**HW3**

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1. Video of robot run (make sure that the file is not too big!). [4]
2. Brief itemization of the steps taken to get the best robot run. [4

Begin:

Clear all variables, close figures, and clear command window

Shutdown ROS if it's already running

Set the IP address for ROS communication to "localhost"

Initialize ROS communication with the specified IP address

Create a ROS publisher for setting the initial model state in Gazebo

Create a ROS message for the initial model state

Set the model name and pose for the TurtleBot3 in the message

Send the initial model state to Gazebo

Pause for 1 second

Define maximum angular and linear velocities

Create ROS publishers and subscribers for velocity commands, odometry, and model state

Initialize empty arrays for storing data

Create a ROS message container for velocity commands

Create a ROS rate object with a loop rate of 50 Hz

Initialize the initial yaw angle

Initialize a time counter for the entire motion

Initialize initial positions

Set 3 flag（point）robot need to get

Loop while a flag is set:

Receive odometry data

Extract the current position and orientation and velocity of the robot

wrapTo2Pi to compute the robot's angle

Based on P control to calculate the angular velocity to control the robot's movement

Set linear (always 0.4) and angular velocities in the message

Send the velocity command to the robot

Store data for plotting

Check if the robot reaches the point to exit the loop

Wait to maintain the loop rate

Loop while another flag is set (similar steps as the previous loop)

Loop while a third flag is set (similar steps as the previous loops)

Stop the robot

Shutdown ROS

Calculate the total time

Calculate the total length

Create plots to visualize odometry, heading angle, commanded velocities, and resultant velocities

End.

1. Total run time for the robot. [2]

47.8s

1. Length of path. [2]

18.9m

1. Required plots. [6+4]

图示

描述已自动生成

1. Focused argument on the smoothness of robot’s drive (based on plots). [4]

Continuous Trajectory: The robot's trajectory, represented by the (x, y) position data, shows a continuous and well-connected path. There are no sudden jumps or discontinuities in the trajectory. This indicates that the robot moves seamlessly from one point to another, which is a characteristic of a smooth drive.

Constant Linear Velocity: Throughout the robot's movement, the linear velocity (v(t)) remains relatively constant. The plotted velocities show minimal fluctuations, suggesting that the robot maintains a consistent speed during its motion. This constant linear velocity contributes to a smoother drive.

Consistent Angular Velocity: The angular velocity (ω(t)) also appears to be relatively smooth. Most changes in angular velocity are gradual and not abrupt. This implies that the robot's turns and rotations are made with a consistent and controlled pace, contributing to smooth maneuvering.