

ENPM 662: INTRODUCTION TO ROBOT MODELLING

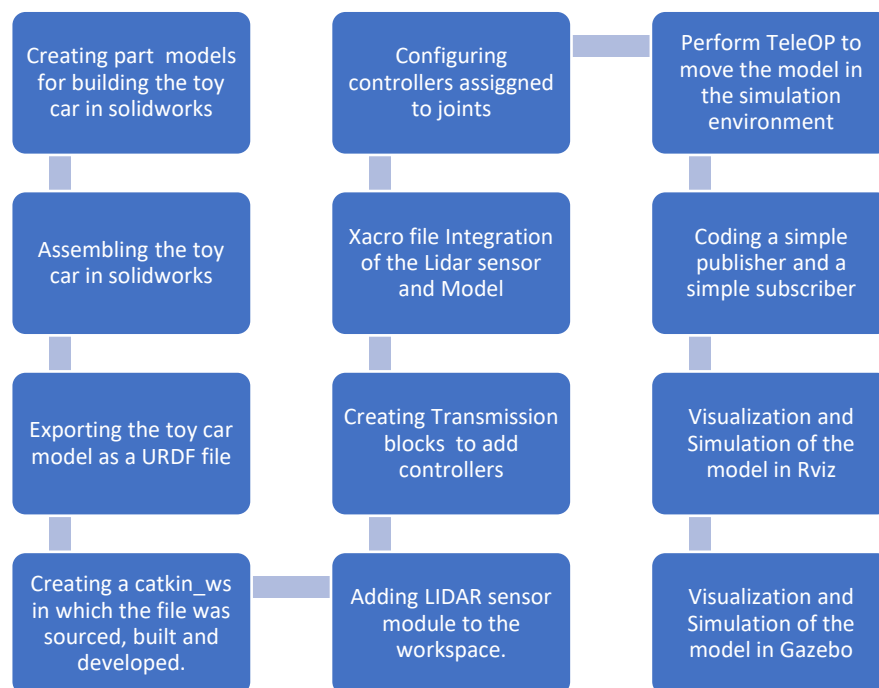
PROJECT 1

Objective: CAD Modelling of a toy 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 Pipeline:



Challenges Faced:

- There was a slight pushback when we faced a problem in regard to part mating, the distance mate and surface mate.
- Alignment of axes for the model in solidworks and the displayed URDF on gazebo wasn't the same, so we had to work on a few iterations to align both of them.
- The Lidar Sensor visualization was a huge backlash, it took us a lot of time to understand what was wrong and where we had to look to make things right. We found out that the z axis of the Lidar sensor was 0 by default because of the shared origin

with the model. The sensor was getting launched but wasn't visible due to the model shadowing it. We changed the coordinate axis, and the problem was fixed.

- The Turning radius of the model was bigger than expected, so the model was turning at an offset distance rather than the desired distance, so we made changes to the model and the error was minimised.
- The laser data of Lidar sensor was not being published while visualizing the model in Rviz, so we changed the origin and coordinate axes of the model in the solidworks.

Contribution:

- Designing and Modelling of the toy car parts in solidworks.
- Assembly of the parts and URDF exporting.
- 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:

1. Publisher Subscriber Video

https://drive.google.com/file/d/1QAYaStPgVa_YBP1gvjawohSNn_GsUQ-/view?usp=sharing

2. TeleOP Video

<https://drive.google.com/file/d/1zRx6uzmF3cWSJEOZHP9xhZw0PBm5h4X6/view?usp=sharing>