

Six Degrees of Freedom Control With Each Hand?

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For some time man has made six degree of freedom inputs to a pair of dextrous manipulators using both hands simultaneously by the use of the master/slave concept. The advent of the micro-processor has the potential to make the master/slave concept redundant by replacing the master with a mathematical model.

Due to inevitable cabin limitations the first spaceborne remote manipulator, the CANADARM, could not utilise the master/slave concept. Resolved motion rate control of the end effector was borne, and has been proven as a satisfactory control method. However the problem of the man machine interface remained. All spacecraft to date, including the space shuttle, that have been flown in six degrees of freedom have been controlled by using both hands, the left hand controlling translation and the right rotation. Almost inevitably the same principle was applied to the CANADARM.

At the instigation of NASA we embarked on the development of a device whereby both translation and rotation could be combined allowing full control with one hand.

This paper describes the development and testing of the device, and the extension of its application into spaceflight control. Also the concept of an adaptable workstation for multi-manipulator and spacecraft flight control is discussed.