

تشخیص خط با استفاده از تبدیل هاف

(فصل ۱۱ کتاب دیویس-ویرایش چهارم)

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اردیبهشت ماه ۱۳۹۴
دانشگاه آزاد اسلامی واحد کاشان

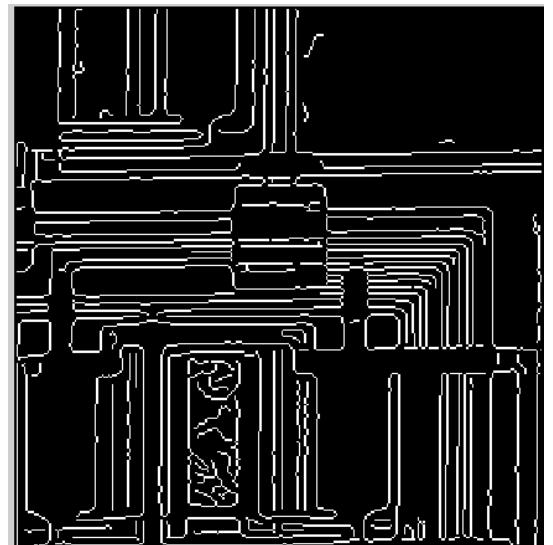
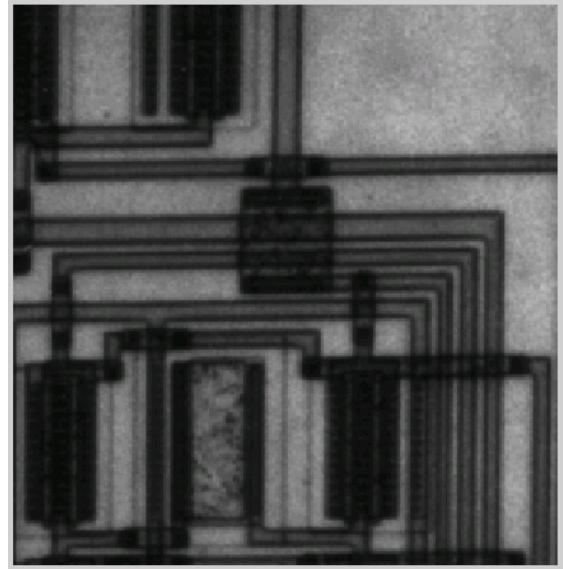
کدهای مهم

- ۳ دستور اصلی برای تشخیص خط با استفاده از تبدیل هاف داریم:

- **[H theta rho]=hough(BW);**
- **p=houghpeaks(H);**
- **lines=houghlines(BW,theta,rho,p)**

مثال

- %% Load Image
-
- `f=imread('circuit.tif');`
- `f=im2double(f);`
-
- %% Perform Hough Transformation
-
- `BW=edge(f,'canny');`
-
- `[H theta rho]=hough(BW);`



edge

Find edges in grayscale image

Syntax

```
BW = edge(I)  
  
BW = edge(I,'sobel')  
BW = edge(I,'sobel',thresh)  
BW = edge(I,'sobel',thresh,direction)  
[BW,thresh] = edge(I,'sobel',...)  
  
BW = edge(I,'prewitt')  
BW = edge(I,'prewitt',thresh)  
BW = edge(I,'prewitt',thresh,direction)  
[BW,thresh] = edge(I,'prewitt',...)  
  
BW = edge(I,'roberts')  
BW = edge(I,'roberts',thresh)  
[BW,thresh] = edge(I,'roberts',...)  
  
BW = edge(I,'log')  
BW = edge(I,'log',thresh)  
BW = edge(I,'log',thresh,sigma)  
[BW,threshold] = edge(I,'log',...)  
  
BW = edge(I,'zerocross',thresh,h)  
[BW,thresh] = edge(I,'zerocross',...)  
  
BW = edge(I,'canny')  
BW = edge(I,'canny',thresh)  
BW = edge(I,'canny',thresh,sigma)  
[BW,threshold] = edge(I,'canny',...)
```

