

ENPM 662: INTRODUCTION TO ROBOT MODELLING

PROJECT-1

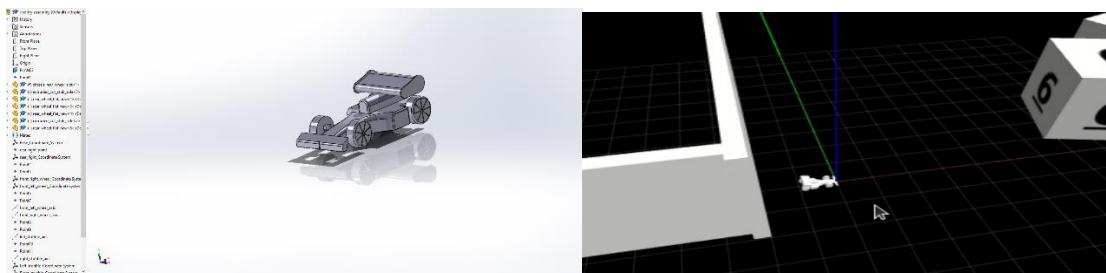
Objective: CAD Modelling of a car in Solidworks, Simulation and Visualization in Gazebo.

Project Goals:

- To build a toy car in Solidworks and export it as a URDF file.
- Adding a Lidar sensor modules to the car model and visualize in Rviz and Gazebo.
- Creating an empty gazebo world into a competition arena.
- Performing TeleOP by coding a publisher and subscriber node, and successfully navigating the competition arena.

Project Steps and Flow:

1. Creating part models for building the car in Solidworks.
2. Assembling the car in Solidworks
3. Exporting the car model as a URDF file
4. Creating a catkin_ws in which the file was sourced, built and developed.
5. Creating a dummy link and dummy joint to visualize model in environment
6. Creating Transmission blocks to add controllers in the URDF of the car.
7. Xacro file Integration of the Lidar sensor and Car Model URDF.
8. Configuring controllers assigned to joints in the .yaml file.
9. Adding LIDAR sensor module to the workspace.
10. Perform TeleOP to move the model in the simulation environment to reach the goal manually.
11. Coding a simple publisher and a simple subscriber to make the car go round in a perfect circle.
12. Visualization of the model in Rviz.
13. Simulation of the model in Gazebo.



Challenges Faced:

- Mating of the parts in assembly.
- Assigning the frames and axes to each joint correctly.
- Car model was not spawning as expected in Gazebo (parts were dislocated).
- Understanding and Integrating all files (Xacro, .yaml, URDF, .launch)
- Lidar sensor visualization in Rviz.
- Wobbling while moving in simulation. (Fixed in the end by adjusting PID values accordingly)

Contribution:

- Designing and modelling the formula 1 inspired car parts in Solidworks.
- Assembly of the Parts and defining axes and frames wherever required.
- Creating URDF, setting appropriate limits, exporting and importing successfully in the gazebo environment.
- Creating a dummy link and dummy joint to visualize model in environment
- Lidar Sensor integration to the model.
- Integration of the model in the Competition arena for visualization
- Working on resolving errors that occurred while performing TeleOP.
- Coding the Publisher and Subscriber node for motion of the model in the environment

Links to Videos:

- Both videos are uploaded on drive link given below.

https://drive.google.com/drive/folders/1NtzUDIFnazQjD_Bw9fVTy2VSewL0-o-2?usp=sharing