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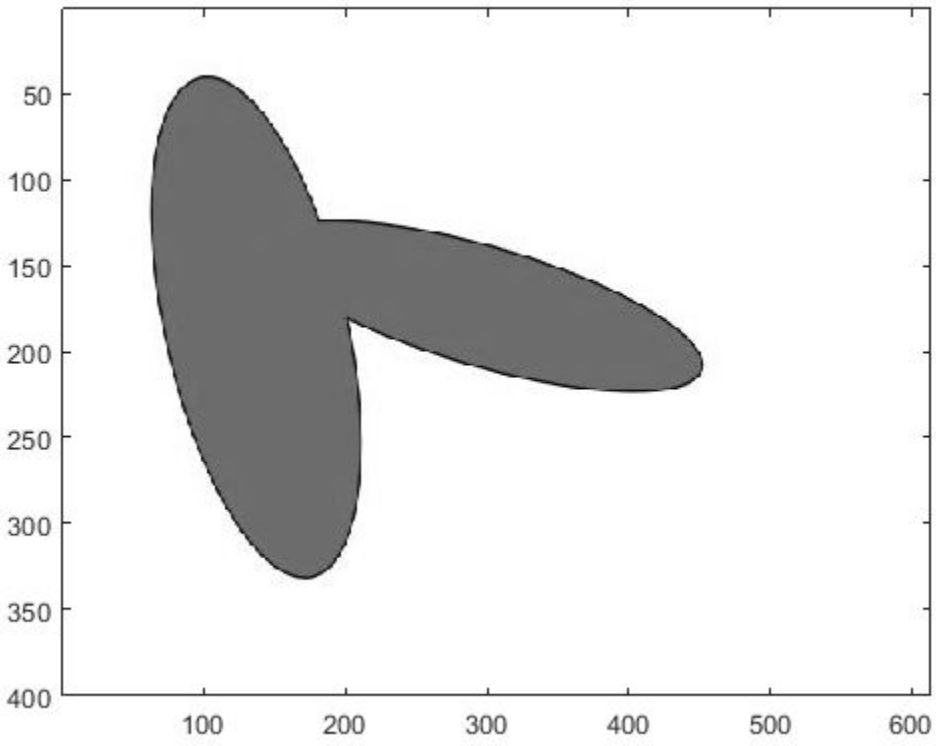
```
clear all
close all
addpath('D:\code2018\ellipseDetection')
addpath('D:\code2018\frangi_filter_version2a')
```

detect 2 ellipses

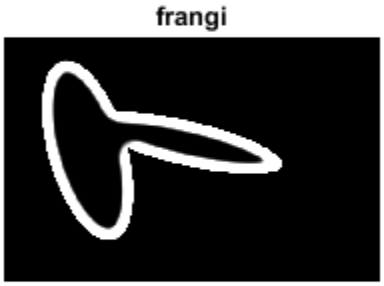
```
img = imread('ellipse3.jpg');
img=rgb2gray(img);

figure
imagesc(img);
colormap('gray');
```



frangi

```
Ivessel=FrangiFilter2D(double(img));
figure
subplot(1,2,1), imshow(img,[]);
subplot(1,2,2), imshow(Ivessel,[0 0.25]);title('frangi')
```

```
Current Frangi Filter Sigma: 1
Current Frangi Filter Sigma: 3
Current Frangi Filter Sigma: 5
Current Frangi Filter Sigma: 7
Current Frangi Filter Sigma: 9
```

