**HW7**

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**1.**

Our strategy is to have the car follow the wall for one complete loop. During this process, we aim to identify the maximum time duration when the laser dot at 90 degrees equals infinity. The time duration for the laser dot at 90 degrees equals infinity increases as the size of the door increases, allowing us to determine which door is the biggest. Simultaneously, we record the pose of the car during laser dot at 90 degrees equals infinity.

After completing one loop around the wall, we let the robot reach the average coordinates of the pose record when passing the biggest door. The car then turns left by 90 degrees, moves forward, and can pass through the biggest door. The car stops when the radar points are equal to infinity.

**2.**

Initialize ROS and set up publishers and subscribers

Set initial positions and velocities for the Turtlebot

Define maximum angular and linear velocities

Begin the control loop:

Receive data from the LiDAR sensor

Process the data to determine distances from the wall

Based on P control calculates the desired angular velocity take distance error as feedback

Limit the angular velocity to stay within defined bounds

Set the linear and angular velocities in the control message

Send the velocity command to the robot

If the measurement of the laser dot at 90 degrees equals infinity

Record robot pose and add time duration

If the measurement of the laser dot at 90 degrees is finite and the time duration is not 0

If time duration is the longest

Set the time duration to 0 and calculate the mean of robot pose as a goal

Check for exit conditions (If return to the initial point, exit the loop)

Wait for the control loop to execute at the specified frequency

End the control loop

Begin the control loop

Receive data from the Odometry sensor

Extract robot position and orientation from odometry

Calculate angular error and control angular velocity based on P control

Set linear and angular velocities in the message and send velocity command

If the robot has reached the target position

Stop the robot and exit the loop

End the control loop

Begin the control loop

Receive data from the Odometry sensor

Calculate the error between the current orientation and the target orientation

Proportional (P) control: Calculate control output

Set linear and angular velocities in the message and send velocity command

If the robot has reached the target angle

Stop the robot and exit the loop

End the control loop

Begin the control loop

Receive data from the LiDAR sensor

Send velocity command = 0.2

If all the laser data is infinite

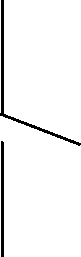
Stop the robot and exit the loop

End the control loop

**3.**

If the robot is not able to keep moving parallel to the wall but is swinging from side to side. The laser dot at 90 degrees may be swept onto the wall too early resulting in inaccurate data and possibly mistaking the other door for the largest door.

(Red line represent laser)



**4.**

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