

ENG5009 Advanced Control 5
Laboratory 1 Worksheet Answer Grid

Fuzzy Logic

1. Introduction to Fuzzy Logic Toolbox

Defuzzification Method	Service	Food	Tipping Value
Centroid	5	5	15
Centroid	7	8	20.3
Centroid	10	2	15
Mean of Maximum	5	5	15
Mean of Maximum	7	8	24.9
Mean of Maximum	10	2	5.1
Bisector	5	5	15
Bisector	7	8	21.6
Bisector	10	2	9.9

2. Integrating the Fuzzy system into the command line

Service	Food	Value
3	3	8.4
9	6	23.7
5	10	19.8

3. Further Fuzzy Logic Example

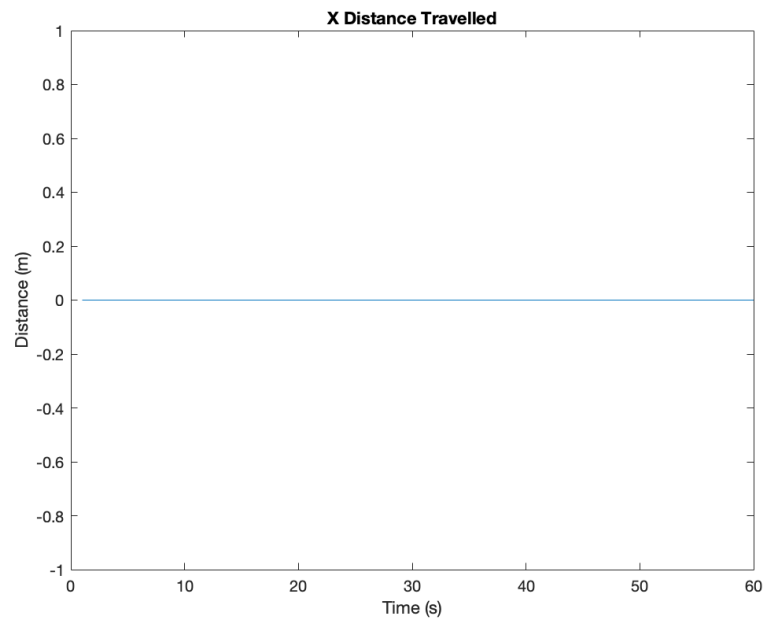
Input Temperature, °C	Output
9	15
13.1	11.2
26.5	-9.6
20	-9.44E-17

Introduction to Model

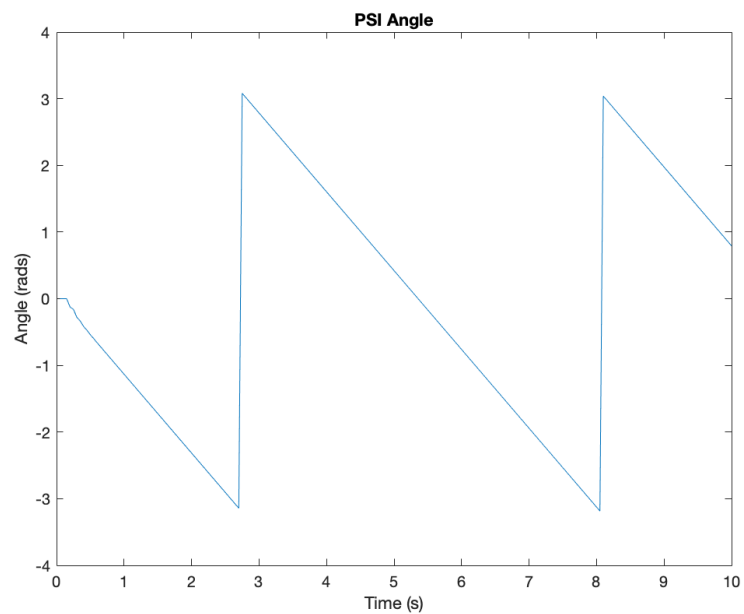
1. Basic Operation

Insert a plot for each of the following:

