Obstacle avoidance using ROS on Gazebo

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Autonomous navigation has recently gained immense popularity from all sections of the world.

This project specifically plans to deal with robot navigation in a static environment.

For this project we aim to implement a LiDAR based scanner with turtlebot3 on Gazebo to make the robot more conscious of its surroundings and identify any obstacles present on its path.

Using rospy python library, the entire project is implemented virtually over gazebo.
Technologies used

- Turtlebot3
- Python
- ROSPY
- Gazebo
- ROS
Intuition behind the code..

- Turtlebot3 uses LiDAR scanner to scan 360 degrees to obtain 360 data points.
- We divide the code scanned areas to 12 equal parts of 30 degrees each.
- Consider the area from 15 to -15 degrees of the LiDAR scanner as front center.
- Check if the front center has any obstacles.
- Move the turtlebot towards the closest region of the 12 regions without any obstacle.
Graphical representation of the turtle bot

- This image shows how the turtlebot is divided.
- Each of the 30 degree sector is a direction the bot can move.
- The front center 30 degrees is the direction the bot moves by default.
Use Gazebo to visualize and python to run the turtle bot.

- Turtlebot3 simulations are used to draw the map in gazebo.
- Gazebo is used to visualize the map and robot.
- Bot identifies the obstacle if it is within 0.6 units in front of it.
- After identification of the obstacle, bot moves with a negative linear velocity of 0.09 units/s and an angular velocity of 1.82 towards the target region.
- After obstacle is avoided, the bot runs again forward.
Demo of the Project
Below is the sample image of the navigation.

- The turtle bot recognizes the walls as obstructions.
- Backs up from the wall.
- Rotates to empty area.
- Moves forward.
Future Direction

- The current project only aims to avoid obstacle and move forward.
- The next step can be to implement aimed navigation.
- Multi-map navigation is also an area that could be explored.
- Dynamic environments can be explored using the current project as base.
The current project used rospy and LiDAR scanner data with Turtlebot3.

Implemented python code to read the scanned LiDAR data and made use of it through avoidance of obstacles.

Successfully implemented obstacle avoiding turtle bot in that can run in any generic map.
Thank you