KRSSG SOFTWARE TASK ROUND

Task 3

Trapped In a Minefield

In the heart of a war-torn land, a team of soldiers found themselves facing a treacherous challenge. They were tasked with navigating a vast and deadly minefield to reach a strategic target deep within enemy territory. The team consisted of Captain Edmund Blackadder, a seasoned veteran renowned for his tactical prowess, Private Baldrick, a skilled demolitions expert, Lieutenant George, a young and determined soldier, and You, a path planner.

Part-1

The enemy is very overconfident that they emailed Captain Blackadder the map of the minefield. The black colored areas are the mines and the white colored area is safe. He hands the map to you (attached below) and gives you the task of planning a path to the target (marked green) from your current location (marked red). You say you can use RRT*-Connect algorithm to plan the path. But Captain Blackadder isn't satisfied. He wants you to use BIT* algorithm for path planning. But at the end of the day, going to the target safe without treading on any mine is all that matters.

Task-

Use the BIT* algorithm to generate a non-deterministic path from the source to the destination along the white area avoiding all the black obstacles (mines) and display it using OpenCV on the png image attached below. Using RRT*-Connect algorithm grants you partial marks.

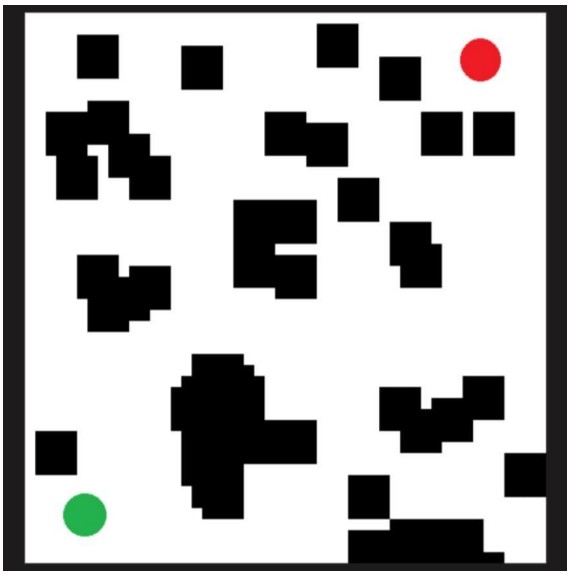

Image1

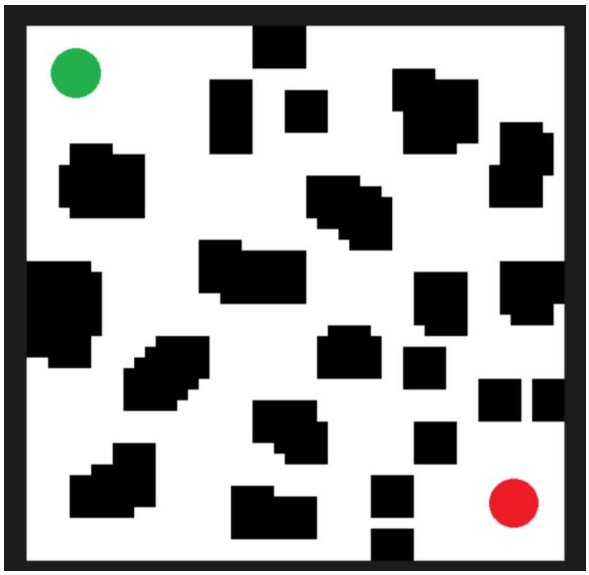

Image2

Part-2

BIT*/RRT*-Connect algorithm generates a safe path. Lieutenant George guides the turtle, avoiding mines. Cheers accompany successful steps, reflecting reality. Skillful adjustments using the PID controller lead to victory. The team celebrates, strengthened by lessons learned. They face the real minefield with confidence and unity.

Task-

Move the turtle in turtlesim(ROS), on the path that you've planned. A simple way to learn the basics of ROS is to use the turtlesim simulator that is part of the ROS installation. The simulation consists of a graphical window that shows a turtle-shaped robot. The turtle can be moved around on the screen by ROS commands, which can be based on input feed or programmed.You need to move the turtle using PID. Use feedback to display the position of the turtle on the image.

Part-3

The enemy, surprised by your skill at path planning abilities, sends out a bomber jet that constantly drops bombs. The pilot is kind of a noob and can only drive it in a circle about the center of the map. The jet can hurt you only if it is directly above you.

Task-

From the 1st part of the task, you have a path from the start to the endpoint. Now, spawn another turtle that moves in a circle of radius 1/4 of the simulator window length with the center of the circle the same as the center of the window. Start moving your initial turtle on the path generated and avoid the other turtle by replanning the path in case there is going to be a collision.

Language: C++ / Python

Suggested Reading : BIT* , OpenCV