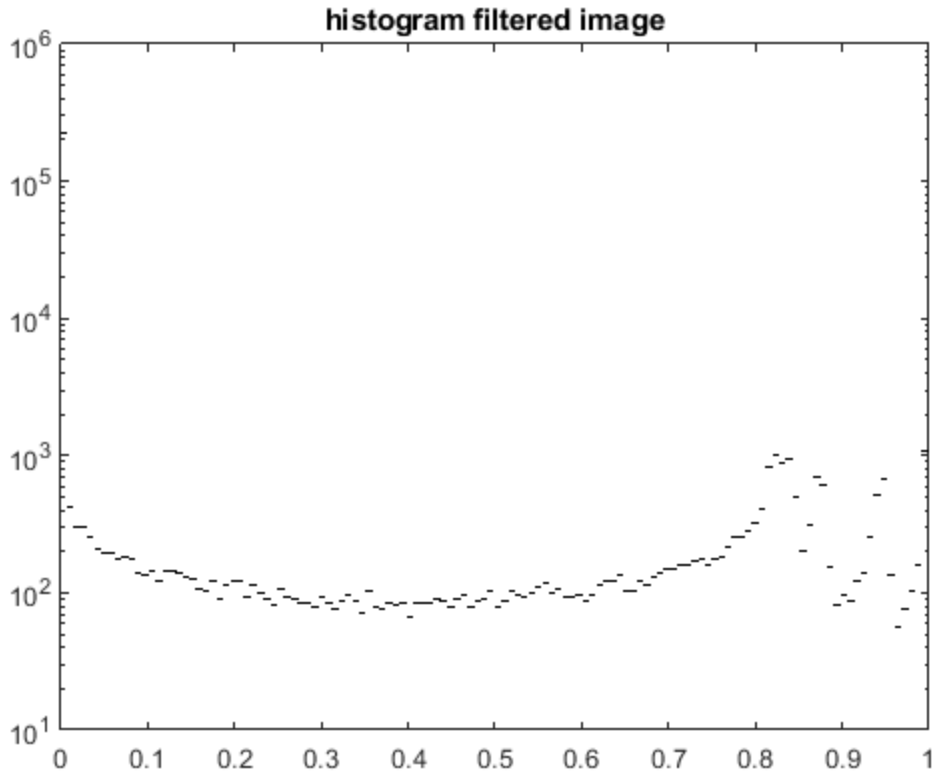


detect ellipse

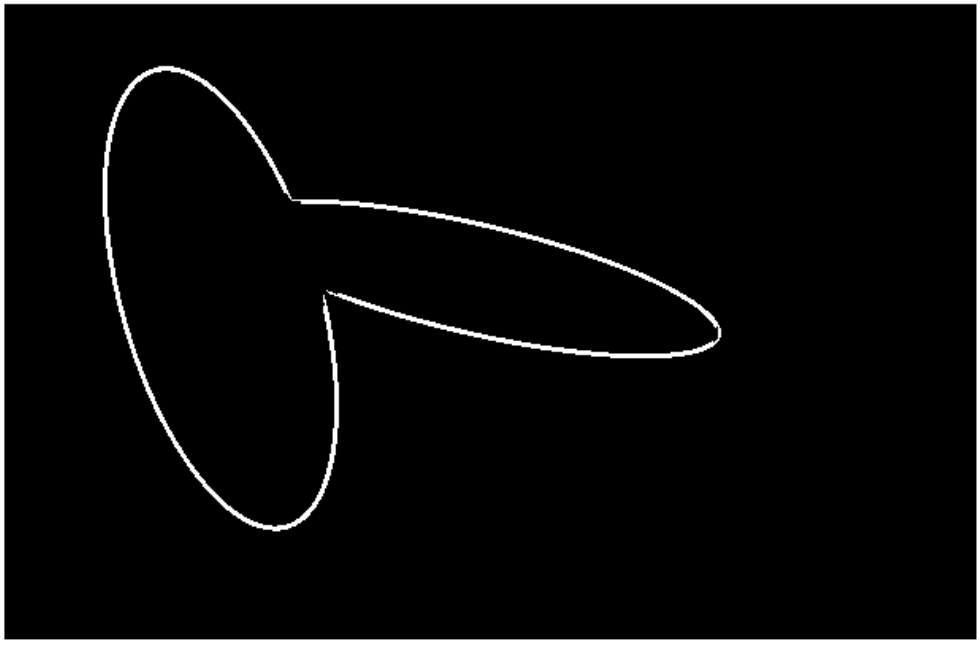
```
maxIv = max(Ivessel(:));

figure()
hist(Ivessel(:),128);title('histogram filtered image')
set(gca,'yscale','log')

% threshold change by experience can be determined by all cases learning
% or by search on histogram levels
LogicVessel = Ivessel>0.9*maxIv;
figure
imshow(LogicVessel);title('LogicVessel')

% detect positive pixels
ind = find(LogicVessel);
[jj,ii] =  ind2sub(size(LogicVessel),ind);

figure()
imshow(LogicVessel);title('LogicVessel and pixels')
hold on;
plot(ii,jj,'r.')


figure()
```

```
imshow(img);title('img and pixels')
hold on;
plot(ii,jj,'r.')

detected_ellipses = fit_ellipse(ii ,jj);

disp(detected_ellipses)

plot_ellipse(detected_ellipses,img)
```

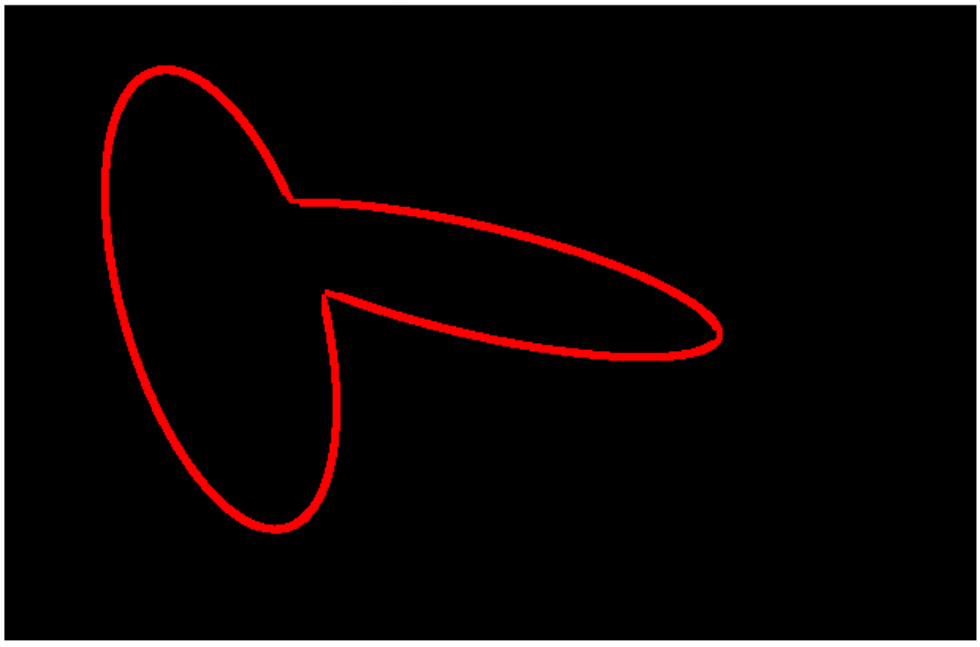
```
            a: 203.1952
            b: 121.9748
          phi: -0.4156
           X0: 285.5619
           Y0: 92.8501
        X0_in: 223.7681
        Y0_in: 200.2363
    long_axis: 406.3904
   short_axis: 243.9496
       status: ''
```

