Discrete Hopfield neural net

Training file for Hopfield neural net :

```
function [nn] = hopfield_net(x)
%to convert binary to bipolar
for i=1:size(x,2)
    if(x(i)==0|x(i)==-1)
        x(i)=-1;
    else
        x(i)=1;
    end
end
nn.input=x;
    nn.w=zeros(4,4);
    nn.w=x'*x;
    for i=1:4
    nn.w(i,i)=0;
    end
    disp('Weight matrix');
    disp(nn.w);
end
```

Test Convergence :

```
function [] = test_covg(net,x)
 y=x;
 yin=zeros(4,4);
 r=[4 2 1 3];
   for i=1:4
        yin(r(i))=x(r(i))+y*net.w(1:4,r(i));
        if yin(r(i))>0
            y(r(i))=1;
        else if yin(r(i))<0
            y(r(i))=-1;
            else
              y(r(i))=y(r(i));
            end
        end

        disp('output after update activation in unit');disp (r(i));
        disp(y);
     end

    if (y==net.input)
        disp('*the net has converged to the stored vector');
        disp('The Converged Ouput :');
        disp(y);
    else
        disp('unknown');

    end
    end
```

command window:

1-binary input:

```
>> [nn]=hopfield_net([1 1 0 0])
Weight matrix
    0    1   -1   -1
    1    0   -1   -1
   -1   -1    0    1
   -1   -1    1    0
nn =
   input: [1 1 -1 -1]
       w: [4x4 double]
```

---

*missing in two component:

```
>> test_covg(nn,[0 0 -1 -1])
output after update activation in unit
    4
    0    0   -1   -1
output after update activation in unit
    2
    0    1   -1   -1
output after update activation in unit
    1
    1    1   -1   -1
```

output after update activation in unit

3

1 1 -1 -1

*the net has converged to the stored vector

The Converged Ouput :

1 1 -1 -1

2-bipolar input:

>> [nn]=hopfield_net([1 1 -1 -1])

Weight matrix

0 1 -1 -1

1 0 -1 -1

-1 -1 0 1

-1 -1 1 0

nn =

input: [1 1 -1 -1]

w: [4x4 double]

---

*missing in two component:

>> test_covg(nn,[0 0 -1 -1])

output after update activation in unit

4

0 0 -1 -1

output after update activation in unit

2

0 1 -1 -1

output after update activation in unit

1

1 1 -1 -1

output after update activation in unit

3

1 1 -1 -1

*the net has converged to the stored vector

The Converged Ouput :

1 1 -1 -1

>> test_covg(nn,[0 0 -1 1])

output after update activation in unit

4

0 0 -1 1

output after update activation in unit

2

0 0 -1 1

output after update activation in unit

1

0 0 -1 1

output after update activation in unit

3

0 0 -1 1

unknown