TELESAR V: TELExistence Surrogate Anthropomorphic Robot

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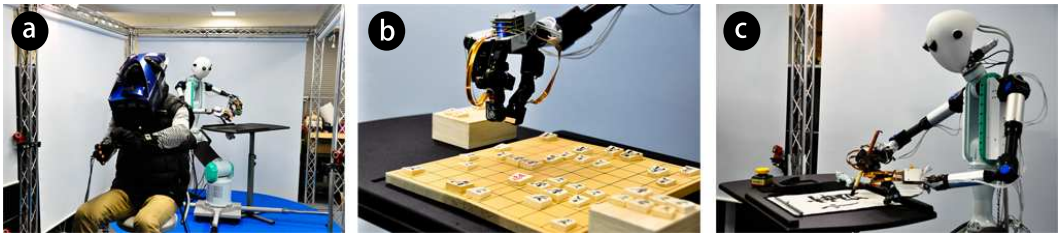

Figure 1: *(a) Glass ball pouring, (b) Playing Shogi (Japanese Chess), (c) Shuji (Japanese Calligraphy)*

1 Introduction

Telexistence is fundamentally a concept named for the general technology that enables a human being to have a real-time sensation of being at a place other than where he actually exist, and to interact with the remote environment [Tachi et al. 1990]. We have achieved human-like neck movements to visually interact with a remote object in 3 dimensional space through previous versions of TELESAR [Watanabe et al. 2007]. We introduce "TELESAR V" which maps a user's spinal[1], neck, head and arm movements into a dexterous slave robot and allowing the operator to feel the robot's body as his own body through visual, auditory, kinesthetic and fingertip tactile [Sato et al. 2007] sensation. With TELESAR V, operator can perform teleoperations confidently with no prior practise.

2 System Overview

As shown in Figure 2, TELESAR V consists of a Master(local) and Slave(remote) system. In slave side, a dexterous robot is developed with 54 DOF similar to an ordinary human's body structure, shape, size and joints. Apart from audio and video sensing using conventional methods, low frequency haptics are captured using a vision based tactile sensor and low to mid frequency haptics were captured using a omni-directional microphone based tactile sensor. In order to track fast and human-like smooth movements, an ungrounded motion capturing system is used in Master side. Robot's joint space is updated real-time with dynamic tracking data. Finger bending is captured upto 14 DOF on each hand using fiber-optic bend sensors. We also designed a HD (1280×800 pixels) Head Mounted Display to experience realistic wide angle first person view as seen from the Robot. Remote fingertip proprioceptive sensation is reproduced using a combination of vertical and shearing stresses excreted by a motor driven belt mechanism [Minamizawa et al. 2008] while tactile sensation is reproduced using a voice coil based vibration actuator.

3 User Experience

We will demonstrate a complete Telexistence operation involving head, body, arms and hands including transmission of haptic sensation. Attendee can dive into the slave robot by wearing the HMD and gloves and look through robot's eyes. Due to the kinesthetic and tactile sensation, operator will feel that his head, body, arms and fingers are bound to the robot during picking up and pouring glass balls. As a result, they can perceive the slave robot as their own body.

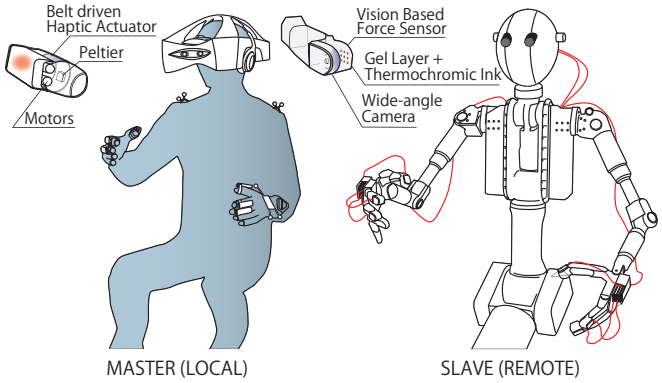

Figure 2: *System Overview*

4 Acknowledgement

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[1] extension, flexion, lateral flexion, and axial rotation

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