NAME: **Chevireddi, Vijay Dev Reddy**
UID: **119491485**
PARTNER: **Abraruddin Syed**
UID: **120109997**

Project Report

STEPS FOLLOWED:

1. The CAD Model was made using SOLIDWORKS.
2. The CAD Model (Assembly) was exported to URDF. Parent links and child links were defined respectively.
3. The exported URDF package was converted to be compatible with ROS2 (Meshes and URDF folders generated by SW2URDF were moved to ROS2 package, moreover, the car_robot.urdf file was renamed to car_robot.urdf.xacro)
4. Position controllers were added to the front wheel joints. Velocity controller was added to the rear shaft. “LiDAR” was also added to the robot.
5. Teleop script was used to control the robot in the competition track and a single lap was completed using this script.
6. We drove the robot from point A (0,0) to point B (10,10) position using a proportional controller.

PROBLEMS FACED:

1. The Inertial Frame of the robot was shifted which made the car move as soon as it got spawned, this happened because we did not define a reference coordinate frame to the robot base link. We overcame this problem by correctly defining the reference coordinate frame to the base link before exporting the CAD model to URDF.

2. The robot was not getting spawned in the gazebo. This occurred because of some instances in launch files. The “test_package” was not replaced with our package name, “car_robot.”

3. As we were trying to control the robot using tele-op, sometimes the front two wheels were not rotating and sometimes the front car wheels were getting dislocated from the front shafts. A couple of changes to the mates of the front two wheels with the front shaft solved these problems and we successfully and completed the competition track with our robot.

4. While working on Proportional controllers we faced problems like getting odometry data from IMU & as we were constrained to use only proportional controllers the error tolerance is set to 0.3.

5. As there was steering and velocity in this project the controlling both with proportional controllers was tedious.

TELEOP VIDEO:

https://drive.google.com/file/d/1KJVCWg_xShSV81s7jR3bMxL7cFnzT952/view?usp=sharing

PROPORTIONAL CONTROLLER GAZEBO VIDEO:

https://drive.google.com/file/d/1L1aLbvsxYZ-9a_f2rOXrzXcH98Cjj_Od/view?usp=sharing

ALL THE IMAGES, VIDEOS & PACKAGE CAN BE FOUND IN BELOW LINK:

https://drive.google.com/drive/folders/1kFI5gInYDYCtavLPweND-oMxF1NxOHjM?usp=sharing

CONTRIBUTIONS:

The project overall was done collectively by two of us on one laptop only to avoid communication gaps & to be more productive. To be precise my contributions were more towards the modelling, exporting to URDF & Adding controllers.

IMPROVEMENTS:

PID controllers or other high level controllers such as LQR or LQG implementation to control the robot to desired position can be implemented for a more practical solution and robust control.