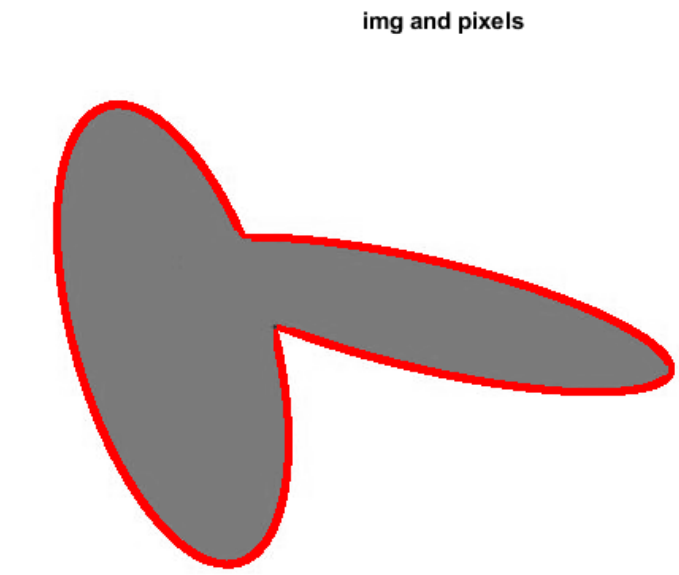


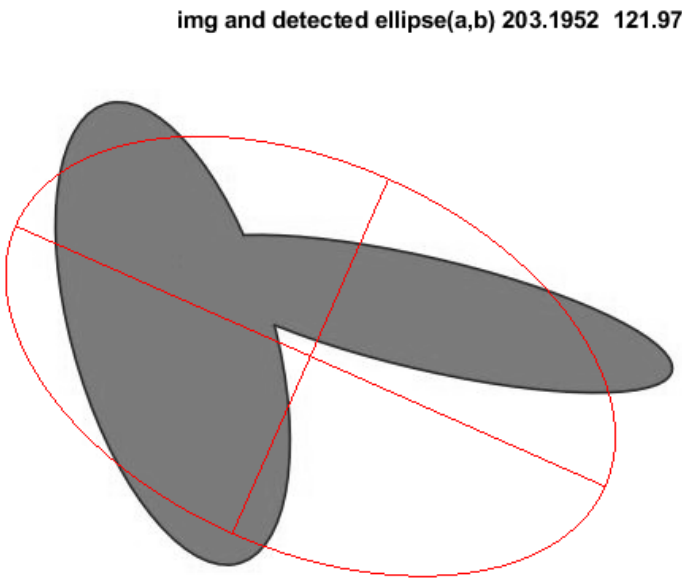
LogicVessel



LogicVessel and pixels







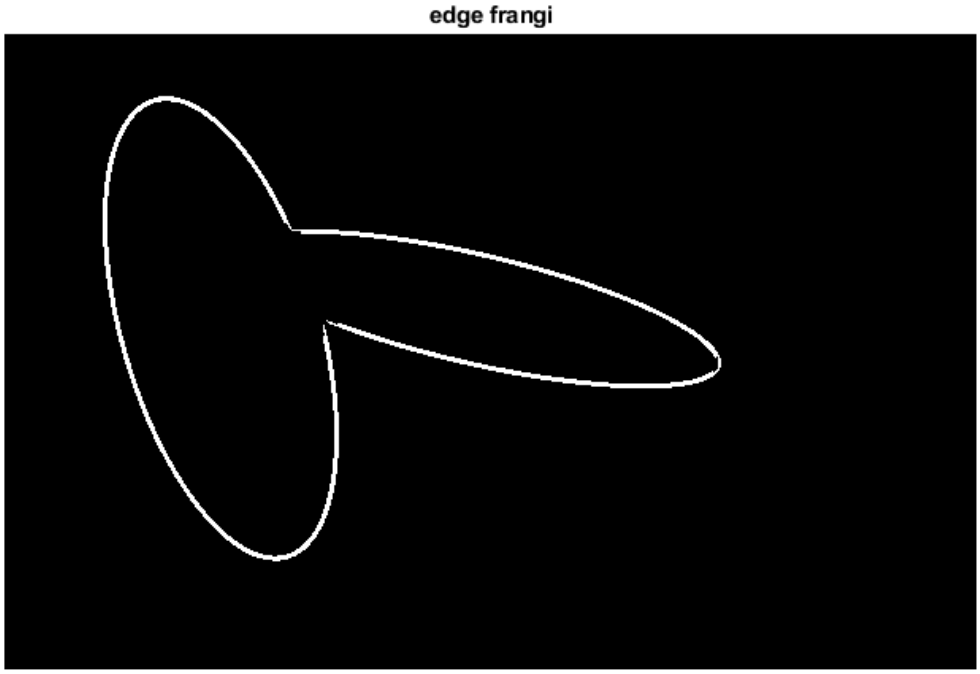
use hough

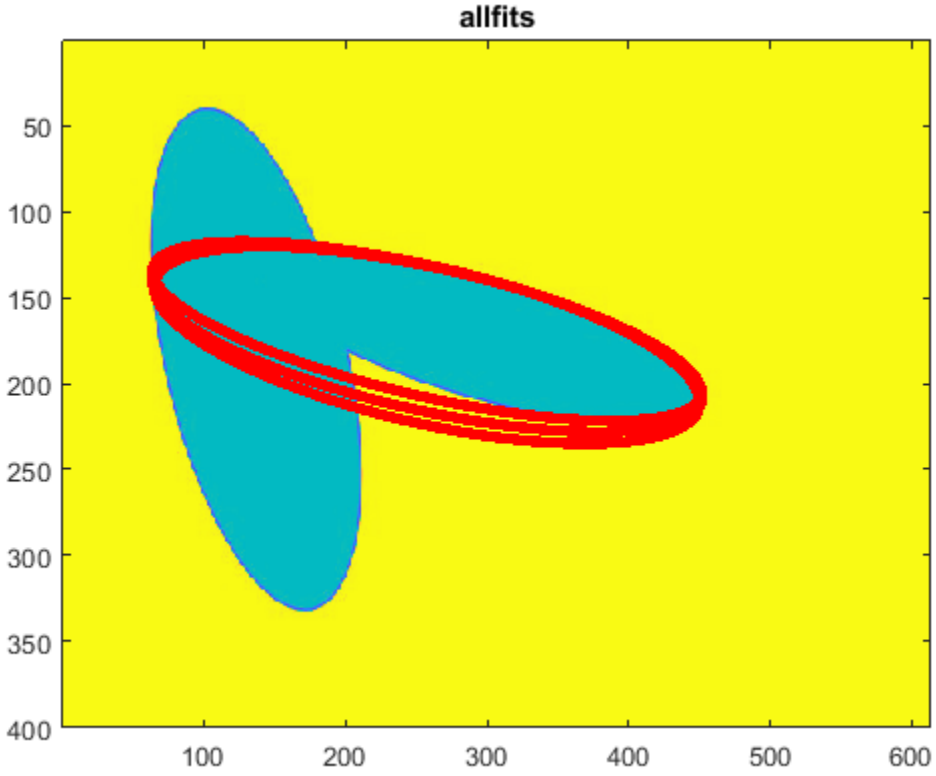
at canny we have to much edges and frangi is better to find long object

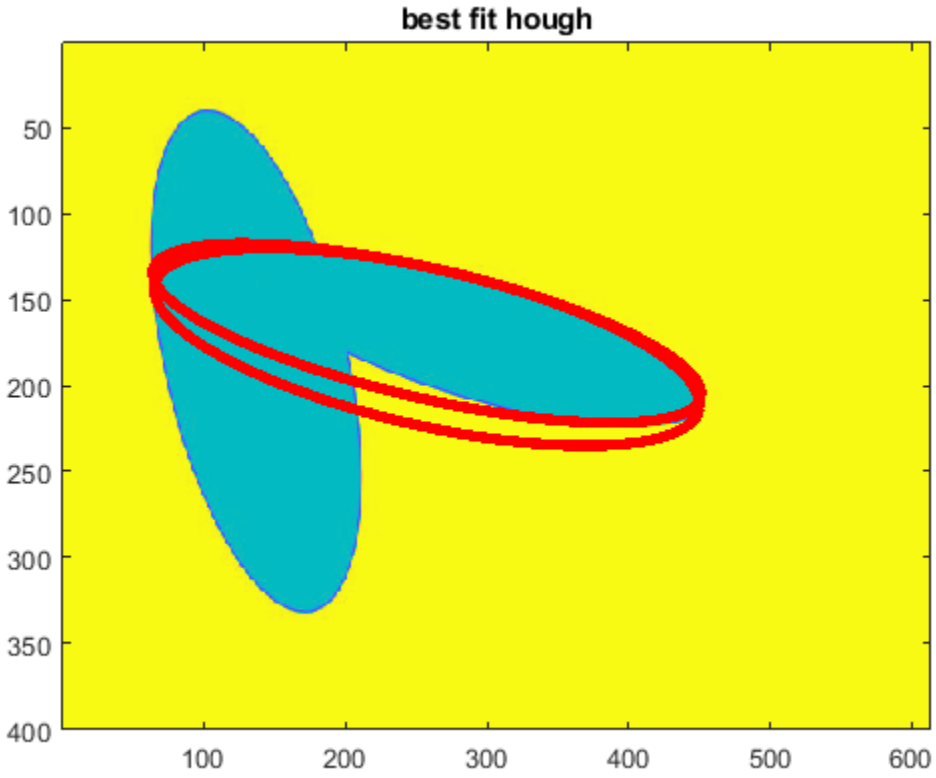
```
E = LogicVessel; %edge(denoisedImage,'canny');
figure(), imshow(E);title('edge frangi')

% override some default parameters
params.minMajorAxis = 50;
params.maxMajorAxis = 500;

% note that the edge (or gradient) image is used
% [x0 y0 a b alpha score]
bestFits = ellipseDetection(E, params);

fprintf('Output %d best fits.\n', size(bestFits,1));

figure;
image(img);

ellipse(bestFits(:,3),bestFits(:,4),bestFits(:,5)*pi/
180,bestFits(:,1),bestFits(:,2),'R');
title('allfits')

[mx idx] = sort(bestFits(:,6),'descend');
figure;
image(img);
ellipse(bestFits(idx(1:2),3),bestFits(idx(1:2),4),bestFits(idx(1:2),5)*pi/
180,bestFits(idx(1:2),1),bestFits(idx(1:2),2),'R');
 title('best fit hough')% still dint find the best
```

```
Possible major axes: 3468 * 3468 = 12027024
..after distance constraint: 5465701
..angular constraint not used
..after randomization: 6936
Output 3 best fits.

an =

    0.1864


an =

    0.1824


an =

    0.1785


an =

    0.1864


an =
```

```
0.1824
```

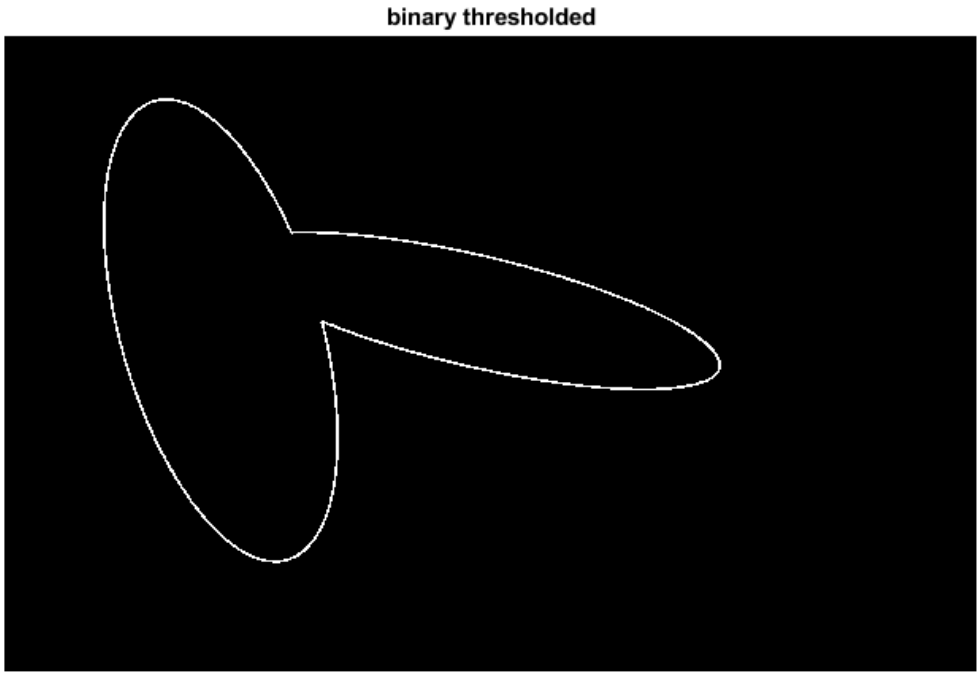


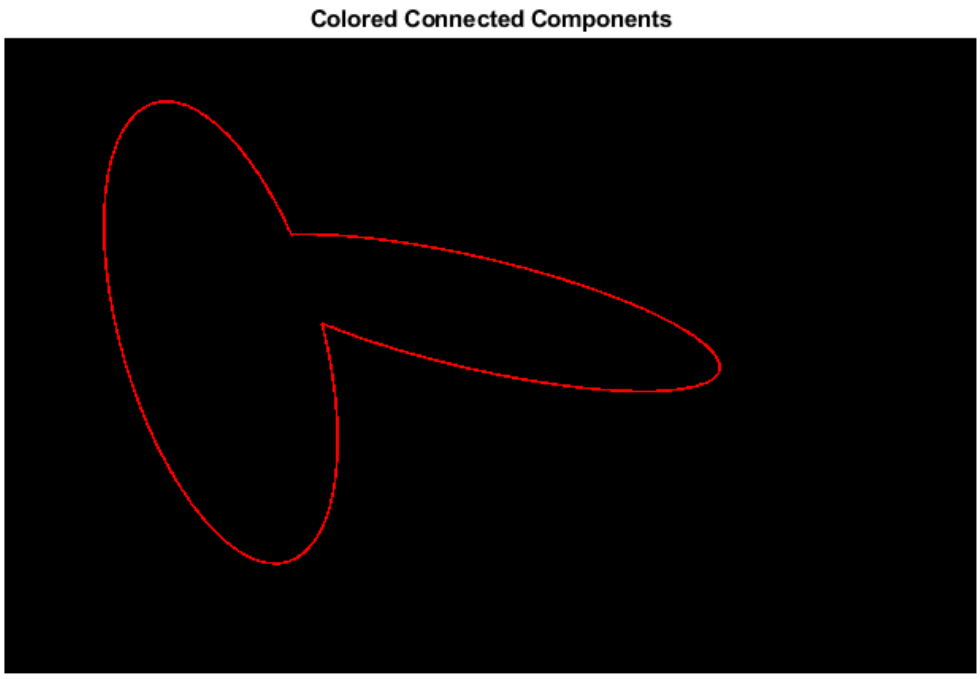

allfits
50
100
150
200
250
300
350
400
100
200
300
400
500
600


best fit hough
50
100
150
200
250
300
350
400
100
200
300
400
500
600

binary work

```
BW = ~(img>100);
BW = bwareaopen(BW,10);
figure,imshow(BW);title('binary thresholded')

CC = bwconncomp(BW);

% Create a label matrix
label_matrix = labelmatrix(CC);
% Use label2rgb to assign different colors to labels
colored_labels = label2rgb(label_matrix, 'hsv', 'k', 'shuffle');
% Display the colored connected components
figure()
imshow(colored_labels);
title('Colored Connected Components');
```



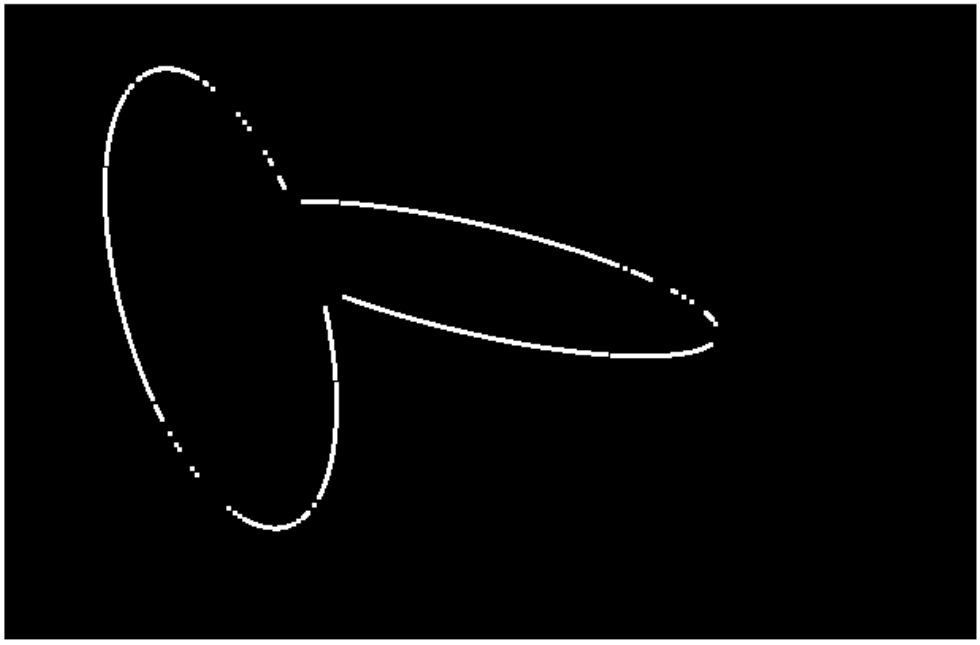


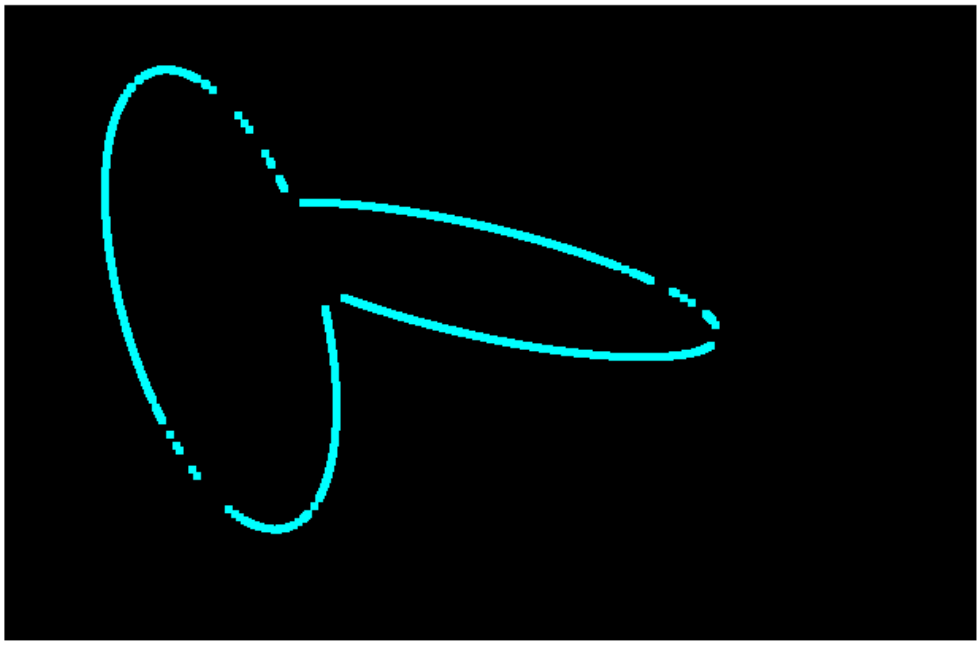
morphology

```
SE = strel("square",3)
 bw=imopen(LogicVessel,SE);
figure,imshow(bw)

idx = find(bw);
[jj,ii]=ind2sub(size(bw),idx);

 figure,imshow(bw),hold on,plot(ii,jj,'c.')


X = [ii jj];
idx = kmeans(X,2);

figure,imshow(bw)
hold on
plot(X(idx==1,1),X(idx==1,2),'r.')
plot(X(idx==2,1),X(idx==2,2),'b.')
title('kmeans clustering')

[Xout,idxOut ]= clearClusters(X,idx,bw);

 figure,imshow(bw)
hold on
plot(Xout(idxOut==1,1),Xout(idxOut==1,2),'r.')
plot(Xout(idxOut==2,1),Xout(idxOut==2,2),'b.')
```

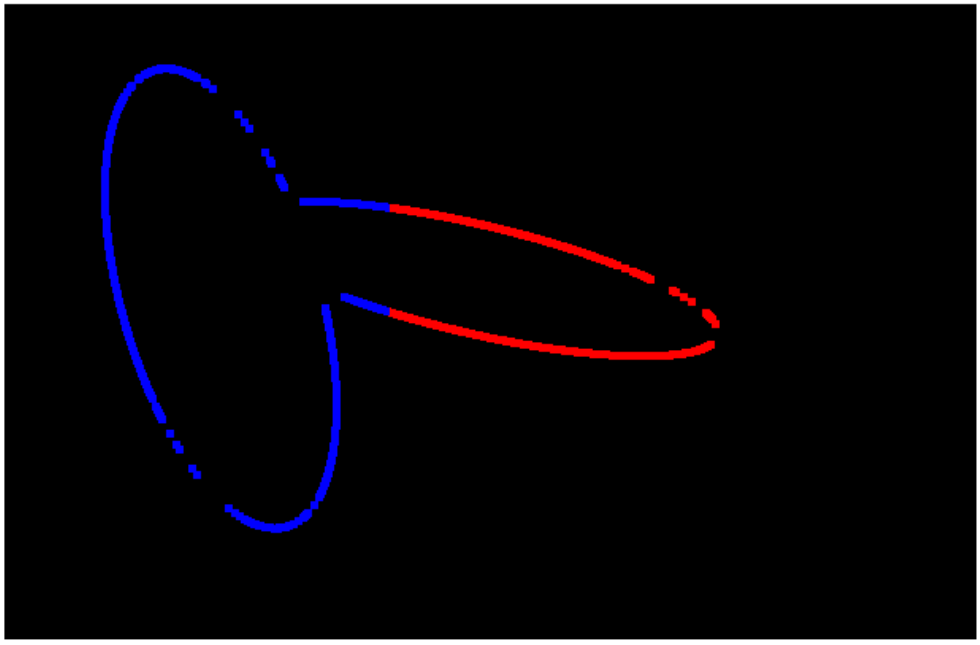
```
 title('kmeans clustering clean intenal cluster')


 % detect elipse
detected_ellipses1 = fit_ellipse(Xout(idxOut==1,1),Xout(idxOut==1,2));
detected_ellipses2 = fit_ellipse(Xout(idxOut==2,1),Xout(idxOut==2,2));

disp(detected_ellipses1)
disp(detected_ellipses2)

plot_ellipse(detected_ellipses1,img)
plot_ellipse(detected_ellipses2,img)


;
```

```
SE =

strel is a square shaped structuring element with properties:

      Neighborhood: [3×3 logical]
    Dimensionality: 2

             a: 156.2457
             b: 34.2822
           phi: -0.2289
            X0: 329.3347
            Y0: 101.5448
         X0_in: 297.6980
         Y0_in: 173.6335
     long_axis: 312.4913
    short_axis: 68.5644
        status: ''

             a: 62.4595
             b: 149.5128
           phi: 0.2831
            X0: 79.5756
            Y0: 216.7816
         X0_in: 136.9708
         Y0_in: 185.9181
     long_axis: 299.0255
    short_axis: 124.9189
        status: ''
```

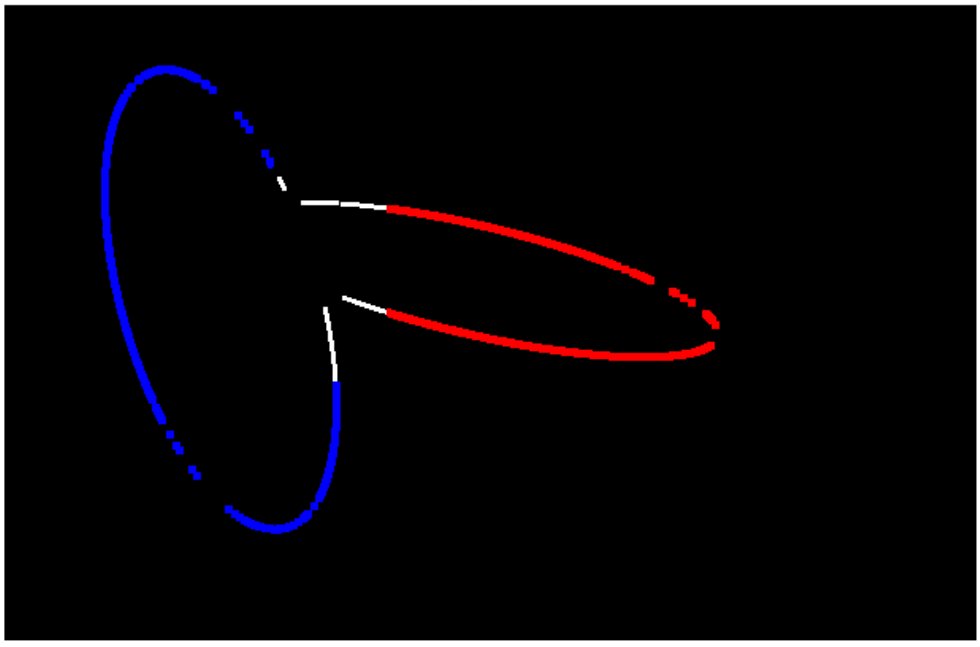


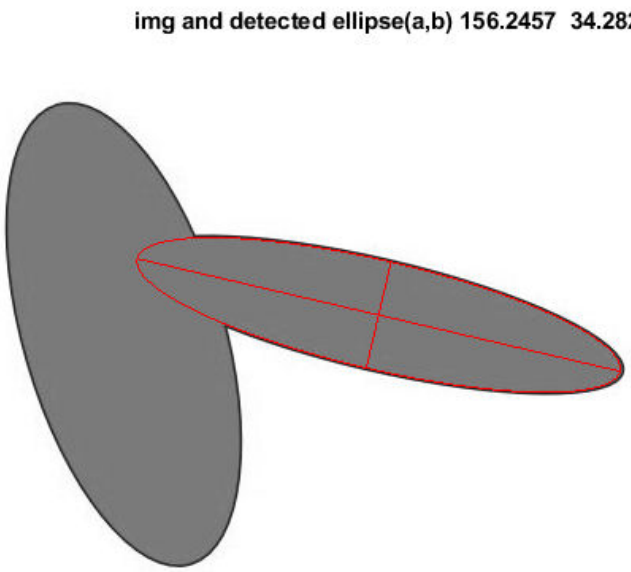


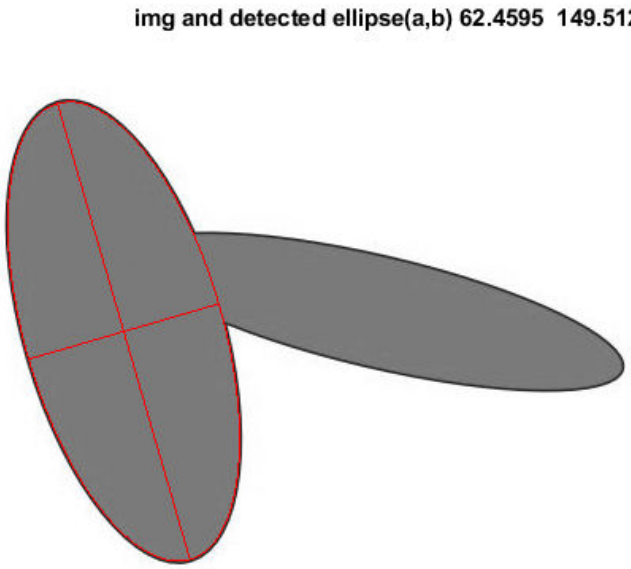
kmeans clustering



kmeans clustering clean intenal cluster







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