

## Design sensitive model reference controller with application to medical technology

### ABSTRACT

The past two decades have seen the incorporation of robotics into medical applications. From a manufacturing perspective, robots have been used in pharmaceuticals, preparing medications. But on more novel levels, robots have been used in service roles, surgery, and prosthetics. The capability of high-precision operation in manufacturing settings gave the medical industry high hopes that robots could be used to assist in surgery. Not only are robots capable of much higher precision than a human, they are not susceptible to human factors, such as trembling and sneezing, that are undesirable in the surgery room. Another advantage to robots in medicine is the ability to perform surgery with very small incisions, which results in minimal scar tissue, and dramatically reduced recovery times. The popularity of these minimally invasive surgical (MIS) procedures has enabled the incorporation of robots in surgeries. In this paper, model reference computed torque controller is recommended for four degrees of freedom serial links robot manipulator, which modeled in SIMSCAPE. To design stable controller conventional computed torque controller is recommended. It is a nonlinear, stable, and reliable controller. The proposed approach effectively combines of design methods from nonlinear controller, and linear Proportional-Derivative (PD) control to improve the performance and stability. This paper has two important objectives: a) study on modeling of 4 degrees of freedom (DOF) based on Simscape software and b) design PD model reference computed torque controller to improve the sensitivity of surgical robot manipulator.

**Keyword:** Surgical robots; Four degrees of freedom; Model reference computed torque controller