Request for Proposal Report

Csce 488

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For Steven Scott

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With these proposals we were required to come up with project ideas dealing with Lego robots and wireless communication. The first proposal is a pair of maze solving robots which fulfill both of the requirements of the assignment. The second proposal is an autonomous scavenger hunt robot. The maze project would require more programming skills than anything else. Algorithms would need to work well and be efficient to win this competition. The scavenger hunting proposal deals with not just the programming aspect but some fundamental physics that all engineers should be able to handle.

Project Proposal Number 1

Autonomous Maze Solving Robots

Objective- The objective of this project is to build two computer controlled robots that can navigate their way through a maze while communicating with one another. The layout of the maze will be unknown prior to the competition. Once one of the robots solves the maze it will communicate the solution to the other robot which will then use the received solution to solve the maze. Each robot must reach the end of the maze and then return to the beginning (reversing its discovered solution) with the fastest time to win the competition.

The Maze- The maze will be made in such a way so that it can be easily changed. (See Figure 1 in Appendix A) The current idea is to represent the maze hallways with lines of white tape on black ground. The hallways will be 25 cm wide. There will be one solution

to the maze, so it is beneficial to have the robots communicate which paths have been traversed to increase efficiency. The end of the maze will be signified by a different color of tape.

Robot Operation-The robots must be completely autonomous. They are placed at the entrance and once the start button is pressed they must complete the tasks without any outside intervention. The robots must stay within the tape outlines of the hallways as it proceeds (there will be a time penalty if it leaves the outline of the maze). They must be able to avoid colliding with each other, they must be small enough to pass each other in the hallway (any collision will result in a time penalty). The robots must communicate wirelessly as stated in the objective. Once the solution is found, the robots should be able to follow it without any mistakes.

Robot Construction/ Size

Each Robot will only be constructed from the provided LEGO components, motors, sensors, and the Handy Board controller. Additional parts will require approval from the professor and a bid adjustment commensurate to the design cost increase. There is a limit of $200 worth of components that can be requested. The size of the robot is limited to a 13 cm x 10 cm square with no height restrictions. (Remember the robots must be able to pass each other in the halls without touching)

The type of wireless communication scheme and components used will be up to the individual groups.

Project Proposal #2

Scavenger Robots

Objective

This competition involves building robots to collect various parts, much like a scavenger hunt. The robots are to be able to collect these parts, and this is how points are scored for your team. The contest will be run head-to-head, by putting two teams robots against each other to see which one collects the most unique items.

The Arena

The arena will contain in the center, various sized objects, but some objects will be identical in the pile. (See Appendix A Figure 2) There will always be two for each groups of an object, to allow for the teams to compete and find the same objects. You are to collect one object of each, and place in it a designated area for collection. This will require a winning strategy of having the robot identify the item, as to collect only one of them, and do this quickly as possible. You will be awarded points for each of these collected unique items.

Rules

The robot must have the capacity to move or carry one item or more items at a time. The items placed in the area specifications will be given ahead of time, so their dimensions and properties can be pre-programmed into the robot. These items will vary in shape and size. Prior to the contest, a scavenger list of the subset of the items will be presented, as these items will be the only items to be collected by the robot.

The contest will run for a certain amount of time, in which a score of the collected items will take place. The items need to be placed in the specified region or basket before being scored as successfully retrieved (See Appendix A Figure 2 for Arena Layout). Only items from the scavenger list will be scored, as item not on this list will result in negative points. These points will then be tallied at the end of the time limit.

The robots also need to implement some sort of collision avoidance. As many robots will be scavenging the arena quickly, it is vital that the robots avoid physical damage.

Robot Construction

The robot must fit in a 30 cm cube, and be constructed of the "Technic" LEGOs, using the Handy Board to interface to the motors and sensors. Any additional parts will require approval from the professor.

The robots will be autonomous, as human intervention at no time during the contest will be allowed. Polarized light will be used to distinguish each robot's basket, so the necessary sensors need to be used. Therefore, it is beneficial to equip the robot with the ability to find, categorize, and move the largest amount of items in the least amount of time.

These proposed projects are possible to complete in a semesters length of time. They are both challenging in their unique ways and yet the goal is clear for each one. Either project would adequately test our knowledge about programming and robotics. The maze project has the added experience of using wireless communication. This aspect leads us to choose our first proposal as our favored project.

