WASP Project Course 2021
Vision-based Manipulation and Mobility

Background

The primary goal of WARA Robotics is to build a surrogate industrial-like environment that facilitates the development and the evaluation of AI-based robot technologies.

In this project we will integrate existing solutions into a single system to solve a mobile robotic kitting and assembly task on a mobile ABB YuMi robot. Depending on how many and which students join the project, COVID-19 restrictions etc. we will solve all or some of the parts outlined below in the challenges section.

More specifically the proposed task can be specified by a description of the final object arrangement (pose and type, or other constraints). Scenarios of varying difficulty will be considered. For example, all required objects are already in front of the robot, objects are distributed in known locations (i.e., shelf/table is known, but exact position is unknown), or objects are in completely unknown places.

Participants

Industrial partner: ABB

Industrial supervisor: Pietro Falco, pietro.falco@se.abb.com

Academic supervisor: Christian Smith, ccs@kth.se

Coordinating WARA representative: Jonas Larsson

Suggested WASP PhD students: Leonard Bruns, Matteo Iovino, Jonathan Styrud, Truls Nyberg

Challenges to investigate

Solving this task involves the following technical components:
- RGB-D-based vision for pose and shape estimation of known and unknown objects,
- Mobile navigation and localization,
- Vision-based grasping,

- Kitting and assembly controlled by a behavior tree synthesised by a planner and/or Genetic Programming (GP) algorithm or other,
- Integration of all these components on real system using ROS
- Learn from demonstration any missing subtasks or actions more likely to fail.

Resources

WARA Robotics arena, including YuMi robots, cameras etc.

Deliverables

- Working code to execute algorithms on the WARA Robotics systems
- Demonstration of working system live or recorded
- Project report detailing the work done

References

Sucar, Edgar, Kentaro Wada, and Andrew Davison. "NodeSLAM: Neural object descriptors for multi-view shape reconstruction." 2020 International Conference on 3D Vision (3DV). IEEE, 2020.

Keywords

Robotics, vision, manipulation, mobility