EE 301P: Control Systems Laboratory

Lab Exercise 9

Lab session: October 20, 2023 *Report due*: October 27, 2023

1 Objective:

To incorporate additional sensor data to adjust the reference on-the-fly with respect to the closed loop test scenario in lab exercise 6.

2 Lab exercises

(a) To fetch the sonar data using Simulink, and understand the fetched data while varying the distance between the sensor and an obstacle.

(b) Based on your understanding, choose suitable value for the following parameters:
(i) Threshold (d_{th} cm): To classify the object location with respect to the sensor in one of two categories (near or far).
(ii) High and low reference (R_{high} rpm and R_{low} rpm): To indicate the high and low speed of the given DC motor.

(c) Improvise your Simulink model design in lab exercise 6 to adjust the reference on-the-fly based on the sonar sensor data.

(d) Demonstrate the following test cases:
(i) The given DC motor tries to operate at low speed when the obstacle is near.
(ii) The given DC motor tries to operate at high speed when the obstacle is far away.

3 Required hardware

(a) DC motor(s)

(b) Motor driver

(c) Ultrasonic Sensor

(d) Arduino

(e) Breadboard

(f) Couple of jumper wires

(g) Computer with Matlab and Simulink

4 Deliverables

Lab report should include

(a) Matlab code/ Simulink model(s)

(b) Tuned value of parameters

(c) Threshold and reference parameters

(d) Obtained plots to demonstrate the performance