

ENPM662 INTRODUCTION TO ROBOT MODELLING - PROJECT 1

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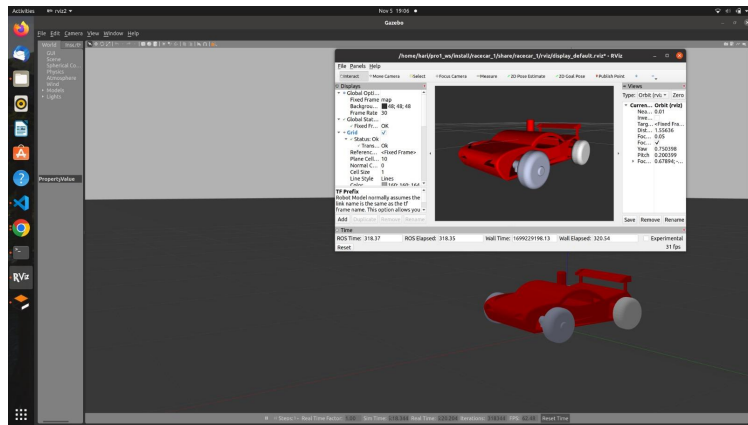


Fig 1: Both the Gazebo and RVIZ windows visible with the robot

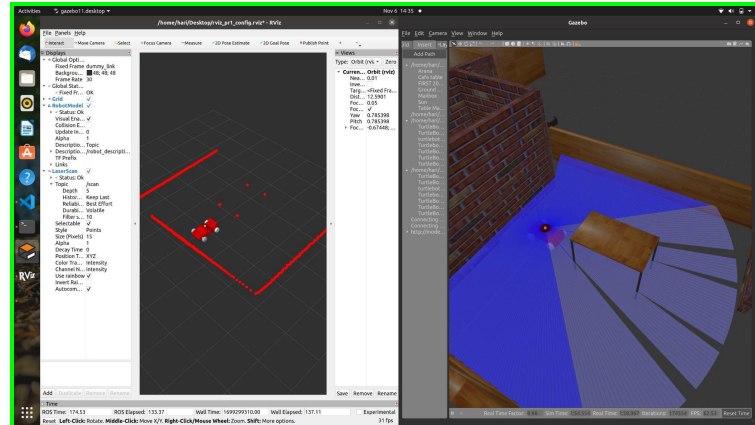


Fig 4 : RVIZ LiDAR Visualization.

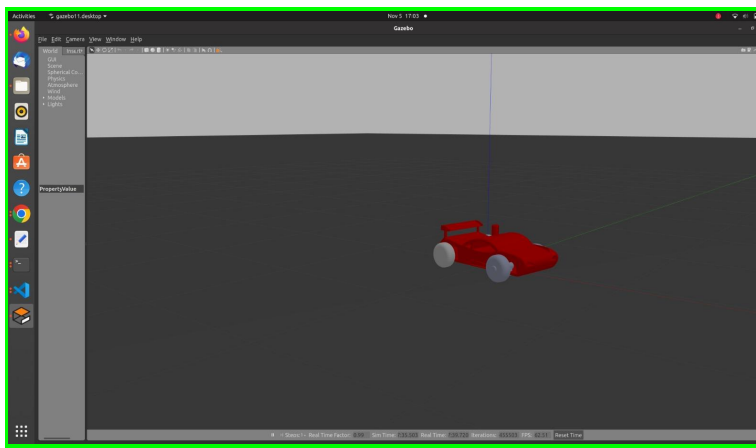


Fig 2: Robot visible in Empty World

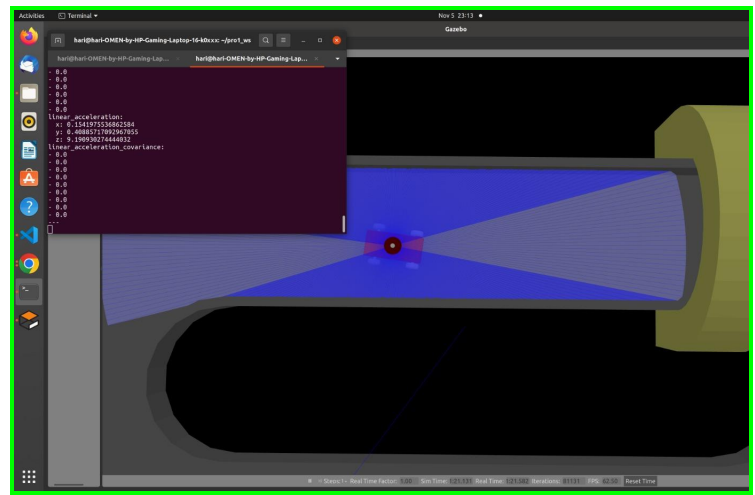


Fig 5: IMU Plugin Topic Visualization -Terminal with information being published to the imu topic.

