Virtual Tele-presence Robot

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ABSTRACT
This paper presents very cost efficient futuristic technology called Virtual Tele-presence Robot. The technology available in market is too costly that common man cannot afford it. The Virtual Tele-presence system is the technology which is very useful. The aim is to provide cost efficient virtual telepresence system to physically disabled and aged people which are not able to travel long distance. The components used are raspberry pi cheap credit size computer with video streaming server. It gives 3 Dimensional immersive viewbut like other technologies it doesn't require costly virtual reality headset. By using cheap VR and simple smart phone we can achieve the same 3D effect.

Keywords
Raspberry Pi,

1. INTRODUCTION
Tele-presence refers to a set of technologies which allow a person to feel as if they were present, to give the appearance of being present, or to have an effect, via tele-robotics, at a place other than their true location.

Tele-presence requires that the users' senses be provided with such stimuli as to give the feeling of being in that other location. Additionally, users may be given the ability to affect the remote location. In this case, the user's position, movements, actions, voice, etc. may be sensed, transmitted and duplicated in the remote location to bring about this effect. Therefore information may be travelling in both directions between the user and the remote location.

A popular application is found in tele-presence videoconferencing, the highest possible level of video-telephony. Telepresence via video deploys greater technical sophistication and improved fidelity of both sight and sound than in traditional videoconferencing. Technical advancements in mobile collaboration have also extended the capabilities of videoconferencing beyond the boardroom for use with hand-held mobile devices, enabling collaboration independent of location

A telepresence robot is a remote-controlled, wheeled device with a display to enable video chat and video conferencing, among other purposes which enable the participants to see and talk to remote locations, as if they were there. They also enable much more interactivity than regular video conferencing. In a distance education class, for example, a telepresence robot can move around the room and interact face-to-face with individual students, just as an on-premises instructor might. Telepresence robots can enable remote tour guides, administrative assistants, home visitors, night watchmen and factory inspectors, among many other possibilities. To create the same-room illusion, telepresence solutions use a combination of technology elements like high quality audio, HD video, telemetry system and remote control all working in parallel to achieve the goal. As organizations continue to become more international in their business practices, there is a rapidly growing demand for communication tools that support these activities while effectively combating the increasing costs of domestic and international travel. Although telepresence robots aren't inexpensive

2. BLOCK DIAGRAM

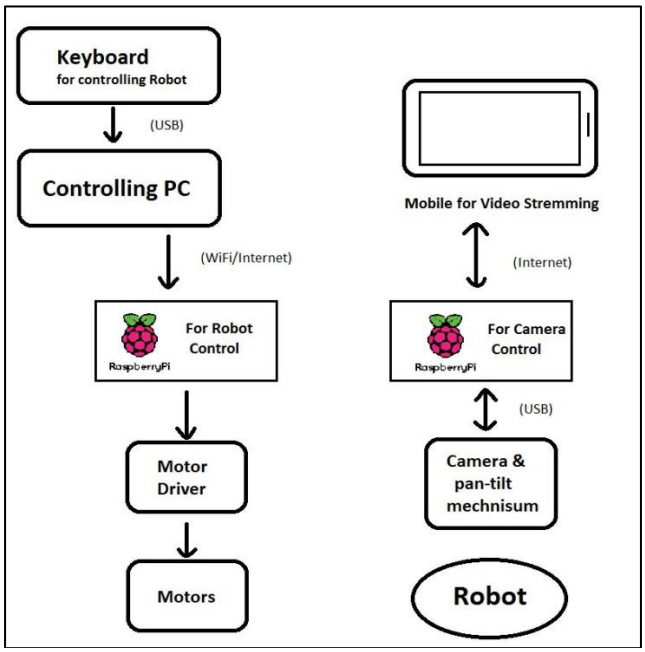

Fig 1. Block diagram of virtual telepresence

2.1 Description
The raspberry Pi on the robot is configured to a Wi-Fi access point; we can connect to the robot with multiple devices. The PC is the remote controlling machine. It sends the connected keyboard command to the robot via sockets by a python program.

Separate raspberry pi is used for the movement control from the PC keyboard, and for the head tracking. Another socket program for the head movement is developed. In this program socket from wireless IMU android app on raspberry pi is received and get and mapping this to servo positions. In the program user can limit the servo movement to the physical limits of the mechanic.

For the video stream UV4L streamer solution is used. User can connect to the stream with browsers, so it's really universal. In the current experimental setup 640x360 videos is streamed. User can connect to this stream via mobile

browser, and display the two pictures in real time using Dual Screen android app.

Only low resolution video is used, for the experimenting, because the android phone what we use can't decode high resolution stream in real time. On PC we can easily achieve 720p video in real time. Than other reason for the low resolution is, the low quality of the cardboard is used. It's only good for the proof of concept, not for the real usage.

2.2 Raspberry Pi

The Raspberry Pi is a credit card-sized computer that plugs into your TV and a keyboard. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word processing, browsing the internet, and playing games. It also plays high-definition video.

