MAT JOURNALS
e-ISSN: 2581-849X
Volume 5 Issue 2

Telerehabilitation using Real Time Communication

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Abstract

There are many diseases affecting the population trends globally.Miniaturization of sensors in combined with medical information technology provides efficient solutions to reduce costs and deliver remote medical services through connected devices. Remote consultation via video-conferencing has been well established, but the chronic or long-term musculoskeletal conditions require pro-active management and therapy thus raising the need to develop more advanced telerehabilitation systems. In this paper, we introduce KinectRTC that can be used for Kinect-based telerehabilitationwith efficient real-timetransmission of video, audio and skeletal data. The Web Real-TimeCommunication (WebRTC) technology has benefitted to the proposed framework which is able to manage video and audio streams based on the state of the network and the available bandwidth to guarantee the real-time performance of the communication.

Keywords: *Kinect, real-time, telerehabilitation, video*

INTRODUCTION

The primary need for rehabilitation tracking system is to meet the patient's and clinic's requirements. And to provide an intuitive, simple interface on the screen for a therapy. Research has found that the rehabilitation needs for individuals with long-term conditions such as stroke, TBI and other neurological disorders are often unmet in the patient's local community. Telerehabilitation expands to improve the patient's condition that prevails during the therapy.It engages clinicians with the patient, outside of the medical setting,thus diminishing the issue of distance between them. Telerehabilitation gives the opportunity to continue rehabilitation within the patient's own social and vocational environment leading to greater functional outcomes.

EXISTING METHODOLOGIES

KinectRTC

Real time communication systems provide specialized healthcare via video conferencing and remote monitoring technologies. This approach to medical care delivery has been expanding for the last decade and currently covers various specialty areas, such as prenatal care, cardiology, rehabilitation, stroke and others. Until now, the primary areas of video based telemedicine have been in (a) simulation and training, (b) video consultation and remote diagnosis, and (c) video monitor and vital signs tracking. In the past, the majority of the telemedicine systems used dedicated networks for transmission of data. However, recently several cost effective commercial products have emerged that support secure real time video and audio transmission between a health provider and a patient Although the video based consultation has been quite successful for certain specialty areas, the technology has not been widely used for rehabilitation. The reasons for slow adoption in telerehabilitation include the cost of video equipment, limited network connectivity from home, complexity and cost of hardware, insurance reimbursement model, and difficulty of obtaining reliable observations from video while providing effective feedback to the patient remotely.

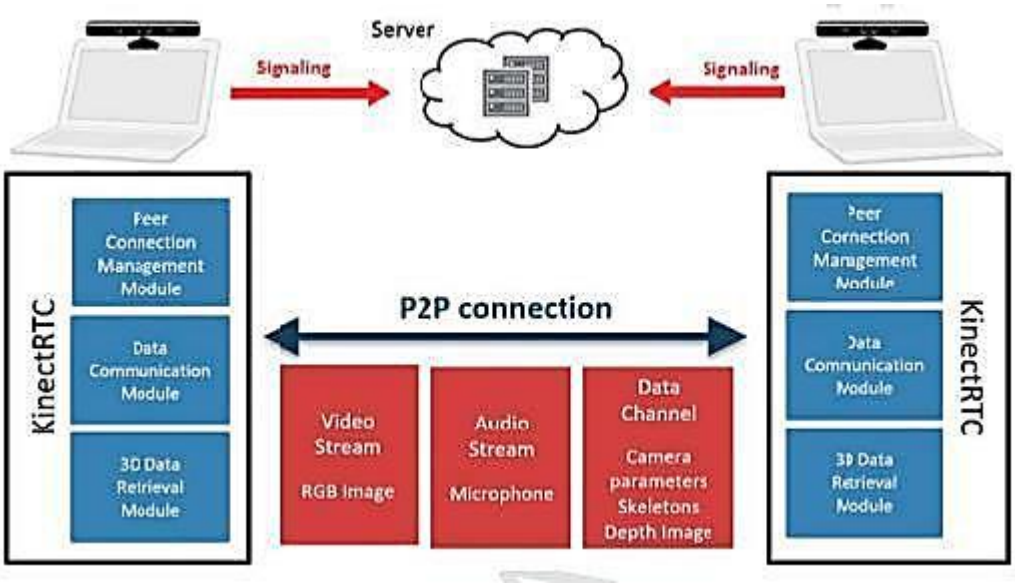

Figure 1: *Architecture of KinectRTC*

Virtual GloveTele-Supervision and Simulation SystemVirtual glove is a system that uses a set of video cameras surrounding the patient hand to collect a set of synchronized videos used to track hand movements unlike technologies based on mechanical haptic interfaces. The hand tracking is done using a numerical hand model that is used to calculate physical, geometrical and mechanical parameters. It also implements some boundary constraints such as joint dimensions, shape, joint angles, etc. This highly accurate system is aims to be low cost, very less bulky (touch-less), easy to use, and reuse.Moreover, there are many models based on hand tracking experimental measurements done with the corresponding poses of the real hand.

Figure 2: *Virtual glove*

Virtual reality can be termed as pseudo sensory experience through computer-simulated reality, which is able to replicate an environment that simulates a virtual physicalpresence in the real world, allowing the user interaction with the world. Virtual realities artificially create sensor deployments where the person can actually sense it.

