

# IE4060 - Robotics and Intelligent Systems Assignment

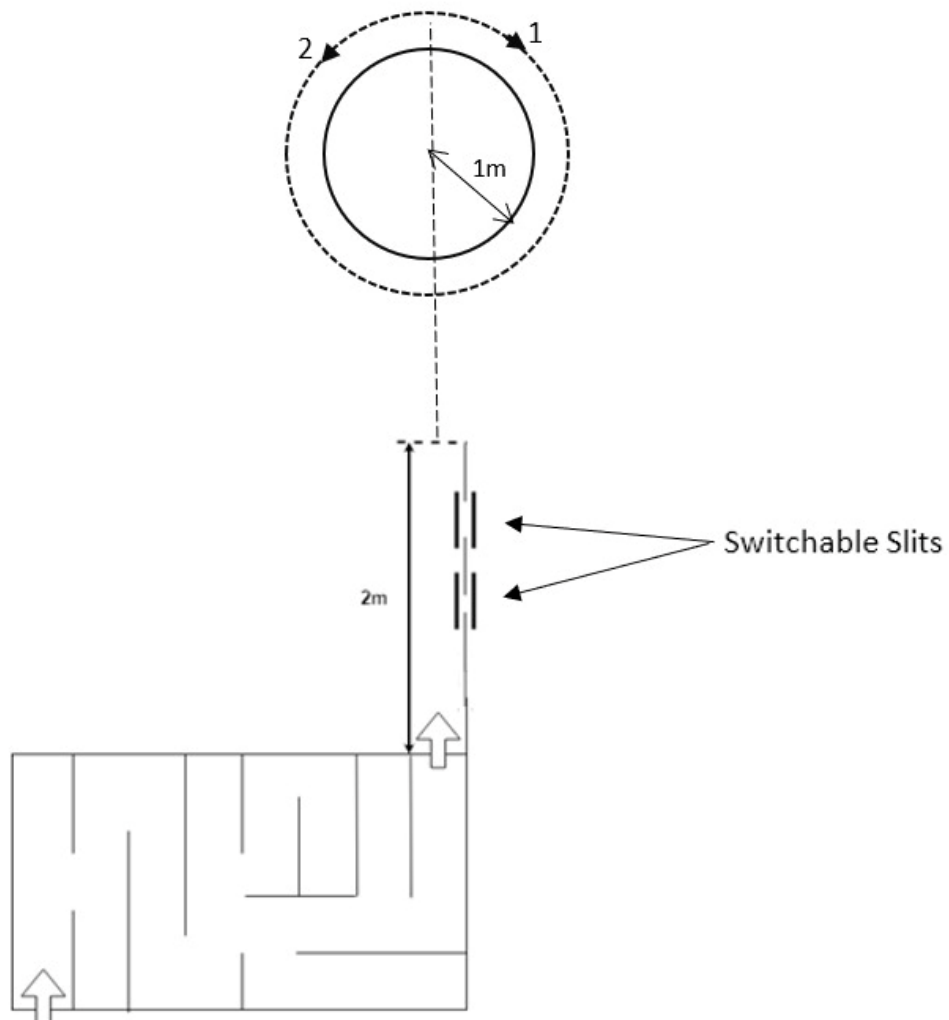
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## Semester 1 - 2022

In this assignment, you will program a robot to complete a certain task. This is an individual project conducted in the class (normal lab hours) as well as outside the class.

Total Marks = 100

### Task



### Step 1

The robot has to navigate through the maze autonomously and find the exit point. You may use any algorithm to do this task. The width of the inside paths of the maze would be 10 inches wider than your robot. The maze may be slightly different at the final demonstration. Marks would be based on the time of completion of the maze.

$$\text{Marks for Solving the Maze} = \frac{20 \times t_{min}}{t}$$

$t$  = Time taken by your robot to complete the maze

$t_{min}$  = Minimum time taken by a robot to complete the maze

### Step 2

The robot may find a straight wall to its right, upon exiting the maze. The wall has two slits which could be opened or closed randomly when performing your demonstration. The robot must identify the number of open slits in the wall while navigating forward to reach the end of the wall.

### Step 3

As shown in the diagram, a cylinder with a radius of 1m is placed at the end of the wall and the robot has to detect the cylinder. There will be two paths around the cylinder. The robot must choose the correct path based on the number of open slits detected in the straight wall.

Example: 1 Open slit detected → Choose path 1

The paths are not marked or guided by any means. The robot must be pre-programmed with the two paths to follow. The robot should stop after making a complete rotation around the cylinder.

### Marking Grid

| Component                                      | Marks      |
|--|------------|
| Progress at the preliminary assessment         | 10         |
| Smooth navigation within the maze              | 05         |
| Solving the maze                               | 20         |
| Identifying the correct number of open slits   | 10         |
| Following the trajectory accurately            | 30         |
| Making a complete rotation around the cylinder | 05         |
| Verbal Explanation of the algorithms used      | 10         |
| Quality of coding                              | 10         |
| <b>Total</b>                                   | <b>100</b> |

## **Progress Guidelines**

| <b>Date/ Week</b>           | <b>Expected Progress Level</b>  |
|-----------------------------|---|
| 25 <sup>th</sup> April 2022 | Announcement of assignment tasks  |
| 30 <sup>th</sup> April 2022 | Design a simple maze using Gazebo simulator and navigate the robot through it using teleop operation                                      |
| 7 <sup>th</sup> May 2022    | Choose an appropriate navigation algorithm to navigate the maze   |
| 14 <sup>th</sup> May 2022   | Demonstrate the maze solving component of the task  |
| 21 <sup>st</sup> May 2022   | Count the number of open slits in the straight wall upon exiting the Maze, Detect the correct navigation path and describe the trajectory |
| 28 <sup>th</sup> May 2022   | Final Demonstration and Viva  |