clear all

close all

clc

n =10;

k = 1;

h=2;

xo=5;

yo=5;

x=0:10;

y=0:10;

for i=1:n+1

for j=1:n+1

alpha(i,j) = 0.01;

beta(i,j) = 0.3;

gamma(i,j) = 0.5;

end

end

delta1=0.1;

delta2=0.2;

delta3=0.3;

for i=1:n+1

for j=1:n+1

S0(i,j)=2\*exp(-((i-xo).^2 + (j-yo).^2 ));

A0(i,j)=1\*exp(-((i-xo).^2 + (j-yo).^2 )); %initial addicted people

R0(i,j)=0;

end

end

S=S0;

Snew=S0;

A=A0;

Anew=A0;

R=R0;

Rnew=R0;

for m=1:20

for i=2:n

for j=2:n

Snew(i,j)=S(i,j)+k\*(-alpha(i,j)\*S(i,j)\*A(i,j) ...

+delta1\*((S(i-1,j)-2\*S(i,j)+S(i+1,j))+S(i,j-1)-2\*S(i,j)+S(i,j+1))/h^2)

Anew(i,j)=A(i,j)+k\*(alpha(i,j)\*S(i,j)\*A(i,j) ...

+delta2\*((A(i-1,j)-2\*A(i,j)+A(i+1,j))+A(i,j-1)-2\*A(i,j)+A(i,j+1))/h^2 ...

+gamma(i,j)\*R(i,j)\*A(i,j));

Rnew(i,j)=R(i,j)+k\*(beta(i,j)\*A(i,j)+delta3\*(((R(i-1,j)-2\*R(i,j)...

+R(i+1,j))/h^2)+((R(i,j-1)-2\*R(i,j)+R(i,j+1))/(h^2)))-gamma(i,j)\*R(i,j)\*A(i,j));

end

end

for j=2:n

Snew(1,j)=0; %left boundary

Snew(n+1,j)=0; %right boundary

Anew(1,j)=0; %left boundary

Anew(n+1,j)=0; %right boundary

Rnew(1,j)=0; %left boundary

Rnew(n+1,j)=0; %right boundary

end

for i=2:n

Snew(i,1)=0; %bottom boundary

Snew(i,n+1)=0; %top boundary

Anew(i,1)=0; %bottom boundary

Anew(i,n+1)=0;

Rnew(i,1)=0; %bottom boundary

Rnew(i,n+1)=0;

end

subplot(1,3,1)

surf(x,y,Snew);

title(['time: ',num2str(m\*k),' seconds'])

shading interp;

zlim([0 2])

drawnow

subplot(1,3,2)

surf(x,y,Anew);

title(['time: ',num2str(m\*k),' seconds'])

shading interp;

zlim([0 2])

drawnow

subplot(1,3,3)

surf(x,y,Rnew);

title(['time: ',num2str(m\*k),' seconds'])

shading interp;

zlim([0 2])

drawnow

F(m) = getframe;

S=Snew;

A=Anew;

R=Rnew;

end

movie2avi(F,'test.avi')