Robotics and Embedded Systems

KI.FABRIK

Master/Bachelor Thesis – Semester Project

DARKO - Mobile Robot Manipulator Simulation and Trajectory Planning

Background

The EU-project **Dynamic Agile** Production **Robots** that learn and optimize **Knowledge** and **Operations** (DARKO) represents a cutting-edge endeavor in the realm of mobile robot manipulation, The DARKO project represents a pioneering initiative in mobile robot manipulation, synergizing Robotnik's [1] mobile robot base with Franka Emika's [2] state-of-the-art panda robot arm technology. This convergence of cutting-edge hardware holds significant promise for transformative advancements in automation across a spectrum of industries. Our primary objective is to leverage **Moveit!** [3], an open-source framework for motion planning and manipulation, to simulate the DARKO robot. Through simulations, we aim to perform comprehensive performance analysis and optimization, providing valuable insights prior to real-world deployment. Moveit will be instrumental in planning, simulating, and validating trajectories for both the robot arm and base. A central focus of our endeavor is the development of a customized algorithm, drawing on the capabilities of the Open Motion Planning Library (**OMPL**) [4], to generate meticulously designed preplanned paths tailored to specific task requirements and environmental contexts. The ultimate aim of this project is to seamlessly transfer these preplanned trajectories from simulation to the physical DARKO robot, thereby unlocking immense potential in automation-intensive sectors such as logistics, manufacturing, and healthcare.

Your Tasks

In this thesis, your task will be learning state-of-the-art knowledge of robot operation system and Moveit. Further step will be modifying planner scenery and integrating OMPL planner, to be specific:

1. You will first learn basic knowledge of robot operation system (rosnode/rostopic/rospkg etc.).
2. You will reproduce the results from Moveit! / OMPL documentation and other related research repos. By doing this, you will have a deep understanding of path planning algorithms and the state-of-the-art state planners.
3. You will preplan efficient trajectory and execution for the DARKO's arm and base.

Requirement

- High self-motivation;
- Approx. six-month working time;
- Experiences or knowledge from related courses;
- C++ programming experiences.

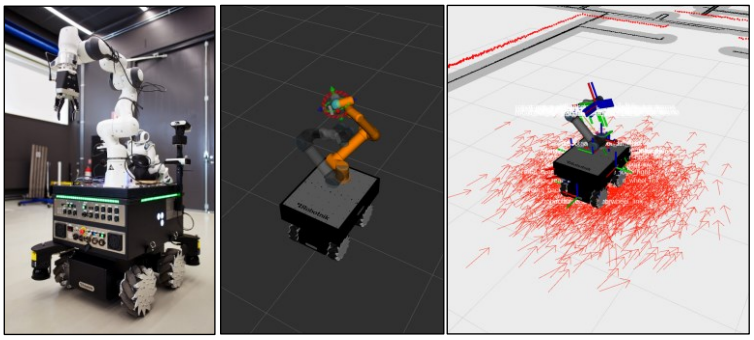

Figure 1 DARKO physical/simulation environments.

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