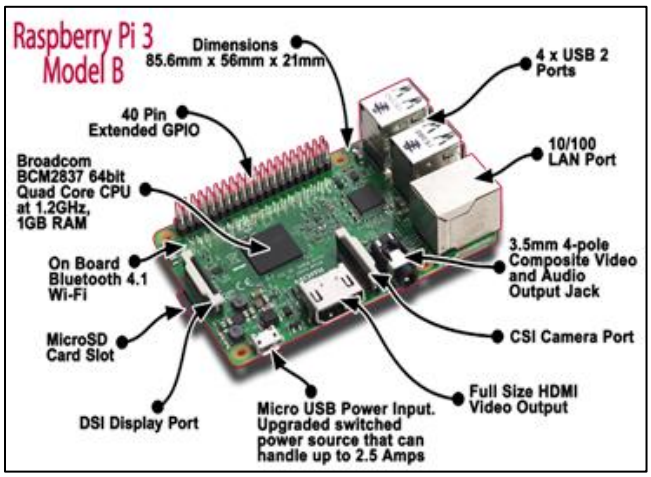

Fig.2 Raspberry pi 3

The Raspberry Pi 3 is the third-generation Raspberry Pi. The Raspberry Pi 3has:

1. A 1.2GHz 64-bit quad-core ARMv8 CPU
2. 802.11n Wireless LAN
3. Bluetooth 4.1
4. Bluetooth Low Energy (BLE)
5. 1GB RAM
6. 4 USB ports
7. 40 GPIO pins
8. Full HDMI port
9. Ethernet port
10. Combined 3.5mm audio jack and composite video
11. Camera interface (CSI)
12. Display interface (DSI)
13. Micro SD card slot (now push-pull rather than push-push)
14. Video Core IV 3D graphics core

3. BENEFITS

Rather than travelling great distances in order to have a face-face meeting, it is now commonplace to instead use a telepresence system, which uses a multiple codec video system (which is what the word "telepresence" most currently represents). Each member/party of the meeting uses a telepresence room to "dial in" and can see/talk to every other member on a screen/screens as if they were in the same room. This brings enormous time and cost benefits. It is also superior to phone conferencing (except in cost), as the visual aspect greatly enhances communications, allowing for perceptions of facial expressions and other body language.
Mobile collaboration systems combine the use of video, audio and on-screen drawing capabilities using newest generation hand-held mobile devices to enable multi-party conferencing in real-time, independent of location. Benefits include cost-efficiencies resulting from accelerated problem resolution, reductions in downtimes and travel, improvements in customer service and increased productivity.

4. LIMITATION

Network Failure: In case the network goes down during Performing task robot cannot be operated, it gets disconnected.

Rotation of Pan-tilt: Pan-tilt cannot be moved 360 degree.

5. APPLICATION

To connect communities: Telepresence can be used to establish a sense of shared presence or shared space among geographically separated members of a group.

In Hazardous environments: Many other applications in situations where humans are exposed to hazardous situations are readily recognised as suitable candidates for telepresence. Mining, bomb disposal, military operations, rescue of victims from fire, toxic atmospheres, deep sea exploration, or even hostage situations, are some examples. Telepresence also plays a critical role in the exploration of other worlds, such as with the Mars Exploration Rovers, which are teleported from Earth.

For Pipeline inspection: Small diameter pipes otherwise inaccessible for examination can now be viewed using pipeline video inspection.

In Remote surgery: The possibility of being able to project the knowledge and the physical skill of a surgeon over long distances has many attractions. Thus, again there is considerable research underway in the subject. (Locally controlled robots are currently being used for joint replacement surgery as they are more precise in milling bone to receive the joints.) The armed forces have an obvious interest since the combination of telepresence, teleportation , andtelerobotics can potentially save the lives of battle casualties by allowing them prompt attention in mobile operating theatres by remote surgeons.
Recently, teleconferencing has been used in medicine (telemedicine or telematics), mainly employing audio-visual exchange, for the performance of real time remote surgical operations – as demonstrated in Regensburg, Germany in 2002.In addition to audio-visual data, the transfer of haptic (tactile) information has also been demonstrated in telemedicine.

6. FUTURE SCOPE

It wasn't so long ago that we were in awe of telepresence its ability to bend space and time to put people who are thousands of miles apart face-to-face instantaneously. Now that we've experienced the power of telepresence, we want more. User wants telepresence all the time. Every user want it to be available and effortless to use like a mobile phone. In effect, it is need that telepresence to be taken to the next

dimension, one that allows for high-intensity collaboration. As with any disruptive technology, the long-term success of telepresence will hinge on its ability to innovate to meet new user demands. In the consumer realm today, people are putting up with poor-quality video and limited functionality for a free service. But enterprise users are seeing the organizational efficiencies and business process transformations that telepresence can deliver, driving the demand for more sophisticated technology.

1) Clear forecast for telepresence in the cloud. Cloud-based telepresence services will be ubiquitous as they will be the equalizer that brings businesses of all sizes into the telepresence age. New telepresence models will continue to emerge and be deployed throughout a variety of markets and across a mixture of public, private and hybrid cloud options. For smaller businesses, a cloud-based service offers the promise of telepresence delivered with an affordable, reliable and highly secure experience.

2) Audio & video quality can be improved.

3) Sharing of Documents can be possible.

4) QR code can be scanned.

5) Extension of Robotic ARM.

7. CONCLUSION

With the successful integration of the hardware and software components, the Virtual telepresence robot moves almost simultaneously with the robot operator. Positions are successfully obtained by the Wireless IMU app and sent to the servo controller raspberry pi and the robot controller via the PC. This unilateral control method provides the human operator with visual telepresence and enables him/ her to remotely control the robot

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