

# Development of 20 DOF Glove Type Haptic Interface Device

## — Sensor Glove II —

Yasuharu KUNII<sup>†</sup> Yoshiaki NISHINO<sup>‡</sup> Toshio KITADA\* Hideki HASHIMOTO<sup>†</sup>

<sup>†</sup> Institute of Industrial Science, University of Tokyo  
7-22-1 Roppongi Minato-ku Tokyo, 106 JAPAN.  
Phone: +81-3-3479-2766 Fax: +81-3-3423-1484  
E-mail: {kunii,nishino,kitada,hideki}@vss.iis.u-tokyo.ac.jp

<sup>‡</sup> Department of Electrical Engineering, Chuo University

\* Asahi Chemical Industry CO.,LTD.

**Abstract** – How should we realize the interactive communication between a real world of a human being and a virtual world which a computer creates? The extremely high speed development of the computer technology, which has opened a new gate for an exciting research world called *Virtual Reality*, let us tackle this greatly important and noteworthy question in Virtual Reality. When a human handles an object with dextrous manipulation, the technology is needed to acquire the movement information from human fingers and transfer to the virtual world. However, if the human hand can feel grasp, the efficiency of the operation should improve notably. At present the development of an effective force feedback devices is just in its beginning phase, where some rather sophisticated devices have already emerged. There is much research into *Haptic Interface* device which let human fingers feel the force-sensory information of the virtual object. However we know few developed devices which have more than three fingers and is available to the dextrous manipulation by the fingers.

In this paper, we present a sensor glove II (SGII) device, a multi-DOF haptic interface, which has 20 degrees-of-freedom (Fig.1). Each joint is driven by an actuator through wire transmission. We measure joint angles by rotary encoders and torques of human fingers by strain-gauges as the stress of links. The operator can interact with the virtual environment simulator by this device. It is also used for tele-operation or tele-robotics. We intend

not to merely teleoperate but obtain *human skill* by using our system. The accumulation of human skill will assist more dextrous and intelligent manipulation effectively. We call this system Intelligent Assisting System(IAS) or Intelligent Cooperative Manipulating System (ICMS) in Fig.2. The development of the Sensor Glove II (SGII) is the first step of IAS. SGII acquires the information of the complicated movement and force of human fingers. We believe that SGII realizes more intimate communication between the real world and the virtual world.

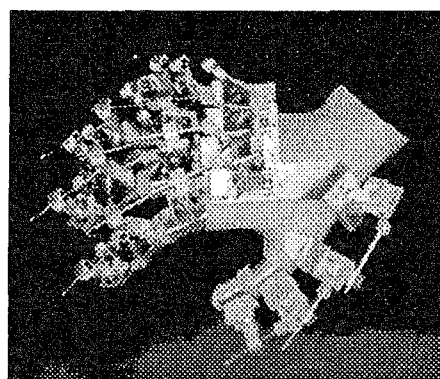


Fig. 1. Sensor Glove II

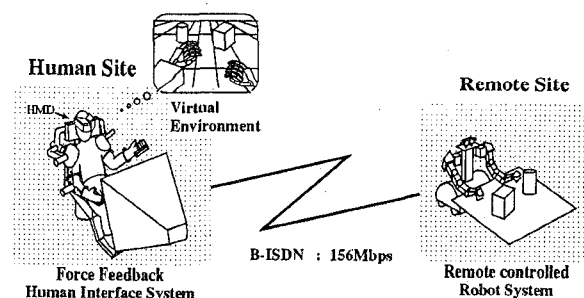


Fig. 2. Intelligent Cooperative Manipulating System (ICMS)