Project Proposal for Carrybox with Ros Vacuum Gripper Plugin

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***Abstract*— The project is to accomplish the carry box that will have ros vacuum gripper to carry the box from the source to target.**

I. Problem Statement

In a logistics warehouse, to improve efficiency and reduce manual labor, we need to transfer items from various locations to designated destinations. The goal is to optimize the movement process, ensuring that items are transported in a timely, accurate, and cost-effective manner. Factors such as the layout of the warehouse, the size and weight of the items must be considered. The solution should minimize human intervention while maintaining the flexibility to handle various types of goods and accommodate dynamic changes in demand.

II. Approach

A. Selecting a Category

Among the research-oriented, application-oriented and implementation oriented ways, we choose to use application-oriented by utilizing the existing robotics algorithm to solve our target problem.

B. Approaches

For this application-oriented project, we are using a Universal Robots (UR) robotic arm equipped with a gripper attachment to transfer items. The approach leverages the flexibility and precision of the UR robot to automate the movement of goods within the warehouse. The gripper plugin enables the robot to handle the item efficiently, particularly those with flat surfaces or delicate packaging. This approach is applied to the new application by programming the UR robot to pick up items from designated locations and place them in specific destinations, reducing manual labor and increasing overall operational efficiency. Additionally, the system can be adapted to different item sizes and weights, making it a versatile solution for dynamic warehouse environments.

III. Simulation Environments

For the simulation environment in this project, we are using Gazebo, a widely recognized physics simulation engine. Gazebo provides a robust platform for testing and validating robotic experiments by accurately simulating real-world physics parameters, including gravity, inertia, and collision detection. This enables us to replicate the behavior of the UR robot and suction cup attachment in a virtual warehouse environment, ensuring the accuracy and feasibility of item transfers before implementing them in the physical world.

By leveraging Gazebo's ability to model various physical interactions and sensor data, we can simulate complex scenarios, test different configurations, and fine-tune the robot's performance without the risk of damaging real equipment. This also allows us to identify and resolve potential issues in a controlled environment, saving time and resources in the development process.

IV. Evaluation

The success of the project will be evaluated by focusing on the efficiency of the robot's motion planning during the item transfer process. This includes assessing the smoothness and speed of the robot's movements as it grasps, transfers, and places items. The evaluation will also consider the overall system's ability to handle continuous motion tasks without interruptions, ensuring that the transfer process is efficient and optimized for real-world application. By analyzing the motion planning performance, we can determine whether the robot successfully automates the item transfer task.

References

[1] Universal Robot ROS-Industrial, "universal_robot," GitHub repository. Available: `https://github.com/ros-industrial/universal_robot`. Accessed: Sep. 18, 2024.

[2] L. Huang, "ur5_ROS-Gazebo," GitHub repository. Available: `https://github.com/lihuang3/ur5_ROS-Gazebo`. Accessed: Sep. 18, 2024.

[3] J. Proberge, "robotiq," GitHub repository. Available: `https://github.com/jproberge/robotiq`. Accessed: Sep. 18, 2024.