KVP: A Knowledge of Volumes Approach to Robot Task Planning

Abstract:
Robot task planning is an inherently challenging problem, as it covers both continuous-space geometric reasoning about robot motion and perception, as well as purely symbolic knowledge about actions and objects. This paper presents a novel "knowledge of volumes" framework for solving generic robot tasks in partially known environments. In particular, this approach (abbreviated, KVP) combines the power of symbolic, knowledge-level AI planning with the efficient computation of volumes, which serve as an intermediate representation for both robot action and perception. While we demonstrate the effectiveness of our framework in a bimanual robot bartender scenario, our approach is also more generally applicable to tasks in automation and mobile manipulation, involving arbitrary numbers of manipulators.

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