Enforced Telexistence

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Figure 1: *(a) Local-Remote Collaborative Whiteboard, (b)Natural Social Interaction with Others, (c) Grabbing a Functional Virtual Copy of TV Remote*

1 Introduction

Telexistence [Tachi 2010] systems require physical limbs for remote object manipulation [Fernando et al. 2012]. Having arms and hands synchronized with voluntary movements it allows a user to feel the robot's body as his own body through visual, auditory, and haptic sensation. With Enforced Telexistence, we introduce a novel technique that provides virtual arms for existing telexistence systems that does not have any arms and allow the user to have an experience of embodied enforcement towards the remote environment. This virtual extended arms can be extended to touch and feel remote objects that is unreachable. When the user touches a remote object, a functional virtual copy will pop-up and interface between virtual and the remote world. Enforced Telexistence not only allows a user to experience a non existing arm in telexistence, but also allows to enforce remote environment in various ways.

2 System Description

To realize the concept, we used a Master/Slave Robot system called "TELUBee" a human sized ubiquitous telexistence robot which synchronizes with the users head movements and leg movements using a Motion Tracking System (OptiTrack) and a Pressure Pad (Wii Fit). The robot uses two binaural microphones and two Full-HD web cameras for audio and video transmission.

User can perceive the presence of his body by real-time superimposing virtual arms which are mapped to his own arms kinematics [Saraiji et al. 2013]. Eye-to-hand vector is maintained between his physical body and the virtual body.

As shown in Fig 2, a depth sensor array (PrimeSense) mounted on the robots head allows the user to scan the remote environment in 3D space and calculate the collision point between the depth map and the eye-to-hand vector. Thus it can measure the vertical and
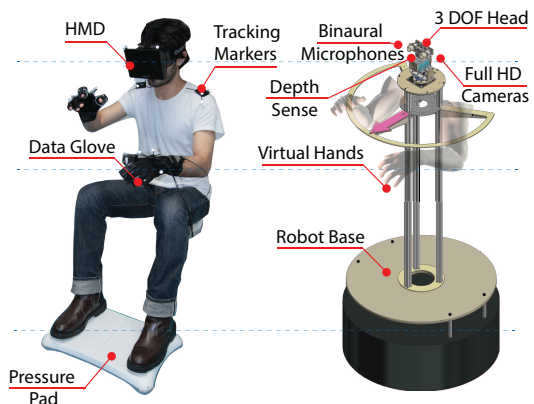
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Figure 2: *System Overview*

shearing forces acting on virtual fingertips and display on the users fingertips. Robot and user are connected with a IP network where the connection is initiated with a server-client network architecture.

Acknowledgement

References

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