hough

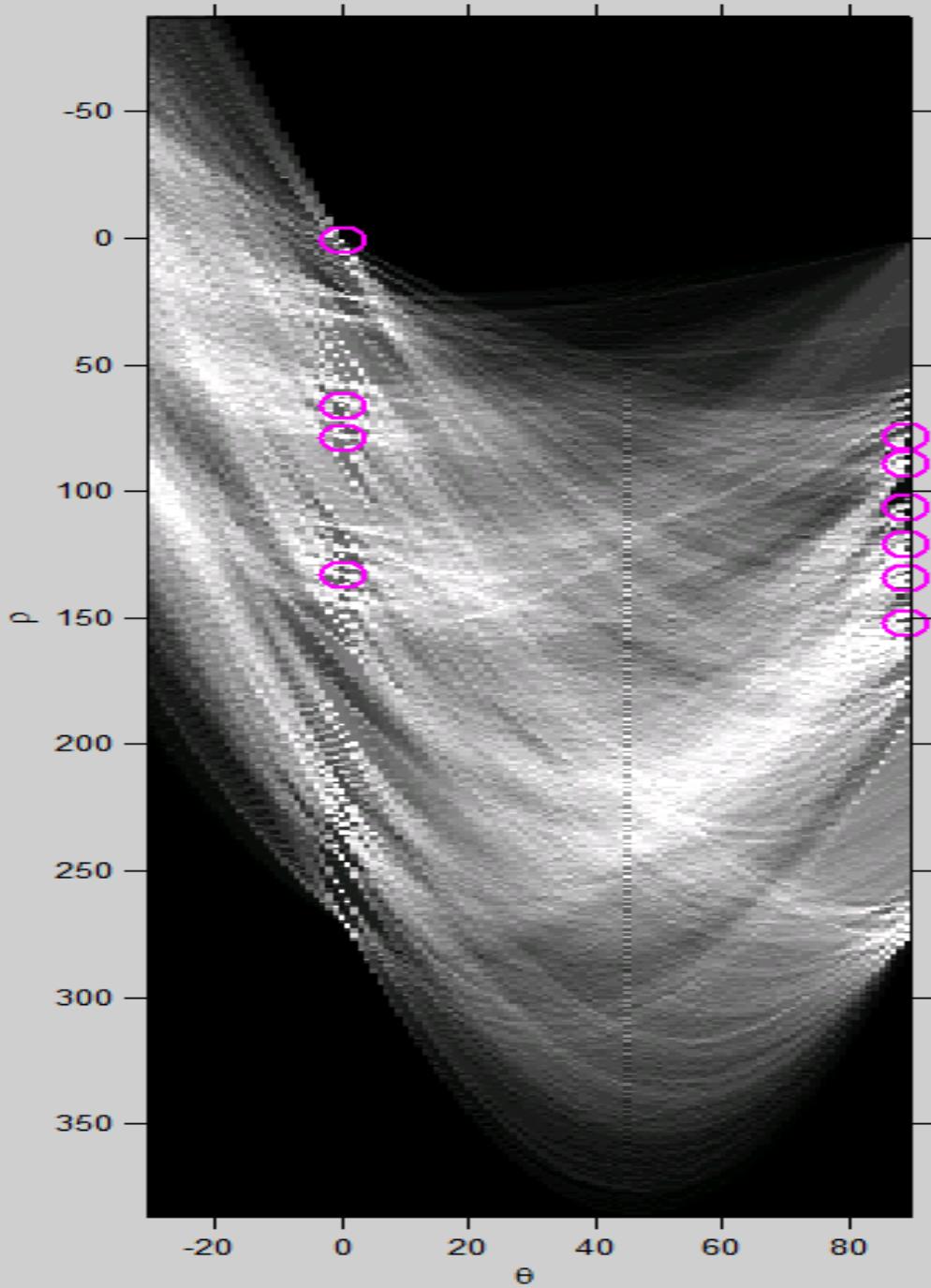
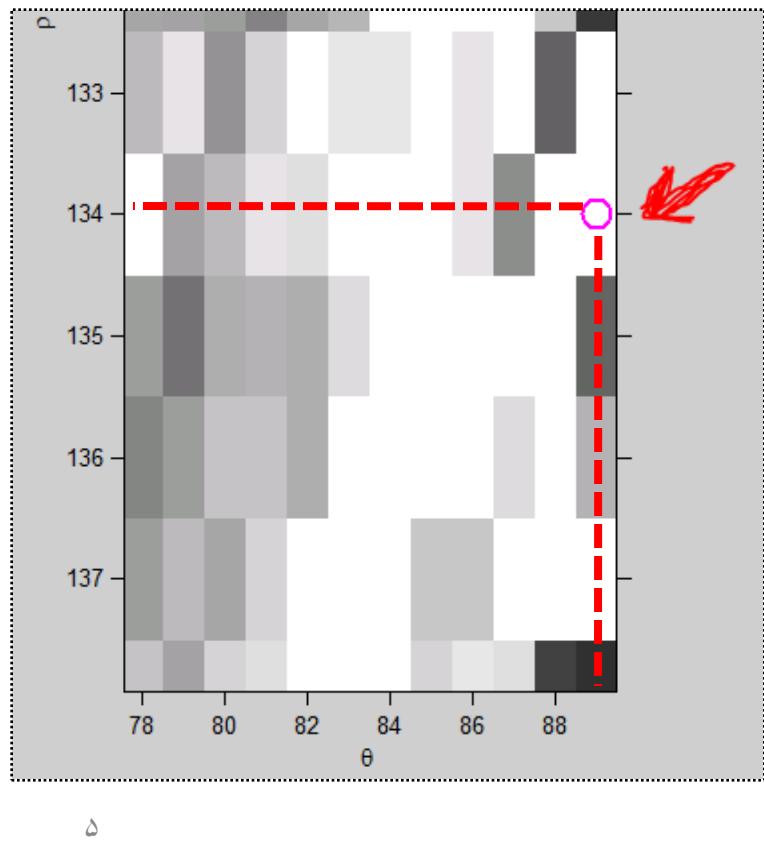
Hough transform

Syntax

```
[H, theta, rho] = hough(BW)  
[H, theta, rho] = hough(BW, ParameterName, ParameterValue)
```

- The function returns *H*, the Hough transform matrix.
- *theta* (in degrees) and *rho* are the arrays of *rho* and *theta* values over which *hough* generates the Hough transform matrix.

