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Experiment No. 1:

Title: Generate AND, NOT function using McCulloch-Pitts neural net by MATLAB program.

Aim: Write down briefly about the importance/ applicability of McCulloch-Pitts neural net.

Theory: Write it as taught in the class.

Matlab Code:

```
%AND function using McCulloch-Pitts Neuron
clc
clear all
%close all
%Getting weights & Threshold value
disp('Enter the weights');
w1 = input('Weight w1=');
w2 = input('Weight w2=');
disp('Enter the Threshold value');
theta = input('Theta=');

y = [0 0 0 0];%initialize to avoid garbage value
x1 = [0 0 1 1];%Input1
x2 = [0 1 0 1];%input2
z = [0 0 0 1];%ideal output

zin = x1*w1+x2*w2;
for i=1:4
    if zin(i)>=theta
        y(i)=1;
    else y(i)=0;
    end
end
disp('Output of net=');
disp(y);
if y==z
    disp('Net is Learning properly');
else
    disp('Net is not Learning properly');
end
```

```

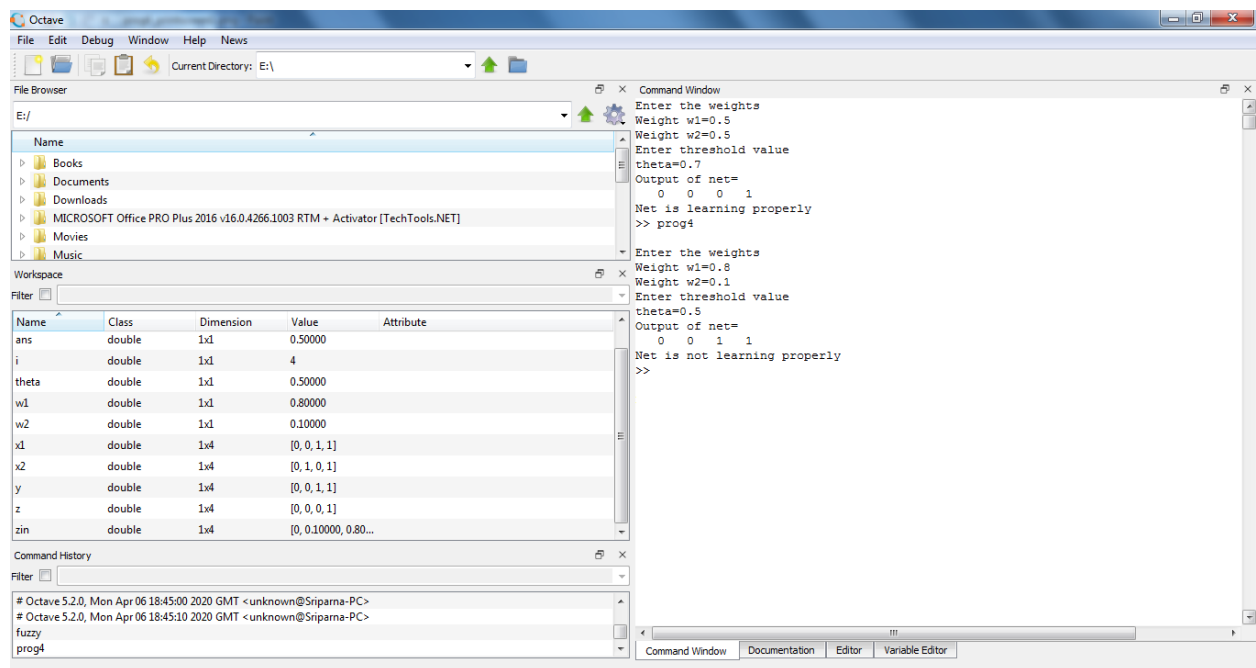
%NOT function using McCulloch-Pitts Neuron
clc
clear all
%close all
%Getting weights & Threshold value
disp('Enter the weights');
w1 = input('Weight w1=');
disp('Enter the Threshold value');
theta = input('Theta=');

y = [0 0];%initialize to avoid garbage value
x1 = [0 1];%Input1
z = [1 0];%ideal output

zin = x1*w1;
for i=1:2
    if zin(i)>=theta
        y(i)=0;
    else y(i)=1;
    end
end
disp('Output of net=');
disp(y);
if y==z
    disp('Net is Learning properly');
else
    disp('Net is not Learning properly');
end

```

Results:



The screenshot shows the Octave software interface. The workspace table lists variables and their properties:

Name	Class	Dimension	Value	Attribute
ans	double	1x1	0.50000	
i	double	1x1	4	
theta	double	1x1	0.50000	
w1	double	1x1	0.80000	
w2	double	1x1	0.10000	
x1	double	1x4	[0, 0, 1, 1]	
x2	double	1x4	[0, 1, 0, 1]	
y	double	1x4	[0, 0, 1, 1]	
z	double	1x4	[0, 0, 0, 1]	
zin	double	1x4	[0, 0.10000, 0.80...	

The Command Window shows the following output:

```
Enter the weights
Weight w1=0.5
Weight w2=0.5
Enter threshold value
theta=0.7
Output of net=
0 0 0 1
Net is learning properly
>> prog4

Enter the weights
Weight w1=0.8
Weight w2=0.1
Enter threshold value
theta=0.5
Output of net=
0 0 1 1
Net is not learning properly
>>
```

Conclusion:

Reference:

<https://www.youtube.com/watch?v=6XhSJbfT1pk>

Experiment No. 2:

Title: Write a MATLAB program for Perceptron net for an AND function with bipolar inputs and targets.

Aim: Write down briefly about the importance/ applicability of Perceptron net.

Theory: Write it as taught in the class.

Matlab Code:

% Perceptron for AND Function

clear;

clc;

x=[1 1 -1 -1;1 -1 1 -1];

t=[1 -1 -1 -1];

w=[0 0];

b=0;

alpha=input('Enter Learning rate=');

theta=input('Enter Threshold Value=');

con=1;

epoch=0;

while con

con=0;

for i=1:4

yin=b+x(1,i)*w(1)+x(2,i)*w(2);

if yin>theta

y=1;

end

if yin<=theta && yin>=-theta

y=0;

end

if yin<-theta

y=-1;

end

if y-t(i)

con=1;

for j=1:2

w(j)=w(j)+alpha*t(i)*x(j,i);

end

b=b+alpha*t(i);

end

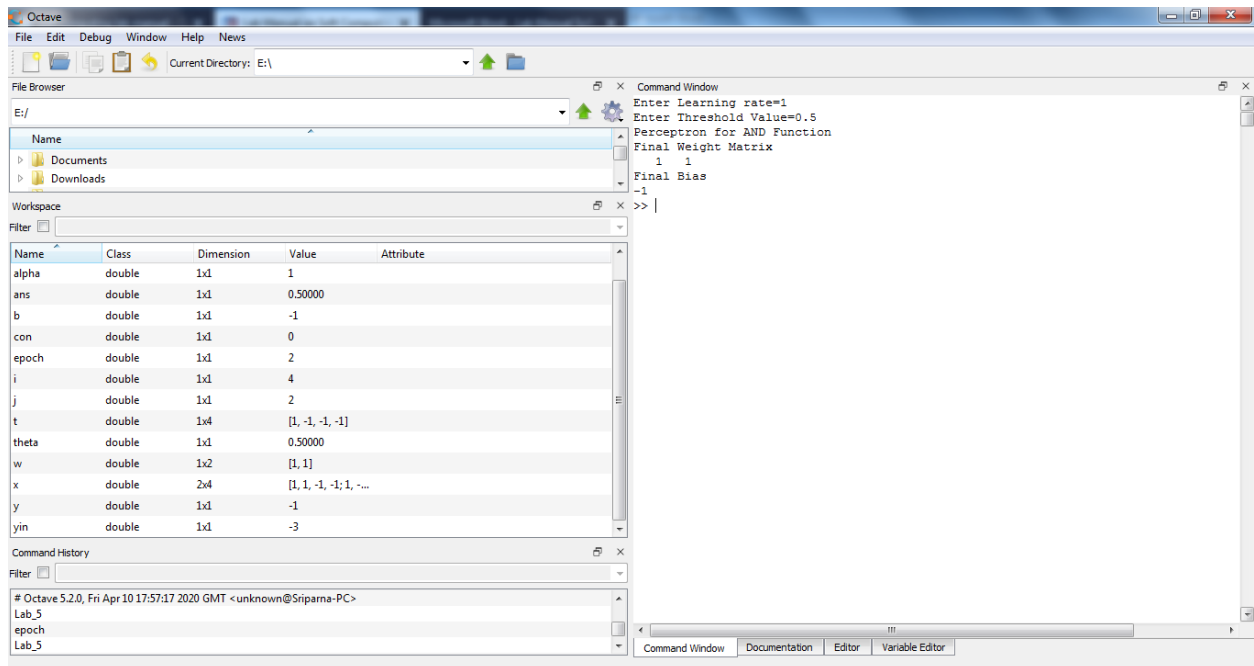
end

epoch=epoch+1;

end

```
disp('Perceptron for AND Function');  
disp('Final Weight Matrix');  
disp(w);  
disp('Final Bias');  
disp(b);
```

