EEE3099S 2023 MILESTONE 2: Robot Motion Control, Line and object detection in Simulation.

Due	14th September 2023 11:55 PM
Number of resubmissions allowed	3
Accept Resubmission Until	19th September 2023 11:55 PM
Grade Scale:	Points (max 100.00)

Assignment Instructions

Specifications

To show your understanding of robot motion and line tracking using digital line sensors, you must demonstrate the following in both simulation and on the robot hardware platform:

- That the robot can move a given distance (i.e. 1 meter) and stop. While moving straight as possible (Hint: You need to use the encoder sensors).
- That the robot can move given angles of 90, 180, and 270 degrees and stop.
- That the robot can follow a line with varying winding.
- Robot can detect an object in within the maze.
- Robot can remember object location in maze.

You should firstly simulate the robot using the already available Mobile Robotic Training Library in
Simulink. **The base file for this will be provided.** The library includes a Robot Simulator block, Encoder block, Motor block, Line sensor, Ultrasonic sensor block and other blocks you can use to create the simulation. The Motor block requires you to model the real-world motor, which is provided.

You will be provided with up to 5 sensors (suggested positioning (x: 64.3mm, y: 35.4mm), (x:
67.5mm, y: 5mm), (x: 67.5mm, y: (-)5mm) and (x: 64.3mm, y: (-)35.4mm)), see Figure 1 Differential drive robot axis for robot axis. You may place the sensors in any configuration. Therefore, you can use 1 – 5 sensors in any configuration. The less they are, the more efficient the system will be but line following will be more complex and vice-versa.

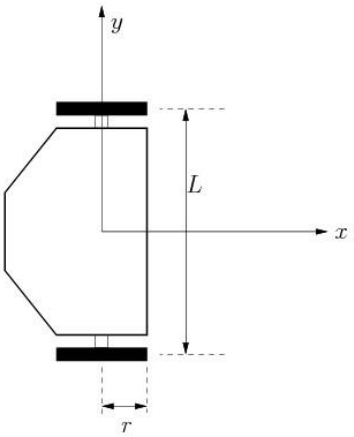

Figure 1: Differential-drive robot axis for robot axis

s.

Submission

1. A short report (1-7 pages maximum) containing how the different subsystems work and how you modelled them.
2. Approximately 6-7 Simulink files per group one for each demonstration. If you use one file, please make sure to label everything appropriately.

    a. Simulation
        i. Robot moves 1 meter (within 10% error)
        ii. Robot can turn 90, 180, and 270 degrees (within 10% error) in place.
        iii. Robot follows the line of varying winding.
        iv. Robot detects object and records distance.
        v. Robot remembers location of object.

Extras

- Name your submission as follows (or lose **5%**): EEE3099S_2023_PAPER_DESIGN_GROUP_#_STDNUM001_STDNUM002_STDNUM003.pdf
- You will have 3 resubmissions.
- Late penalty will be 5% per day, until 5 days after the due date, when you will no longer be able to submit your document.

Helpful Resources

- Localization with Encoders in Simulink
- Odometry with Encoders

1.5 RUBRIC

Milestone 2: Robot Motion Control and Line Tracking		Date:	
Group number		Mark	Subtotal

Report	Distance and Angle Control Algorithm			5
	Line following algorithm			5
	Object Detection Algorithm			5
	Localisation Algorithm			5
Demo	Simulation	The robot moves 1 meter (within 10% error)		10
		The robot can turn 90, 180, and 270 degrees (within 10% error) in place		10
		The robot follows lines of varying winding		20
		Robot detects object and records distance.		10
		Robot remembers location of object		20
Code and Model Neatness/Originality/Correctness (includes correct usage of parameters, labelled Simulink connections and appropriately commented MATLAB code)				10
Penalty				Penalty
Total				100

Table 2 Milestone 2 rubric