Research Intern/Master Thesis – Semester Project

Synthesize Behavior Trees from Human Demonstrations for Industrial Assembly Tasks

Background

Sequential planning for robot manipulation holds pivotal importance in the robotics field, with Behavior Trees (BT) being prevalent methods for executing sequential tasks in robotic applications [1]. BTs excel in generality and are theoretically able to realize any strategy. The method has recently gained more recognition because of its simplicity and readability with graphical visualization. However, a notable limitation lies in its dependency on manually defined behaviors and hierarchical structures to manifest robust behaviors. To address this gap, the proposed thesis work aims to explore learning BTs from visual-tactile demonstrations [2-4]. More explicitly, our objective is to develop a planning framework oriented towards: 1) reasoning about the assembly sequence; and 2) being reactive and robust to uncertainty or failures, especially during assembly processes demanding tight-clearance.

Keywords: task and motion planning, behavior trees, learning from demonstration.

Work Package

- Literature review on behavior-trees-based planning and learning from demonstrations;
- Propose and implement an efficient framework and integrate into our existing software architecture for robot control, planning and learning;
- Verify the proposed method via real-world experiments.

Requirements

- Highly motivated and research-oriented.
- Good programming skills (Python or C++). Familiarity with ROS would be a plus.
- Prior knowledge and experience in planning, robotics, and computer vision.

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Figure 1 Setup of the assembly task

References

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