

U-Tsu-Shi-O-Mi: The Virtual Humanoid You Can Reach

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1 Introduction

We propose a tele-existence framework that enable us to feel human existence with a humanoid robot and computer graphic avatars. The purpose is to give computer graphic avatars more presence and make them physically interactive.

The system consists of a synchronized pair of a whole humanoid robot and a 3D model computer graphic avatar, and an HMD that overlays the avatar onto the robot. As far as we know, there is no such framework.

It requires that the robot can contact with human in safe. In order to make it satisfied, we developed a robot which arms are light-weighted and has force detecting sensors on the arms.

2 Exposition

U-Tsu-Shi-O-Mi is an augmented reality system which consists of a synchronized pair of a humanoid robot and virtual avatars, and an HMD that overlays the avatars onto the robot. The system overview is shown in Fig.1.

The robot is life size and can make motions with neck, arms, and trunk and the avatars can follow these motions. And the robot is covered with a green fabric to apply chromakey techniques to combine the avatar images with real images. People who wear the HMD can see that the robot in front of them as if it were a realistic avatar. That means this is a meeting space with imaginary people rather than a robot for users.

The applications of the system would be not only entertainment but also serious games for training, and short video content.

Our core technology is the integrated sensing and control system that has been developed to keep the robot and the avatar motions synchronized at all times and keep it safe during the physical contacts with humans.

The robot has joint angle sensors and force detecting sensors. The joint angle sensor data are used not only to control the robot motions but also to make the avatar motions. It makes those synchronized motions possible. And an optical sensor tracks user's head movements to make precisely register the virtual images.

The force sensors using strain gauges detect the contact forces and keep the relations between robot and humans safe during their contact.

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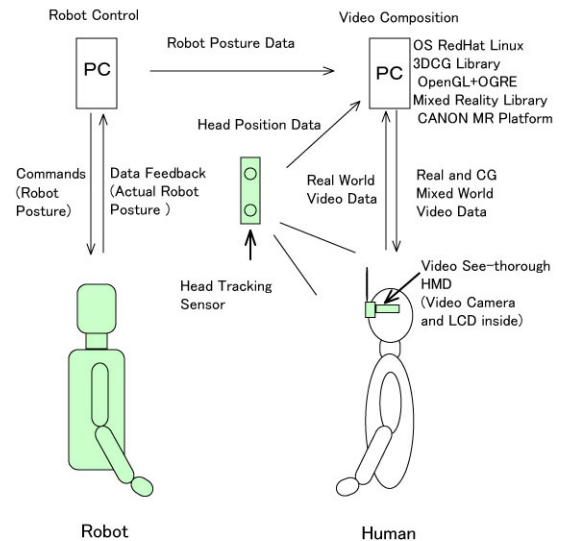


Figure 1: System overview.

3 Conclusion

The composite application for humanoid robot and mixed reality is proposed. The system offers an experience to have physical contacts with computer graphics avatars. And the force detecting sensors of the robot keep prevent users from doing potentially damaging motions.

Our next target is to develop authoring tools to make content with low cost and in short term.