Robotic Haptics: Retrofitting a Pick and Place Manipulation Arm to Haptic Input Device

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Courtney C. de Lautour

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Masters Abstract

Robotic haptics has been and continues to be an area of intense research, primarily in medical and exploration industries. This is due to an ability to provide high data throughput between human and machine. In medical applications, it is possible to detect and compensate errors such as a hand tremor in a surgeon. It is possible to apply scaling factors to assist in microsurgery situations, and can allow leading experts to perform procedures from anywhere on the globe.

As part of a collaboration to develop a robotic method of femur fracture realignment between Auckland University, Auckland District Health Board, and Massey University, the project seeks to provide a haptic driven HMI for the realignment system.

To reduce construction required, an existing manipulation arm (Mitsubishi RV-M1) is used as the hardware interface device. A new motor controller is designed to provide additional functionality as the standard controller provides no force control or real-time feedback of position.

A software interface is developed (using version 3 of the C# programming language, developed by Microsoft, and version 3.5 of the Microsoft .NET Framework) with the ultimate specification of becoming being the primary interface platform for the realignment system. The interface has been implemented to the point of providing a simulated environment for the haptic device.

It was found that the configuration of the RV-M1 provides a tight area of high dexterity as a haptic device, and as such, similar kinematic configurations are poor candidates for practical implementation. The implication of which, is that a new manipulator should be designed which grants a larger volume of high dexterity space.

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