with movements with three or else more grades of liberty [11]. Virtual Reality, more than a technology, evolved as new science which integrates many areas as computers, graphics, cognition and engineering . Worlds of Virtual reality are 3D environments generated through computer graphics methods in which one or more users are involved partially or completely for communicating with virtual factors. The special of the experience of the user in a virtual reality world is provided through the graphics resolution and also by the distinctive devices usage for communication. Fundamentally, the devices revitalize human senses like the sight, hearing and the touch [15,17].

Several purposes are there for virtual reality systems, yet a very significant one is the initiation of training methods. Training simulation offers vital advantageous over other techniques, importantly in complicated procedures where the human life or else large financial resources are participated.

In the following Figure 1, the virtual reality simulator can be observed and the evaluation system is independent, yet performs simultaneously.

The user's communications with the system are observed and the information is delivered to the evaluator system which evaluates the data and effuses a report on the performance of the user at the final period of the training. Typically, an on-line analysis system must be effective to observe the virtual environment simulation. For that is necessary to Accumulating information offered by by the environment and by the user communication is required for that, like positions, forces, torque, speeds, resistance, accelerations, visualization ,temperatures, and/or visualization angle, smells ,sounds, and etc. This information is utilized for feeding the evaluation system [18].

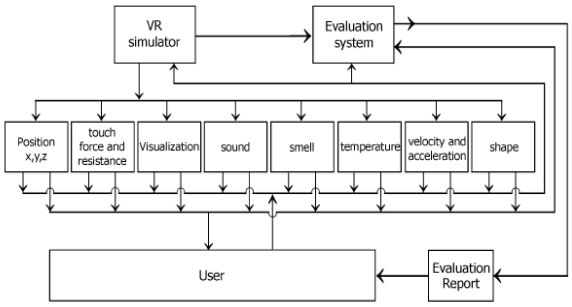

Fig. 2.2.1 Diagram of the complete system: Virtual Reality Simulator and Evaluation System.

Based on the application, every variable or a few of them will be observed as per their appropriateness to the training. Several performed procedures are available in medicine with no visual information to the physician.

2.3 VIRTUAL PATIENT PROJECTS

A blooming discipline with several challenges is the art plus science of emerging interviewing skills utilizing VPs. One earlier method is comparison of performances derived during interviews having both live very standardized patients and also with VPs, then conducting co relational evaluation of interest metrics. Then this information may be examined related to an Objective Structured Clinical Examination (OSCE) [19-21]. These tests generally consume 20-30 minutes and need a faculty member for observing the student performance a clinical interview while videotaped. Furthermore, The evaluation comprises a self-assessment rating together with faculty review and videotape assessment. This practice is general, though is utilized variably, according to the actors, possible faculty members plus space and time limitations at the training site. A common complexity related in teaching typical interviewing skills has been that there are several theoretical orientations plus methods to select from and the challenging is determining prevailing commonality across such techniques for the usable creation and trustable VPs flexible to every clinical orientation [22]. For reducing these issues in our first attempts, we have focused on skills assessment needed to detect very particular mental disorders (i.e., conduct disorder, depression, PTSD, etc.). We also apply a first intake interview setting for limiting the test setting for gathering understandable data for driving future research. In test protocols clinicians are generally offered some knowledge for why the patient is there (i.e., a referral question), but required for questioning the patient strategic questions for deriving an demonstrated history useful for specifying a clinical condition in assistance with having a differential detection and for creating a treatment plan.

2.4 IMPROVING VIRTUAL REALITY SYSTEM FOR MEDICAL APPLICATION

A well known topic of the medical community is three dimensional (3D) visualization. Several methods with procedures are suggested and explained to enhance this revolutionary medical imaging technique. Based on this matter, while resources are redundant, often they are distributed and a particular 3D visualization processing part is covered. Compilation of these resources are done and offered step by step method on the way 3D visualization is attained [23]. This spans from providing marching cubes algorithm, the aim of which was unearthing the isosurface from 3D data-set plus the usage of reconstruction of 3D mesh by using lighting, clearness and shading utilizing Open Graphics Library (OpenGL) Application Programming Interface (API). Eventually, a graphical user interface (GUI) environment was executed utilizing Fast Light toolkit (FLTK). Moreover, user interface of rotation and the 3D model zooming is presented for providing fundamental requirements in virtual reality environ. C++ language is utilized for writing the source code. The effects are then explained by presenting the ultimate snapshots of application.

