DESIGN OF A CUSTOMIZED, SEMI-AUTONOMOUS, SINGLE ARM ROBOTIC MANIPULATOR FOR A HAZARDOUS ENVIRONMENT

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ABSTRACT

The purpose of this project is to build upon past research to develop and implement a cost effective, reliable single-armed robotic manipulator that can be used to perform repetitive tasks in the radioactive environment of a hot-cell. Current practice often involves handling material through the use of mechanical manipulators that pass through the walls of the hot-cell. These can be very expensive and impractical for repetitive tasks. Low cost single-arm robots on the market either suffer adversely from the environment or are unreliable. High cost, more durable arms are too expensive to maintain or replace. This project explores designing a manipulator that is simple enough to maintain, inexpensive enough to replace, and reliable enough to perform its task adequately. These design criteria are used to develop a conceptual robotic manipulator design. A mathematical model of the manipulator is derived from the conceptual design. Numerical simulation is used to optimize the design, develop a control algorithm, and evaluate performance criteria. A prototype manipulator is constructed and tested, and physical measurements from the device are compared to predicted responses from the model. Design and construction of a customized semi-autonomous robotic manipulator is found to be cost effective and feasible.

Keywords: *Single-Arm Robot, Hazardous Environment, Semi-Autonomous*