TESTING – Odometer and Correction

Project: Design an Autonomous Robot

Task: To design an autonomous robot that is capable of navigating to a predetermined position while avoiding obstacles and firing objects at two targets. This is to be done in the shortest time possible.

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Software Version: 2.0

Hardware Version: 2.0

Goal: The goal of this test is to know the accuracy of the odometer and its correction.

Table of Contents

[Purpose 3](#_Toc416467958)

[Objectives 3](#_Toc416467959)

[Procedure 3](#_Toc416467960)

[Expected Results 3](#_Toc416467961)

[Format of Output Required 4](#_Toc416467962)

[Sample Calculations 4](#_Toc416467963)

[Test Report 5](#_Toc416467964)

[Conclusion 5](#_Toc416467965)

[Action 5](#_Toc416467966)

[Distribution 5](#_Toc416467967)

# Purpose

The purpose of the test is to know how accurate the odometer reading is comparing to the measured coordinates while the odometer correction is on. This is the most essential part as there are many other codes such as Navigation and Obstacle Avoidance will use odometer as the base.

This test will be done with the hardware version 2.0 and a testing code that can be found in the “Code/Merged Version 2.0” folder.

# Objectives

The objective of the test is to know if the odometer can work properly and display the right information on X/Y coordinates. The objective of the test on odometer correction is to investigate on how well the correction code can reduce the error when the correction mode is turned on.

# Procedure

1. Place the robot at a position (0, 0) (i.e.: at an intersection of the grids).
2. Run the odometer code, and the robot will run in a designated path, from (0,0) to (30,60) then to (75,75)
3. Repeat step 2) 5 times, and measure change in the X and Y components after the robot stops.
4. Repeat 2) and 3), but this time let the robot travel from rom (0,0) to (60,30) then to (75,75) instead.

# Expected Results

The expected result is that the odometer reading will read about (60,75) once it goes around the designated path. We want to make sure that the odometer does not display numbers that deviate too much from x & y coordinates measured. The best case of the test is that the odometer will go back to the origin and display (60,75)after going around the square. The worst case scenario of the test is that the odometer reading is way off from the actual x & y reading (ex: read (63,72) but the actual coordinates are (59,70)).

# Format of Output Required

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (30,60) to (60,75) | | | | |  |
|  | Odometer Values (cm) | | Actual Values (cm) | | Error (cm) | |
| Observation | X | Y | X | Y | X | Y |
| 1 | 74.43 | 74.82 | 74.8 | 75.8 | 0.37 | 0.98 |
| 2 | 74.92 | 75.6 | 76.8 | 75.6 | 1.88 | 0.00 |
| 3 | 73.89 | 74.98 | 75.8 | 75.9 | 1.91 | 0.92 |
| 4 | 73.76 | 75.44 | 75 | 76.2 | 1.24 | 0.76 |
| 5 | 74.66 | 75.94 | 75.5 | 75.5 | 0.84 | -0.44 |
| Mean | 74.332 | 75.356 | 75.58 | 75.8 | 1.248 | 0.444 |
| Standard Deviation | 0.49636 | 0.45725 | 0.78867 | 0.78867 | 0.52009 | 0.63094 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (60,30) to (60,75) | | | | |  |
|  | Odometer Values (cm) | | Actual Values (cm) | | Error (cm) | |
| Observation | X | Y | X | Y | X | Y |
| 1 | 75.7 | 74 | 76.5 | 75.5 | 0.08 | 1.5 |
| 2 | 75.01 | 74.35 | 76.9 | 75.6 | 1.89 | 1.25 |
| 3 | 75.09 | 74.02 | 76.9 | 75.6 | 1.81 | 1.58 |
| 4 | 74.87 | 74.17 | 76 | 76.2 | 1.13 | 2.03 |
| 5 | 75.09 | 74.4 | 76.3 | 75.6 | 1.21 | 1.2 |
| Mean | 75.152 | 74.188 | 76.52 | 75.7 | 1.224 | 1.512 |
| Standard Deviation | 0.31925 | 0.31925 | 0.31925 | 0.31925 | 0.72538 | 0.33132 |

# Sample Calculations

The mean value can be obtained by the following formula:

For the mean of error of X with odometer correction, cm

In this test, the mean values for error of x and y are 1.246 and 0.982 cm, respectively.

The standard deviation can be obtained as

In this test, the standard deviation for x-axis and y-axis are respectively 0.52009 and 0.63094 cm**.**

# Test Report

The collected results are acceptable because the error of x and y is within 2 cm off, and the standard deviation values are lowin the in the first path, 0.52009 and 0.63094 cm for each axis respectively.

# Conclusion

This testing is considered “passed” as the error between the odmeter reading and the actual distance are negligible. The measurements are only around 1 to 2 cm off, which can be considered accurate.

# Action

The codes for both odometer and odometer correction are working the way as we expected; therefore, the odometer codes are usable in order to make other codes function.

# Distribution

This testing belongs to the software development.