THE UNIVERSITY OF TEXAS AT DALLAS

Obstacle avoidance using ROS on Gazebo

BY -

TEAM 2,

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INTRODUCTION

- 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.

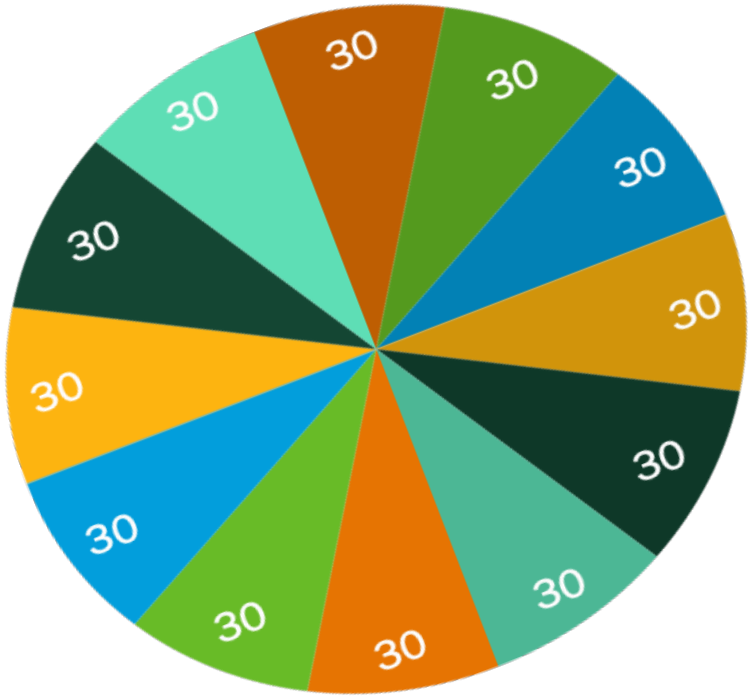
Technologies used

- 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



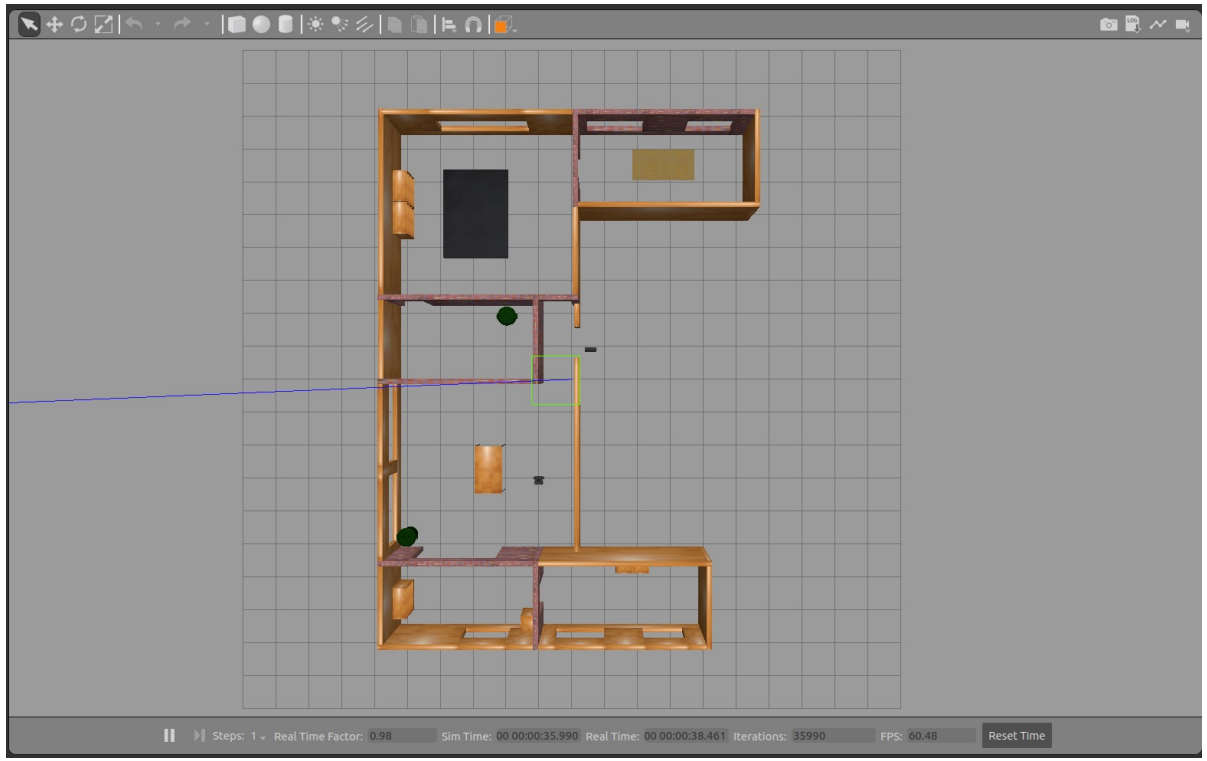
- This image shows how the turtlebot is divided.
- Each of the 30 degree sector is a direction the bot can move.
- The front center 30 degrees is the direction the bot moves by default.

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.

Conclusion

- 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

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