

Saran Jarudamrogsak 2014: Wrist Rehabilitation Robot Using Bilateral Control for Master – Slave System. Master of Engineering (Information and Communication Technology for Embedded Systems), Major Field: Information and Communication Technology for Embedded Systems, Department of Electrical Engineering. Thesis Advisor: Mr. Chowarit Mitsantisuk, D.Eng. 47 pages.

Since 2007 in Thailand, the field of physical therapy has a tremendous power manful shortage, but in fact there have needed of physical therapists up to 1,446 people. It challenge research in an engineering field to build the robot as medical tools for supporting on physical therapy. The robot is applied to transfer force and movement though the robot system. Haptic technology is a tactile feedback technology which recreates the sense of touch by applying forces, vibrations, or motions to the user. This mechanical stimulation can be used to assist in the creation of virtual objects in a computer, to control such virtual objects, and to enhance the remote control of machines. Haptic devices may incorporate tactile sensors that measure forces exerted by the user on the interface. But the generally haptic technology has implemented the force sensor in device which has a limitation about bandwidth, point of measure and high cost of high resolutions sensor. In order to solve this problem, disturbance observer method is applied to estimate external force. The feedback disturbance estimation is also used to compensate an unknown disturbance from the motor side and to ensure the system's robustness. In this research, the proposed wrist robot assistive system consists of master and slave robot which has control based on bilateral control. Bilateral control supplies interaction force feedback information of rehabilitation training through a master robot of the physician. On the other hand, a slave robot is applied to interact with the patient. By using the proposed bilateral controller, it is possible to provide a high transparency and good perception interaction force of assisting rehabilitation training.

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