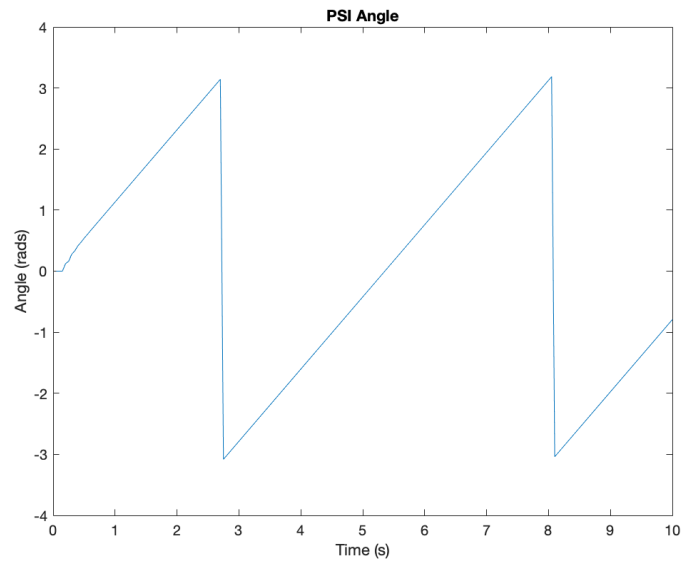
- *Straight Line motion Insert a plot of the x distance travelled.*



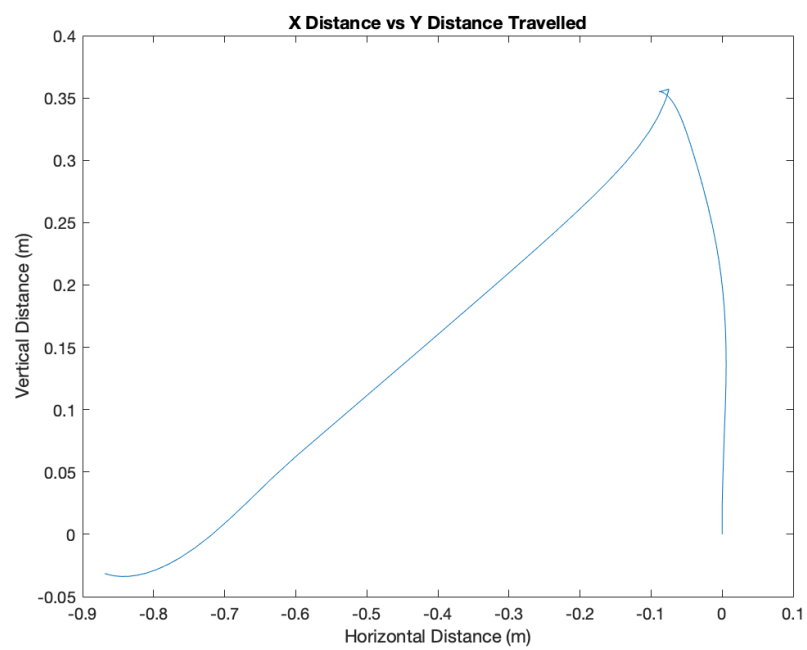
- *Turn counterclockwise Insert a plot of the psi angle.*



- *Turn Clockwise Insert a plot of the psi angle.*

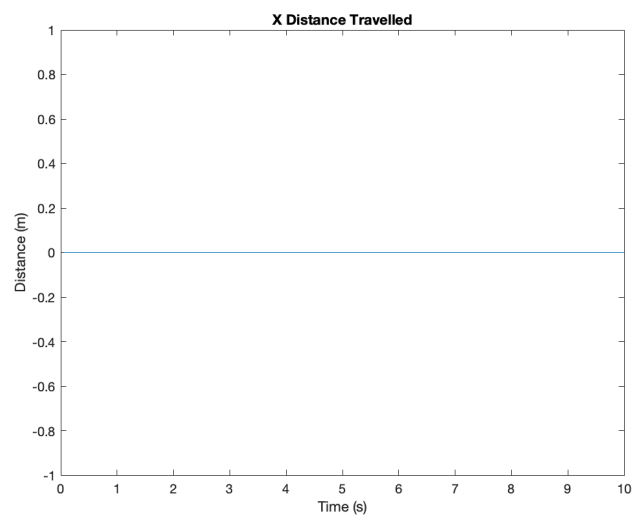
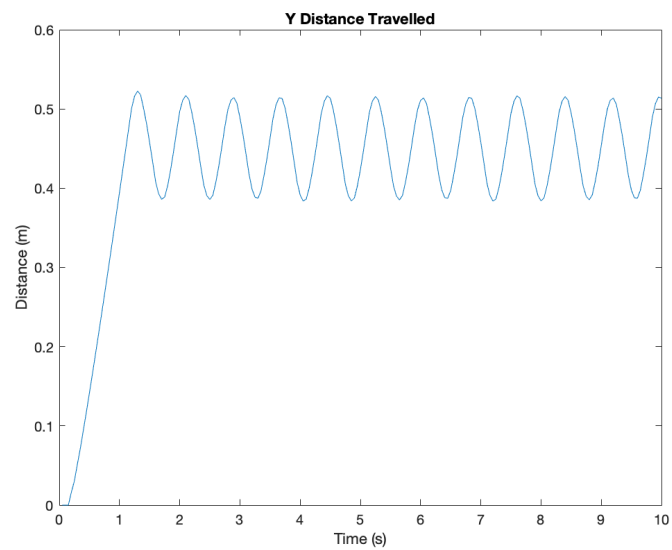
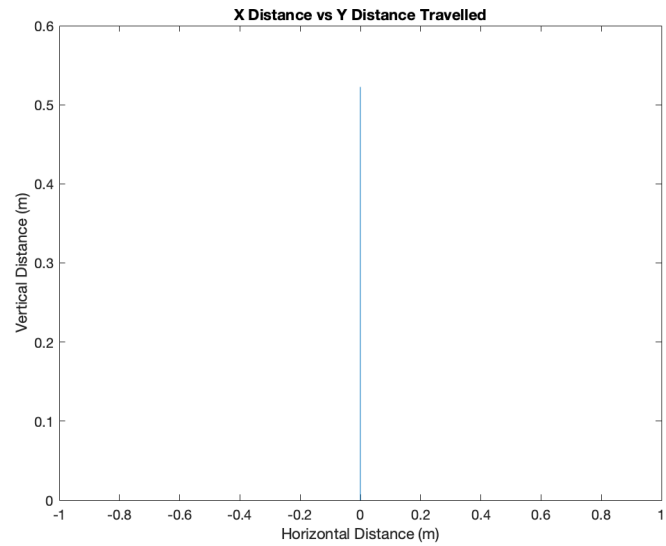


- *Complete a short forward, turn left, forward, turn right Insert a plot of the x/y position*

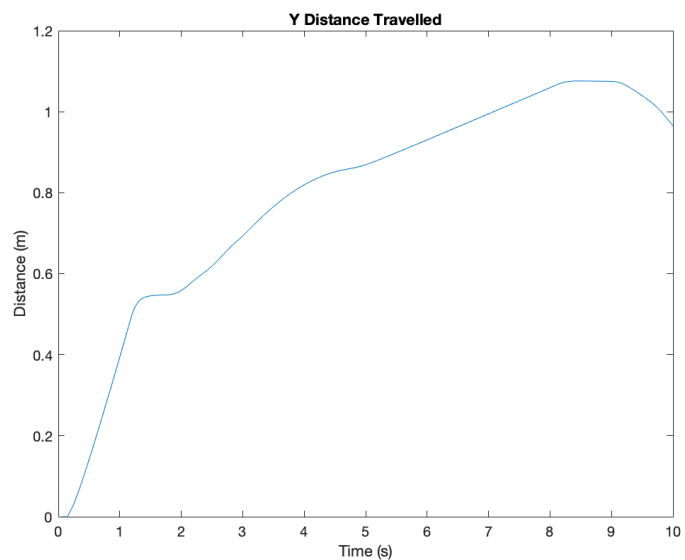
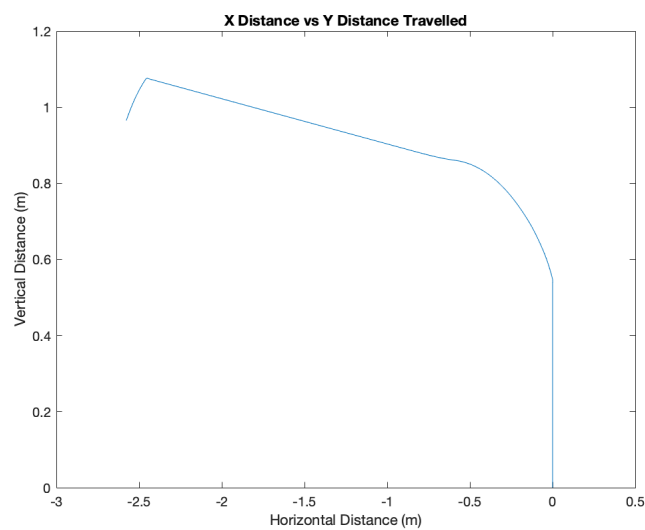


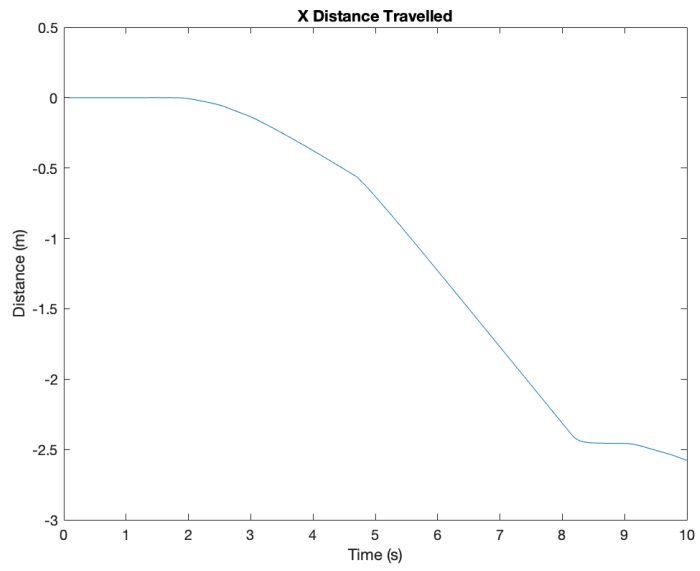
2. Running the Model with a Fuzzy Controller

- Provide a plot of the path of the system using the tutorial example:



