ENPM662 PROJECT 1 Report

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1. CAD MODELLING

3D model of “CHOMS” was created in **SolidWorks**. All the parts such as wheels, chassis, links etc. were modelled individually as parts and then assembled into a final assembly file.

2. URDF

A **URDF** file was created by defining all the necessary points, axes, joints etc. While exporting the URDF, relations between the links were defined using joints. The chassis of the robot was the base(parent/primary) link to which the other child(secondary) links were attached. The steering links further have wheels as child links. The steering links are attached to the chassis as revolute joints and the wheels are attached to the steering links as continuous joints. After the URDF file was exported, a ROS package folder named “CHOMS” was created.

3. TRANSMISSIONS AND HARDWARE INTERFACES

Actuation of the robot is achieved by adding transmission blocks and hardware interfaces. The robot is a rear-wheel-drive system and hence velocity joint interfaces were used at the rear wheels. The steering in the joints in the front was achieved by choosing effort joint interface for them. For proper alignment of the robot with the gazebo world origin we made use of a **dummy link** attached to the base of our robot using a fixed joint.

4. ROBOT & LIDAR INTEGRATION

Integration between the **Robot** and the **LiDAR** was achieved using the **XACRO** files, **LiDAR URDF** and the mesh files that were given for the project. The LiDAR module was attached to the Robot by providing a fixed link between the two by editing the XACRO files to include the URDF files of the Robot and the LiDAR module. The new XACRO file was then converted into a new URDF file.

5. TESTING

The **gazebo.launch** file was updated by adding world launch controller and **Rviz** nodes. PID Tuning was done for the controller. The **teleop** script provided for this project was modified to publish values to the correct topics. It was then tested if the Robot moves correctly in the gazebo world. A Rviz was saved by adding the Robot model and LiDAR point cloud to it. Publisher and subscriber scripts were written in **python3**.

Links to the Videos:

1. **Teleop Simulation:**
   https://drive.google.com/file/d/1_AaLywGfDssssdiJXZKYk8Bc-r6feBMx/view?usp=share_link

2. **Pub-Sub Simulation:**
   https://drive.google.com/file/d/1p_0If2JChMQBO1SWCuDrgRfBhSvqqid2/view?usp=share_link

3. **Rviz:**
   https://drive.google.com/file/d/1lL5qbzMOFCfjhbWBrgXkUoISMiRPwdQk/view?usp=share_link