CupStacking

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Introduction/Problem Statement

Idea: Cup Stacking

Challenge: Arrange cups in a pyramid shape with high speed and accuracy

Objective: Design a robot that is able to stack a two level pyramid (three cups) without causing a collapse

Requirements:

- High speed and accuracy
- No cups fall while constructing the pyramid

Environment

Simulation: Gazebo

World Description: Flat plane with a table to work in. Cups arrange in a way that allows for easy gripping and stacking. Similar environment used in previous homeworks

Planning: Use MoveIt package to plan gripper movements

Implementation

- Implementing this project consists of the following steps:
    - Setting up the environment.
    - Planning out the trajectory for the robot to move the cup to the goal position.
- Setting up the environment involves finding the right COLLADA model of the cup and configuring the model's friction and moment of inertia.
- Planning out the trajectory involves using TRAC-IK to determine the right joint configuration such that the robot can move the cup to the destination.
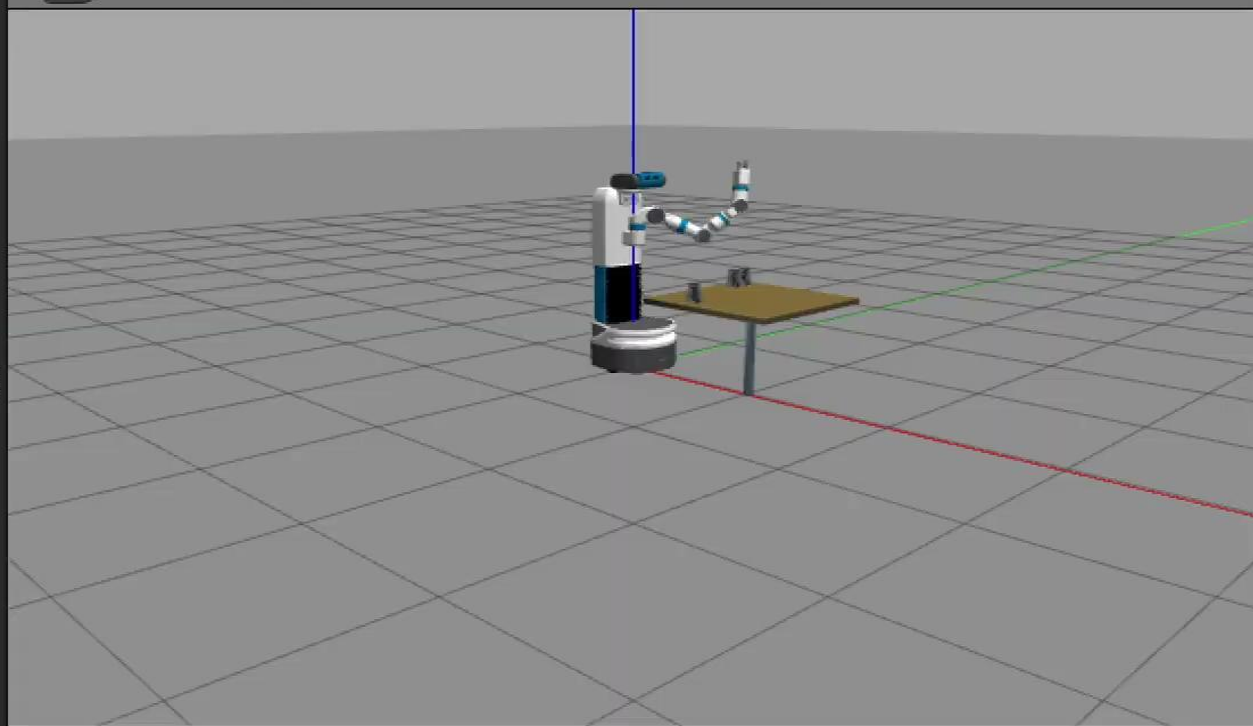
Results and Conclusion

- Speed and accuracy
    - Average speed of 57 seconds for layer of two, not enough accuracy for layer of 3
    - Stacking more than a layer of two in this manner is unfeasible
    - The gripper will often collide with the top most cup when returning to origin, providing a harder challenge when doing more layers
- Future steps
    - Pre-calculate the path needed for the arm rather than relying on model-based results to ensure faster response time.