

## Design Project Specifications

The basic task has been described as follows:

Construct an autonomous robot capable of locating, grasping, carrying and placing an optical beacon, while navigating within an enclosed area populated with known obstacles placed at restricted locations within the enclosure. The task of the robot is to play a version of “Capture the Flag” with a single opponent where the beacon serves as the flag.

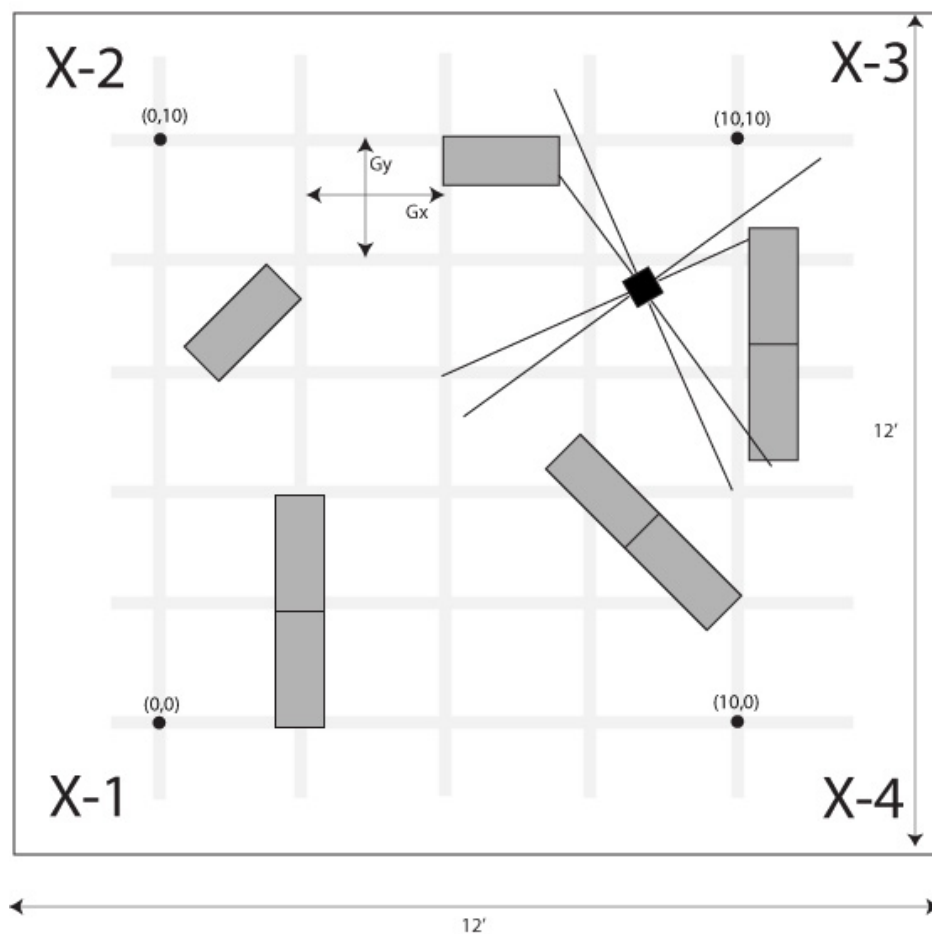


Figure 1

Upon receiving instructions on Bluetooth radio, the robot will assume the role of either defender or attacker and proceed according to its role. If the role assigned is attacker, the robot proceeds to search for the flag, capture it, and place it at a location specified in the instructions received. Otherwise, if the role assigned is defender, then the robot proceeds to the flag location specified in the instructions received, captures the flag, and places it in an arbitrary location within the enclosure (usually chosen to make it difficult for the

attacker to find). Note that the game is not restricted to a 2D plane – the flag may be placed on top of other objects within the enclosure (i.e. wooden block obstacles), so each robot must be capable of picking and placing in 3D. Play proceeds sequentially, with each player having no more than 5 minutes to accomplish its given task. Points are awarded for speed.

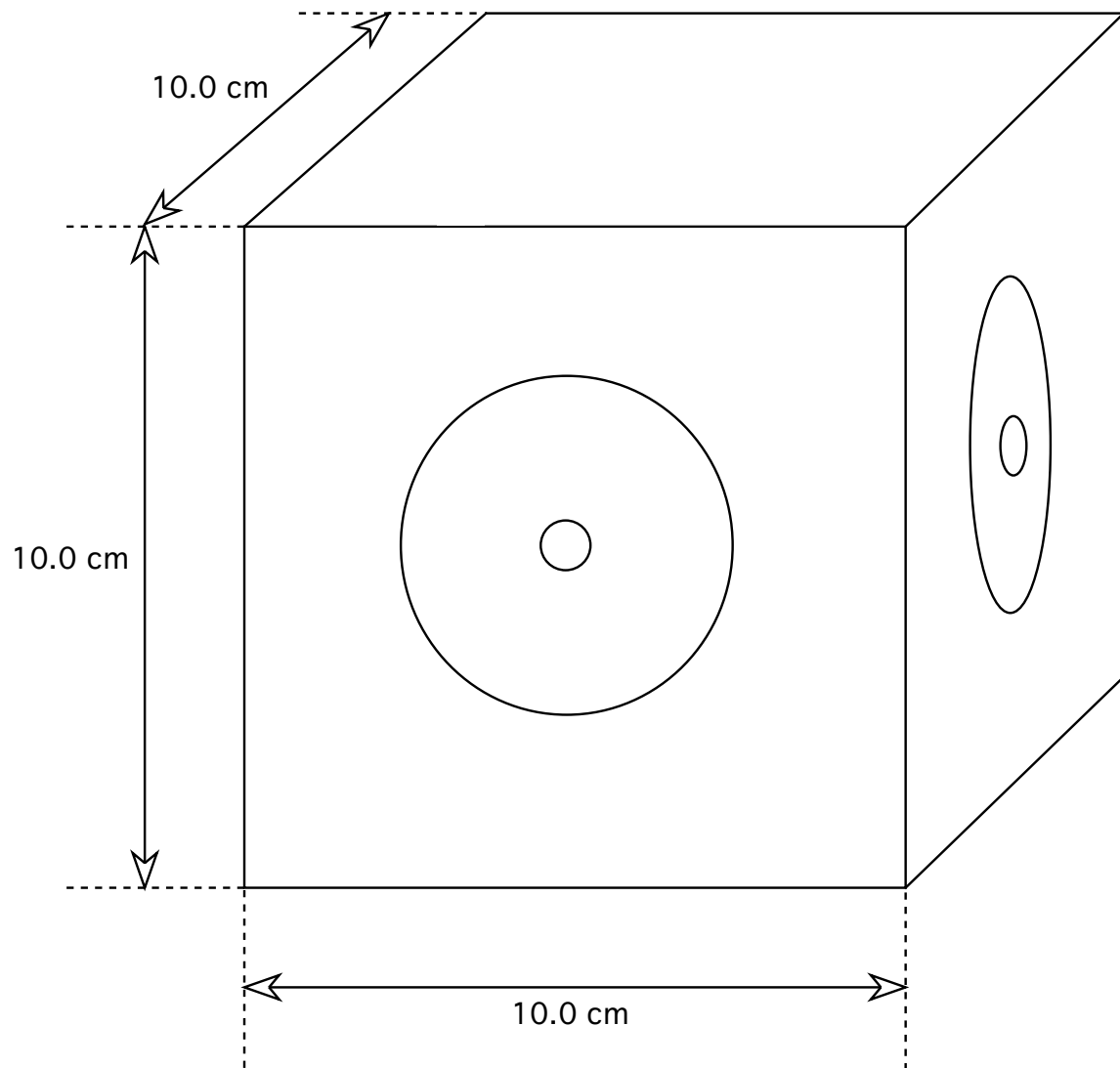
## Details

1. The dimensions and layout of the field are shown in Figure 1. To facilitate operations, the floor is comprised of nine 4'x4' hardwood-covered metal panels that lock together. The surface of each panel is marked with a 4'x4' grid that aligns precisely with adjacent panels. These are intended for navigational purposes, which were covered during one of the one-week labs.
2. At the start of each round, both teams will be directed to place their robots in one of the 4 corners shown, at a random position and orientation within the corresponding tiles. When executing its localization routine, your robot must always keep the center of rotation within the tile (this implicitly limits the footprint of your robot).
3. You will be provided with a Bluetooth class that has methods for retrieving i) the number of your starting corner, ii) your role as either a (A)ttacker or (D)efender, and iii) flag coordinates (x,y) which specify the source location for role = D and destination location for role = A. The coordinate scheme is shown in Figure 1.
4. The competition will be comprised of 3 rounds. In Rounds 1 and 2, each team shall have one round as a defender and one as a forward. Points will be awarded for time taken to complete the task and proximity to specified destination for role = A.
5. For the purposes of the course, a successful design is one that can perform each role successfully during the 6 opportunities afforded.
6. For the competition (which has nothing to do with your final grade), the 3 teams with the most points will be awarded prizes and bragging rights.
7. You may use up to 3 Mindstorms kits to fabricate your design. Any other material used must be with the explicit permission of the instructors. Further, any such materials will be posted to an “additional bill of materials” list on myCoursesII which may then be used by other groups.

As further information becomes available, this list will be expanded accordingly.

FPF+DAL/October 15, 2012

## Appendix 1 – Flag (pinger) Description



### General Description

The pinger consists of 4 LED emitters placed on 4 sides as shown in the diagram. The assembly is made up of blue Styrofoam with side dimensions of 10.0 cm (4 inches).

Final weight has not been determined yet, but is estimated to be approximately 500 g with the center of gravity being close to the base (location of battery pack).

Details will be added as soon as they are available.