Results:



Conclusion:

Reference:

<https://www.youtube.com/watch?v=VRcixOuG-TU>

Experiment No. 3

Title: Write a MATLAB Program on Back propagation neural network.

Aim: Write down briefly about the importance/ applicability of back propagation neural network.

Theory: Write it as taught in the class.

Matlab Code:

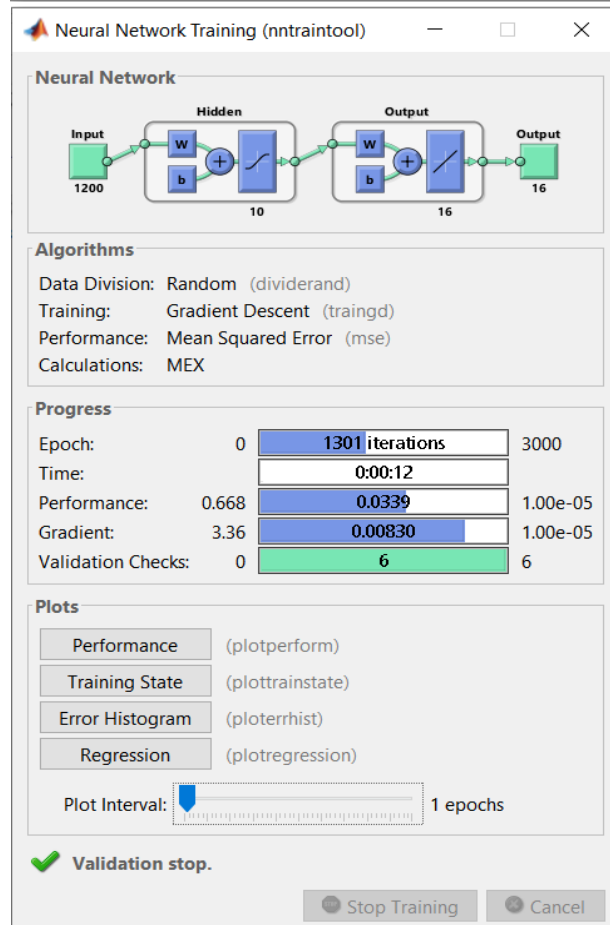
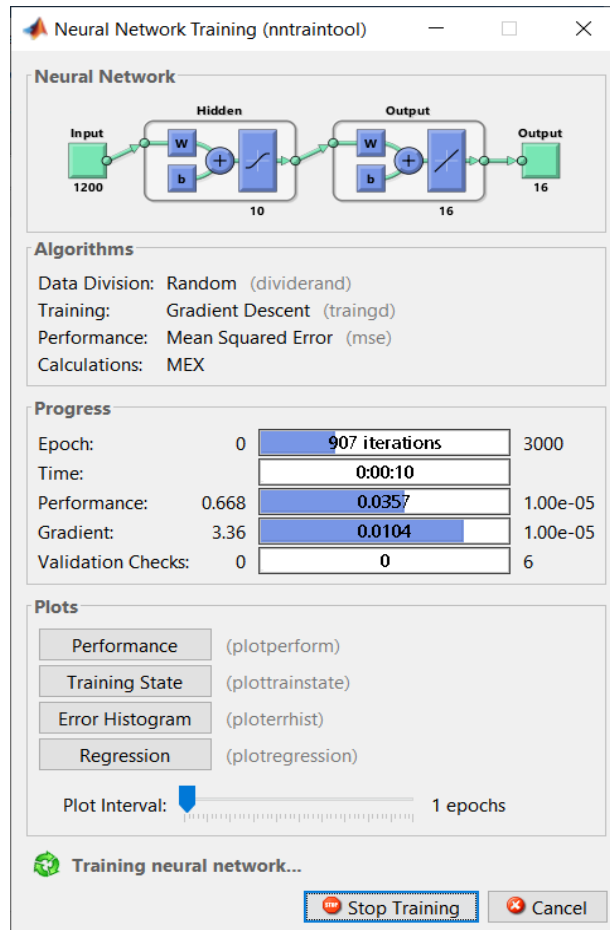
```
clear all;
close all;
clc;

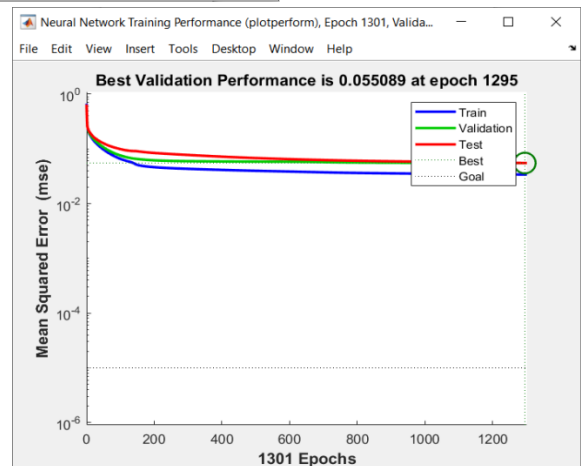
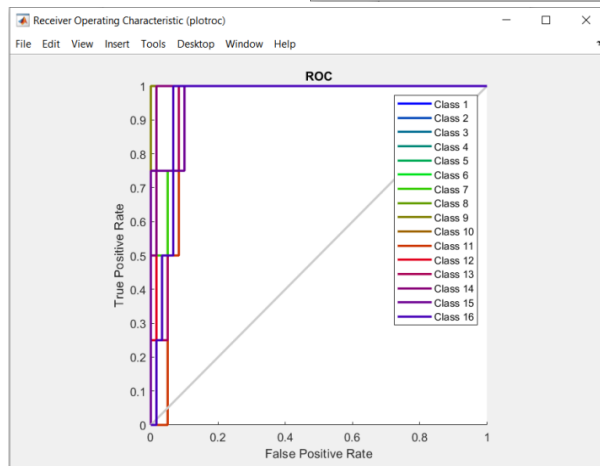
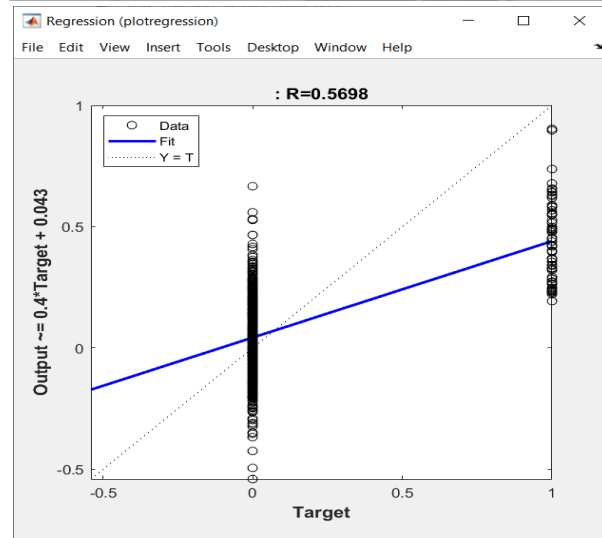
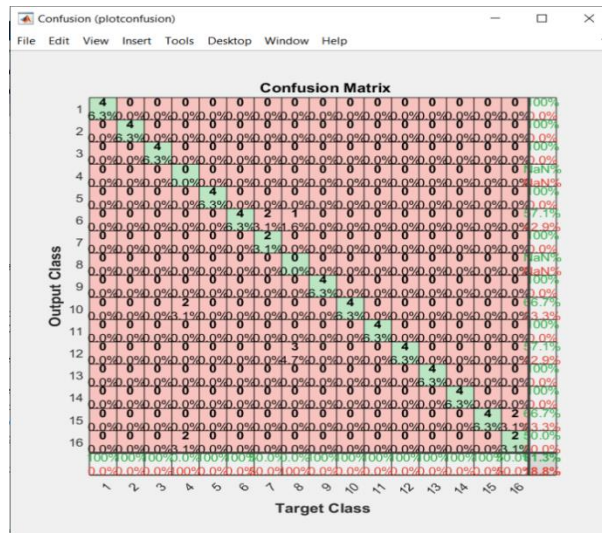
input=xlsread('fv.xlsx');
target=xlsread('target.xlsx');
nntic=tic;
hiddenLayerSize = 10;
net = feedforwardnet(hiddenLayerSize,'traingd');
net.trainParam.lr = 0.05; %its not mandatory to give this value,
automatic value will be taken
net.trainParam.epochs = 3000; %its not mandatory to give this
value, automatic value will be taken
net.trainParam.goal = 1e-5; %its not mandatory to give this
value, automatic value will be taken
net.divideParam.trainRatio = 70/100;
net.divideParam.valRatio = 15/100;
net.divideParam.testRatio = 15/100;
net=init(net);
[net,tr] = train(net,input,target); %training
output = sim(net,input); %simulation
figure,plotconfusion(target,output)
plotregression(target,output); %regresson plot
error = gsubtract(target,output);
performance = mse(error); %mean square error
figure, plotroc(target,output)
nntime=toc(nntic);

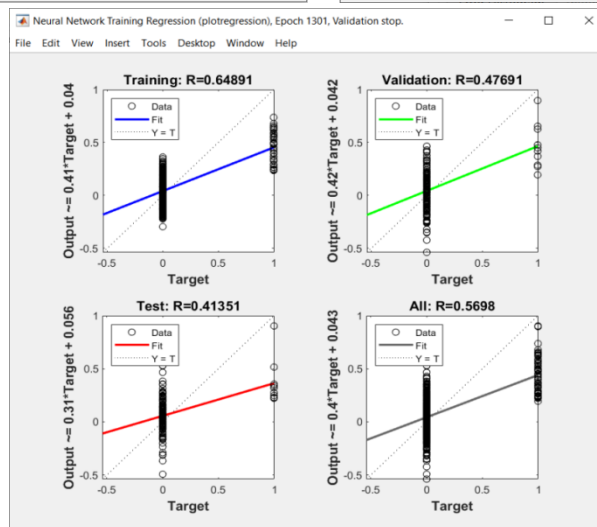
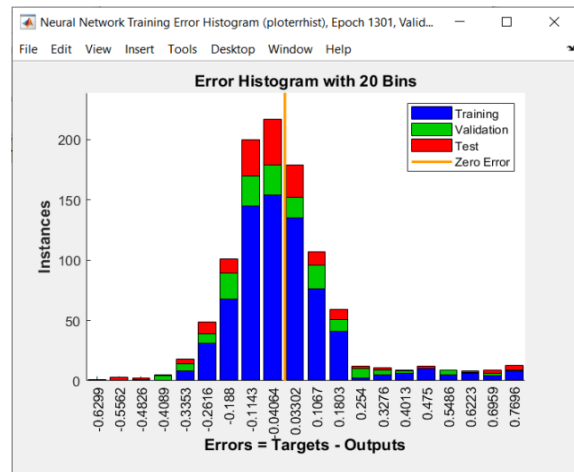
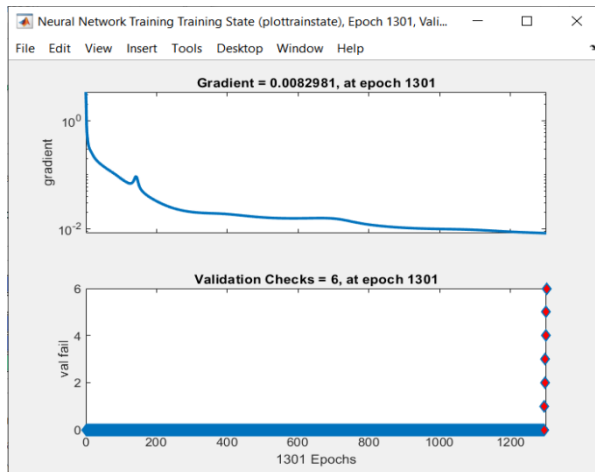
unknown=xlsread('unknown.xlsx');%let it is the unknown feature
value
y = net(unknown);%results obtained for all classes

% initlay is a network initialization function that initializes
each layer i according to
% its own initialization function net.layers{i}.initFcn.
% The weights and biases of each layer i are initialized
according to net.layers{i}.initFcn.
```

