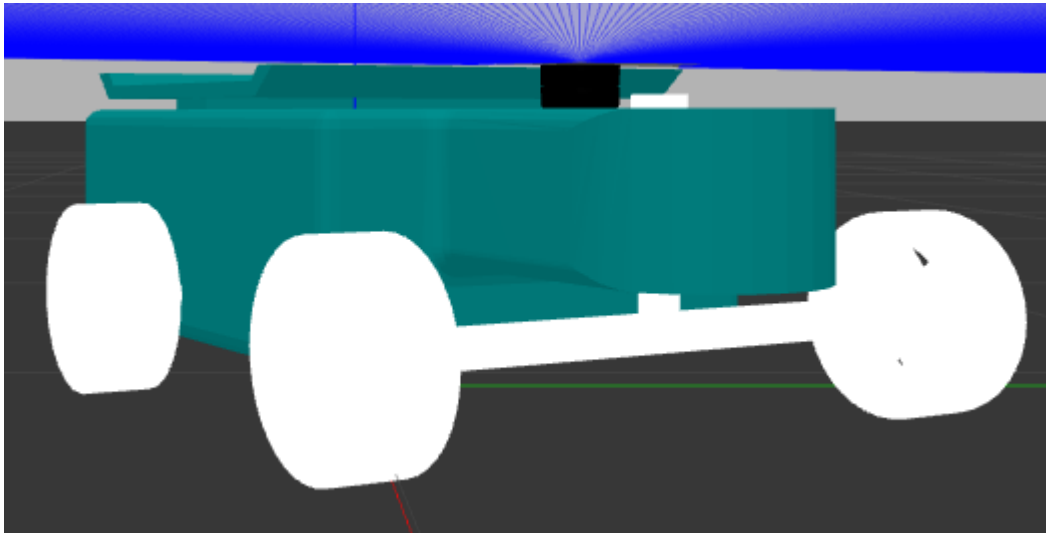


# ENPM662 Project 1

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## Steps:

- Designed the parts of the mobile robot and Assembled them in SOLIDWORKS
- Converted the SOLIDWORKS Assembly File to URDF using SOLIDWORKS2URDF Exporter. Set the parent and child links and let SOLIDWORKS generate the reference frames / Joint Axes.
- Added dummy link and dummy joint in urdf file and ran check\_urdf to check parent-child relationships
- Added transmissions in the urdf file
- Added the LIDAR files
- Created .xacro file for integration of sensor.
- Updated the config file for controllers corresponding to various joints that needed to be controlled. This is where we included PID gains for those too.
- Downloaded the world file given.
- Made the necessary changes to template\_launch.launch file.
- Ran roslaunch mobile\_robot template\_launch.launch to visualize our robot in the given world
- Visualized LIDAR points in Rviz and captured a video.
- Added publishers to controllers in the teleop python file.
- Tested whether teleop commands worked by launching the template\_launch.launch file and running the teleop python file in another terminal

- Wrote publisher and subscriber files in python for making the robot move in a circle and printing out its current angular and linear velocities.
- Used teleop to navigate the robot to the location of the person at the top-right corner.

### **Difficulties faced:**

- Error: mapping values not allowed in xml file. Was due to improper indentation in config file and got solved by giving proper indentation.
- Warning “deprecated syntax for transmission”. Solved by using “hardware\_interface/VelocityJointInterface” and “hardware\_interface/EffortJointInterface” instead of just “VelocityJointInterface” and “EffortJointInterface”.
- Error “No p gain specified”. With advice by TAs, solved it by changing the format in which pid gains were specified. Instead of what was given in the template config file, we had to use a format as follows:

**gazebo\_ros\_control:**

**<joint\_name>:**

**p:**

**i:**

**d:**

- Faced Problems visualizing LIDAR or even getting a LIDAR scan topic. Solved by making the plugin name gazebo\_ros\_head\_hokuyo\_controller and plugin as libgazebo\_ros\_laser.so. And a few changes in topic and frame name.
- Even after this libgazebo\_ros\_laser.so was causing problems giving Segmentation fault: Core dumped error. Solved this by removing the line <always\_on>true</always\_on> in sensor.
- Finally, we were facing an error saying “Spawn Service failed exiting” and “process has died”. Solved this by setting the lower limit of sim\_time parameter in .world file to 0.

### **Contribution:**

- Most of the work was a 50-50 joint effort by me and my teammate.
- My contribution was higher in the design of steering mechanism and the chassis design while my teammate contributed more in conversion of file from Solidworks to URDF.
- Rest of the things like creating xacro file, modifying urdf file, modifying config file, adding laser sensor, modifying python teleop file, publisher/subscriber were done as a team together by us.
- In terms of solving errors, my teammate contributed slightly more in solving the indentation-related errors and the “No p gain specified” error whereas I contributed slightly more in solving the libgazebo\_ros\_laser.so error, “Spawn Service failed” error and the deprecated syntax warning.
- We both made individual videos of teleopping the robot to the person in top-right corner, Rviz and robot moving in a Circle using Publisher/Subscriber. My teammate’s videos came out better hence we included his videos and hence the videos can be considered as my teammate’s contribution.

## Video Links:

- Rviz LIDAR Visualization: [https://drive.google.com/file/d/10tucV\\_YtqXqJ80-po5tFQjeVo2Xj-kF/view?usp=sharing](https://drive.google.com/file/d/10tucV_YtqXqJ80-po5tFQjeVo2Xj-kF/view?usp=sharing)
- Teleop to person: <https://drive.google.com/file/d/1-73bwGYtBICiGYA6iRvnVO3p9tj2Zh9K/view?usp=sharing>
- Moving in Circle (Publisher/Subscriber):  
<https://drive.google.com/file/d/1fOamSZwnbUy0vba6cXZsix6tySMwOnwh/view?usp=sharing>