Technical Assignment

Use turtlebot 3 simulator and the turtlebot 3 gazebo house world model for solving the below tasks

Problem statement 1

Make the robot navigate on user selected waypoints

Problem description

1) Mapping

Create a map of the environment the robot is working in.

2) Select waypoints and store in txt file

On the map created, the user needs to select points and store the same in a text file. The points need to represent a path (x, y). This needs to be like a GUI i.e when the functionality is called, the map should pop up and the user should select waypoints using mouse clicks and the waypoints should be stored in a text file.

3) Robot navigation on user selected text file's waypoints

Read the text file in which the waypoints have been stored and navigate the robot on the same. The robot just needs to stop at the start and stop points and not on the intermediate points.

4) Calling only one functionality

The user has the option to call any one operation at a time i.e the user can either call the **select and store waypoints** functionality or can call the **navigate waypoints** functionality.

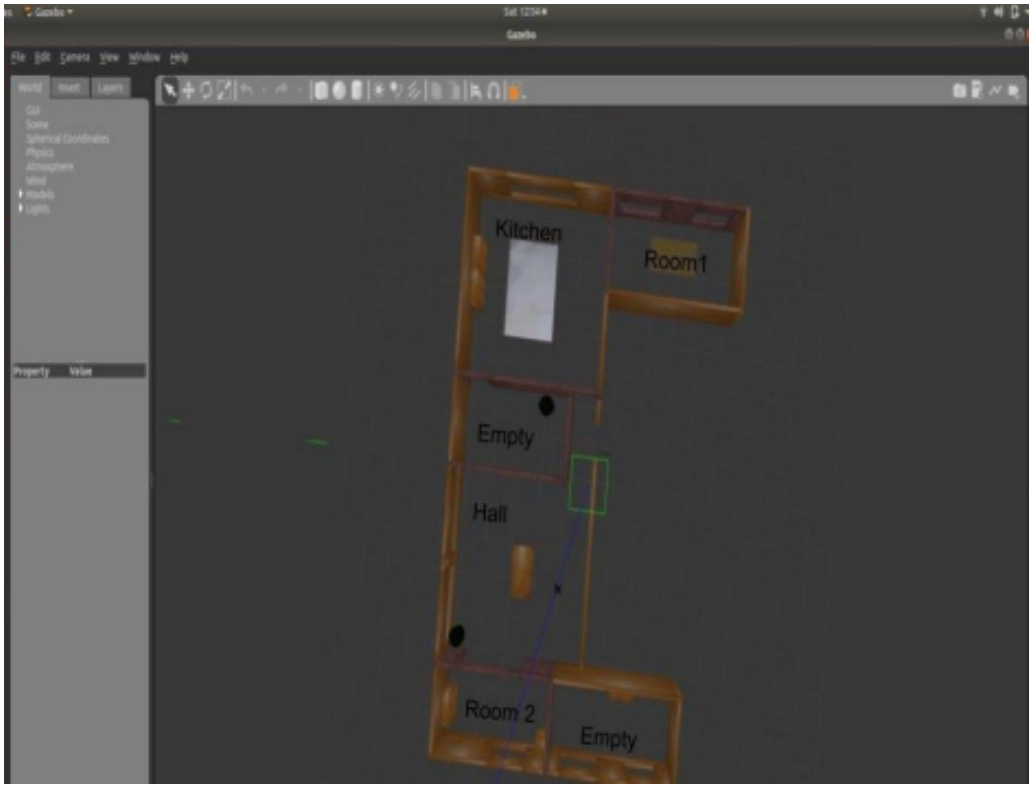
We would like you to explain the thinking process behind defining the architecture for solving the above problem.

Problem statement 2

Find clusters and empty spaces in the point cloud / image

Problem Description

In a turtlebot3 house world given below, there are two empty spaces as shown



You need to go to any one of the empty spaces/arenas and compute

1) Number of clusters and number of points in each cluster
2) The points that represent spaces i.e vacant areas which the robot can enter and leave

It is preferable that you write the clustering algorithm from scratch and not use library defined clustering algorithms either from Point Cloud library or Computer vision library.

You can use any sensor for this task i.e camera or 2d lidar or a combination of both or a depth image or point cloud created from the same.