PROGRESS REPORT (WEEK 2)

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.

Document Version Number: 1

Date: March 4th 2015

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GANTT CHART

The initial Gantt chart has been implemented. It contains tentative dates and important deadlines that need to be followed. It also breaks the project down into categories: initial documents, hardware design, software architecture, research and development, and testing. Each category is then broken into subcategories, in other words, each lab implementation has its own task In the Gantt chart. Furthermore, ever member of the team is allocated tasks on the Gantt chart. The designing phase requires more resources, since multiple ideas are encouraged and tested before a decision on the final design is made. The research and development phase, which mainly involves calibration, does not require as much resources, because it is an easy and straightforward task, where the team member runs the robot and adjusts fixed parameters in order to make the robot function better. Finally, the testing phase requires a lot of resources, because it requires the members to design testing methods, collecting the data, analysis of the data, and corrections if they are required. This is a big task which will require as much resource as we can allocate, since it is time consuming.

MECHANICAL DESIGN

Propositions for the mechanical design has been set. Since lab 5 has not been finished yet, we have decided to take the most accurate and successful “bat the ball” method, since all 3 subteams have used that method. The launching system will then be implemented over one brick, which will be connected to both motors (for the wheels), two ultrasonic sensors (side and front), and a light sensor (back).

SOFTWARE DESIGN

Each team has pooled in all their codes from previous labs into a shared folder. So far, the team has assigned one subteam per lab implementation, and has agreed on a set of variables that will not be changed.

TESTING

We have started to brain storm on testing ideas, and so far, the result has been the following:

1. Loading and Launching Test

In this test, the robot will have to load a set amount of ping pong balls, and shoot them into a specific area. The data will then be analyzed to determine the strength of the launching system, and its reliability. We may need to use a looser or stronger elastic depending on the results.

1. Mechanical Design Test

In this test, the robot will carry an extra set amount of weights and the ping pong balls in the loading system. It will need to walk a certain distance without dropping the balls, or accidentally launching one. This test will testing the durability of the mechanical design. The extra load will test the sturdiness of the mechanical design. The second part of the test where it needs to walk without dropping the balls, will also test the loading capabilities of the robot, making sure that the robot is able to carry the ping pong balls while running.

1. Navigation and Obstacle Testing

In this test, the robot will need to navigate itself to separate points autonomously where we will put random obstacles along its path. The distance will be 1.5x the length of the course, in order to make sure that the navigation will continue to be reliable in case of many obstacles. The starting position will be recorded. Every time it goes to a set point, the odometer reading and the real position will also be recorded. The final positioning on the odometer and the real position will also be recorded. This data will then be used to fix any calibration errors. Finally, the obstacles will be put in many different ways in order to make sure the obstacle avoidance will work in every case.

1. Localization Testing

Similar to lab 4, in this test, the robot will start in a random location in the first square of the grid, and localize itself (angle and position). The odometer positioning and the real positioning will be recorded in order to verify the accuracy of the localization system.