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FOR A SIX-DEGREE-OF-FREEDOM MANIPULATOR TO AVOID UNPREDICTABLE OBSTACLES

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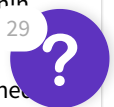
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Abstract

This paper presents the use of a sampling-based planner as a reactive planning scheme to avoid obstacles between a robotic arm and a moving obstacle. Based on a planner benchmark on an obstacle-ridden environment, a rapidly-exploring random tree (RRT) planner has been used to populate the trajectories of the task space and map them into a configuration space using a Newton-Raphson-based inverse kinematic solver. Two robot poses are defined in a cycle of back-and-forth motion; the initial and the goal poses. The robot repeatedly moves from the starting pose to the end pose via the midpoint pose. Each set of trajectories is unique. We define this unique solution within the context of the configuration space as a cycle space. We impose a periodically occurring synthetic obstacle that moves in and out of the robot arm workspace defined



in a simulated environment. Within the robot's workspace, the obstacle moves and cuts through the cycle space to emulate a dynamic environment. We also ran a benchmark on the available sampling planner in the OMPL library for static obstacle avoidance. Our benchmark shows that the RRT has the lowest time planning time at 0.031 s compared with other sampling -based planners available in the OMPL library, RRT implicitly avoids singularities within the cycle space, and reactively attempts to avoid synthetic moving objects near the robot hardware. This research intends to further investigate on the use of RGB-D sensor and LiDAR to track moving obstacles while abiding by the task spacc commands described by the initial and goal poses.

Keywords

Author Keywords: [mechatronics](#); [mhot manipulator](#); [planner](#); [motion planning](#); [dynamic environment](#)

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