Planning Algorithms for Manipulating the Physical World

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Core A (Room 301)

Abstract

A grand challenge in robotics is robustly completing manipulation tasks in everyday human environments in an autonomous manner. Some of the issues that need to be addressed in this context relate to dealing with the high-dimensional nature of robot manipulators, the presence of complex geometries and clutter in human spaces, the coordination of multiple arms to solve a problem as well as reasoning about the underlying dynamics and the resulting uncertainty.

This talk will highlight recent algorithmic solutions that build on top of state-of-art motion planning algorithms to address such problems. In particular, the presentation will show how combining reasoning for manipulation and multi-body planning can a) improve the efficiency of solutions for re-arranging multiple objects with a robot manipulator and b) provide useful planning representations and algorithms for dealing with multi-arm coordination challenges. After these kinematic challenges, the focus will transition to the case of planning for systems with significant dynamics and how a recent contribution in achieving asymptotic optimality in this domain can also help to solve planning under uncertainty problems. It will conclude with exciting research directions in the field, which require interdisciplinary collaboration for achieving significant progress.