```
clc;clear;
tic;
cd test-images-for-q2/
for i = 0:3
```

Preprocess Image

Step 1: Read the image, convert it to binary with proper thresholding.

```
im = imread(strcat('son3rot',int2str(i),'.png'));
level = graythresh(im);
im = im2bw(im,level);

% Step 2: Crop the center portion as the side portions may be distorted
% due to the rotation.

im = imcrop(im,[150,150,225,225]);

% Step 3: Erode the image with a line structuring element and then
% apply canny to get the edge image.
se = strel('line',5,90);
im = imerode(im,se);
im2 = edge(im,'canny');
```

Hough's Transform and Linguistic Properties

Step 4: Apply Hough's Transform on the edge image and get the lines. English text has a property that the bottom part is arranged in a line, we exploit that property.

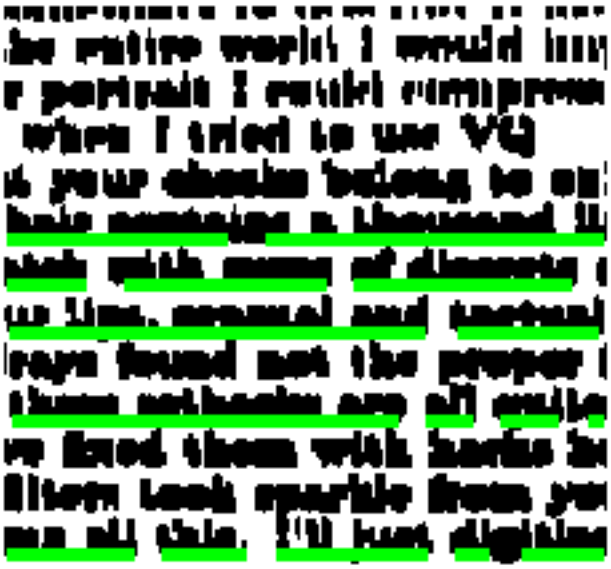
```
[H,theta,rho] = hough(im2);
P = houghpeaks(H,5,'threshold',ceil(0.3*max(H(:))));
lines = houghlines(im2,theta,rho,P,'FillGap',10,'MinLength',5);

% Step 5: Calculate the angle and average it over all points.
angle=0;
for k = 1:length(lines)
     xy = [lines(k).point1; lines(k).point2];
    pangle = atan2(xy(2,1)-xy(1,1),xy(2,2)-xy(1,2))*180/pi;
    if pangle < 0
         pangle = pangle+180;
    end
    angle = angle + pangle;
end
angle = angle/length(lines);
angle = 90 - angle;
if angle < 0
         angle = angle+180;
end
angle = 180 - angle;
disp(strcat('The angle in the text file no: ',int2str(i+1),' is ',int2str(angl
```

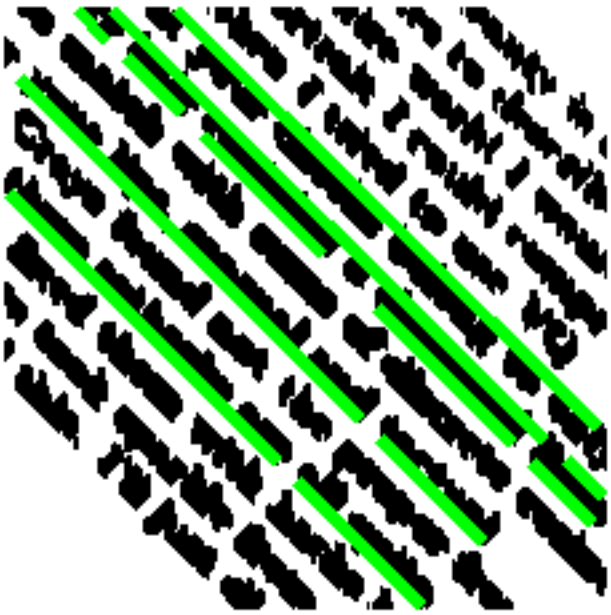
```
figure, imshow(im), hold on
max_len = 0;

% Step 6: Plot the results.
for k = 1:length(lines)
xy = [lines(k).point1; lines(k).point2];
plot(xy(:,1),xy(:,2),'LineWidth',4,'Color','green');
end
```

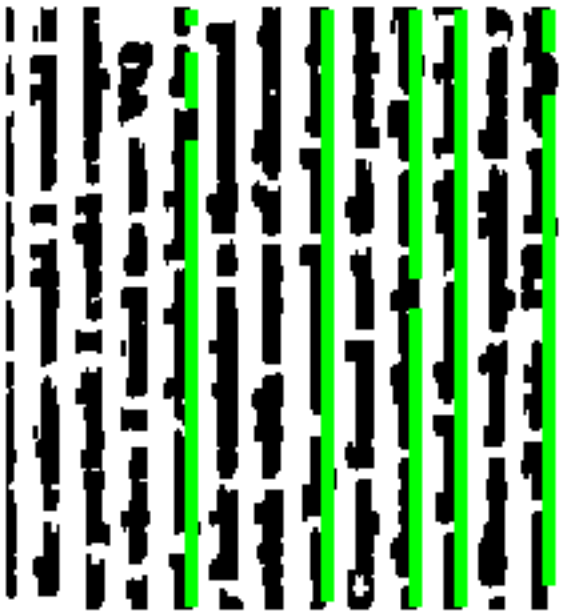
The angle in the text file no:1 is180



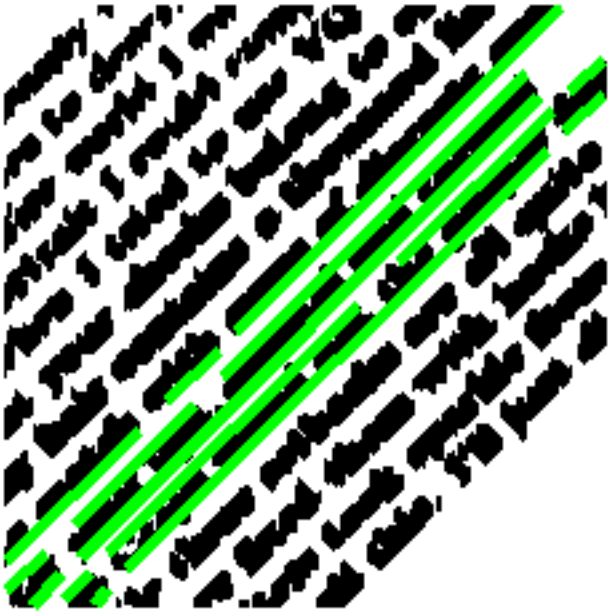
The angle in the text file no:2 is135



The angle in the text file no:3 is90



The angle in the text file no:4 is45



```
end
cd ..
toc;
```

```
        Elapsed time is 4.027943 seconds.
```

Published with MATLAB® R2014a