EXPERIMENT NO: 7

AIM :

To Implement MP Model 3 input Majority

THEORY :

A neural network is a collection of nodes. These nodes are connected in some pattern to allow communication between the nodes.

Basic Mc-Culloh-Pit's Model

Mc-Culloh-Pits proposed a simple Model of a neuron as a binary threshold unit. The model of a neuron computer a weighted sum of its input from other units.

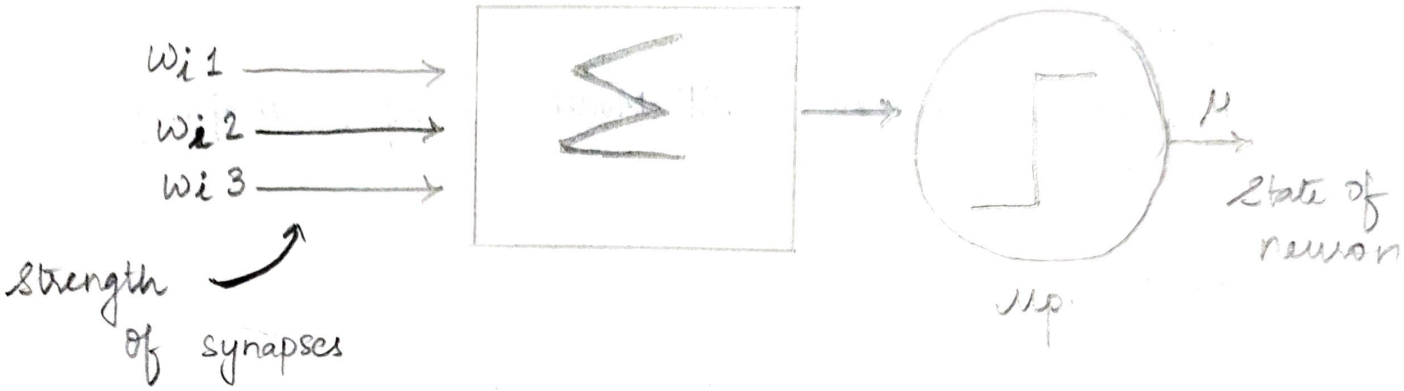
If outputs a zero or one according to whether sum is above or below threshold.

For 1st neuron we have

$$n_i(t+1) = \Theta \sum_j w_{ij}\, n_j(t) - \mu_i$$

where $\mu_i \longrightarrow$ Threshold value for unit i

$\sum_i w_{ij}\, n_i \longrightarrow$ Weighted sum of inputs.



Truth Table for 3 input Majority

x_1	x_2	x_3	y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

either 0 or 1 indicating that whether the state of neuron is firing or not. Time t is taken as discrete with one time unit elapsing per processing step.

$\theta(x)$ is the unit step function.
This is the threshold function

$$\theta(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

The W_{ij} represents the strength of the synapse connecting neuron j to neuron i, It can be positive or negative. If it is 0, then there are no synapses between i and j

$\mu_i \rightarrow$ called as cell parameter and it is a threshold value for unit i.

The weighted sum of inputs must reach or exceed the threshold for the neuron to fire. The sign of weight determines whether the input is excitory (+ve) or inhibitory (-ve).

Mc-Culloh model is a power computational device
It can perform any computations that an ordinary digital computer can do.

Equations

$w_1 x_1 + w_2 x_2 + w_3 x_3 \geq \theta$ firing $y = 1$

$w_1 x_1 + w_2 x_2 + w_3 x_3 < \theta$ Inhibition $y = 0$

Substitution

$x_1 = 0, x_2 = 0, x_3 = 0$

$0 < \theta$ — (1)

$x_1 = 0, x_2 = 0, x_3 = 1$

$w_3 < \theta$ — (2)

$x_1 = 0, x_2 = 1, x_3 = 0$

$w_2 < \theta$ — (3)

$x_1 = 0, x_2 = 1, x_3 = 1$

$w_2 + w_3 \geq \theta$

$x_1 = 0, x_2 = 0, x_3 = 0$

$w_1 < \theta$ — (5)

$x_1 = 1, x_2 = 0, x_3 = 1$

$w_1 + w_3 \geq \theta$ — (6)

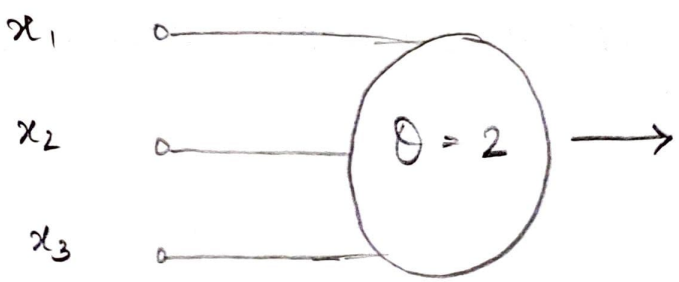
$x_1 = 1, x_2 = 1, x_3 = 0$

$w_1 + w_2 \geq \theta$ — (7)

$x_1 = 1, x_2 = 1, x_3 = 1$

$w_1 + w_2 + w_3 \geq \theta$ — (8)

Assumption $w_1 = w_2 = w_3 = 1$ $\theta = 2$



⇒ STEPS :-

i] Evaluate the Truth table

ii] Inhibition and firing equation.

(a) $w_1x_1 + w_2x_2 \geq \theta$ → firing

(b) $w_1x_1 + w_2x_2 < \theta$ → Inhibition.

(for two inputs x_1 and x_2)

iii] Substitution.

Substitute the values of x and y and on o/p y basis the equation is either categorised as inhibition or firing.

iv] Assumption.

Assume the values of w_1, w_2 and θ that satisfy all the above inhibition and firing equation.

⇒ CONCLUSION:

Thus we have successfully implement MP Model for 3 input majority using Python Programming Language.

Program:

```
x=list(map(int,input('Enter Inputs a,b,c : ').split()))
#Considering w1=1,w2=1,w3=1,Theta=2
w,m=0,0
for i in x: w+=(1*i)
if(w >= 2): m=1
print('w1=1,w2=1,w3=1,Theta=2 and Majority= {0}'.format(m))
```

Output:

```
============== RESTART: C:\Users\asus\Downloads\mpmodel_5117060.py =============
Enter Inputs a,b,c : 1 2 3
w1=1,w2=1,w3=1,Theta=2 and Majority= 1
>>>
============== RESTART: C:\Users\asus\Downloads\mpmodel_5117060.py =============
Enter Inputs a,b,c : 1 1 0
w1=1,w2=1,w3=1,Theta=2 and Majority= 1
>>>
============== RESTART: C:\Users\asus\Downloads\mpmodel_5117060.py =============
Enter Inputs a,b,c : 1 0 0
w1=1,w2=1,w3=1,Theta=2 and Majority= 0
>>>
```