TESTING – SPEED TEST

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: v3.10

Hardware Version: v3.1

Goal: The goal in this test is to determine the optimal speed of travel for the robot in order to increase the chances of winning the competition.

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PURPOSE

In order to win the competition, the robot must complete the objectives in the least amount of time, thus an optimal travel speed must be carefully chosen. In this test, the robot will travel the beta demo path with a range of speeds in order to determine which speed is optimal. This test will test v3.10 software with the v3.1 hardware which will be used for the beta demo.

OBJECTIVES

Ideally, the speed determined by this test will become the final travel speed of the robot during the competition. It must allow the robot to travel without dropping the ping pong balls due to inertia. This speed also needs to allow for obstacle avoidance without the ultrasonic sensor missing the obstacle because the speed was too high. It must also allow the light sensor to read the gridlines without missing any. In other words, the speed will be increased without ruining the existing systems. The speed must be tested, since calibration is needed.

If the speed is too high, the sensors may not be able to detect their respective values properly. If the speed is too low, the robot will not win the competition. Thus, if there is any doubt, a functioning system is much more advantageous than a system that has a chance of not function. Therefore, the safe lower speed will be chose if there are any ambiguities. Speed is measured in degrees/s of the motor wheels.

PROCEDURE

1. Choose a speed
2. Run the beta course
3. Note observations
4. Calibrate the rotation speed
5. Run the beta course again (x2)
6. Note observations
7. Repeat until the optimal speed is observed

EXPECTED RESULTS

The expected speed is between 100 and 400, due to observations made during labs 1 through 4. During the wall follower lab, the speeds of the robot were explored, and the speed used by the three sub teams were in the 200 range. Since, the obstacle avoidance uses the wall follower, a speed in the 200 range is expected. In the 400 range, the balls in the loader will most likely fall due inertia. In the 100 range, it will take too long to run the course.

FORMAT OF OUTPUT REQUIRED

The same speed has been tested three times. However, since the first one was for calibrations, only the results from the last two are taken into consideration.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Speed | LightLocalization | USLocalization | ObstacleAvoidance | Load&Launch | OtherObservations |
| 100 | Yes, Yes | Yes, Yes | Yes, Yes | Yes, Yes | Very very slow |
| 400 | No, No | No, No | No, Yes | No, No | Very very fast |
| 160 | Yes, Yes | Yes, Yes | Yes, Yes | Yes, Yes | Quite slow |
| 180 | Yes, Yes | Yes, Yes | Yes, Yes | Yes, Yes |  |
| 200 | Yes, Yes | Yes, Yes | Yes, Yes | Yes, Yes |  |
| 220 | Yes, Yes | Yes, Yes | No, Yes | Yes, Yes |  |
| 240 | Yes, Yes | Yes, Yes | Yes, No | Yes, No |  |
| 260 | No, Yes | Yes, No | No, No | Yes, No |  |
| 280 | No, Yes | Yes, No | No, No | No, Yes |  |
| 300 | Yes, Yes | No, No | No, Yes | No, Yes |  |
| 320 | Yes, No | No, No | No, No | No, No |  |

SAMPLE CALCULATIONS

No calculations needed

TEST REPORT

From the table of observations, the highlighted results are the only speeds that are able to achieve all the objectives from the demo consistently (twice in this case), thus we will be picking the highest speed from that table, which is 200. Further testing will be needed in order to calibrate and finalize this value, however this speed will be used for the beta demo. Since the robot will be passing through the middle of the grid, the chosen speed needs to be able to avoid obstacles very well, and a low speed is safer than a higher speed, so the robot needs to run more obstacle scenarios in order to be safe.

CONCLUSION

The 200 speed passed the speed test. This speed is consistent with the predictions, since the prediction was the 200 range. For the beta demo, the 200 speed will be used, and it should be functioning. This speed needs to be retested for the worst and best case for the obstacle avoidance, since it is the most important part after the localization of the robot.

ACTION

This test report should be sent to the software team to review the obstacle avoidance process. However, this is not a priority, since improving the run time is not an important part of the project.

DISTRIBUTION

This part of the project belongs in the software development section.

Follow up: Speed Test V2 Pre-Final Competition (Refer to week7 Tests)