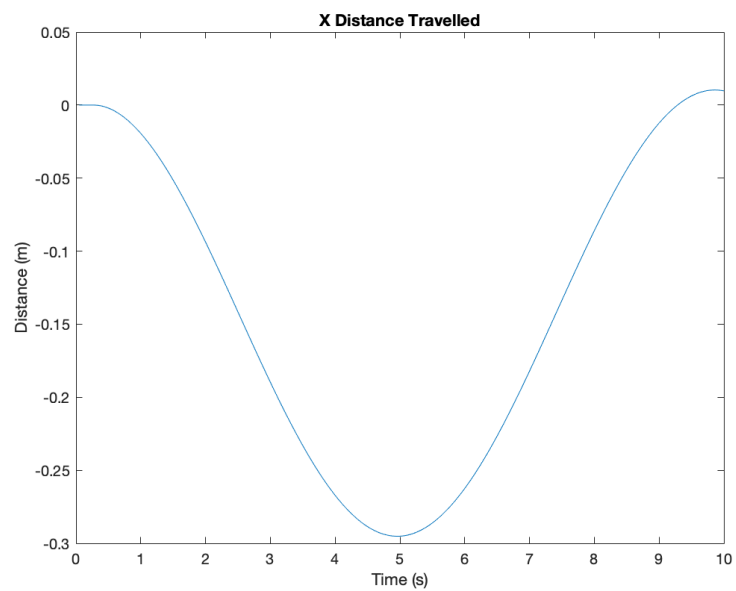
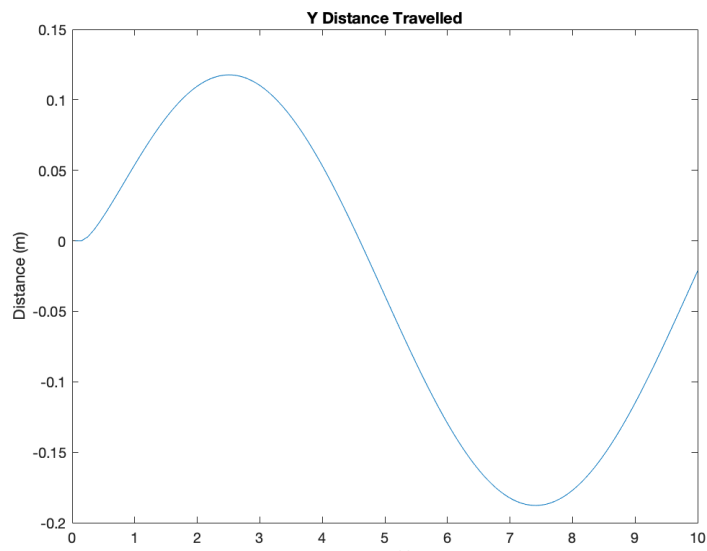
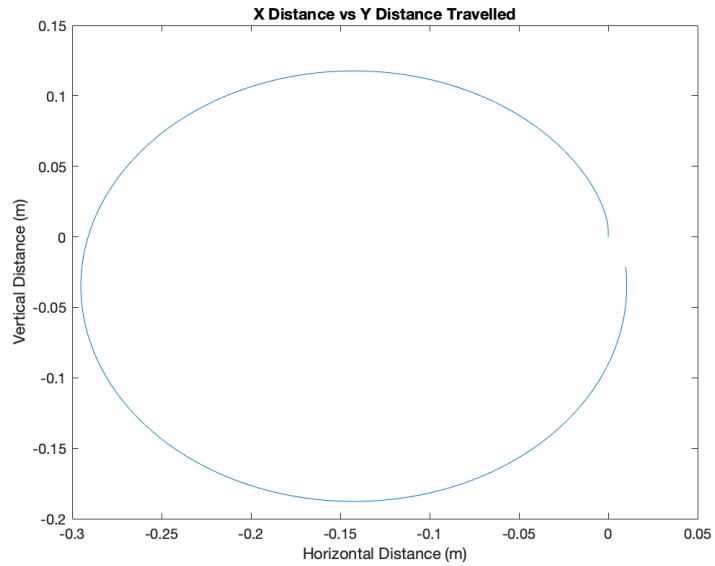
- Comment on the behaviour of the system:
 - The robot doesn't clear the wall, i.e. it attempts to drive into it indefinitely
- Comment on any changes you would make to improve the performance of the system:
 - Change the rule when both sensors are CLOSE such that the robot performs a reverse turn
- Provide a plot of the path of the system with the changes you have implemented





3. Running the Model with a Neural Controller

- Provide a plot of the path of the system using the tutorial example.
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- Comment on the behaviour of the system
 - The robot travels in a circle continuously rather than driving straight when not in the proximity of a wall.
- Comment on any changes you would make to improve the performance of the system
 - Add a condition in the neural controller that if both sensor inputs are 1, apply the same voltage to each motor.
- Provide a plot of the path of the system with the changes you have implemented

