Synopsis:

Motivation:
Why is it interesting? I am working on the project in collaboration with Dalux which is a software company that makes BIM models (Building information modelling). At the moment Dalux has to hire an expensive architect to walk around the construction site to check up on that everything is going according to plan and that there aren't any errors. If this process could be automated such that a robot could walk around a construction instead and send the data directly to Dalux' software, that would be of great benefit to Dalux.

Old objective:
The objective of this project is to program the spot robot from Boston Dynamics to move around construction sites. The robot should be able to walk around the entire construction site on its own and should – while walking – take pictures (or/and point scans) of the construction site. The purpose of this is that after the construction workers have done their day of work the spot robot should wake up at night and walk around the construction site to see if everything is going according to plan and if all deadlines and milestones are met. An intermediate goal of this project would be to simulate all of this in case the robot is not available for use.

New objective V.1:
The objective of this project is to do pathfinding for the spot robot from Boston dynamics. The program should be able to get as input the coordinates of the floor-plan of a building and should from that, output the precise path that the robot should able to 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. Optimal nodes for point scans should be calculated and the path should find an optimal route that includes these nodes.

Further work would be to get the robot to actually traverse around a building site.

New Objective V.2:
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 precise 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 most importantly be in the form of a loop, such that the start and end destinations of the path are the same (this is such that the robot can be put in to the charger the following morning). This is the most important criteria of the path.

Furthermore the program should optimise for a path that maximises exposure to wall area (this is because the overall objective of the robot is to do point scans of as much of the building walls as possible).

The way the program should do this is from calculating a discrete number of nodes that allows for most coverage of wall area. A traveling salesman approximate solution should then be estimated of the path.

The distance of this path should be calculated such that there is a rough estimate of the distance that the robot will be traversing. This way we know approximately how much battery capacity of the robot is used (given a rough translation of distance to battery usage).

If there is still plenty of battery usage left the program should increase the number of optimal nodes to traverse and if the path exceeds battery usage the program should decrease the number of optimal nodes. This should off course happen within reason such that the program doesn't go on in an infinite loop.

This is especially useful for bigger buildings where battery capacity of the robot is a limiting factor.

Further work would be to get the robot to actually traverse around a building site.