- % Find Hough Peaks
- $p = \text{houghpeaks}(H, 10);$



- **%% Find Lines**
- **lines=houghlines(BW,theta,rho,p);**

```
>> lines(5)

ans =

    point1: [76 120]
    point2: [220 118]
    theta: 88.8208
    rho: 121
```

- **%%Find Length**
- `for k=1:numel(lines)`
- `lines(k).length=norm(lines(k).point1-lines(k).point2);`
- `end`

NORM;;
76-220=-144
120-118=2
Length=sqrt((-144^2)-(2^2))=144.01

```
>> lines(5)

ans =
    point1: [76 120]
    point2: [220 118]
    theta: 88.8208
    rho: 121
    length: 144.0139
```

- %%Find Max Length

- [MaxLength MaxLengthIndex]=max([lines.length]);

```
>> max([lines.length])
```

ans =

144.0139

```
>> [a b]=max([lines.length])
```

a =

144.0139

b = شماره خطی که بیشترین طول را دارد

5

```
>> lines(5)
```

ans =

```
point1: [76 120]
point2: [220 118]
theta: 88.8208
rho: 121
length: 144.0139
```

• %% Show Results

• `H2=imadjust(H/max(H(:)));`

• `figure;` پنجره گراف جدید باز می کند

• `subplot(1,2,1);` صفحه گراف را به دو قسمت مساوی تقسیم میکند

۱ ۲ ۳

• `imshow(H2,'Colormap','gray',...`

`'XData',theta,'YData',rho);`

• `axis on;`

• `hold on;`

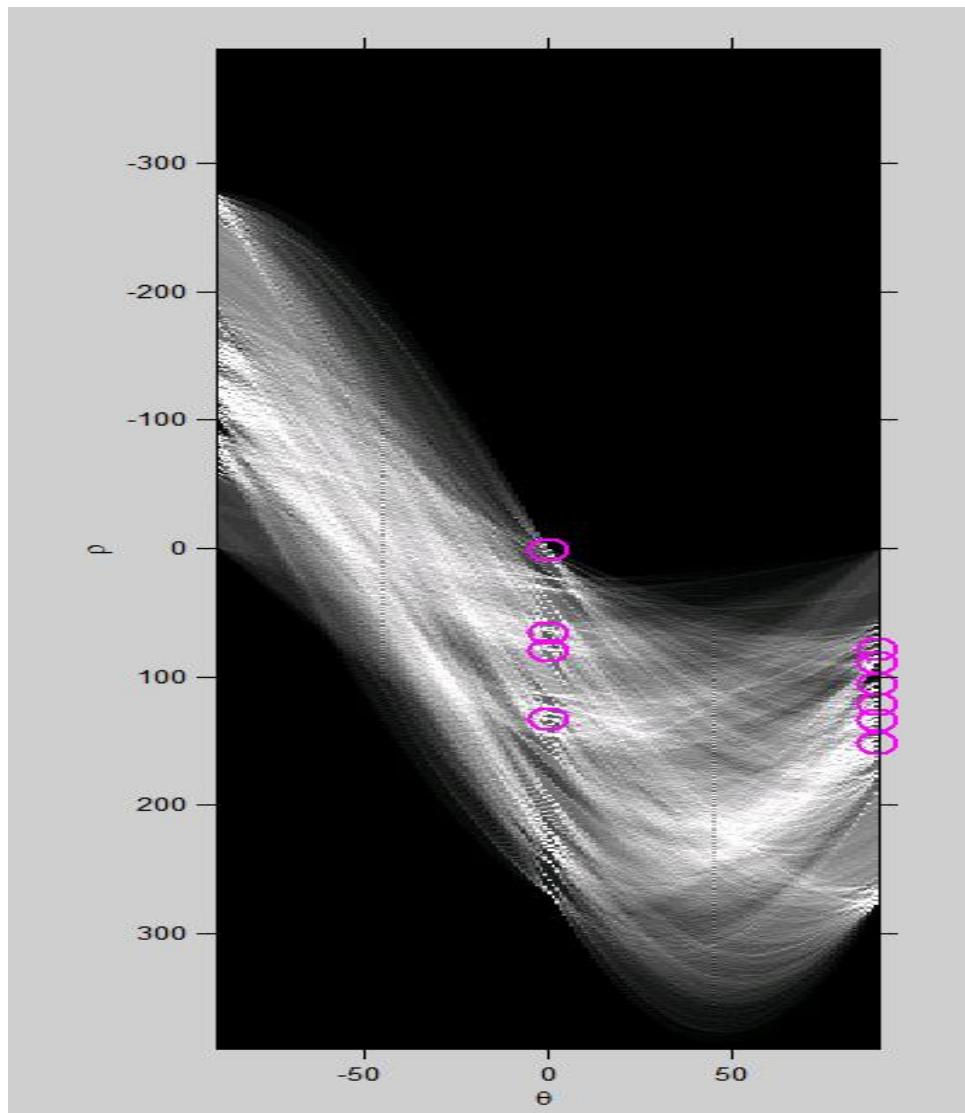
پنجره جاری را برای گراف جدید باز نگه میدارد



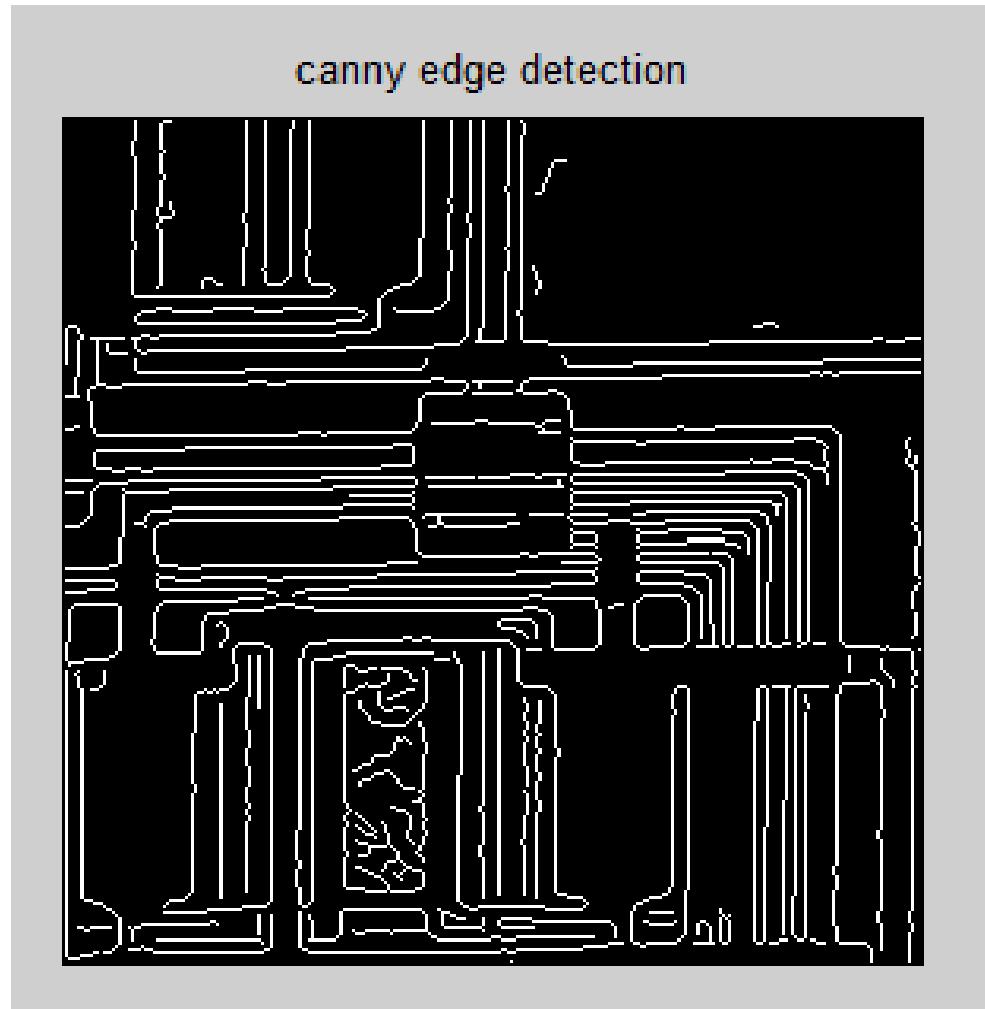
- `plot(theta(p(:,2)),rho(p(:,1)),'o',...`
- `'Color',[1 0 1],...`
- `'MarkerSize',12,...`
- `'LineWidth',2);`

- `xlabel('\theta');`
- `ylabel('\rho');`

- `title('Hough Transform');`

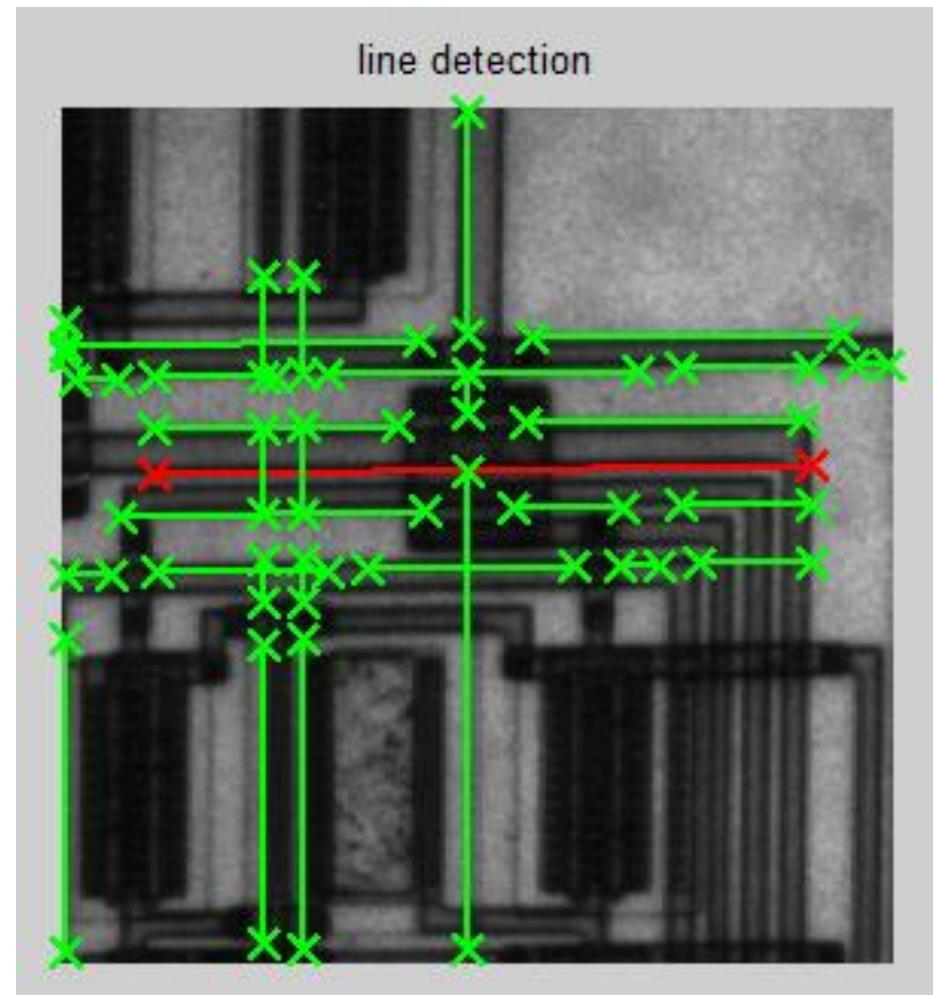


- subplot(1,3,2);
- imshow(BW);
- title('canny edge detection');
- hold on;



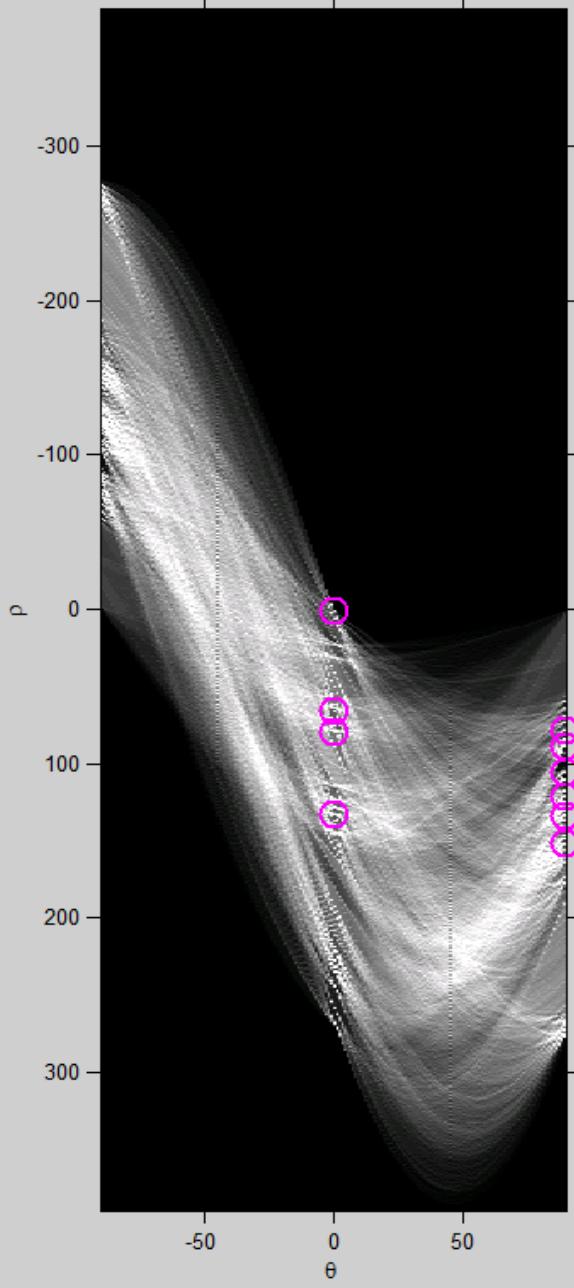
- subplot(1,3,3);
- imshow(f);
- title('line detection');
- hold on;

۱ ۲ ۳

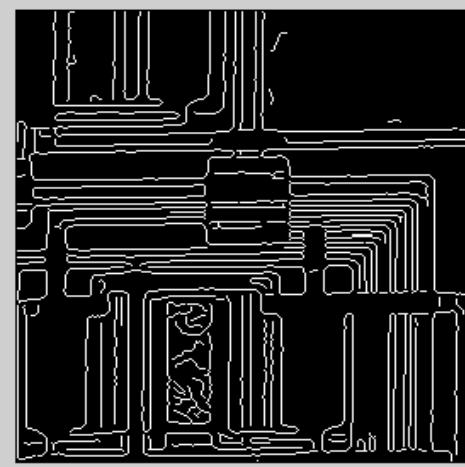


- **%% COLOR**
- for k=1:numel(lines)
- if k==MaxLengthIndex
 Color=[1 0 0]; رنگ قرمز برای خط با بیشترین طول
 else
 Color=[0 1 0]; رنگ سبز
- end
- Start=lines(k).point1;
- End=lines(k).point2;
- plot([Start(1) End(1)],[Start(2) End(2)],...
 'x-','LineWidth',2,'MarkerSize',12,'Color',Color);
- end

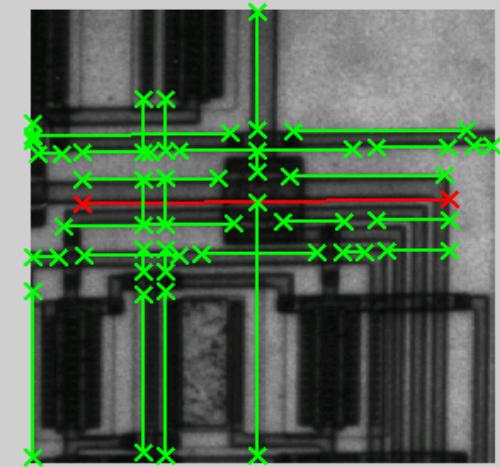
Hough Transform



canny edge detection

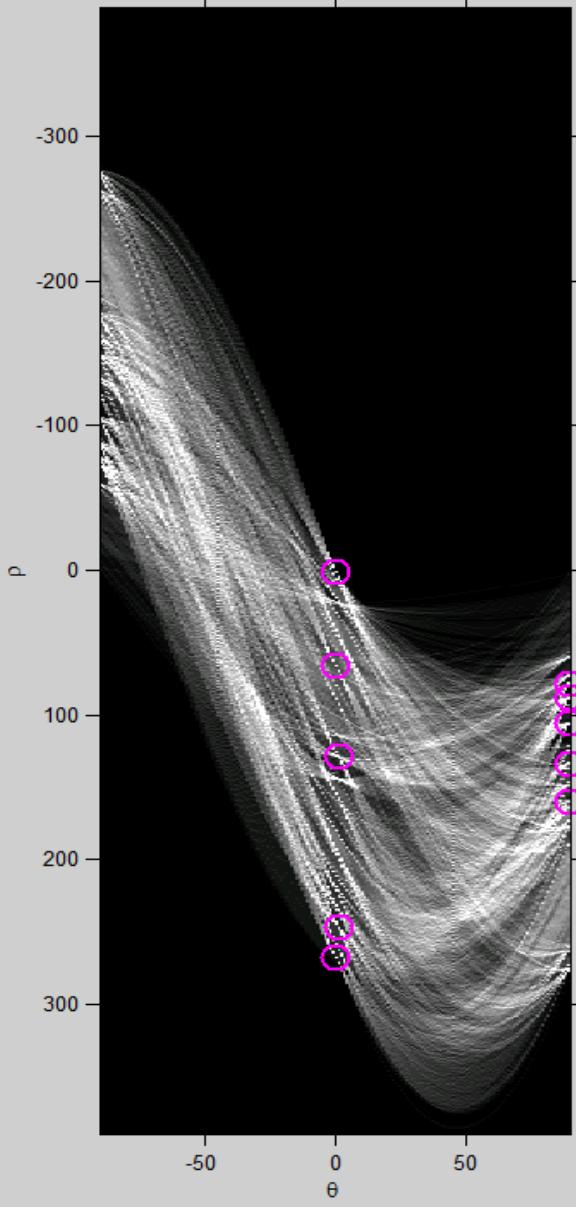


line detection



مقایسه انواع تکنیک های لبه یابی و
تأثیر آن بر تشخیص خط با استفاده
از تبدیل هاف

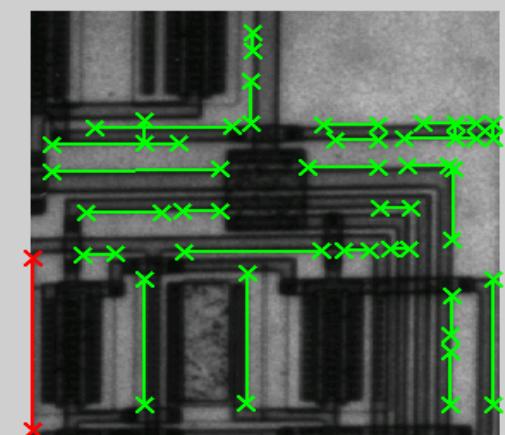
Hough Transform



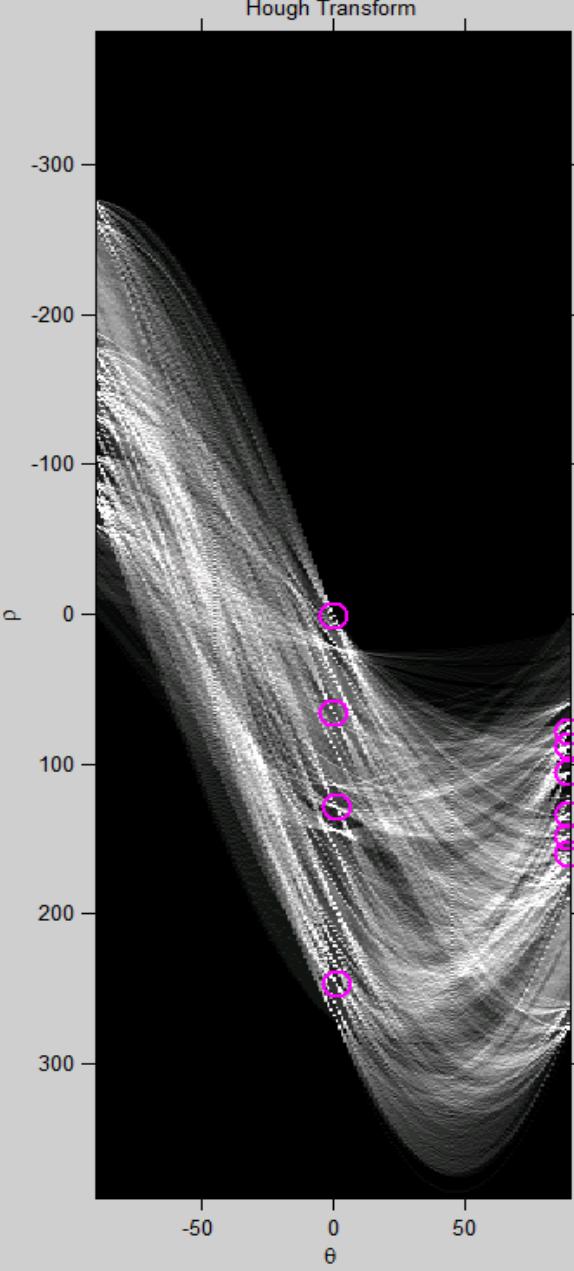
sobel edge detection



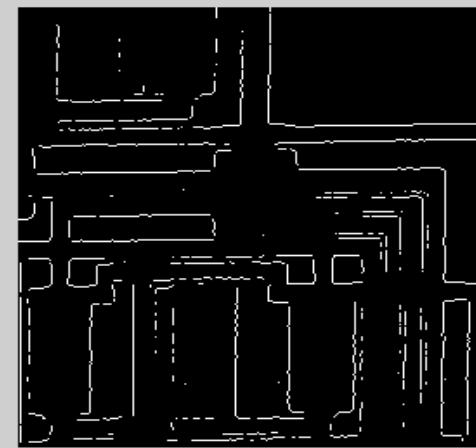
line detection



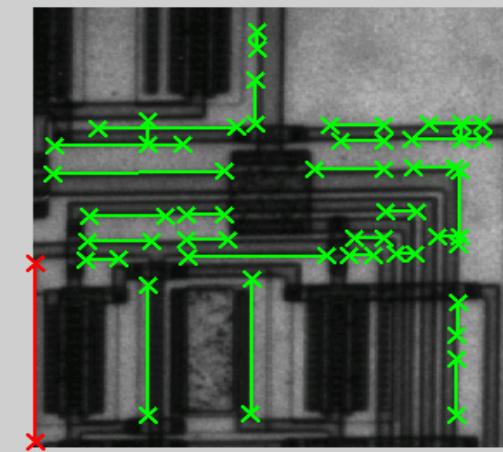
Hough Transform



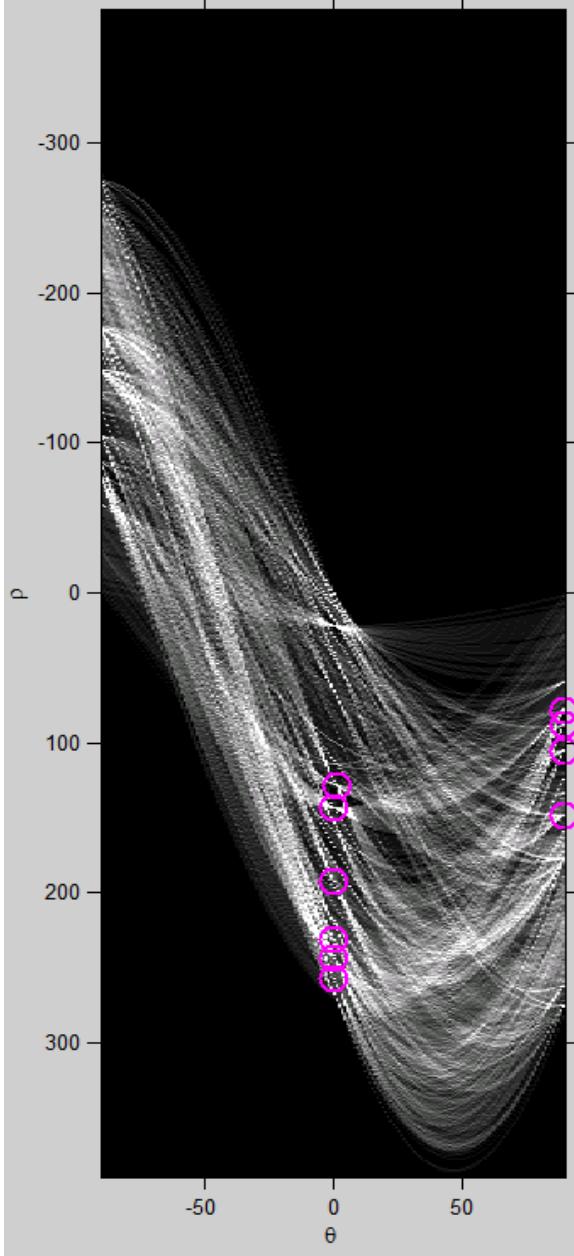
prewitt edge detection



line detection



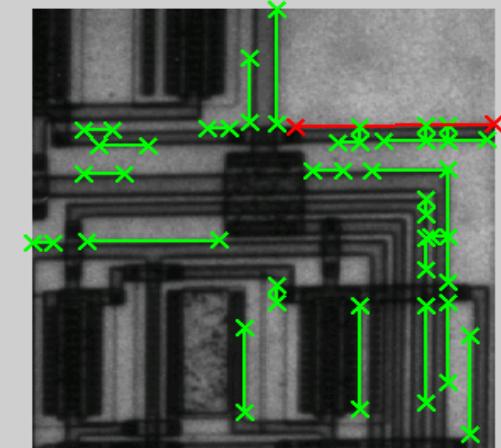
Hough Transform



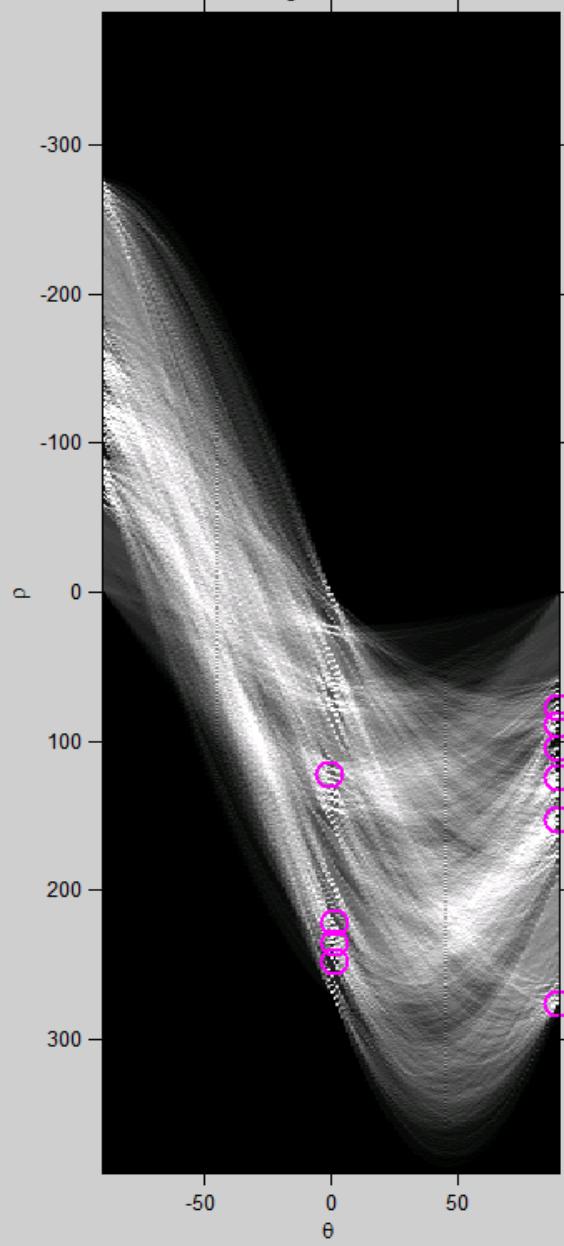
roberts edge detection



line detection



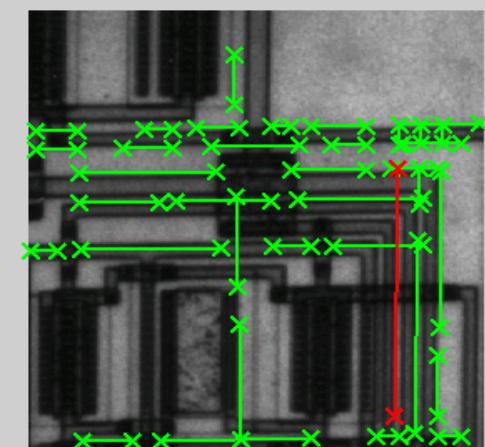
Hough Transform



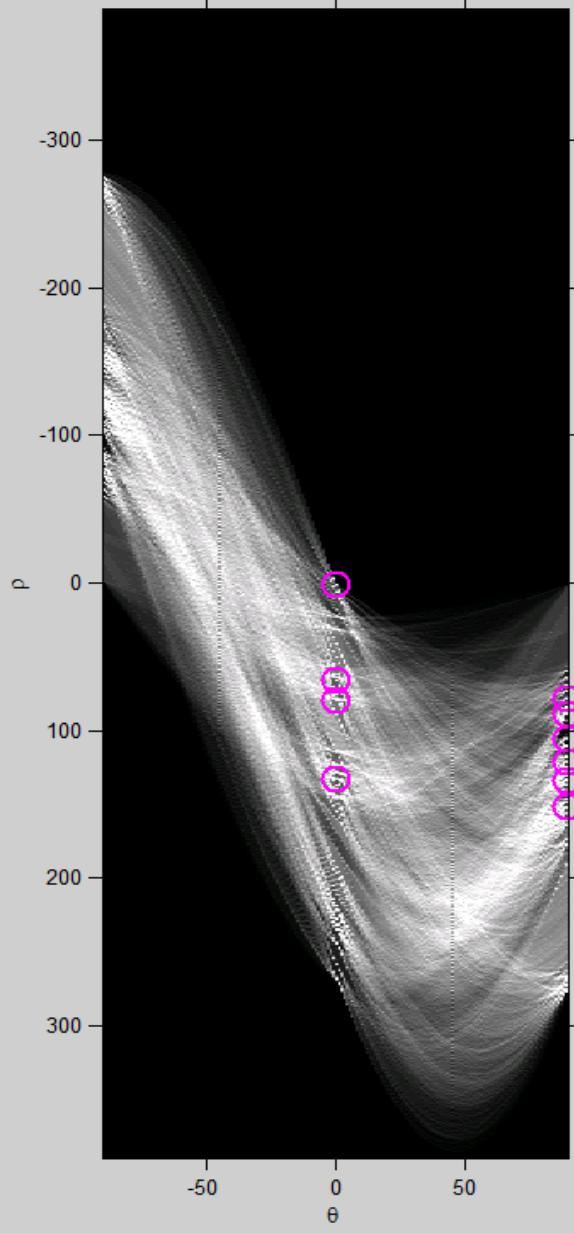
log edge detection



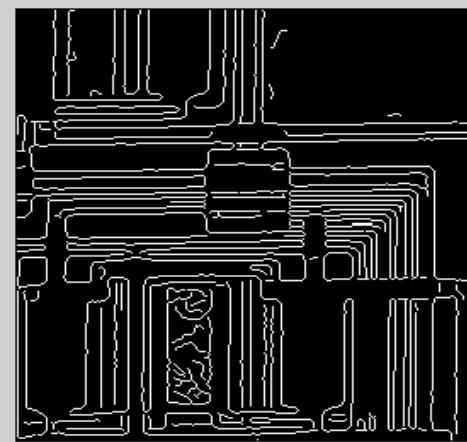
line detection



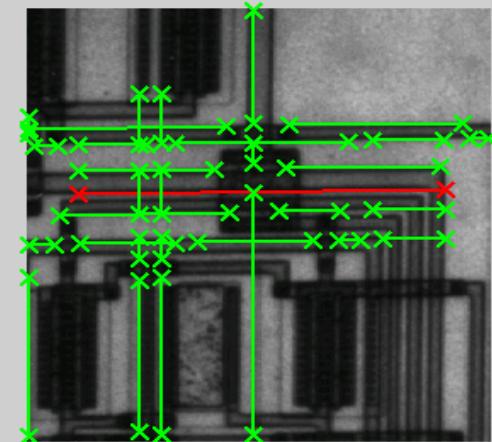
Hough Transform



canny edge detection



line detection



با سپاس از توجه شما