Problem 1.

1. H=-1,J=0;



H=0,J=0;



H=1,J=0;



1. H=0,J=-1;



H=0,J=1:



1. H=4 J=-1



H=4 J=-2;



Problem 2.

For X1:



For X2



For X3:



For X4



Code:

For problem 1:

clear; close all;

N = 10;

X = sign(randn(N,N));

XX = X;

H = 4;

J = -1;

%define the neighbor

for i = 1:N

for j = 1:N

temp = [i-1,j; i+1,j; i,j-1; i,j+1];

ngh{i,j} = temp(min(temp, [], 2) >= 1 & max(temp, [], 2) <= N, :);

end

end

%K sweeps

K = 9;

for k = 2:K

for i = 1:N

for j=1:N

sn = H;

for r=1:length(ngh{i,j})

sn = sn+ J\*X(ngh{i,j}(r,1), ngh{i,j}(r,2));

end

p1 = exp(sn\*2)/(1+exp(2\*sn));

U =rand;

X(i,j) = (U<p1) - (U>p1);

end

end

XX(:,:,k) = X;

end

for k=1:K

subplot(3,3,k);

imagesc(XX(:,:,k));

colormap(gray);

title(sprintf('%d-th run', k));

end

Code for Problem 2:

%HM4 Second Problem

clear; close all;

load('hw4\_2\_data.mat');

N = 100;

X = X4;

XX = X;

H = 4;

J = -2;

%define the neighbor

for i = 1:N

for j = 1:N

temp = [i-1,j; i+1,j; i,j-1; i,j+1];

ngh{i,j} = temp(min(temp, [], 2) >= 1 & max(temp, [], 2) <= N, :);

end

end

%K sweeps

K = 5;

for k = 2:K

for i = 1:N

for j=1:N

mu = 0;

for r=1:length(ngh{i,j})

mu = mu + X(ngh{i,j}(r,1),ngh{i,j}(r,2));

end

mu=mu/length(ngh{i,j});

U =mu+sqrt(0.1)\*randn(1);

X(i,j) = U;

% X(i,j) = random('normal',mu,0.1);

end

end

XX(:,:,k) = X;

end

for k=1:K

subplot(2,3,k);

imagesc(XX(:,:,k));

colormap(gray);

title(sprintf('%d-th run', k));

% pause; clf;

end