ARIA
APPLIED RESEARCH IN ACTION

CAPP: Conditional Variational Auto-Encoder Accelerated Path Planner

A machine-learning approach to path-planning for a 7-DOF robotic manipulator

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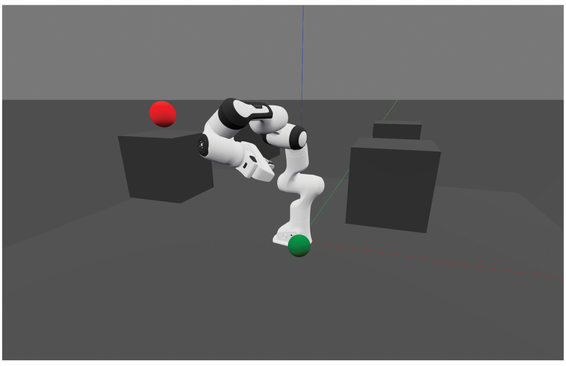

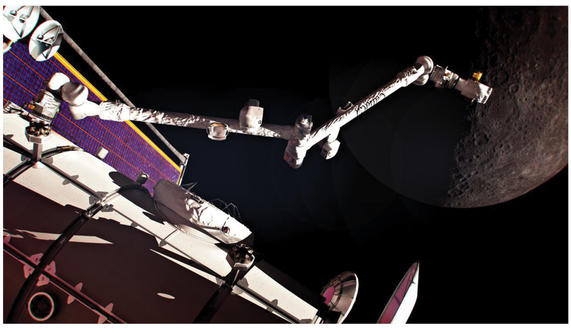

PROJECT SUMMARY

This project presents CAPP, a machine learning enabled optimal path planning method that rapidly accelerates the search for the shortest path between configurations of the FRANKA Panda robotic arm. The method utilizes a Conditional Variational Auto-Encoder (CVAE) to capture the distribution of waypoints along demonstration paths within a challenging obstacle-filled environment. A novel conditioning variable is introduced which improves the training and inference of the CVAE to the ideal sample waypoint distribution centered in the expectation about the likely optimal path. The sample waypoint distribution is then used to bias a Sample-Based Motion Planner (SBMP) thereby accelerating convergence to both valid and optimal trajectory plans. In experiments, CAPP outperforms traditional SBMP methods; presenting an order of magnitude decrease in required SBMP iterations to arrive at both valid and optimal paths. CAPP thus provides significant industrial value in time and resource constrained robotics environments.

MDA

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