Udacity Final Project: Home Service Robot

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I. Introduction

This project simulates a home service robot in Gazebo simulator using ROS (Robot Operating System). The problem statement is as follows:

1) A robot is loaded at any initial location.
2) Pick up location of an object is given and marked using marker.
3) The robot plans its path from initial location to the object/marker location while avoiding obstacles.
4) The robot navigates to the location and picks the object.
5) Once the object is picked the robot is given its drop location.
6) The robot plans a trajectory from its pickup location to drop off location.
7) The robot then executes the motion.

In order to achieve to understand the process of achieving these goal and the packages used we divide the project into Mapping, Navigation and Localization.

II. Mapping

We used gmapping package which provides a laser-based SLAM as a ROS node known as *slam_gmapping*. Using this node, we are able to create a 2-D occupancy grid map from pose data and laser data collected from a robot. Here we primarily used turtlebot as a home service robot. test_slam.sh listed under scripts in catkin workspace launches a gazebo with my custom world and turtlebot at the initial position and slam_gmapping is launched. When the robot is moved using teleop (keyboard) using the laser scan the robot is able to create its own map.

III. Navigation and Mapping

In order to navigate from a given point to its destination, we use ROS Navigation Stack which is based on Dijkstra's algorithm. It is a variant of Uniform Cost search algorithm which plans a path from initial position to goal position. It plans the trajectory avoiding obstacle. In order to test the working of this package we verify by manual providing a navigation goal using rviz. This package helps the robot to navigate in a given environment.

IV. Working of Home Service Robot

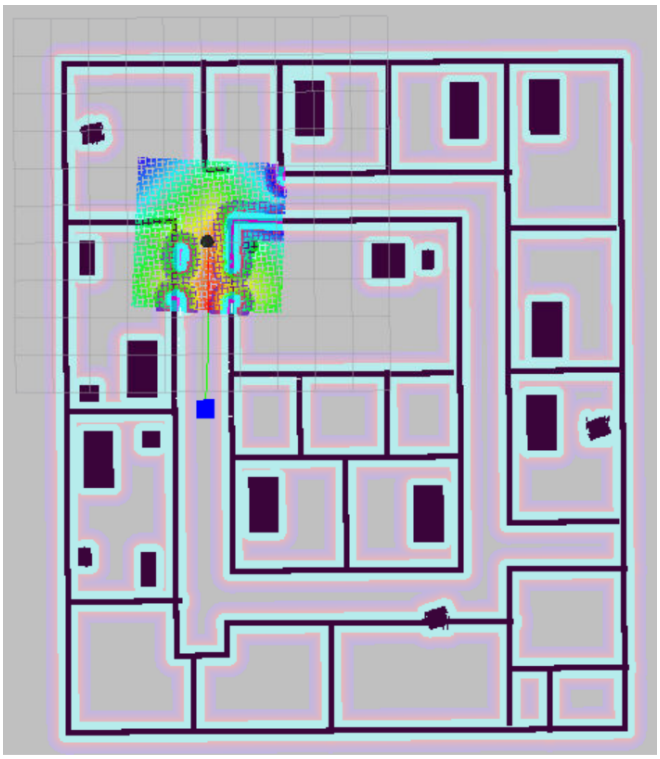

Fig. 1. Robot moving towards pick up location

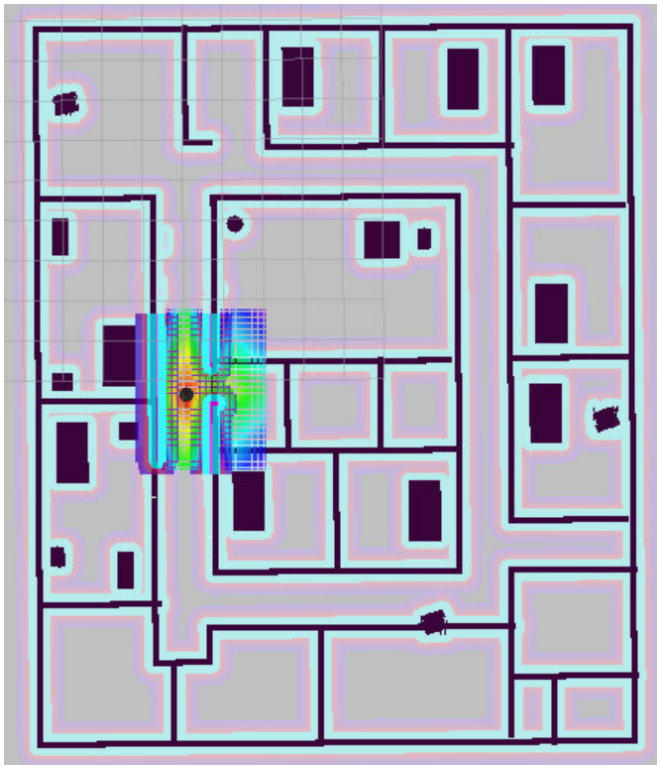

Fig. 2. Robot picked the object

Fig. 3. Robot dropped the object