Using Differential Drive Robot Plugin in Gazebo

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19/03/2025

1 Two-Wheel Differential Drive Robot

In this example, we will use two packages that we have created earlier: `my_robot_bringup` package for `rviz` config file and `gazebo` xml launch file, and `my_robot_description` for holding xacro files describing the robot present in `urdf` folder. In `my_robot_bringup` package, ensure that `package.xml` is updated to:

```
<buildtool_depend>ament_cmake</buildtool_depend>
<exec_depend>my_robot_description</exec_depend>
<exec_depend>robot_state_publisher</exec_depend>
<exec_depend>gazebo_ros</exec_depend>
```

In `CMakeLists.txt`,

```
install(
  DIRECTORY launch rviz
  DESTINATION share/${PROJECT_NAME}/
)
```

In the `launch` folder, create `my_robot_gazebo.launch.xml` file with the following content:

```
<launch>
    <let name="urdf_path"
    value="$(find-pkg-share my_robot_description)/urdf/my_robot.urdf.xacro" />
    <let name="rviz_config_path"
    value="$(find-pkg-share my_robot_bringup)/rviz/urdf_config.rviz" />

    <node pkg="robot_state_publisher" exec="robot_state_publisher">
        <param name="robot_description" value="$(command 'xacro $(var urdf_path)')" />
    </node>

    <include file="$(find-pkg-share gazebo_ros)/launch/gazebo.launch.py">
        <arg name="world" value="$(find-pkg-share my_robot_bringup)
        /worlds/test_world.world" />
    </include>

    <node pkg="gazebo_ros" exec="spawn_entity.py"
    args="-topic robot_description -entity my_dd_robot" />
    <node pkg="rviz2" exec="rviz2" output="screen" args="-d $(var rviz_config_path)" />
</launch>
```

The `test_world.world`, robot environment may be included.

In `my_robot_description` package, update the `CMakeLists.txt` with appropriate DIRECTORY names in `install()`.

For this example, download the four `.xacro` files provided into the `urdf` folder of the package `my_robot_description`. Study these files thoroughly.

Finally, `colcon build` from `ros2_ws` directory and launch the gazebo launch file in the package `my_robot_bringup`. If `rviz` config file does not already exist, add the RobotModel and TF plugins in the gui and save the config file in the appropriate folder (see xml launch file).

In the `mobile_base_gazebo.xacro` file, the settings required for the differential drive robot plugin are given. By default, the plugin looks for inputs from `cmd_vel` topic which is of type `Twist`. From command line, execute (with correct spacing after x: and z:)

```
ros2 topic pub /cmd_vel geometry_msgs/msg/Twist "{linear: {x: 0.2}, angular: {z: 0.1}}"
```

The robot should start moving in the `gazebo` GUI. For more information on the plugin, check

```
https://github.com/ros-simulation/gazebo_ros_pkgs/tree/ros2
https://github.com/ros-simulation/gazebo_ros_pkgs/tree/ros2/gazebo_plugins
/include/gazebo_plugins
https://github.com/ros-simulation/gazebo_ros_pkgs/blob/ros2/gazebo_plugins
/include/gazebo_plugins/gazebo_ros_diff_drive.hpp
```

2 Exercises

1. Modify the differential drive plugin settings in `mobile_base_gazebo.xacro` file so that it can be used with a four-wheel differential drive robot. Test it with four-wheel differential drive robot model on Gazebo.