HARDWARE VERSION 2.5 AND 3 NAVIGATION/ODOMETER TEST

GROUP 4

2nd December 2016
Version 2

Abstract

This test is used to find out the calibration of the track and wheel radius and check the odometer error. We found out that the best track width was 11.6 and 2.1 was the best wheel radius.

Contents

1 BACKGROUND

1.1 Edit History

Jake Zhu: 2016-10-28, Initial set up

Mamoun Benchekroun: 2016-11-11, Added abstract section

Jake Zhu: 2016-11-12, Added Table

Benjamin Willms: 2016-11-13, Edited the table, filled out the goal, procedure, and expected result, and added more tables.

Quentin and Richie: 2016-11-13, Ran the tests for 2.5 and recorded the results.

Benjamin Willms: 2016-11-13, Made various corrections.

Jake Zhu: 2016-11-16, Edited the procedure section

Jake Zhu: 2016-11-21, Edited Abstract

Jake Zhu: 2016-11-30, Edited Software Version Number

Jake Zhu: 2016-12-01, Updated more concise conclusion

1.2 Test Information

Testers: Quentin, Richie

Authors: Quentin, Jake, Mamoun, Ben, Richie

Hardware Version: 2.5 and 3

Software Version: 36e5080

2 GOAL

The goal of this series of tests is to determine whether hardware versions 2.5 and 3 drive properly without slipping, and if it is determined that the robot drives properly, the wheel radius, and track width constants are to be calibrated based on observations on the turns at each corner, the distance traveled on each side of the square path, and the odometer error at the end of the path.

3 PROCEDURE

Setup/Assumptions:

1. Edit the lab 2 code used earlier in the course by any of the groups to no longer use odometry correction, have the motors attached to the correct ports, and set the track width constant to 11 cm.
2. If necessary, modify the lab 2 code to turn 90 degrees at the end of its path (in theory, to set the robot to the same position and orientation it started at), so as to better observe the orientation and position of the robot at the end of its path.

Test: If extreme slipping is observed during the test, conclude the test immediately to avoid wasting time, and notify the hardware team with the observations.

1. Place the robot in the starting square, oriented at 0 degrees.
2. Mark the starting location of a reference point of the robot on the floor.
3. Upload the code to the robot
4. Click the right button on the robot to run the lab 2 code in "drive in a square" mode.
5. Observe the distance traveled on each side of the square, and the turns made at each corner.
6. Once the robot finishes the square path observe its final position and orientation compared to the starting point.
7. If the observations made throughout the test suggest that the robot isn't quite turning 90 degrees, or traveling the required distance, update the constants appropriately, and repeat from step 1.
8. If the robot appears to be traveling close to perfectly, record the values of the constants.
9. Repeat steps 1-5 five times while recording error values from the odometer and actual position.
10. If the average total error is greater than 3cm, update the constants accordingly, record them, and repeat from step 8.

4 EXPECTED RESULT

Hardware versions 2.5 and 3 are expected to be able to navigate without much slipping. This means that the odometer error testing, and constant calibration should be able to be completed. The final constants determined should be close to their true measured values.

5 TEST REPORT

5.1 Initial Constant Calibrations

This was done with hardware version 2.5, and acts as a starting point for both versions.

Track Width	Wheel Radius	Proper Navigation
11	2.1	Underturned
15	2.1	Overturned
12.5	2.1	Overturned
12	2.1	Overturned
11.7	2.1	Overturned
11.65	2.1	Slight Overturn
11.6	2.1	Precise

5.2 Odometer Error and Calibrations

5.2.1 Hardware Version 2.5

Track Width	X(error)	Y(error)	Total Error	
= 11.6	-1.32	-3.02	3.30	
Wheel Radius	-0.28	-3.71	3.72	
= 2.1	-0.72	-0.92	1.17	
	-1.83	-0.65	1.94	Average Error
	-0.53	-2.17	2.23	2.47

5.2.2 Hardware Version 3

Track Width	X(error)	Y(error)	Total Error	
= 11.6	2	3	1	
Wheel Radius	2	2	0	
= 2.1	3	3	1	
	3	3	1	Average Error
	3	3	1	0.80

6 CONCLUSION

From our tests we've concluded that for both hardware versions 2.5 and 3.00 the optimal track width and wheel radius is 11.6 and 2.1 respectively. We also concluded that hardware version 3 is clearly the superior model with an average error of 0.8 compared to hardware version 2's error of 2.47.

7 ACTION

Nothing needs to be furthered improved as the error was in +/- 3 centimeters. This test should be run again after further hardware iterations.

8 DISTRIBUTION

Hardware Team
Software Team