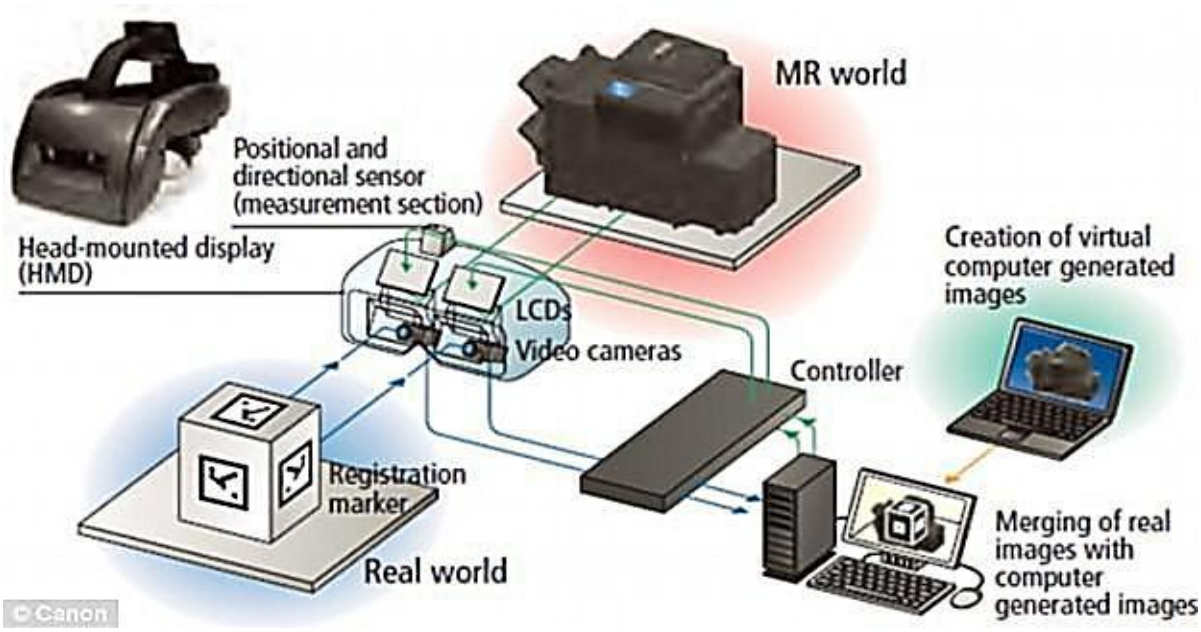

***Figure 3**: Architecture of VR*

PROPOSED METHODOLOGY

In this work, the main aim is to deliver telerehabilitation on the theoretical foundation of digitised human-workpiece interactions. In this work, human actions and corresponding skeleton data are simultaneously tracked in realtime to produce a digital data stream that represents the task. This stream is synchronously exchanged over sites that enable remote collaboration. The workfurther aims to discover means of achieving synchronous bidirectional data transfer to ensure low-latency, robust and lossless exchange of data in real-time between the sites. Introspection of this research is the use of motion-capture technology provided by depth sensors that use infrared light. The functionalities of the sensors is utilised by using them to detect and track moving objects during a task. Microsoft Kinect is one such example of depth imaging sensor.

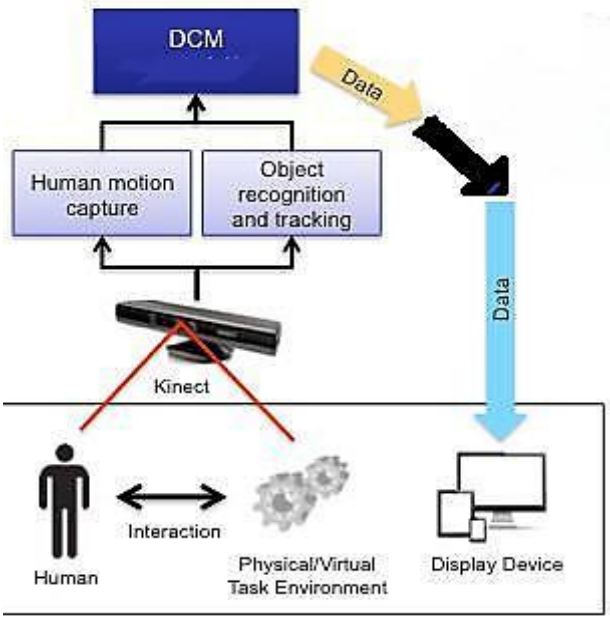

***Figure 4:** Real Time Communication*

The advantages that serve patients are they might exercise longer and find it more enjoyable.Due to successful recognition of static and dynamic hand gestures. Real time communication is enhanced where no special physical trainings required over again. Thus, problems in colour detection threshold may occur.
More the distance between user and camera, lesser precision leads to wrong object extraction whereas system limitations restrict applications.

ACKNOWLEDGEMENT
I am thankful for the immense encouragement, support and guidance from all Teaching staffs of Information Technology Department which helped me in successfully completing the work.

CONCLUSION
In this survey we study various techniques used for real time communication which are required to secure real time multimedia transmission with minimum delay and better quality for interactive communication over telerehabilitation systems.

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Cite this article as: