Task 2 Documentaion

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***Abstract*— Implemented the Probabilistic Roadmaps (PRM) algorithm for path planning in a 2D environment represented by the maze image "maze.png". The PRM algorithm constructs a roadmap within the workspace, facilitating navigation for robots while avoiding obstacles.**

In this project, a Python program was developed to implement the PRM algorithm. The maze image "maze.png" served as the environment representation. The algorithm was executed for both "Start Easy" and "Start Hard" scenarios to demonstrate its effectiveness in navigating through different levels of complexity.

The PRM algorithm has broad applications across various fields. In robotics, it is used for autonomous navigation, enabling robots to maneuver through dynamic environments safely. In industrial automation, PRM aids in optimizing workflow by guiding robots efficiently across factory floors. Moreover, in the realm of autonomous vehicles, PRM facilitates the development of self-driving cars capable of navigating urban environments with ease.

I. INTRODUCTION

Navigating through complex environment poses a significant challenge in robotics.The task involves finding path between predefined start and end point in a environment with obstacles using PRM algorithm with linear planner as local planner and A* algorithm as main path planner.PRM offers a methodical approach by sampling points from the environment and establishing connections between feasible points, thereby constructing a roadmap.

II. PROBLEM STATEMENT

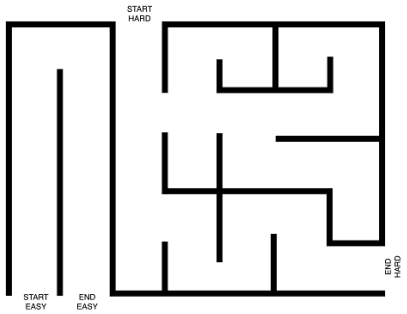

Fig. 1. Maze image

The objective of this project is to develop a **PRM** path planning algorithm for a 2D environment .Then the algorithm needs to be employed in a 2D maze environment (Fig.1) and visualising the path in the maze image using any image processing library.

III. FINAL APPROACH

Before starting the algorithm The maze image was pre-processed to obtain a new image(Fig.2).

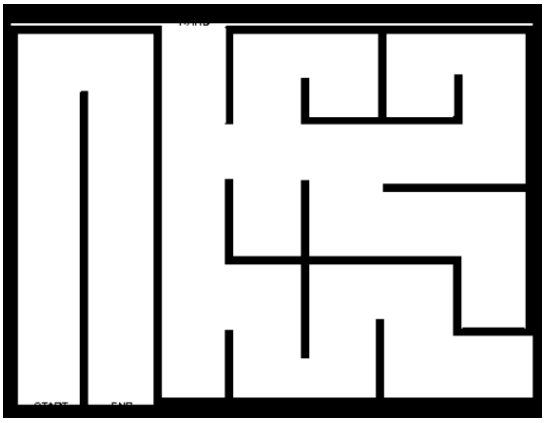

Fig. 2. Pre-processed maze image

A graph was constructed on the environment by randomly sampling large number points which are not inside obstacles. For each node, the nodes in a specific search radius were added to neighbors of the node if there existed no obstacle between the two nodes(Fig.3).

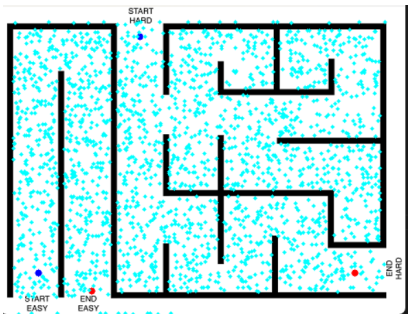

Fig. 3. Sampled points

Then A* algorithm was employed to find the path between start easy, end easy and start hard, end hard. OpenCV library was used to visualize the path found on the maze image(Fig.4)

CONCLUSION

The task comprised of 2 parts, I could almost tackle the first part . The second part was to employ the PRM algorithm developed in a Autonavism 2D environment.I was unable to complete the 2nd part due to very few resources available.

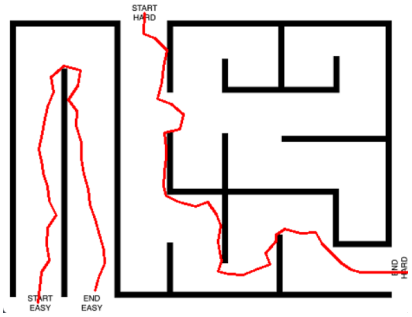

Fig. 4. Final path

REFERENCES

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