1 Introduction

Robot manipulators may come into physical contact with their environment intentionally, for instance in the task of grasping, or unintentionally, through some form of collision with an obstacle. Contact with another body can limit the controllability of the robot [1]. Thus, it is important that contact be modelled in the dynamic simulation of robot systems.

A variety of contact models simple enough for real-time simulation have been proposed. Impulse-momentum models assume contact time is instantaneous and employ a coefficient of restitution to relate velocities at the moments before and after impact.

Models based on Hertz Theory, or point-contact models, assume a small localized deformation at the point of contact. Hunt and Crossley have proposed a contact model based on Hertz Theory that combines spring and damper elements [2, 3].

A volumetric contact dynamics model has also been recently proposed for real-time simulation of space-based manipulator contact [3]. (I will be performing validation experiments for this contact model as a part of my thesis work.)
It is the aim of this work to evaluate these methods for use in modelling contact for the simulation of robot dynamics.

2 Proposed Work

The three contact models described above (impulse-momentum, Hunt-Crossley, and volumetric) will be compared on the basis of their suitability in modelling robot dynamics. Existing literature on these models will be reviewed, giving special attention to their use in manipulator analysis. In addition, a simple manipulator in contact will be modelled in order to compare the three methods.

References

