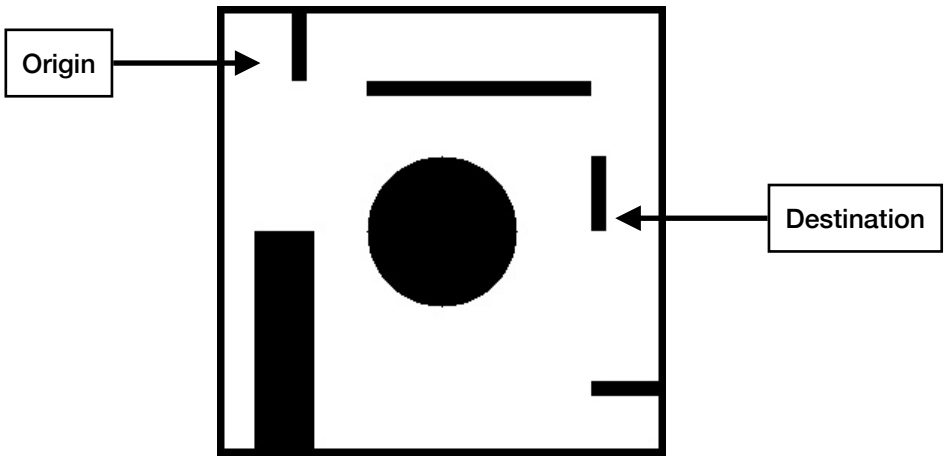
RPN Assignment #1

Team #3 : Makkhi-2

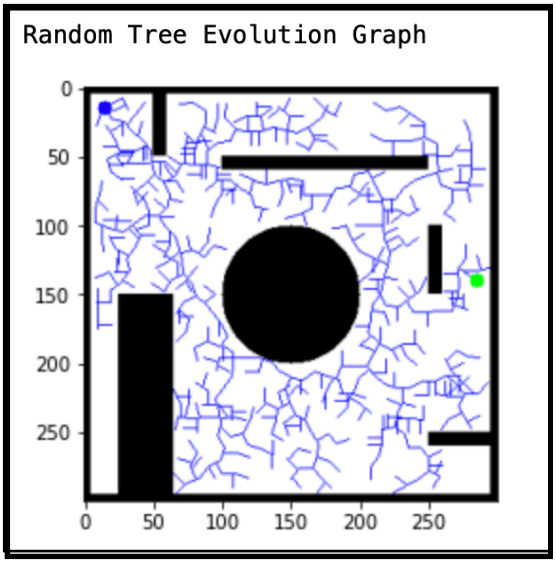
RRT - Rapidly-exploring Random Tree

A Rapidly-exploring Random Tree (RRT) is a data structure and algorithm that is designed for efficiently searching (or navigating) high-dimensional spaces. RRTs are constructed incrementally in a way that quickly reduces the expected distance of a randomly-chosen point to the tree. RRTs are particularly suited for path planning problems that involve obstacles and differential constraints (non-holonomic).



RRT Holonomic Results

Random Tree Evolution - (Link to video)



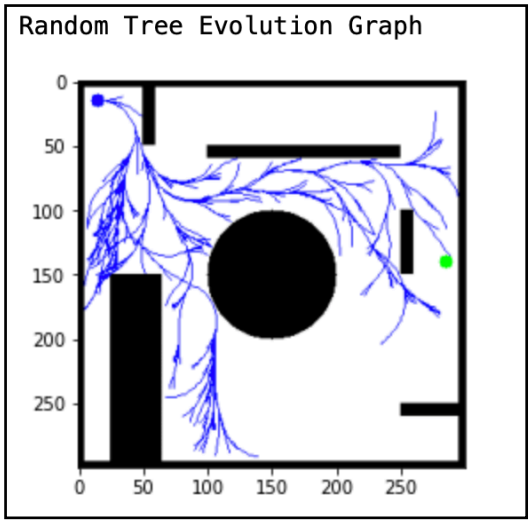
Origin - Blue circle
Destination - Green circle

The first plot represent the path traversed by the robot and the second plot shows the wheel trajectories.

We first randomly find the cluster of nodes. Then we calculate distance to find the net possible node and move along a fixed distance. We have to keep checking for collisions, and avoid them. Once the tree is formed, we go backwards from

RRT Non-Holonomic Results

Random Tree Evolution - (Link to video**)**



Origin - Blue circle
Destination - Green circle

For non-holonomic we do the same as holonomic but the only difference instead of just have a restriction on the distance, we also have to consider the orientation. Orientation can be imagined as the turning angle.

Again we check for collisions and try to avoid them. And finally, once the tree is fully formed we can traverse from the destination to the source node to determine the path

Other notes

The colour scheme in the pictures in the report and the video are different as the plots were generated using matplotlib whereas individual snapshots were saved using OpenCV. OpenCV uses BGR as its default colour order for images, matplotlib uses RGB.

Work segregation was not entirely exclusive and we work together on the whole assignment. Yet to fulfil the requirements of the assignment we have mentioned the segregation below.
- Holonomic part done by Amogh - 2018111003
- Non-Holonomic part done by Tanmay - 2018102023