3. BENEFITS OF VIRTUAL REALITY IN MEDICINE

Virtual reality technology has been progressively being utilized in healthcare for teaching medical students, providing training to new staff members and also revitalizes recent medical professionals on their trade skills. Since virtual training is more typical, health facilities are detecting a number of advantageous to the system through more conventional teaching models. Virtual reality is utilized in several areas of healthcare that is ranging from diagnosis, treatment, e.g. counseling [, surgery and rehab 24]. It is also applied for training the upcoming generation of paramedics, doctors, and other medical personnel and it has exhibited huge advantageous from doing such. The benefits of virtual reality in healthcare comprise many fields that are associated for

medical/surgical training, counselling, preventative medicine, and architectural design of modern hospitals.VRT acts as an effective bridge betwixt an unnatural stressful environ and the actual world. After undergoing virtual reality therapy, several patients feel secured in stepping into the real world plus challenging their frightening in person. Controlling over their psychological worries and also symptoms (North) is attained. As per the virtual reality medical center, they contain 92% success rate in offering treatment to the patients (Virtual Reality Medical Center).

4. LIMITATIONS OF VIRTUAL REALITY IN MEDICINE

The equipment's utilized in virtual reality are very expensive. It comprises complicated technology. We can't go by our own such as in the actual world in virtual reality environment. When virtual reality is applied as a tool for training for the industries of medicine and also transportation, it is also utilized as a ways for assisting individuals to subjugate phobias, and is an emerging form of entertainment. Also, it is an untested technology which may contain unfavorable side-effects on the brain plus cognitive systems. One of the largest disadvantages of virtual reality is that the required technology for a riveting or inartificial experience has stayed evasive. Haptic systems offering physical feedback or permitting a complete expressive proximity within an environment have been clumsy and may provide issues during utilization. A simple head-mounted kind hardware may fail in the immersion sense as the adjustments for the device required for being made and also features of wires and headphones become shackles to natural movement [25].

5. CONCLUSION

In this study, the rationality of variant models is demonstrated in a virtual reality system through accumulation and evaluation of preceding studies on the medical field.Probably, VR is the most beneficial tool for decoupling visual information, proprioception, head orientation and vestibular cues, and analyzing their role independently in medical diagnosis. VRT handles with health risks. Patients suffering from flashbacks, heart disease, panic attacks, epilepsy are consuming drugs with huge psychological impacts and are in at risk for psychological harm utilizing VRT. To prevent any harm, Patients must reveal any applicable information prior to employing VRT and therapists must observe the patients keenly at all times. Other concern handles with the software virtual environments execution and the restrains of whatever can be attained. Ultimately, there are apprehensiveness regarding the social effect that immersive environ have on people, and the psychological impacts of extended usage.

REFERENCES

[1] Benali, Abderraouf, Paul Richard, and Philippe Bidaud. "A six DOF haptic interface for medical virtual reality applications: design, control and human factors." In Virtual Reality, 2000. Proceedings. IEEE, p. 284. IEEE, 2000.
https://doi.org/10.1109/VR.2000.840512

[2]. Coelho, Carlos M., Allison M. Waters, Trevor J. Hine, and Guy Wallis. "The use of virtual reality in acrophobia research and treatment." Journal of Anxiety disorders 23, no. 5 (2009): 563-574.
https://doi.org/10.1016/j.janxdis.2009.01.014

[3]. Dech, Fred, C. Jonathan, and M. D. Silverstein. "Rigorous exploration of medical data in collaborative virtual reality applications." In Information Visualisation, 2002. Proceedings. Sixth International Conference on, pp. 32-38. IEEE, 2002.

[4]. De Moraes, Ronei M., and Liliane S. Machado. "Comparing evaluation methods based on neural networks for a virtual reality simulator for medical training." In Fuzzy Systems (FUZZ), 2013 IEEE International Conference on, pp. 1-8. IEEE, 2013.
https://doi.org/10.1109/FUZZ-IEEE.2013.6622345

[5]. Falah, Jannat, Soheeb Khan, Tasneem Alfalah, Salsabeel FM Alfalah, Warren Chan, David K. Harrison, and Vassilis Charissis. "Virtual Reality medical training system for anatomy education." In Science and Information Conference (SAI), 2014, pp. 752-758. IEEE, 2014.

[6]. Faulkner, Gabriele. "Virtual Reality Laboratory for Medical Applications." IN MEDICINE (2001): 133.
https://doi.org/10.1002/0471216690.ch5

[7]Gong, ZhaoZhe, WeiMin Peng, XueFeng Zhang, and XiaoYing Shi. "Research on virtual reality image processing system based on medical platformaper." In Progress in Informatics and Computing (PIC), 2015 IEEE International Conference on, pp. 327-331. IEEE, 2015.

[8]. Lange, T., D. J. Indelicato, and J. M. Rosen. "Virtual reality in surgical training." Surgical oncology clinics of North America 9, no. 1 (2000): 61-79.

