

Master thesis topic: TIAGo, help me unpack some boxes

Background

How many times have you moved to a new apartment? Imagine that you have a robot that helps you to unpack the content of the boxes. Unpacking and cleaning are some of the most repetitive tasks in a household environment. How wonderful would it be to have a robot doing these tasks for us? These tasks aim at evaluating the different capabilities of robots in challenging environments.



Problem and goal

In this thesis, the students will design and develop a virtual environment similar to the above figure. Then, they will develop a variety of learning, reasoning and control methods to manipulate different objects. For example:

- Implement and develop various reasoning and knowledge methods to enable high-level decision making. This will allow robots to infer the possible locations of objects.
- Investigate and develop recent methods in the Explainable AI Planning area to learn robotic plans in complex scenarios. The robot should automatically create plans using recent planners such as PDDL or sequence planner. Students will investigate local and global planners for mobile manipulation tasks.

The goal of this project is to allow a robot to identify and grasp objects from inside a box and place them in the correct locations, for example, the robot will learn that cups and plates should be stored in the cupboard in the kitchen. Sometimes, the robot may need to move to another room, for example, to the living room to place books on the bookshelf or the toothpaste in the bathroom. Then, the learned models will be transferred into a virtual service robot (e.g. the TIAGo robot) to interact with humans in a virtual scenario.

Prerequisite: Basics of Automatic Control, Learning algorithms, Basics on Computer Programming (ROS, Python or C++).

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