Compact Representations for Efficient Robot Motion Planning with Formal Guarantees

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Abstract

This work provides compact representations for single- and multi-robot motion planning in the context of prehensile robot manipulation. This work explores asymptotic near-optimality and probabilistic near-optimality of these planners. This allows for lightweight storage of planning structures which are quick to query, and provides probabilistic bounds on path quality after finite computation. A compact representations for n-arm manipulation is given and efficient planning methods for multi-robot planning involving object hand-offs are provided. This work provides significant groundwork for asymptotically-optimal integrated task and motion planning problems using lightweight data structures.

Defense Committee: Prof. Kostas Bekris (Chair), Prof. Jinjing Yu, Prof. William Stieger, Prof. Devin Balkcom, Dartmouth University