[10].Lim, Daniel Wee Lian, Haidi Ibrahim, and Umi Kalthum Ngah. "Development of virtual reality system for medical application using OpenGL." In Innovative Technologies in Intelligent Systems and Industrial Applications, 2008. CITISIA 2008. IEEE Conference on, pp. 44-48. IEEE, 2008.
https://doi.org/10.1109/CITISIA.2008.4607333

[11]. Machado, Liliane S., and Ronei M. Moraes. "Evaluation of Collaborative Activities in Medical Simulators Based on Virtual Reality." In Virtual and Augmented Reality (SVR), 2013 XV Symposium on, pp. 244-247. IEEE, 2013.
https://doi.org/10.1109/SVR.2013.31

[12]. Park, Chung Hyuk, Kenneth L. Wilson, and Ayanna M. Howard. "Pilot study: supplementing surgical training for medical students using a low-cost virtual reality simulator." In Computer-Based Medical Systems (CBMS), 2014 IEEE 27th International Symposium on, pp. 125-127. IEEE, 2014.
https://doi.org/10.1109/CBMS.2014.74

[13]. Parsons, Thomas, J. Galen Buckwalter, Belinda Lange, and Patrick Kenny. "A New Generation of Intelligent Virtual Patients for Clinical Training."

[14]. Parsons, Thomas D., and Albert A. Rizzo. "Affective outcomes of virtual reality exposure therapy for anxiety and specific phobias: A meta-analysis." Journal of behavior therapy and experimental psychiatry 39, no. 3 (2008): 250-261.
https://doi.org/10.1016/j.jbtep.2007.07.007

[15], Pensieri, Claudio, and Maddalena Pennacchini. "Overview: virtual reality in medicine." Journal For Virtual Worlds Research 7, no. 1 (2014).

[16]. Riva, G. "Applications of virtual environments in medicine." Methods of information in medicine 42, no. 5 (2003): 524-534.
https://doi.org/10.1055/s-0038-1634379

[17].Rizzo, Albert, J. Difede, Barbara O. Rothbaum, J. Martin Daughtry, and Greg Reger. "Virtual reality as a tool for delivering PTSD exposure therapy." Post-Traumatic Stress Disorder: Future Directions in Prevention, Diagnosis, and Treatment (2013).

[18]. Satava, Richard M. "Virtual reality for medical applications." In Information Technology Applications in Biomedicine, 1997. ITAB'97., Proceedings of the IEEE Engineering in Medicine and Biology Society Region 8 International Conference, pp. 19-20. IEEE, 1997.
https://doi.org/10.1109/ITAB.1997.649389

[19]. Silverstein, Jonathan C., and Fred Dech. "Precisely exploring medical models and volumes in collaborative virtual reality." Presence 14, no. 1 (2005): 47-59.
https://doi.org/10.1162/1054746053890233

[20]. Sofronia, Raluca E., George G. Savii, and Arjana Davidescu. "Real-time collision detection for long thin medical instruments in virtual reality-based simulators." In Optimization of Electrical and Electronic Equipment (OPTIM), 2012 13th International Conference on, pp. 1107-1112. IEEE, 2012
https://doi.org/10.1109/OPTIM.2012.6231883

[21]. Stansfield, Sharon, Daniel Shawver, Annette Sobel, Monica Prasad, and Lydia Tapia. "Design and implementation of a virtual reality system and its application to training medical first responders." Presence: Tele operators and Virtual Environments 9, no. 6 (2000): 524-556.
https://doi.org/10.1162/105474600300040376

[23]. Watanabe, Masahiro, Motoi Okuda, Yukihiro Karube, Ryuichi Matsukura, and Teruo Matsuzawa. "Collaborative environment with visualizing medical volume data by virtual reality." In Parallel and Distributed Computing, Applications and Technologies, 2007.

PDCAT'07. Eighth International Conference on, pp. 347-352. IEEE, 2007.
https://doi.org/10.1109/PDCAT.2007.84

[24]. Yamaguchi, T., N. Furuta, K. Shindo, T. Hayasaka, K. Yamazaki, J. Noritake, H. Igarashi, and A. Yoshida. "The hyper hospital-a novel medical care system on the virtual reality network." In Engineering in Medicine and Biology Society, 1994. Engineering Advances: New Opportunities for Biomedical Engineers. Proceedings of the 16th Annual International Conference of the IEEE, vol. 2, pp. 1388-1389. IEEE, 1994.
https://doi.org/10.1109/IEMBS.1994.415486

[25]. Yoshizawa, Makoto, KEN-ICHI ABE, Tomoyuki Yambe, and SHIN-ICHI NITTA. "Medical Applications of Virtual Reality in Japan." IN MEDICINE (2001): 171.