



## Hybrid Control in a Virtual Environment

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Virtual reality system usefully builds a sense of touch, smell, and sound to the user without building an actual environment. The user can interact with the virtual environment which is created by computer graphics. In addition, a device called a haptic interface is used to produce force feedback to the user as shown in Fig 1.

At the Institute of Field roBOtics (FIBO), there were two kinds of haptic interface research works which related to the free motion and constrained motion. The free motion is a motion without constraint along x, y, and z axes, such as hand moving in the space without cashing anything. The constrained motion is a motion along a wall and/or an object. There are two types of control systems which are impedance control and admittance control. The impedance control receives velocity and acceleration from the motion of haptic equipment then it calculates force feedback to the user. In addition, an admittance control, which is the inverse process of impedance control, is also widely used in haptic interface research. Normally, the admittance control is suitable for the free motion while the impedance control is suitable for the constrained motion.

The research goal is to improve the transient interaction of touching which occurs during the transition between the free motion and the constrained motion as illustrated in Fig.2

Therefore, this research presents a hybrid control system for providing a smooth transition between free motion and constrained motion in virtual environment. It could be applied for skill training in industry, operating system in a medical, and etc. Furthermore, this hybrid control system can increase

effectiveness of productivity because it reduces cost and time in process of training.



Fig.1 A haptic interface system

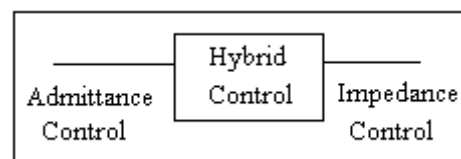


Fig.2 A hybrid control system

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