Appendix A

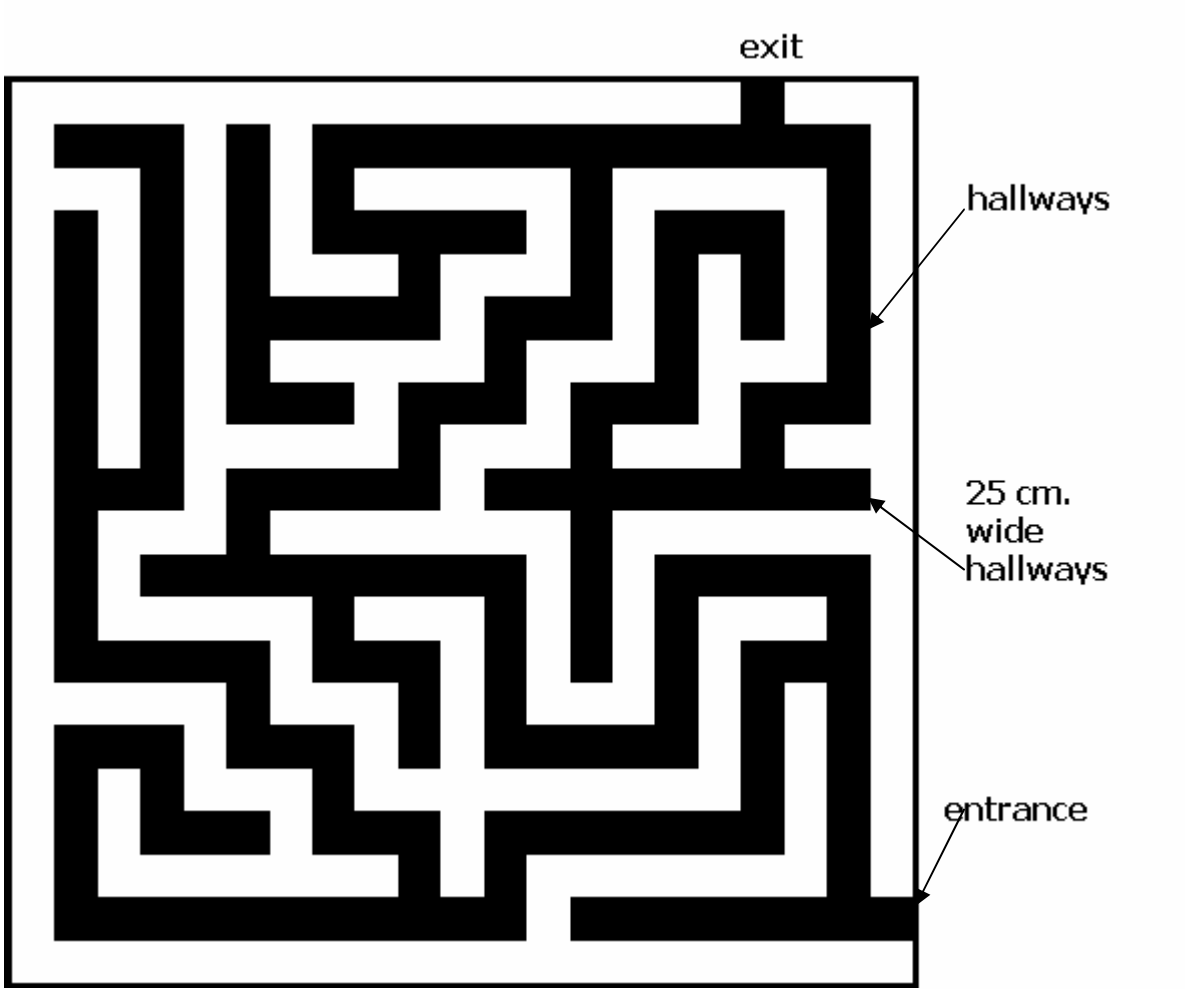

Figure 1- Example Maze Layout

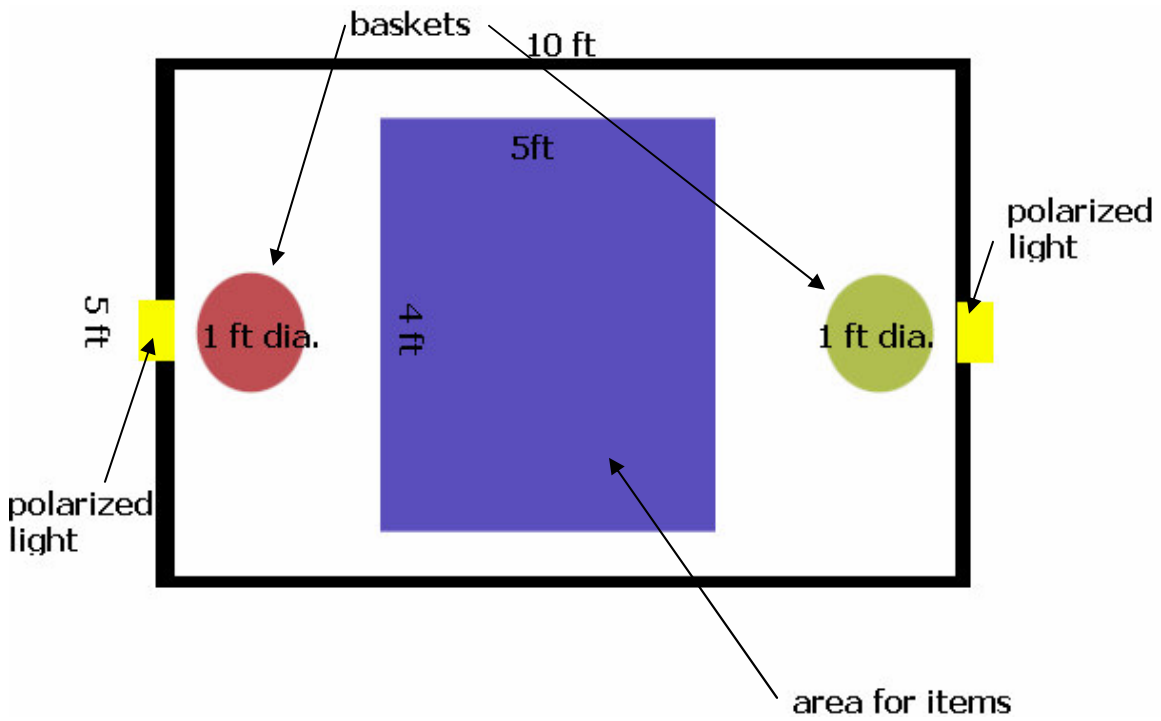

Figure 2- Arena Layout

References

"*The Handy Board FAQ*"
http://www.handyboard.com/
Modified: February 4, 2002.