```
clear all;
close all;
clc;
Img=imread('C:\Users\Administrator.PC--20140307PHG\Desktop\tupian.jpg');
a=Img;
Img=double(rgb2gray(Img));
b=Img;
g=fft2(Img);
g=fftshift(g);
[M,N]=size(g);
nn=2;
d0=25;
m=fix(M/2);
n=fix(N/2);

for i=1:M
        for j=1:N
            d=sqrt((i-m)^2+(j-n)^2);
            h=1/(1+0.414*(d/d0)^(2*nn));
            result(i,j)=h*g(i,j);
        end
end

result=ifftshift(result);
y2=ifft2(result);
y3=uint8(real(y2));
figure(1);
subplot(1,2,1);
imshow(uint8(a));
subplot(1,2,2);
imshow(uint8(y2));
title('butter滤波图');


Img=double(y3);
[nx,ny]=size(Img);
ic=floor(nx/2);
jc=floor(ny/2);
r=ic/3;
u = zeros([nx,ny]);

for i=1:nx
    for j=1:ny
        u(i,j)= r-sqrt((i-ic).^2+(j-jc).^2);
```

```
    end
end

figure(1);
imshow(uint8(Img));
hold on;
[c,h] = contour(u,[0 0],'r');
epsilon=1.0;
nu=250;
delta_t=0.1;
nn=0;

for n=1:600

    H_u = 0.5*(1+(2/pi)*atan(u/epsilon));


    c1=sum(sum(H_u.*Img))/sum(sum(H_u));
    c2=sum(sum((1-H_u).*Img))/sum(sum(1-H_u));


    delta_H = (1/pi)*epsilon./(epsilon^2+u.^2);
    m=delta_t*delta_H;
    C_1 = 1./sqrt(eps+(u(:,[2:ny,ny])-u).^2+0.25*(u([2:nx,nx],:)-u([1,1:nx-1],:)).^2);
    C_2 =
1./sqrt(eps+(u-u(:,[1,1:ny-1])).^2+0.25*(u([2:nx,nx],[1,1:ny-1])-u([1,1:nx-1],[1,1:ny-1])).^
2);
    C_3 = 1./sqrt(eps+(u([2:nx,nx],:)-u).^2+0.25*(u(:,[2:ny,ny])-u(:,[1,1:ny-1])).^2);
    C_4 =
1./sqrt(eps+(u-u([1,1:nx-1],:)).^2+0.25*(u([1,1:nx-1],[2:ny,ny])-u([1,1:nx-1],[1,1:ny-1])).^
2);
    C = 1+nu*m.*(C_1+C_2+C_3+C_4);
    u =
(u+nu*m.*(C_1.*u(:,[2:ny,ny])+C_2.*u(:,[1,1:ny-1])+C_3.*u([2:nx,nx],:)+C_4.*u([1,1:nx-1
],:) )+m.*((Img-c2).^2-(Img-c1).^2))./C;

end;
g=Img;
g(u>0)=c2+10;

f=Img;
f(u>0)=255;
f(u<0)=0;
figure(2);
```

```
imshow(uint8(f));
hold on;
[c_r,h] = contour(u,[0 0],'r');
hold off;


T=100;
bw=zeros(size(f));
low_T=find(f<=T);
high_T=find(f>T);
bw(low_T)=0;
bw(high_T)=1;
figure(3);
imshow(bw);
bw = bwareaopen(bw,30);
se = strel('disk',2);
bw = imclose(bw,se);
bw = imfill(bw,'holes');
figure(31);
imshow(bw);

I= zeros([nx,ny]);

for i=1:nx
      for j=1:ny
          I(i,j)= 0.5*b(i,j)+0.5*c1*bw(i,j);
      end
end

figure(5);
imshow(uint8(I));




Img=I;
se = strel('disk',2);

Img = imclose(Img,se);

for n=1:600

      H_u = 0.5*(1+(2/pi)*atan(u/epsilon));
```

```
        c1=sum(sum(H_u.*Img))/sum(sum(H_u));
        c2=sum(sum((1-H_u).*Img))/sum(sum(1-H_u));


        delta_H = (1/pi)*epsilon./(epsilon^2+u.^2);
        m=delta_t*delta_H;
        C_1 = 1./sqrt(eps+(u(:,[2:ny,ny])-u).^2+0.25*(u([2:nx,nx],:)-u([1,1:nx-1],:)).^2);
        C_2 =
1./sqrt(eps+(u-u(:,[1,1:ny-1])).^2+0.25*(u([2:nx,nx],[1,1:ny-1])-u([1,1:nx-1],[1,1:ny-1])).^
2);
        C_3 = 1./sqrt(eps+(u([2:nx,nx],:)-u).^2+0.25*(u(:,[2:ny,ny])-u(:,[1,1:ny-1])).^2);
        C_4 =
1./sqrt(eps+(u-u([1,1:nx-1],:)).^2+0.25*(u([1,1:nx-1],[2:ny,ny])-u([1,1:nx-1],[1,1:ny-1])).^
2);
        C = 1+nu*m.*(C_1+C_2+C_3+C_4);
        u =
(u+nu*m.*(C_1.*u(:,[2:ny,ny])+C_2.*u(:,[1,1:ny-1])+C_3.*u([2:nx,nx],:)+C_4.*u([1,1:nx-1
],:) )+m.*((Img-c2).^2-(Img-c1).^2))./C;


end;

F=Img;
F(u>0)=255;
F(u<0)=0;
figure(6);
imshow(uint8(F));
  hold on;
        [c_r,h] = contour(u,[0 0],'r');
  hold off;



Img=g;

[nx,ny]=size(Img);

ic=floor(nx/2);
jc=floor(ny/2);
r=ic/3;

u1 = zeros([nx,ny]);
```

```
for i=1:nx
    for j=1:ny
        u1(i,j)= r-sqrt((i-ic).^2+(j-jc).^2);
    end
end

figure(7);
imshow(uint8(Img));
hold on;
[c,h] = contour(u1,[0 0],'b');

epsilon=1.0;
nu=250;
delta_t=0.5;
nn=0;

for n=1:6000

    H_u = 0.5*(1+(2/pi)*atan(u1/epsilon));


    c11=sum(sum(H_u.*Img))/sum(sum(H_u));
    c21=sum(sum((1-H_u).*Img))/sum(sum(1-H_u));


    delta_H = (1/pi)*epsilon./(epsilon^2+u1.^2);
    m=delta_t*delta_H;
    C_1 = 1./sqrt(eps+(u1(:,[2:ny,ny])-u1).^2+0.25*(u1([2:nx,nx],:)-u1([1,1:nx-1],:)).^2);
    C_2 =
1./sqrt(eps+(u1-u1(:,[1,1:ny-1])).^2+0.25*(u1([2:nx,nx],[1,1:ny-1])-u1([1,1:nx-1],[1,1:ny-
1])).^2);
    C_3 = 1./sqrt(eps+(u1([2:nx,nx],:)-u1).^2+0.25*(u1(:,[2:ny,ny])-u1(:,[1,1:ny-1])).^2);
    C_4 =
1./sqrt(eps+(u1-u1([1,1:nx-1],:)).^2+0.25*(u1([1,1:nx-1],[2:ny,ny])-u1([1,1:nx-1],[1,1:ny-
1])).^2);
    C = 1+nu*m.*(C_1+C_2+C_3+C_4);
    u1 =
(u1+nu*m.*(C_1.*u1(:,[2:ny,ny])+C_2.*u1(:,[1,1:ny-1])+C_3.*u1([2:nx,nx],:)+C_4.*u1([1,
1:nx-1],:) )+m.*((Img-c21).^2-(Img-c11).^2))./C;

end;
B=Img;
figure(8);
imshow(uint8(B));
```

```
hold on;
            [c_b,h] = contour(u1,[0 0],'b');
hold off;
f1=B;
f1(u1>0)=0;
f1(u1<0)=255;

figure(9);
imshow(uint8(f1));



T=100;
bw1=zeros(size(f1));
low_T=find(f1<=T);
high_T=find(f1>T);
bw1(low_T)=0;
bw1(high_T)=1;
figure(10);
imshow(bw1);
se = strel('disk',2);
bw1 = imclose(bw1,se);
bw1 = imfill(bw1,'holes');
bw1 = bwareaopen(bw1,30);
figure(11);
imshow(bw1);

I1= zeros([nx,ny]);
for i=1:nx
      for j=1:ny
           I1(i,j)= 0.5*g(i,j)+0.5*(c11+10)*bw1(i,j);
      end
end

figure(12);
imshow(uint8(I1));



Img=I1;
se = strel('disk',2);
Img = imopen(Img,se);
Img = imclose(Img,se);
```

```
epsilon=1.0;
nu=250;
delta_t=0.5;
nn=0;

for n=1:6000

    H_u = 0.5*(1+(2/pi)*atan(u1/epsilon));

    c11=sum(sum(H_u.*Img))/sum(sum(H_u));
    c21=sum(sum((1-H_u).*Img))/sum(sum(1-H_u));

    delta_H = (1/pi)*epsilon./(epsilon^2+u1.^2);
    m=delta_t*delta_H;
    C_1 = 1./sqrt(eps+(u1(:,[2:ny,ny])-u1).^2+0.25*(u1([2:nx,nx],:)-u1([1,1:nx-1],:)).^2);
    C_2 =
1./sqrt(eps+(u1-u1(:,[1,1:ny-1])).^2+0.25*(u1([2:nx,nx],[1,1:ny-1])-u1([1,1:nx-1],[1,1:ny-
1])).^2);
    C_3 = 1./sqrt(eps+(u1([2:nx,nx],:)-u1).^2+0.25*(u1(:,[2:ny,ny])-u1(:,[1,1:ny-1])).^2);
    C_4 =
1./sqrt(eps+(u1-u1([1,1:nx-1],:)).^2+0.25*(u1([1,1:nx-1],[2:ny,ny])-u1([1,1:nx-1],[1,1:ny-
1])).^2);
    C = 1+nu*m.*(C_1+C_2+C_3+C_4);
    u1 =
(u1+nu*m.*(C_1.*u1(:,[2:ny,ny])+C_2.*u1(:,[1,1:ny-1])+C_3.*u1([2:nx,nx],:)+C_4.*u1([1,
1:nx-1],:) )+m.*((Img-c21).^2-(Img-c11).^2))./C;

end;

B1=Img;
B1(u1>0)=125;
B1(u>0)=255;
B1((u1<0)&(u<0))=0;
figure(13);
subplot(1,2,1);
imshow(uint8(a));
title('原图');
subplot(1,2,2);
imshow(uint8(B1));
title('1b25滤迭代600*6000');
hold on;
[c_b,h] = contour(u1,[0 0],'b');
[c_r,h] = contour(u,[0 0],'r');
```

```
hold off;
```