Institute of FIeld roBOtics (FIBO)

A Cradle of Future Leaders in Robotics

Bilateral Control of Telemanipulators

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Telerobotics, the body of science and technology bridging human control and purely autonomous machines, is a merging modern developments in robotics, control theory, cognitive science, machine design, computer science. In teleoperation, a human operator conducts a task in a remote environment via master and slave manipulators.

In theory, providing contact force information to the human operator can improve task performance. It is more useful when provided directly, by reflecting the measured forces to motors of the master. When this is done, the contact force is said to be reflected to the human operator, and the teleoperator is said to be control bilaterally. Force feedback can considerably improve an operator's ability to perform complex tasks that interact with the remote environment. Examples are assembly, surface following and inspection.

However, in the presence of transmission delays, such as when the teleoperation performs the task over a great distance, the system could be destabilized.

Owing to above reason, it is necessary to find a new control scheme based on dynamic response of the teleoperator to enhance the stability and transparency, the ability to send data feedback, in bilateral teleoperation. The five blocks diagram of the figure.1 below represent a teleoperator system.

Another objective of this research is to develop a testbed at FIBO. It consists of positional control mode at the human's shoulder to his/her fingers. Such a mode enables telepresence and bilateral control covering all fingers of human operators to feel contact forces from environment.

This research greatly benefits from two CRS-robots donated by Seagate Technology, Thailand Co., Ltd. (Thailand). Figure2 depicts the set up of equipment for this project.

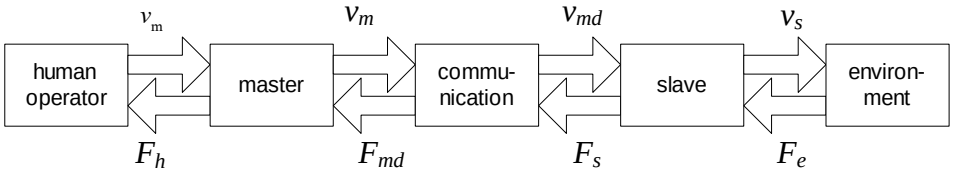

Figure1 A block diagram of teleoperator system

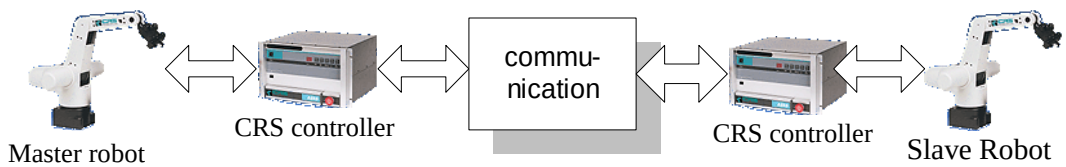

Figure2 An Implementation with CRS-robots

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