Results:







Conclusion:

Reference:

https://www.youtube.com/watch?v=PEmSbdC4y_Y&list=PLsEIbHOtypISN0ZXjZ7Uhp0YwCToyrolm

Experiment No. 4:

Title: Write a program in MATLAB to plot various membership functions.

Aim: Write down briefly about importance/ applicability of membership functions.

Theory: You are supposed to explain about different membership functions along with their equations.

Matlab Code:

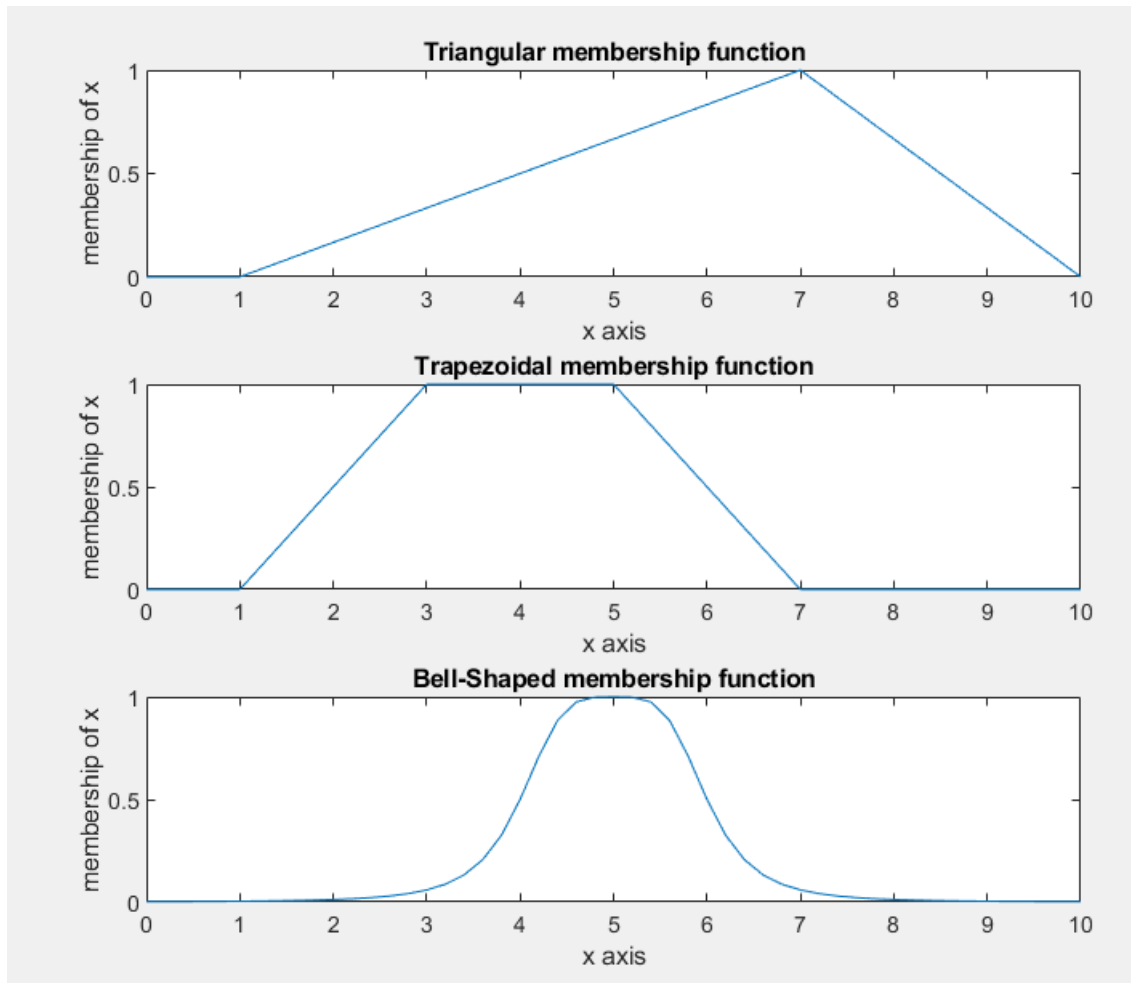
```
clc
clear all
close all

%Triangular Membership Function
x=(0:1:10)';
y1=trimf(x, [1 7 10]);
subplot(3,1,1)
plot(x,[y1]);
xlabel('x axis')
ylabel('membership of x')
title('Triangular membership function')

%Trapezoidal Membership Function
x=(0:1:10)';
y1=trapmf(x, [1 3 5 7]);
subplot(3,1,2)
plot(x,[y1]);
xlabel('x axis')
ylabel('membership of x')
title('Trapezoidal membership function')

%Bell-Shaped Membership Function
x=(0:0.2:10)';
y1=gbellmf(x, [1 2 5]);
subplot(3,1,3)
plot(x,[y1]);
xlabel('x axis')
ylabel('membership of x')
title('Bell-Shaped membership function')
```

Results:



Conclusion:

Reference:

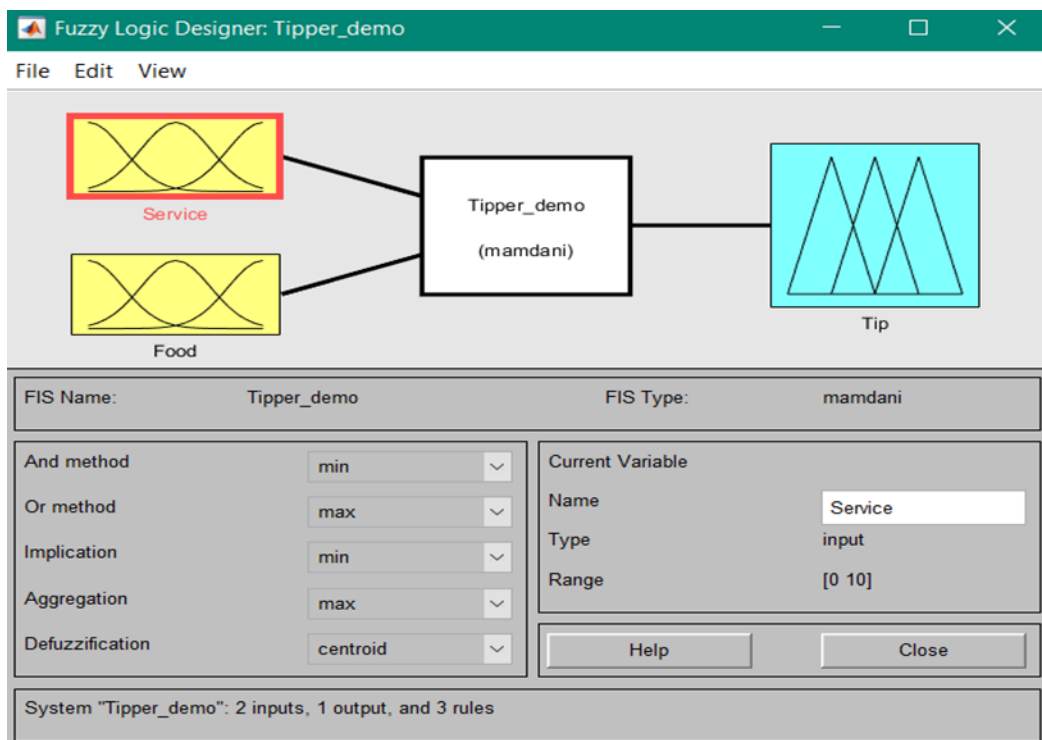
https://www.youtube.com/watch?v=whIR88tAANE&list=PLJ5C_6qdAvBFqAYS0P9INAogIMklG8E-9&index=3

Experiment No. 5:

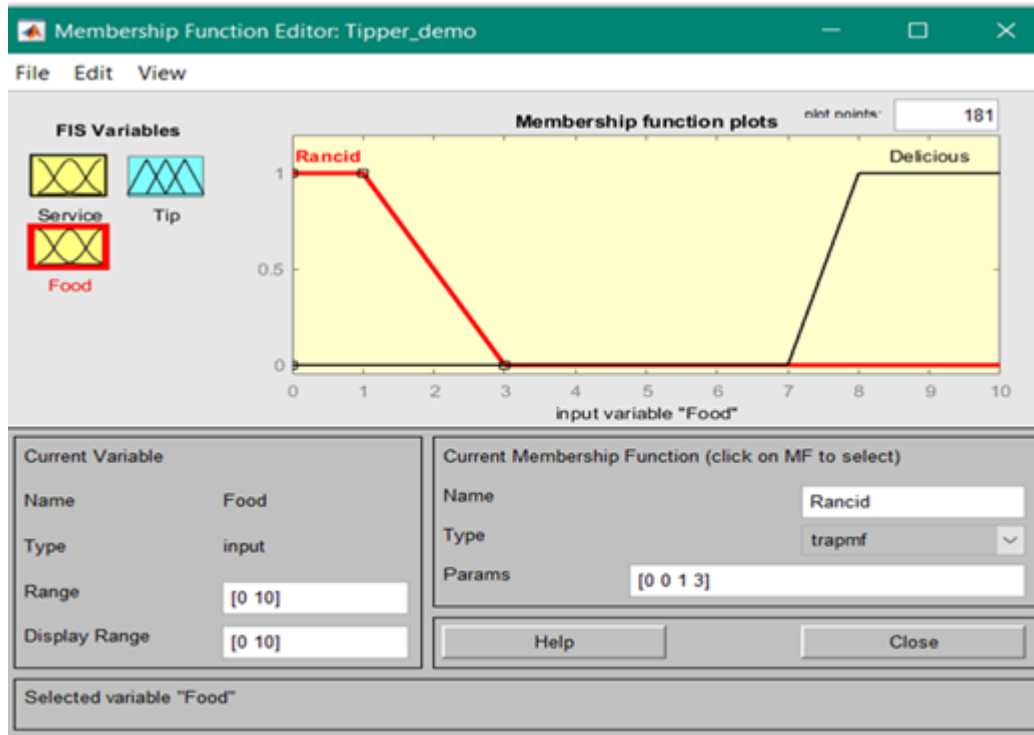
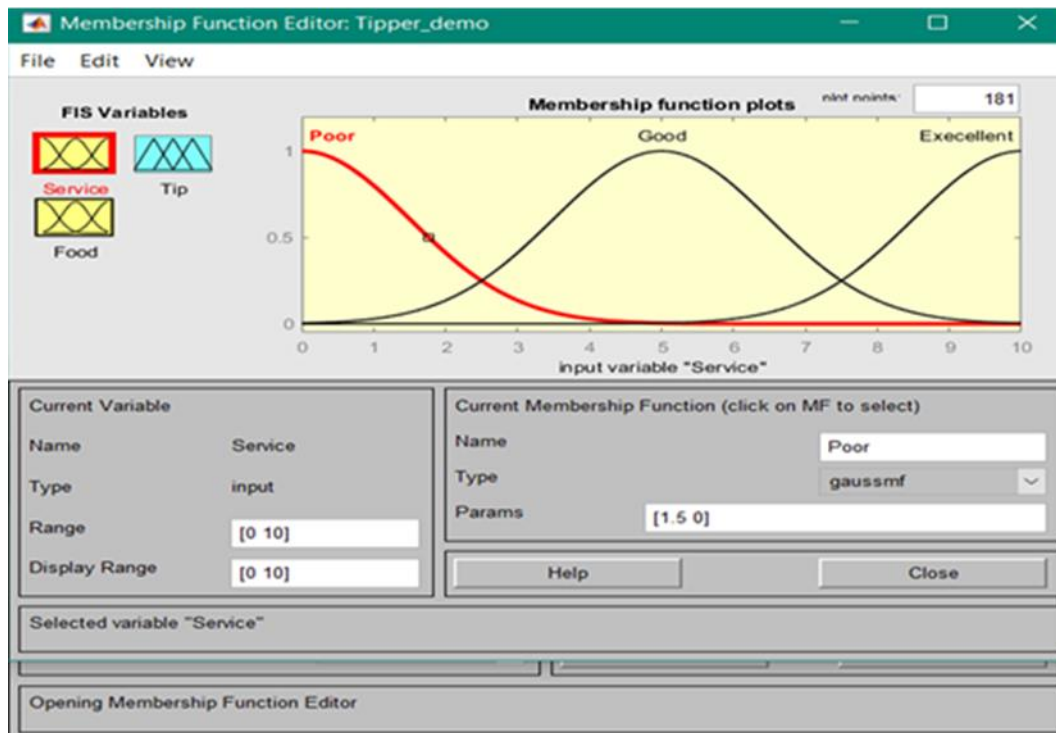
Title: Use Fuzzy toolbox to model tip value based on service and food quality.

Aim: Write down briefly about the importance/ applicability of fuzzy toolbox.

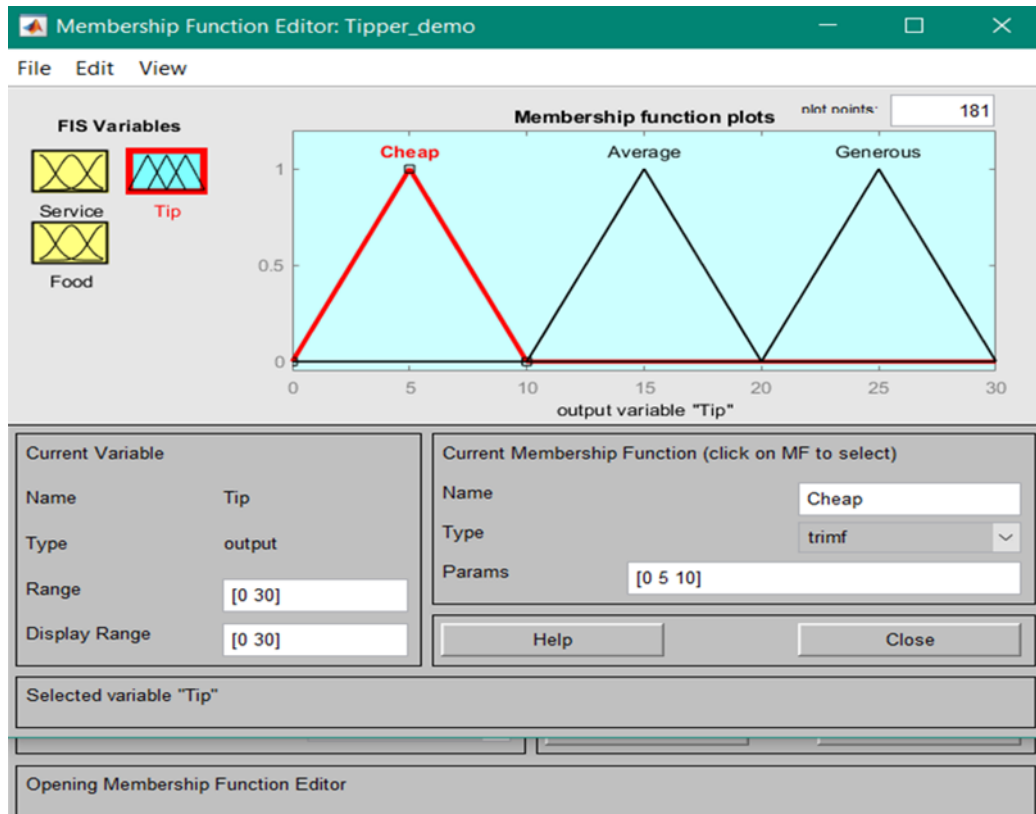
Procedure and Results: You are required to explain how fuzzy toolbox can be implemented.



Input linguistic variables: Service (Poor, Good, Excellent) & Food (Rancid, Delicious)

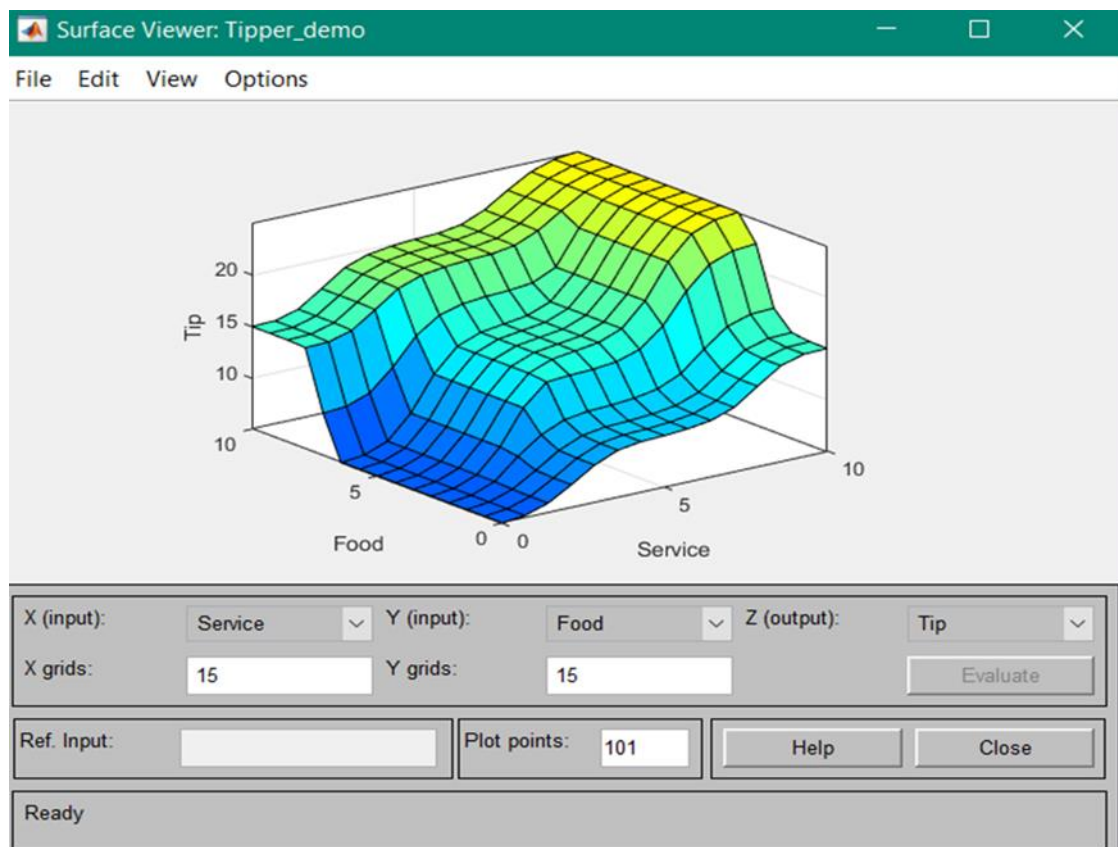


Output linguistic variables: Tip (Cheap, Average, Generous)



In general a compositional rule for inference involves the following procedure:

- Compute memberships of current inputs in the relevant antecedent fuzzy set of rule.
- If the antecedents are in conjunctive form, the AND operation is replaced by a minimum, if OR then by Maximum and similarly other operations are performed.
- Scale or clip the consequent fuzzy set of the rule by a minimum value found in step 2 since this gives the smallest degree to which the rule must fire.
- Repeat steps 1-3 for each rule in the rule base. Superpose the scaled or clipped consequent fuzzy sets formed by such a superposition. There are numerous variants of the defuzzification.



Conclusion:

Reference:

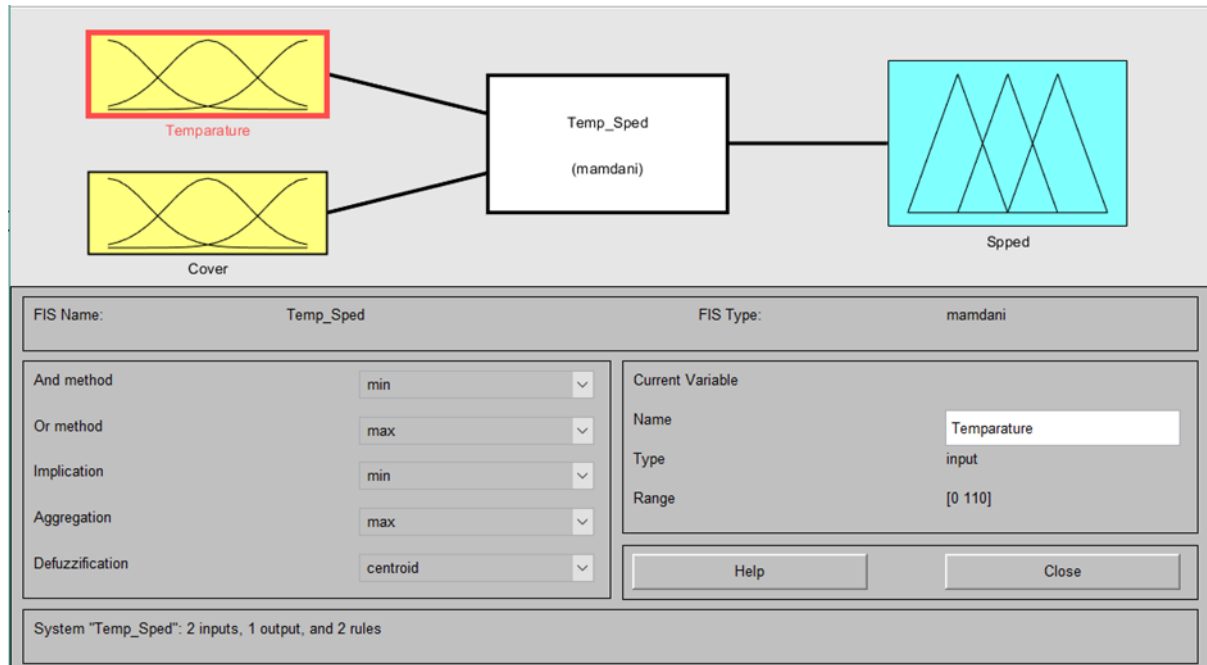
- <https://www.youtube.com/watch?v=O348HnWPm7A&t=1s>
- <https://www.youtube.com/watch?v=wBrHEXkTero&t=20s>
- https://www.youtube.com/watch?v=LupUhRJo_sU&t=3s

Experiment No. 6:

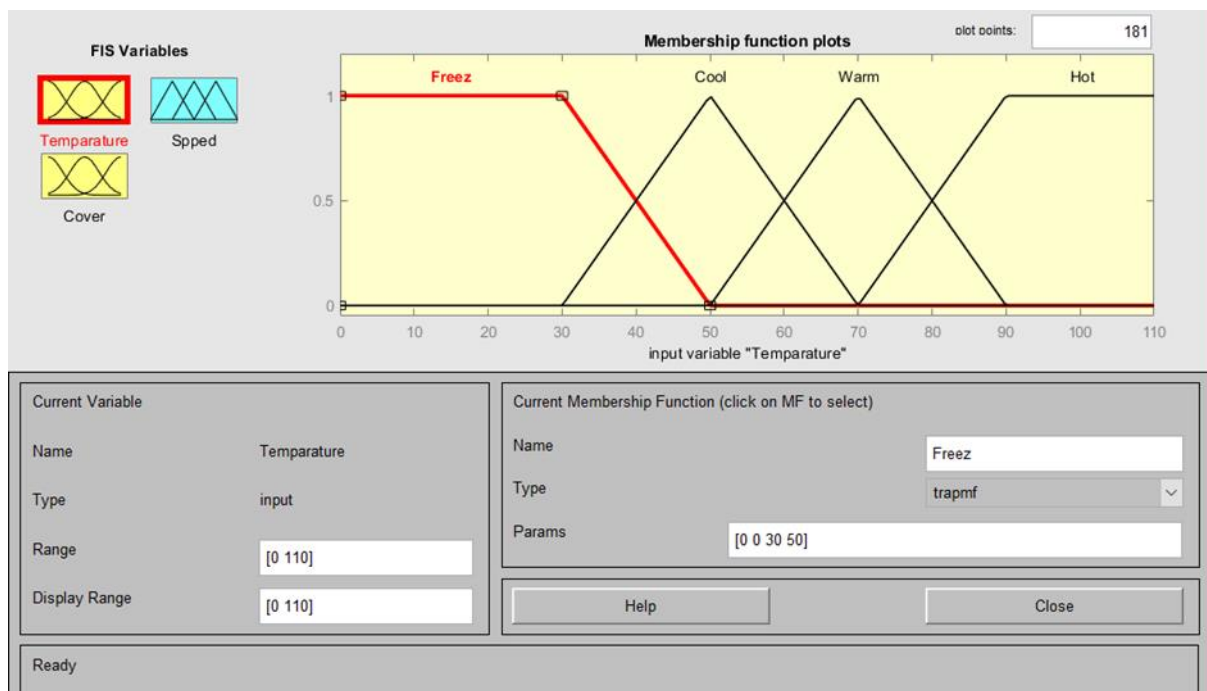
Title: Implement FIS Editor.

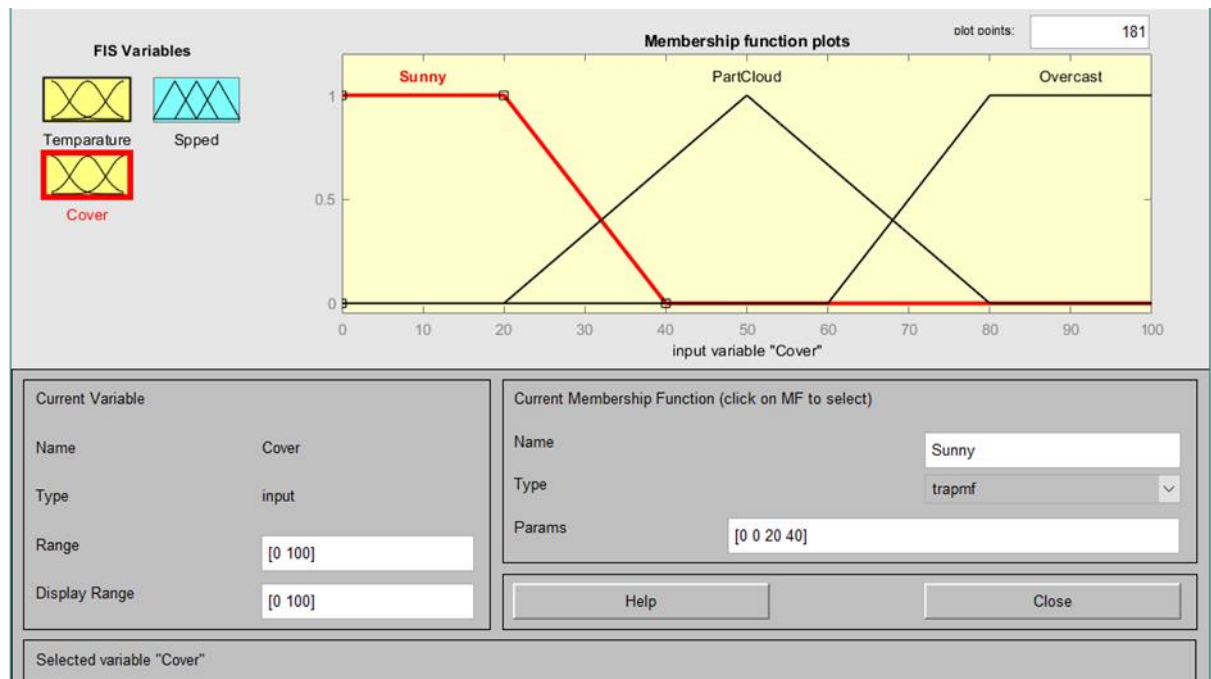
Aim: Write down briefly about the importance/ applicability of fuzzy editor.

Procedure and Results: You are required to explain how fuzzy editor can be implemented.

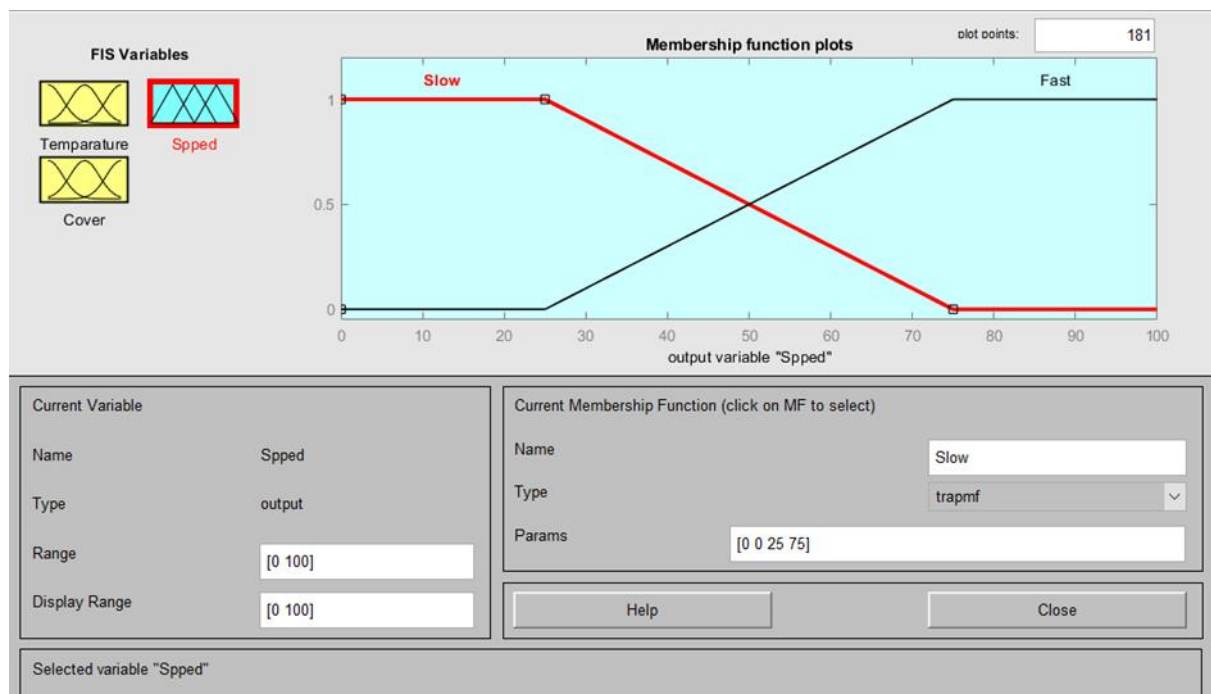


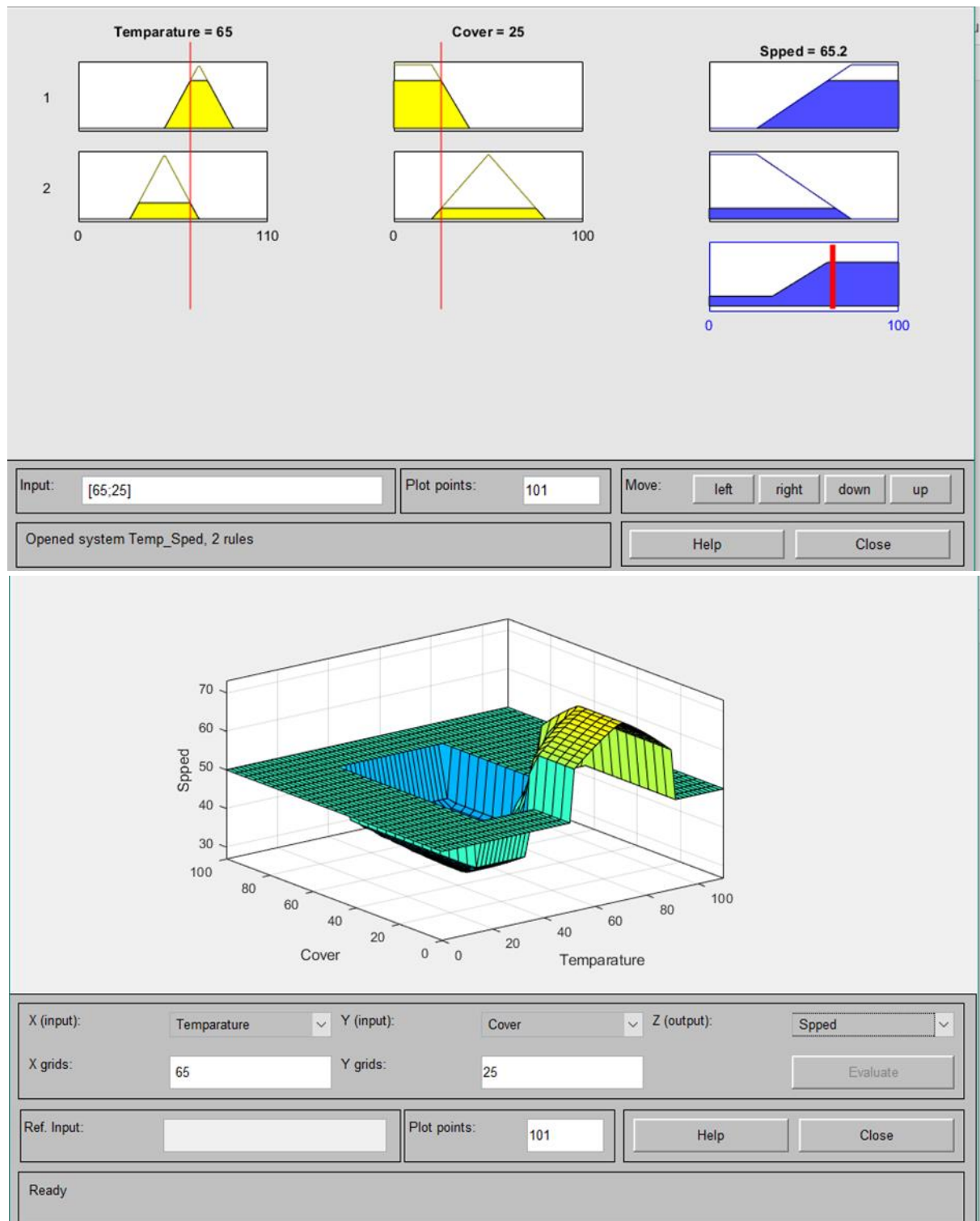
Input linguistic variables: Temperature (Freezing, Cool, Warm, Hot) & Cover (Sunny, Partly, Overcast)





Output linguistic variables: Speed (Slow, Fast)





Conclusion:

Reference:

