

Objective:

The objective of this project is to make a pathfinding algorithm for the spot robot from Boston dynamics **on any given building**. The program should be able to get as input a one level floor-plan of a building and should from that, output the path that the robot should traverse. The path should take into consideration the dimensions of the robot, such that it does not walk into walls or such that the planned path is not too narrow for the robot.

The path should be in the form of a loop, such that the start and end destinations of the path are the same - such that the robot can be put into the charger the following morning.

How will this be done?

It makes sense to split this objective into 3 distinct problem definitions:

1. Making a graph - which we will denote “grid”- graph - from the input data. A

resolution for the graph is chosen and nodes will be sampled from the floor plan. The graph will include three types of nodes; “grid”, “room” and “door” nodes. The “room” nodes will be the nodes that the robot will have to visit on its path. The “door” nodes will allow for traversal through walls. The “grid” nodes will be all the other nodes in the graph. Furthermore, within a certain distance of the walls in the floor plan only the door nodes will exist, this is to account for the dimensions of the robot.

2. Making a subgraph - which we will denote “room”-graph - from the “grid”-graph.

Here we will make a subgraph from the “grid”-graph where only the “room” nodes are included. An optimal graph traversal algorithm (e.g A^*) will be used to find the shortest distance between each room node. An important property of this subgraph will be that it is fully connected; this means that all room nodes are connected to each other.

3. **Making a path that traverse through all “room” nodes in the “grid” graph.** The path will be generated by finding an approximate solution to the traveling salesman problem where each “room” node has to be visited at least once.