Learning to Assemble using 6D Pose Estimation for Insertion Tasks

Description

In this project, we aim to develop an algorithm that can use 6D pose estimation to support the task of object assembling or insertion.

Figure 1: Example of 6D pose estimation for assembly tasks.

In this project, we will re-implement a 6D pose estimation algorithm for object-object assemblies [2]. This approach uses domain randomization to generate different scene settings, e.g. objects textures, sizes, and configurations. In a single task, one manipulation object is given. All the generated scenes accept this given manipulation object as the corrected object. An 6D pose of the corrected place would be estimated. We will transfer this approach to industrial insertion tasks, and propose improvements to make perfect insertion execution.

Tasks

- Re-implementation: The approach in [2] needs to be re-implemented.
- Improvements: As the assembling pose might not be fitting well to the intended place, we should use RL (e.g. QT-Opt [1]) to fine-tune the plan.
- Benchmarking: The approach will be evaluated against the existing method on a simulated robot system and demonstrate on industrial insertion task, e.g. eBike assembly.

References
