

FORCE DISPLAY FOR MASTER SLAVE MANIPULATOR WITH DIFFERENT CONFIGURATIONS

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ABSTRACT. *A new type of interactive master slave manipulation system for tele-operation is developed. The system consists of a master and a slave subsystem with different structure. These two subsystems are governed by bilateral control scheme. For master slave manipulation systems, nonlinear interferences may deteriorate performance in the bilateral control systems. To realize a sense of force for slave manipulation, the bilateral control scheme together with a decoupling control for slave is introduced to the master manipulator with different configurations. Experimental results demonstrate the effectiveness of the proposed control method.*

Keywords: Tele-operation, Force display, Master slave manipulator, Bilateral control, Different configuration

1. Introduction. Development and practical use of human supporting robots have made remarkable progress in recent years. A master slave manipulator with a quick response, easier handling, and reflective for human intension is highly required for human supporting robots. Many robot manipulators are often used for flexible automation, tele-operation system, power assisting systems, or haptic devices [1, 2, 3]. For conventional tele-operation systems, sense of force acting on robot manipulator cannot be exactly transferred to human operators. It is expected to realize a sense of force between the control element and the robot manipulator for master slave manipulation systems.

Considering the situation where human supporting robots are used for nursing care, the nursing care robots must have the capability to recognize the force acting on robots themselves. This force must be transferred to the operator with a sense of force acting on its control element. To realize this function, an interactive control element with a master slave manipulator is developed. A force display system with human interventions for tele-operation is studied in this paper.

Conventional master slave manipulator systems have been with the same configurations for master and slave systems [4]. The configuration of master manipulators must be converted according to the configuration of slave manipulator because the configuration of slave manipulator may change according to their environments. Therefore, control methods for master slave systems with different structure are strongly desired. The operability of master manipulator is influenced by the configuration of the master systems [5, 6, 7].