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Project 1 – Differential Drive Robot

General Overview:

- Narrowed down on differential drive-model for designing the mobile robot.
- The chassis has 2 front wheels with castor mechanism attached in front that rotate as per command and the rear wheels rotate independently. The robot is rear wheel drive.
- Converted the Solid works model into URDF file by attaching co-ordinate frames and defining rotation axis along the way keeping in my complexity of the robot mechanism and limitations of gazebo platform.
- After converting to URDF file, after adding a dummy link, it was opened in gazebo and performed a check_urdf on the URDF file to check for any errors while creating the URDF.
- Transmissions and controllers were then attached to all joints depending on the use of that joint. For Example, in rear wheel joints velocity joint controllers were added while for steering the robot effort joint controllers were added.
- Chose a suitable location in front of chassis to attach the lidar and added the coordinates in the launch file accordin gly.
- The URDF and LIDAR file were combined using xacro file to check for errors.
- Selected PID values after tuning for the task and updated controller settings.
- The launch file was edited to add controllers and the world along with some xacro commands and other tasks.
- Lidar data was visualized using the rviz.
- Teleop file was modified according to the needs and parameters were tuned accordingly.
- Defined Publisher and Subscriber to allow robot to navigate a predefined path.

Difficulties:

- The naming conventions and formatting errors resulted in errors in xacro integration of robot URDF and Ydlidar.
- While importing the urdf file, the intermediate joint was absent as parent child link definition were not consistent.
- The robot was exported upside down in gazebo due to mislabeling of coordinate axises.
- Indentation errors while making the xacro files.
- The front castor wheels were not turning as the controller assignment was improper

- In URDF file of robot, joint effort, joint velocity, and upper and lower values were absent which caused some errors.
- Some parameters like velocity were increased and also some other parameters were tuned to have front wheels steer and rear wheels drive the car.

Individual Contribution:

- All ROS and Ubuntu related tasks
- Debugging the package
- Modifying URDF, launch file, controller files, teleop files
- Writing Publishing and Subscriber nodes.

Video Links

Teleop Video:
https://drive.google.com/file/d/1_l9il-zWSXnKKfm3xUuuMq6tuhafhlmx/view?usp=sharing
Publisher-Subscriber Video:
https://drive.google.com/file/d/1AFmsseBvi6jBOujx4tKujdtezHHeLi3k/view?usp=sharing

Rviz:

https://drive.google.com/file/d/1eCRXw9q8WG6VDo5JnxFJ9DGuu6eaIDwi/view?usp=sharing