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SIMULATION OF A SOFT BODY NON-GRASP MANIPULATOR USING A SPRING-MASS-DAMPER CLOTH MODEL

By

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Abstract

Simulation and modeling are well known and important tools in the field of robotics, being used to validate design and in the development of robotic control systems. Traditionally, robotic systems have been primarily rigid body systems and used in well controlled environments where interactions are highly predictable, and exceptions are minimized. With the ever-increasing adoption of robotics in the medical field, typical robotic environments are becoming highly unpredictable and requiring the modeling and simulation of not only rigid body systems but soft systems and interactions between the two.

This work addresses the improvement of a model of a "soft and hard" robotic system for the intended use in the medical field. Through previous teams in the RBDSL group, a novel approach was taken to development a "soft and hard" robotic manipulator for the reduction of pressure ulcers in immobile hospital patients. The force bed that was developed relied upon a rigid body parallel chain mechanism and a soft body air bladder to accomplish its manipulation of patients. The force bed air bladder model was improved upon using recent techniques in cloth modelling and simulation. Results show an intuitive matching with the real-world physical force bed and the improved simulated force bed model.