```
I=imread('..\data\输入\\r2_5.bmp');
I=im2double(I);
[M,N]=size(I);
figure;
imshow(I);
%二值化
I=imbinarize(I,0.5);
figure;
imshow(I);
%形态学处理
I=~bwareaopen(~I,50);
I=bwareaopen(I,50);
figure;
imshow(I);
%细化
Ibw = ~bwmorph(~I, 'thin', inf);
figure;
imshow(Ibw);
%细化后处理
C = ~Pruning(~Ibw, 5);
%去除桥接
B1=[0,1,1;1,0,1;1,1,0];
B2=[1,0,0;0,1,0;0,0,1];
hm=bwhitmiss(~Ibw,B1,B2);
[x,y]=find(hm==1);
C(x-1:x+1,y-1:y+1)=1;
figure;
imshow(C);
%细节点检测
```

```
lcn=zeros(size(I));
for i=2:M-1
    for j=2:N-1
        if C(i,j)==0
            cn=abs(C(i-1,j)-C(i-1,j-1))+abs(C(i-1,j+1)-C(i-1,j))+abs(C(i,j+1)-C(i-1,j+1))...
            +abs(C(i+1,j+1)-C(i,j+1))+abs(C(i+1,j)-C(i+1,j+1))+abs(C(i+1,j-1)-C(i+1,j))...
            +abs(C(i,j-1)-C(i+1,j-1))+abs(C(i-1,j-1)-C(i,j-1));
            lcn(i,j)=cn/2;
        end
    end
end
figure;
imshow(C);
%标注
[row,col]=find(lcn==1);
hold on, plot(col,row,'gs','MarkerSize',10)
[row,col]=find(lcn==3);
hold on, plot(col,row,'rs','MarkerSize',10)

%去掉边缘细节点
fun2 = @(x) std2(x);
ls = nlfilter(I,[3 3],fun2);
lbd=zeros(size(I));
for i=5:M-5
    for j=5:364
        if ls(i,j)~=0
            lbd(i:i+1,j:j+10)=1;
            break;
        end
```

```
        end
    end
    for i=5:M-5
        for j=5:M-5
            if ls(M-i,N-j)~=0
                lbd(M-i,N-j-7:N-j)=1;
                break;
            end
        end
    end
    lcn(lbd==1)=0;
    figure;
    imshow(C);
    %标注
    [row,col]=find(lcn==1);
    hold on, plot(col,row,'gs','MarkerSize',10)
    [row,col]=find(lcn==3);
    hold on, plot(col,row,'rs','MarkerSize',10)

    %---------------------


    function C = Pruning(A, len)

    B = CreateEndpointSE();
    X1 = A;
    for k = 1:len
        endpoints = false(size(A));
        for m = 1:size(B,1)
            endpoints = endpoints | bwhitmiss(X1, B{m,1}, B{m,2});
```

```
        end
        X1(endpoints) = 0;
    end

    X2 = false(size(A));
    for m = 1:size(B,1)
        endpoints = bwhitmiss(X1, B{m,1}, B{m,2});
        X2(endpoints) = 1;
    end

    se = strel(ones(3,3));
    X3 = X2;
    for k = 1:len
        X3 = imdilate(X3, se) & A;
    end

    C = X3 | X1;
    end

    %--------------------
    function B = CreateEndpointSE()
    B{1,1} = [0 0 0; 1 1 0; 0 0 0];
    B{1,2} = [0 1 1; 0 0 1; 0 1 1];
    for k = 2:4
        B{k,1} = rot90(B{k-1,1});
        B{k,2} = rot90(B{k-1,2});
    end
    B{5,1} = [1 0 0; 0 1 0; 0 0 0];
    B{5,2} = [0 1 1; 1 0 1; 1 1 1];
```

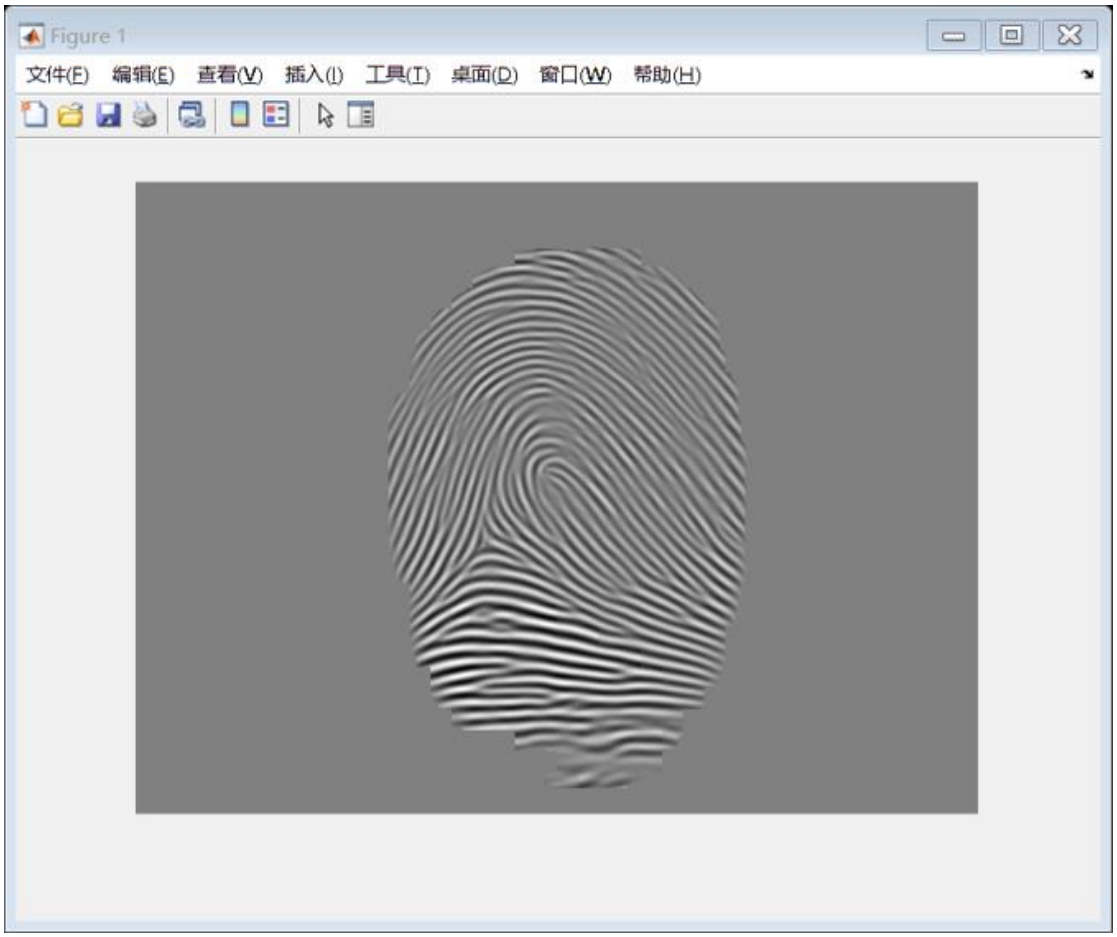
```
for k = 6:8

    B{k,1} = rot90(B{k-1,1});

    B{k,2} = rot90(B{k-1,2});

end

end
```



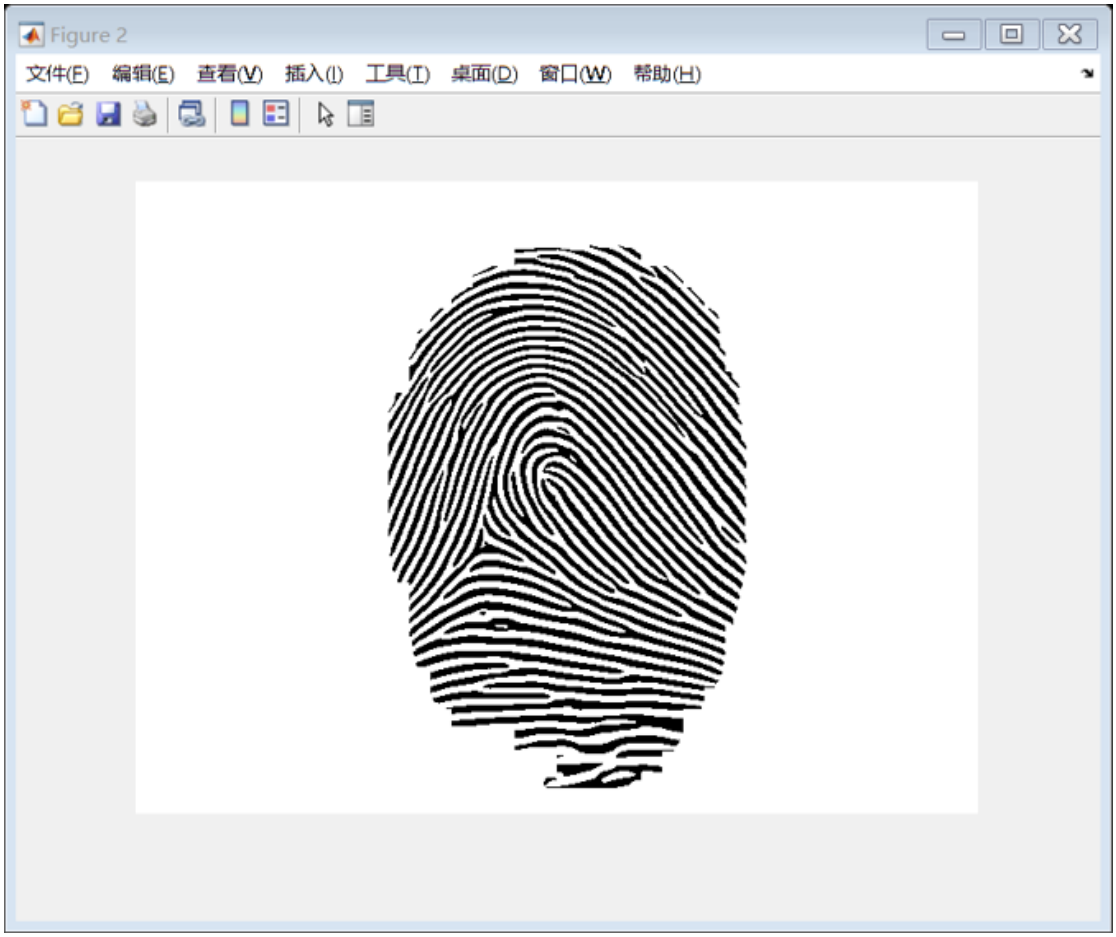


Figure 2
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)

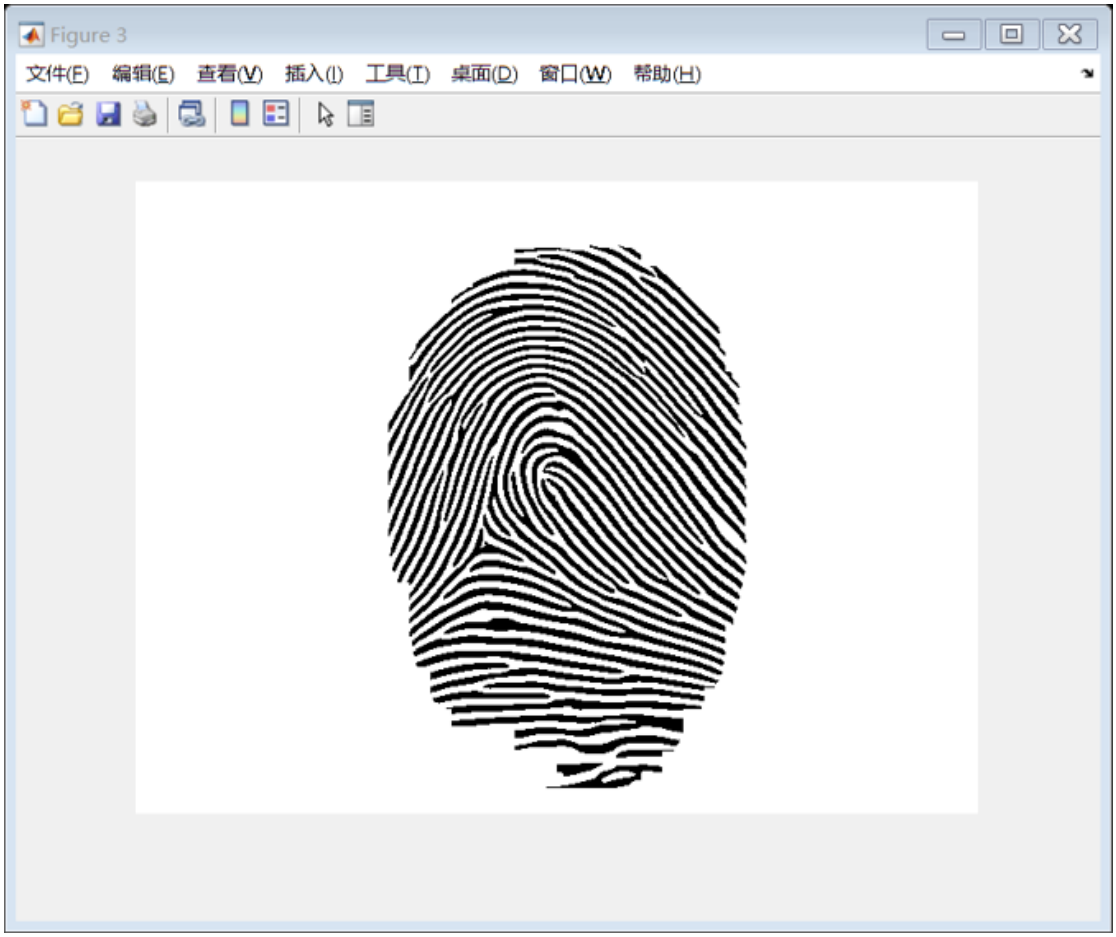


Figure 3
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)

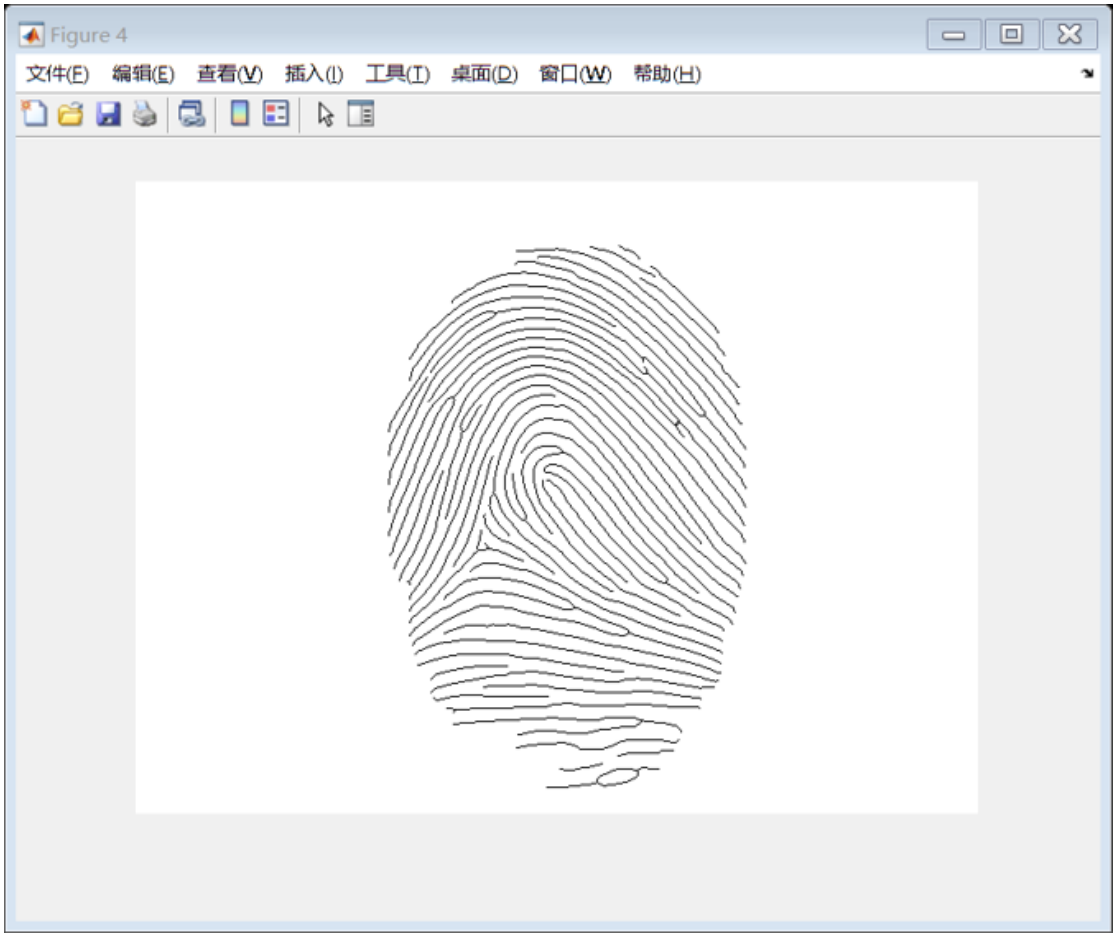


Figure 4
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)

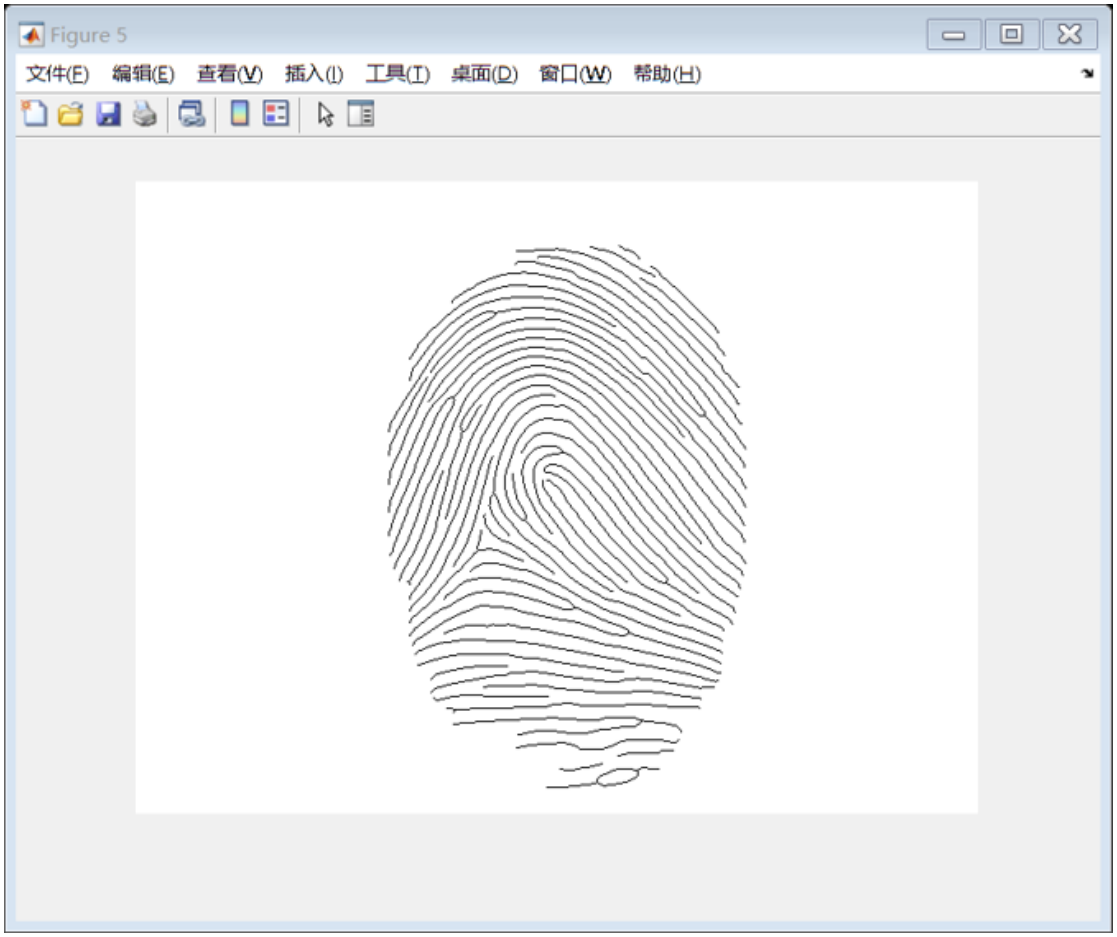


Figure 5
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)

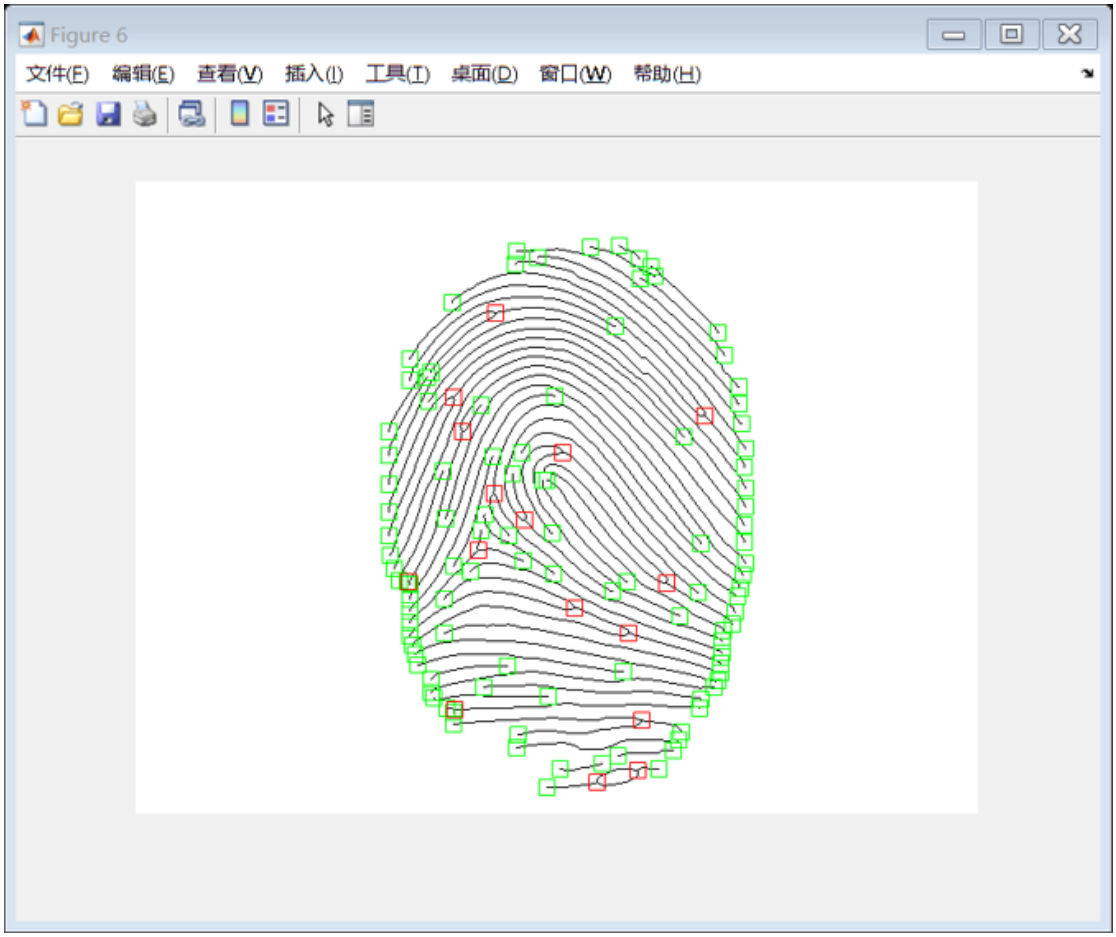
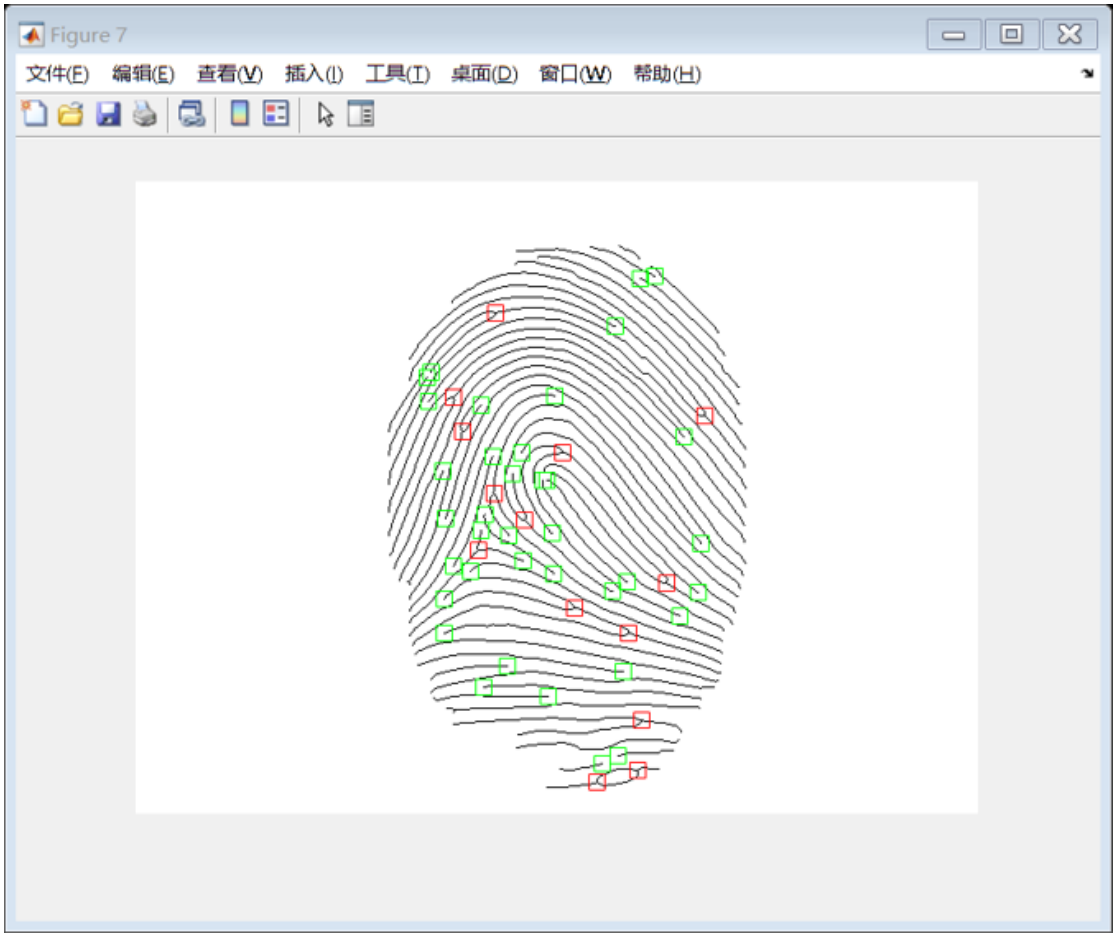


Figure 6
文件(F) 编辑(E) 查看(V) 插入(I) 工具(T) 桌面(D) 窗口(W) 帮助(H)



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