- <https://www.youtube.com/watch?v=uBxWYTdF0UA>

Experiment No: 7:**Title: Write a MATLAB Program on Basic Operations of Genetic Algorithm.****Aim:** Write down briefly about the importance/ applicability of genetic algorithm.**Theory:** Write it as taught in the class.**Matlab Code:**

```
clc
clear all
close all

%generation of genes randomly
%generate 10 genes each of length 30 using binary encoding
pool = randi([0,1], 10, 30);

%fitness is decided based on summation of values for each gene
fitness = sum(pool,2);

%selection of best fittted genes
high_first = max(fitness);
for i = 1:10
    if fitness(i) == high_first
        a=i;
    end
end
parent_one = pool(a,:);
disp('Parent 1:'), disp (parent_one)

high_second = max(fitness(fitness<max(fitness)));
for i = 1:10
    if fitness(i) == high_second
        a=i;
    end
end
parent_two = pool(a,:);
disp('Parent 2:'), disp (parent_two)

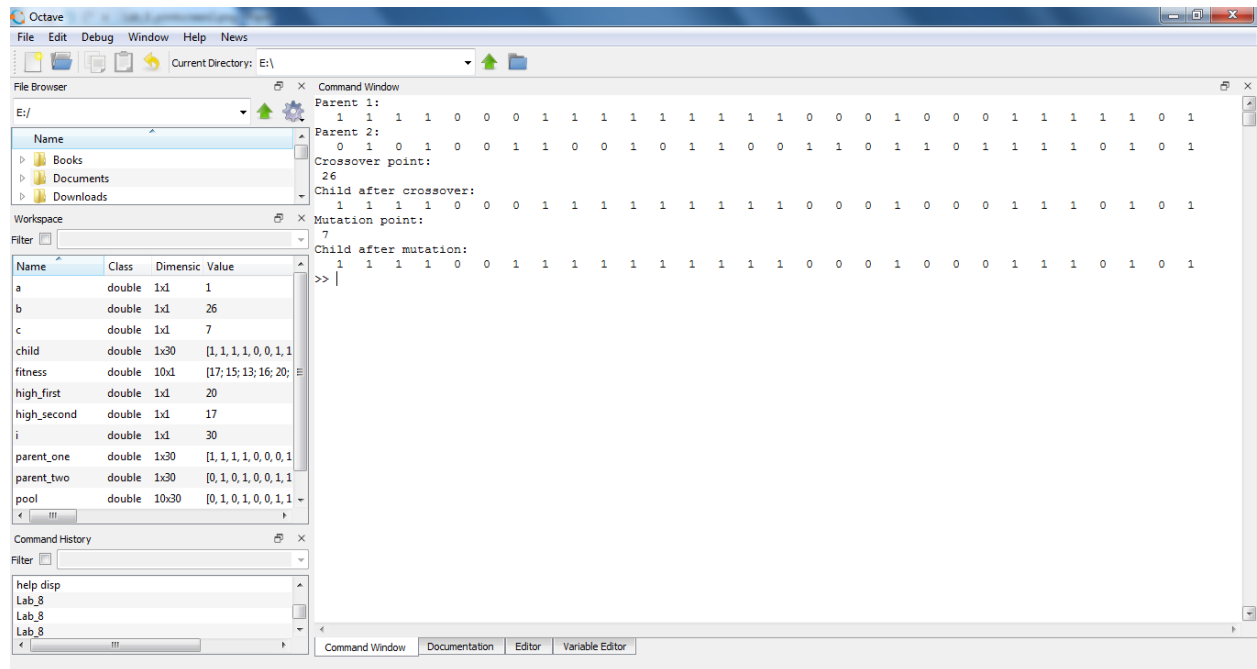
%crossover is done at any random point
b = randi([1 , 30]);
for i = 1:30
    if i <= b
        child(i) = parent_one(i);
    else
        child(i) = parent_two(i);
    end
end
disp('Crossover point:'), disp (b)
disp('Child after crossover:'), disp (child)
```

```

%mutation is done at any random point
c = randi([1 , 30]);
if child(c) == 0
    child(c) = 1;
end
disp('Mutation point:'), disp (c)
disp('Child after mutation:'), disp (child)

```

Results:



Conclusion:

Reference:

https://www.youtube.com/watch?v=mwXckn8up_U&list=PLsEIbHOtypISN0ZXjZ7Uhp0YwCToyrOLM&index=2

Experiment No: 8:

Title: Basic Understanding of Prolog Programming.

Aim: Write down briefly about the importance/ applicability of knowledge representation.

Theory: Write it as taught in the class.

Facts:

Pheonix is hot in summer.

Loss Angels is warm in winter.

Pheonix is warm in winter.

Query:

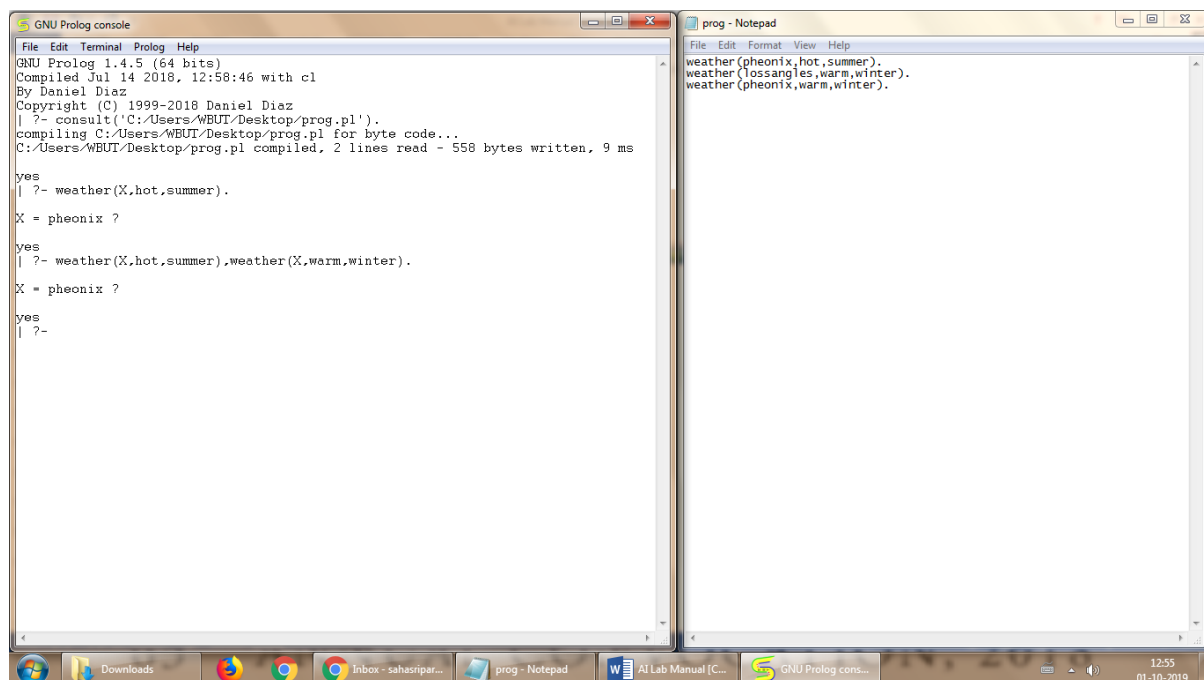
1. Which city is hot in summer?
2. Which city is hot in summer and warm in winter?

Code:

```
weather(pheonix,hot,summer) .  
weather(lossangles,warm,winter) .  
weather(pheonix,warm,winter) .
```

Query:

```
weather(X,hot,summer) .  
weather(X,hot,summer),weather(X,warm,winter) .
```



Facts:

- a. Ram likes mango.
- b. Seema is a girl.
- c. Bill likes Cindy.
- d. Rose is red.
- e. John owns gold.

Code:

```
likes(ram, mango).  
likes(bill, cindy).
```

```
girl(seema).
```

```
red(rose).
```

```
owns(john, gold).
```

Query:

```
likes(ram,What).  
likes(Who,cindy).  
red(What).  
owns(Who,What).
```