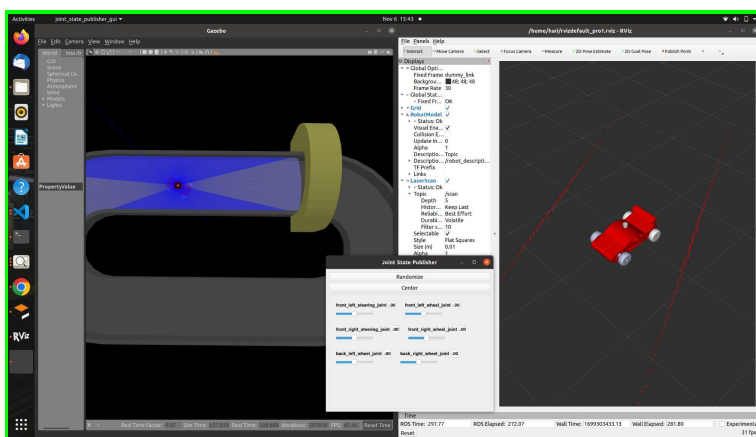


Fig 3 : Robot visible with joint controller slider GUI in RVIZ

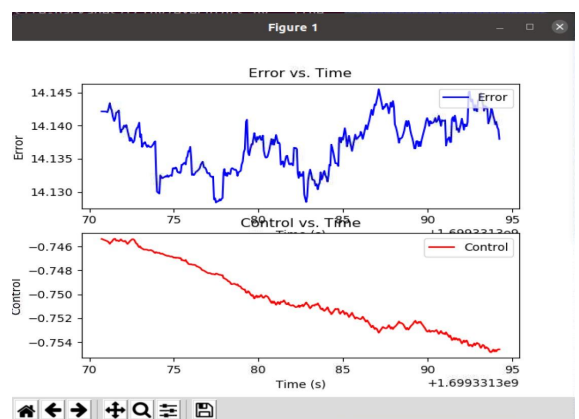


Fig 6: Error and Control vs Time Graph of the Proportional Controller.

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Teleop of Robot Moving around the track.

[.Project1 - Teleop Operation with the model in Competition track](#)

Proportional Controller to Move the robot in a straight line.

[Proportional Controller](#)

The Steps and Process Throughout the Project Flow :

- Firstly, creating the robot using SolidWorks.
- Using the SW2URDF plugin, convert the SolidWorks file to URDF formatOpen Ubuntu to export the URDF file from Windows.
- In Ubuntu, set up a workspace and create a package for the ROS2 file to run in workspace.
- To the workspace target file(racecar_1), the URDF and mesh folders are added from the exported URDF file. changing the ROS1 file to convert to ROS2 file
- Making changes in the ROS1 file to convert to ROS2 file, also updating the CMakeLists.
- Add color to the URDF file in the racecar_1. urdf.xacro file, also defined a cylinder to place a lidar sensor and add IMU .
- Create the controllers for various joints to allow for robot mobility.
- Sourcing the commands to the file to start the controllers. publish the data to the joints .
- To evaluate the robot's Lidar properties in RViz, introduce obstacles in Gazebo.
- After Including the code inside the workspace for teleoperation and Use the WASD keys
- Put the robot in a competition track area and drive by using teleoperation.
- To show movement from (0,0) to (10,10), created a proportional controller, then recorded the performance by taking Error and Control vs Time Graph of the Proportional Controller.
- Record every image of the result, including the setup, testing, outcomes, and design.

Personal Contribution:

Topic	Contributor
SolidWorks and URDF export	Sai Jagadeesh Muralikrishnan
Teleoperation of the Robot in Competition Setup	Sai Jagadeesh Muralikrishnan
Proportional controller : Code & Publish	Sai Jagadeesh Muralikrishnan and Hariharasudan

Errors and Troubleshooting:

- At the initial stages we did not save in VS code and assumed it to be auto-saved but it didn't and also we forgot to colcon build after making changes to it.
- The cylinder was not given as a link on top of the car so was created in the urdf.xacro file by trial and error to place it in the correct position.
- The laser points of Lidar on the rviz window were initially not visible. It started working again after Ubuntu was restarted. The restart was the option to solve multiple problems.
- Xacros was not originally installed in the system. This resulted in various errors. Installing xacros solved this issue.

Difficulties Faced: The coding part of proportional controller to find the position using IMU

Improvements to the documentation: The documentation was useful but we felt the videos associated with the tasks in the documentation were to be reviewed in ELMS, which was hard. If the videos of the software session are available in the documentation page it would be useful.