EE565: MOBILE ROBOTICS

LAB # 9: USING IROBOT CREATE TO MAKE ENVIRONMENT GRID MAP WITH LASER RANGE SCANNER

DESCRIPTION

This lab introduces the students to the slam_gmapping node, whose function is to do Simultaneous Localization and Mapping (SLAM) from the data acquired from a laser scanner equipped iRobot. SLAM has been one of the most widely researched topics in robotics community. Students will be implementing SLAM algorithm to make a 2D map of an environment.

IN-LAB WORK

This lab is composed of two components that are to be completed in lab time. There's no lab assignment.

HARDWARE COMPONENT:

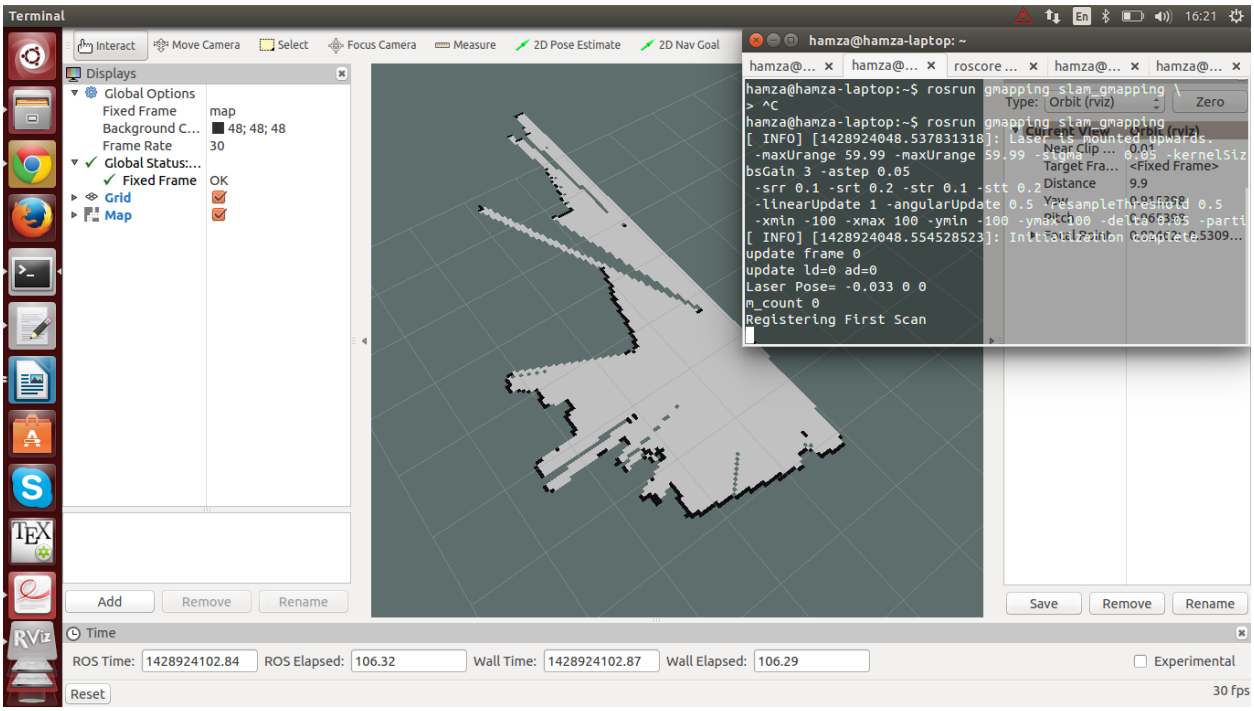
You will be provided with a rosbag file that has odometry and laser scan data, recorded by moving iRobot (w/scanner) around SSE 3rd floor. You are required to map the environment as a 2D grid map by using gmapping ROS package.

To make a bag file:

1. Install hokuyo-node and gmapping packages.
2. Connect the hokuyo laser scanner with 12V power, and the USB data cable with the PC.
3. Open the port: sudo chmod 777 /dev/ttyACM0
4. Set the port: rosparam set hokuyo_node/port /dev/ttyACM0
5. Run the laser scanner: rosrun hokuyo_node hokuyo_node
6. Visualize the laser data topic "/scan" in rViz.
7. Now, connect the iRobot Create. Launch minimal_launch and turtlebot_teleop_joy nodes.
8. Verify if all topics are being published and the robot is able to move with the help of controller.
9. Record using rosbag with the laser mounted on iRobot and traverse around the target environment that you want to map.
10. Once you have the recording, continue with the map building process.

Running gmapping:

11. Play the recorded bag file that has the desired topics (/tf, /scan, /odom, etc.)
12. Run the slam_gmapping node.
13. Launch rViz and visualize the "map" topic.
14. As the bag file keeps playing, you'll see the map keeps updating.
15. Get your map checked.



SIMULATION COMPONENT:

In this component, you have to perform SLAM using a robot in Gazebo with hokuyo sensor mounted on it. You can use turtlebot and put the hokuyo sensor on it by editing its model.sdf file. Once you have a working robot, ensure that it is publishing the /tf topic that has the transformation between the sensor, and odometry reference frames. /scan topic should be publishing the data from hokuyo laser scanner. After all this is ready, run the slam_gmapping node with this simulation setup and visualize the 2D grid map in rViz. It will be similar to the one made in hardware component.

Note: You should use the map maze model provided on LMS and try to map that maze. You may use any robot (iRobot isn't necessary). The map model is as follows: