

IMAT5121 Mobile Robotics

MAIN COURSEWORK

Environment

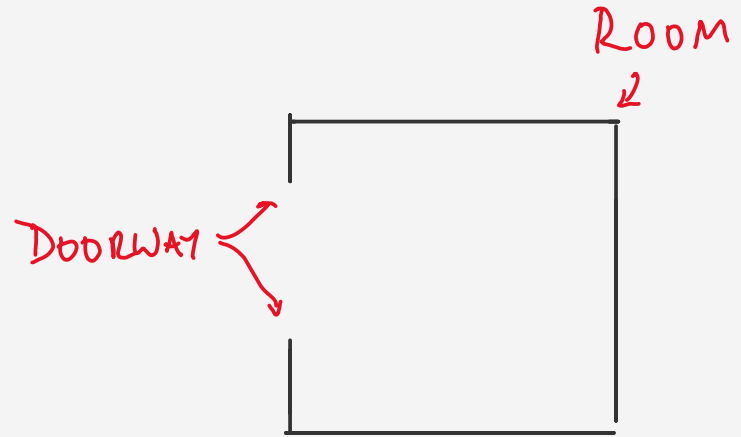
The Environment

- ▶ For the coursework you should use the map `courseworkMap_iRobotCreateToolboxSim.txt` provided here for the iRobot Create Toolbox Simulator or `courseworkMap_VREP.ttt` for VREP, any other simulator you should build a environment similar to the environment in the next slide.
- ▶ The robot's initial position should be any random place inside the room in the middle of the map

The Environment

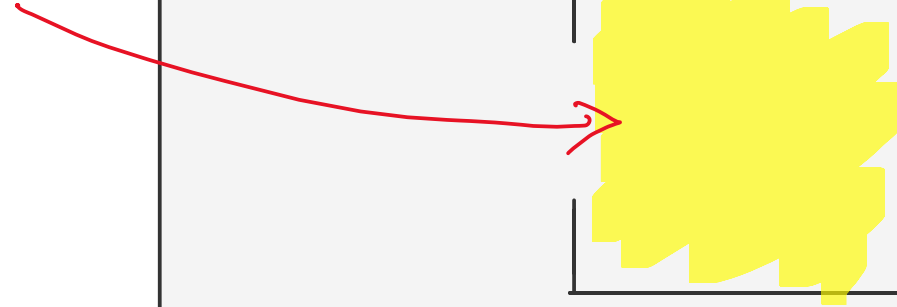
The map is formed of boundary walls and a room in the centre of the map with a doorway.

WALLS →



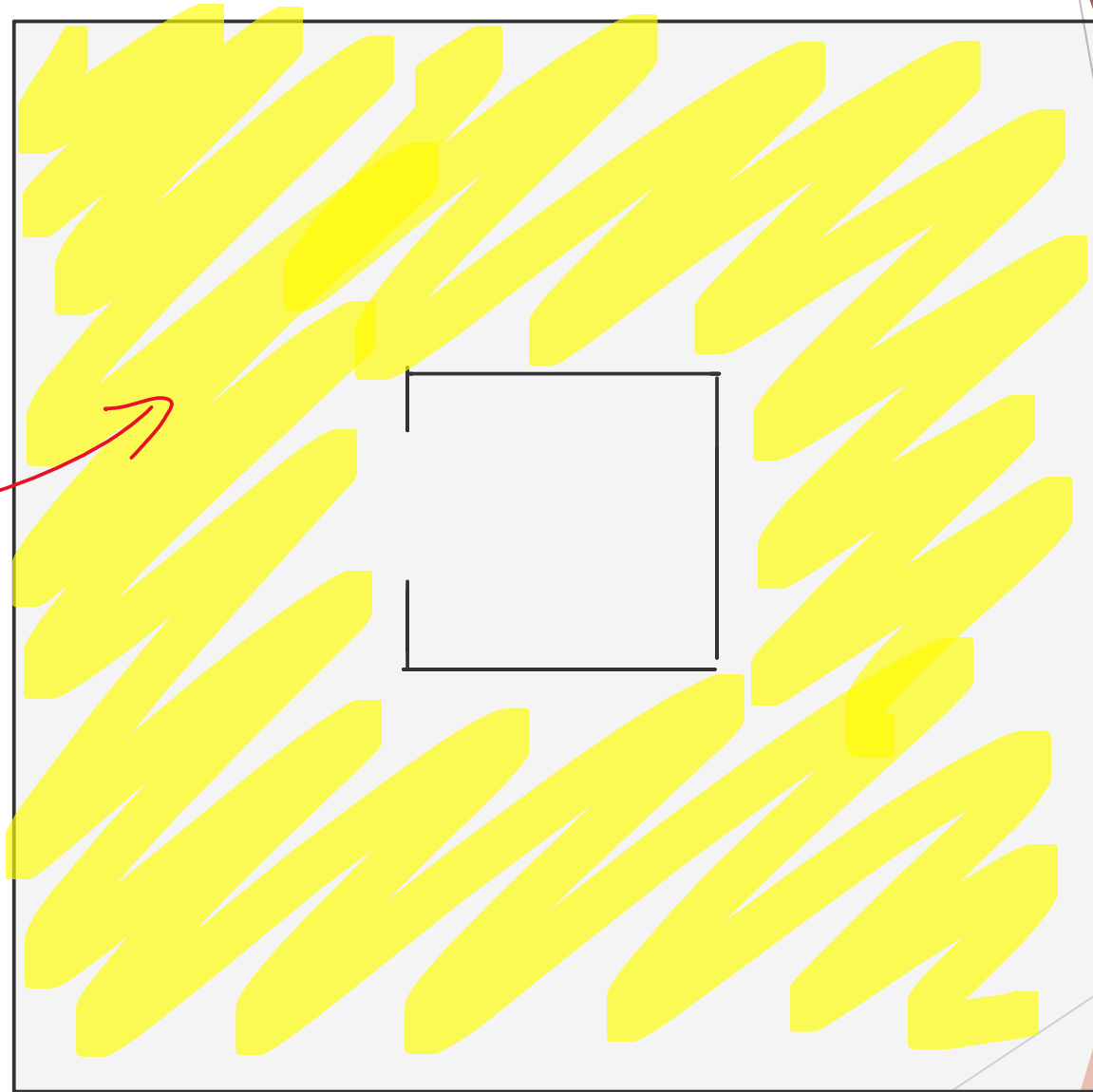
The Environment

The robot starts in a random position and heading in the room



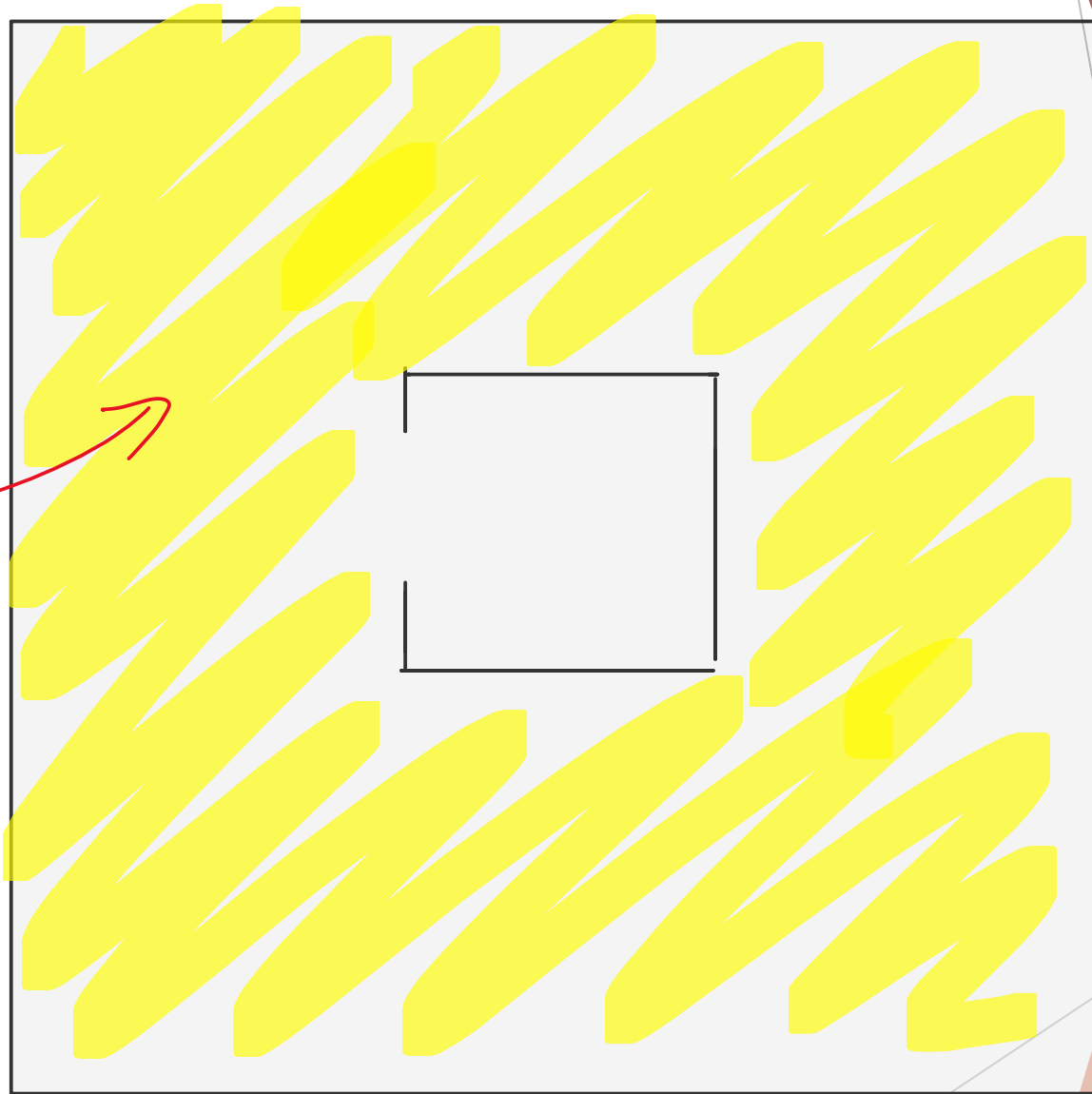
The Environment

The outside room is currently empty, however you should place objects randomly yourself into this space, the robot must avoid these.



The Environment

The beacon should be placed inside this environment.



The Beacon

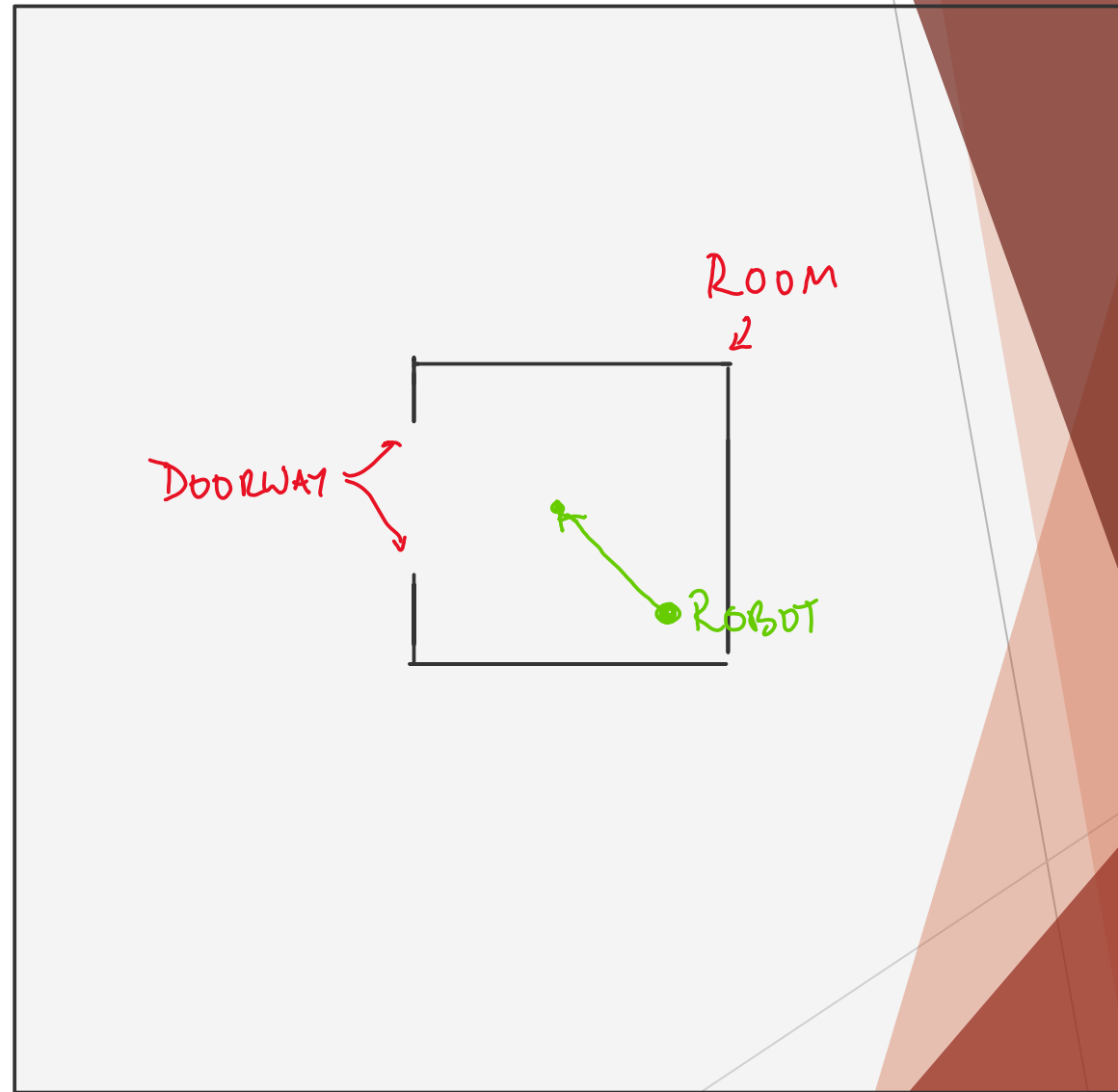
Beacon

- ▶ Please see the handout named “IMAT5121_BeaconSupplement.pdf”

Tasks

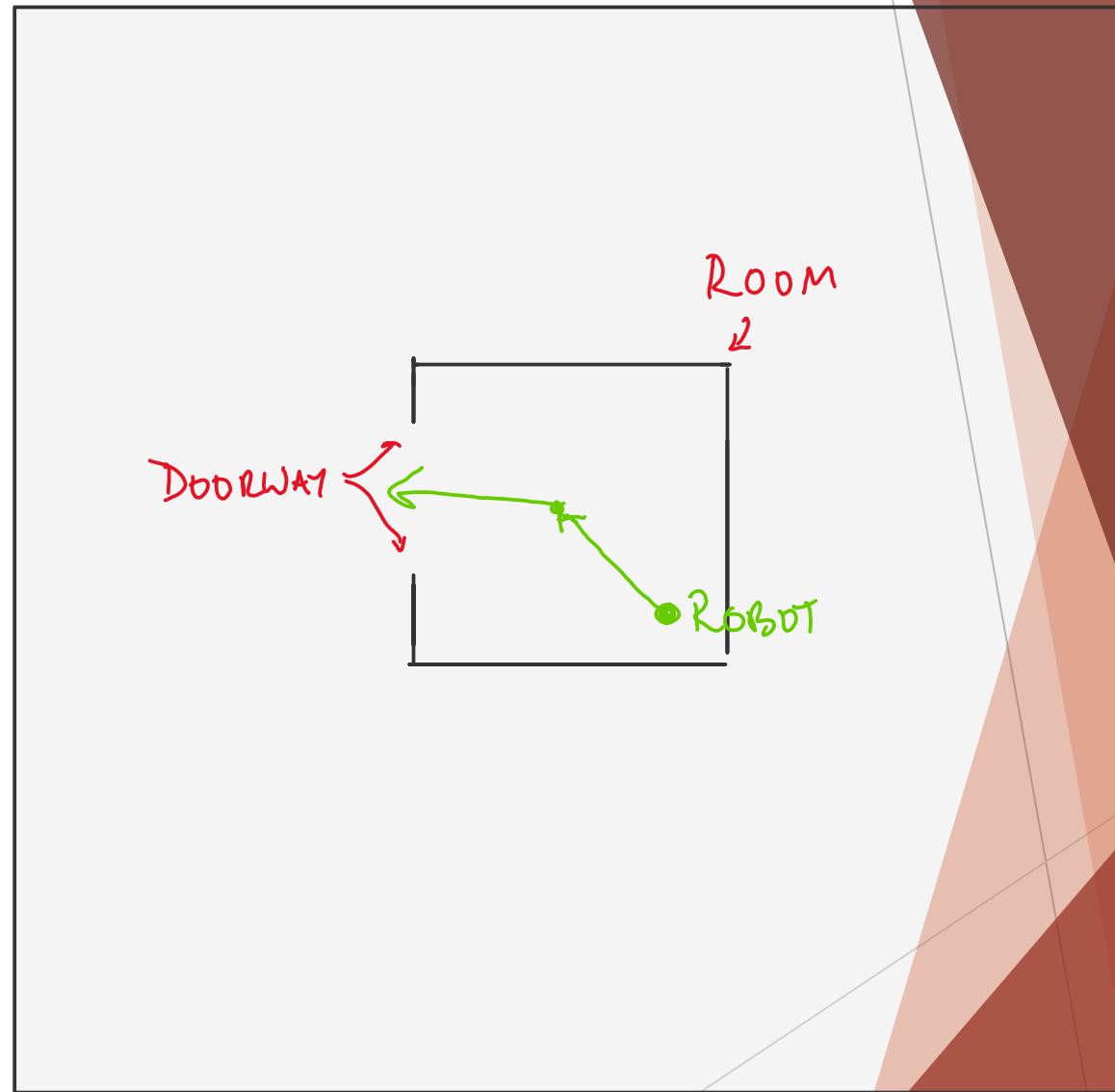
Task 1

- ▶ The robot should start anywhere in the room, move around and using the sensors find the middle of the room



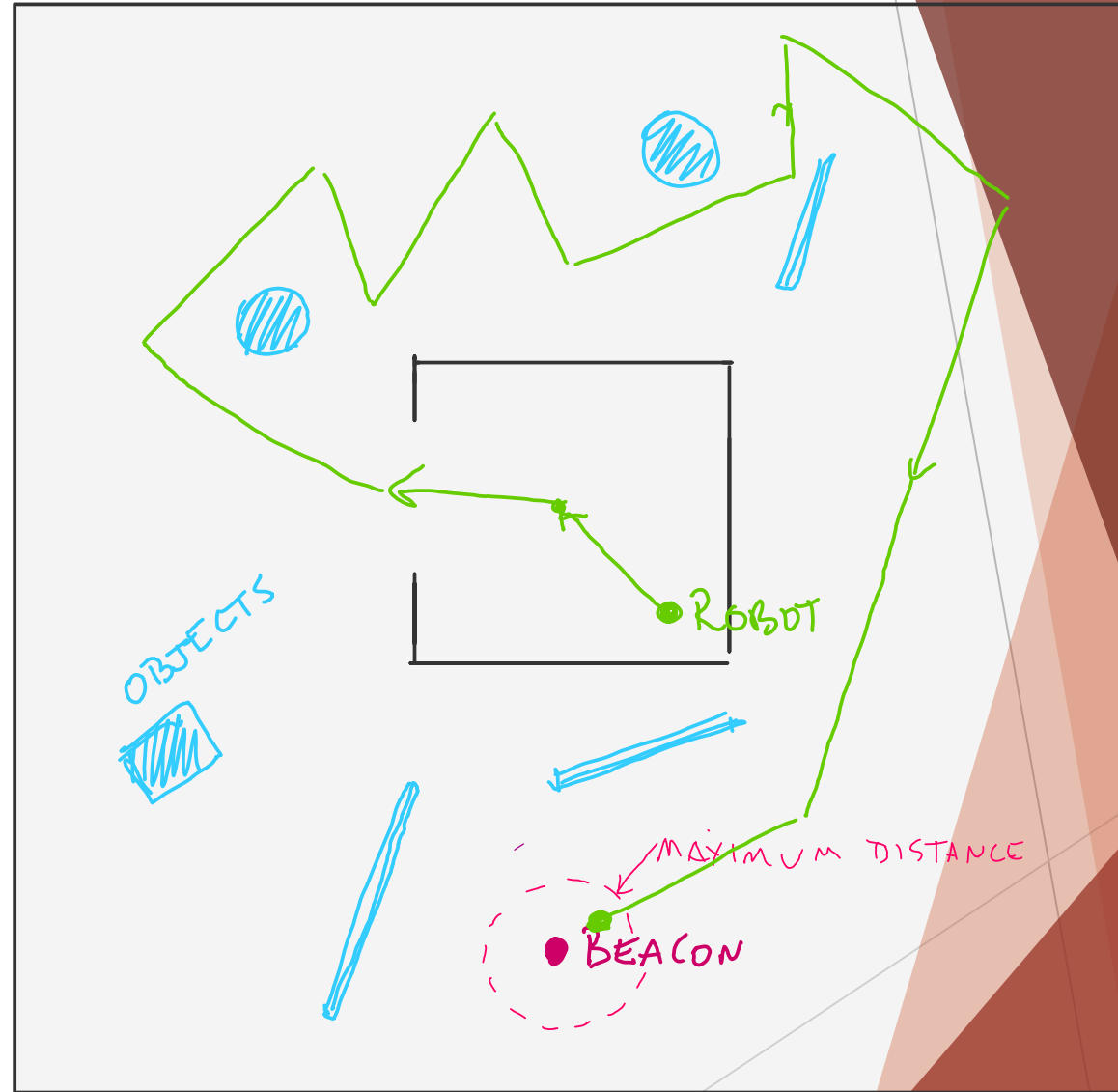
Task 2

- It should then align itself with the exit and come out in a straight line without crashing into the doorway



Task 3 - Beacon task

- ▶ Once out of the room, the robot should start exploring the environment to find the beacon, avoiding objects
- ▶ Once the beacon is found the robot should stop near the beacon (less than 0.5 meters)

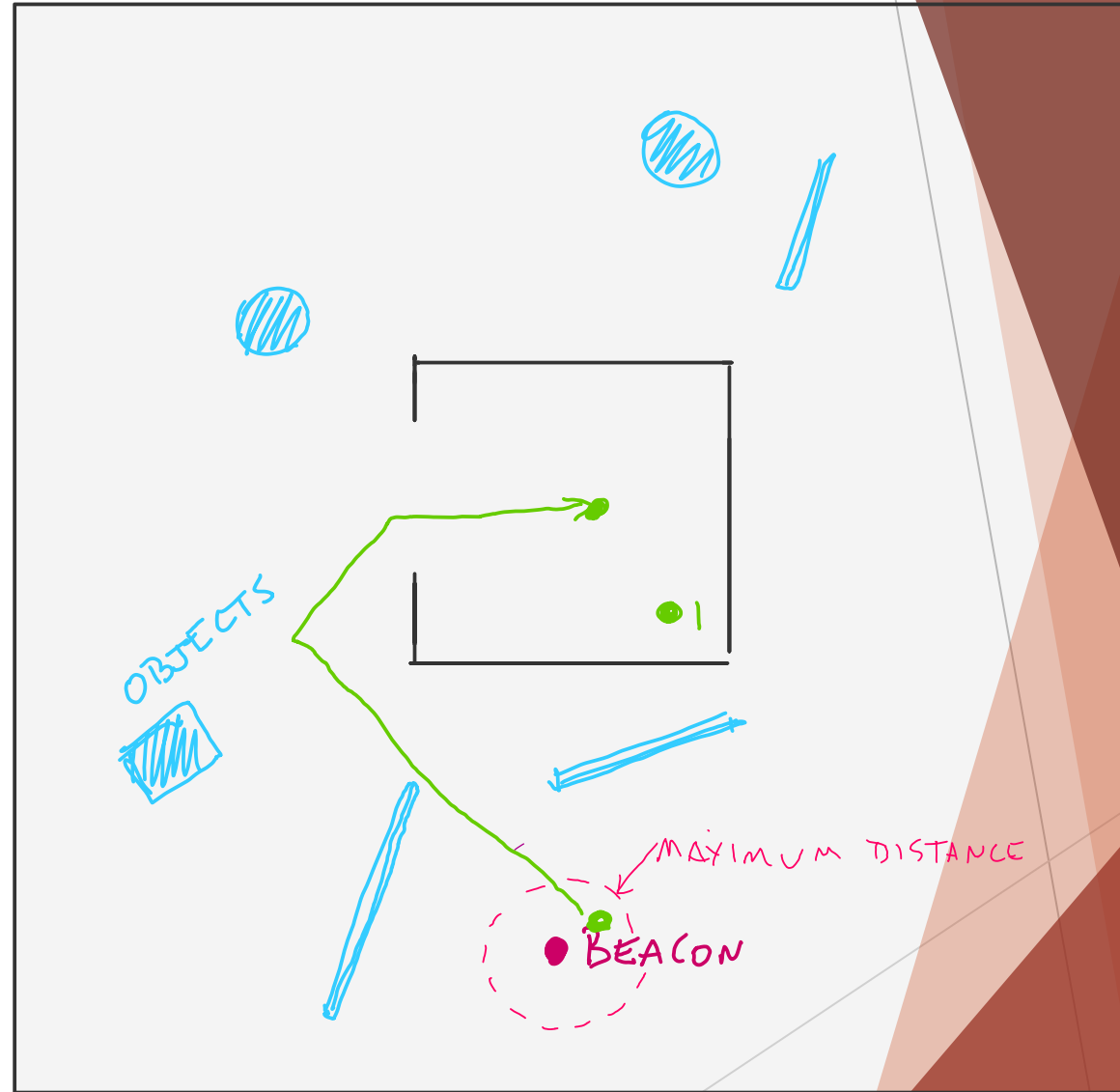


Task 3 - Mapping Tasks

- ▶ Instead of finding the beacon, you should map the environment completely and accurately.
- ▶ You may experiment with methods to reduce the amount of data in the mapping (such as RANSAC, creating line segments etc)

Task 4

- ▶ Once the beacon is found, or mapping is completed, the robot will set off to find the room
- ▶ And of course find the entrance to the room
- ▶ The final objective is to enter the room without bumping to the sides
- ▶ And stop exactly in the middle of the room



Task 5

- ▶ During all the tasks, the robot should attempt to map the environment using data from the sensors.
- ▶ You will learn about this in Week 7
- ▶ The scattergram data may be saved when the robot has completed the tasks, then shown in Excel, Matlab, Python or any other method afterwards.
- ▶ You may also may want to show the data live as the robot completes its tasks.

Experiments

Some Experimenting

- ▶ Once your program executes the full task using the map provided, experiment with different setups.
- ▶ Start the robot in different places in the room
- ▶ Change the position of the beacon, make it difficult to find it.
- ▶ Create another map (make sure there is a small square room for the robot) and add complexity if you are doing the mapping task.
- ▶ Add more or less objects, of different types in the environment. Is the robot able to complete its tasks?

Assessment

Assessment

- ▶ This coursework is marked based on the quality of the report. Therefore the report is an important component of the submission and should show how you tackled the problem and how well the robot performed.
- ▶ You should submit a report explaining how you tackled the problem and presenting the solution developed by you,
- ▶ Make sure you report the testing and measuring of the performance of the various requirements outlined in this handout
- ▶ Make sure you include well documented source code, a good structure with all relevant sections, analysis and conclusions

Assessment

- ▶ Submit the report using the turnitin link
- ▶ Submit the code and any other supplementary material in a zip file to the zip submission link
- ▶ This assessment will be 50% of your overall mark