EE475 HW-5

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I. Question-1

A. *Gazete.bmp*

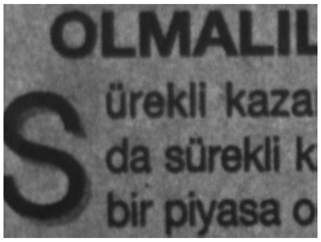

Fig. 1: Original Gazete Image

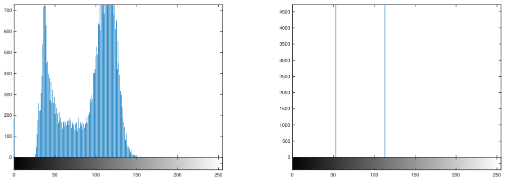

Fig. 2: Histogram of Original Image-Result Image

Because of the histogram has 2 peak values, we set number of cluster to 2 in order to look only gray distance.

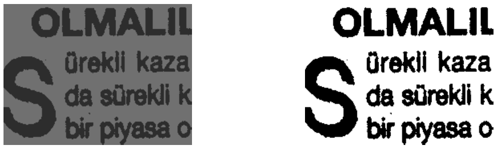

Fig. 3: Result Image-Segmented Parts,N=2,(gray)

To group pixel by their [x y gray] distances, we set number of cluster(N)=20,45,90,180 respectively. Because we look 3-D distance, the algorithm consider not only intensity values but also the coordinate values. So, it groups pixels according to local similarity. For instance when N=45, 1 or 2 characters are grouped.

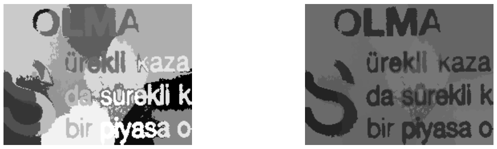

Fig. 4: N=20,(x,y,gray)

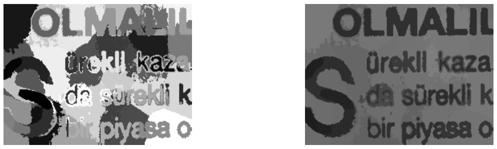

Fig. 5: N=45,(x,y,gray)

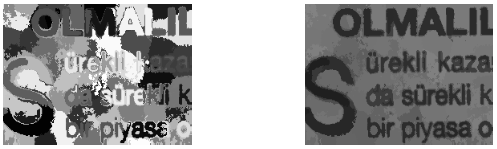

Fig. 6: N=90,(x,y,gray)

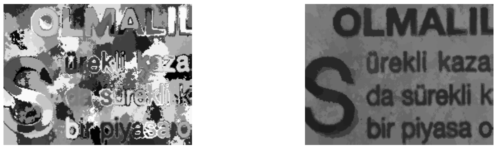

Fig. 7: N=180,(x,y,gray)

When we look [x y gray] and N=20, words are segmented onto different cluster. When N=45, one or two characters segmented onto different characters.

When N=90, some clusters has one characters, some clusters also has 2 or 3 characters and some also has half characters. On the other hand, increasing the number of the cluster makes the resulted image similar to the original image, because when N is low, we lose many pixels.

B. pcb.bmp

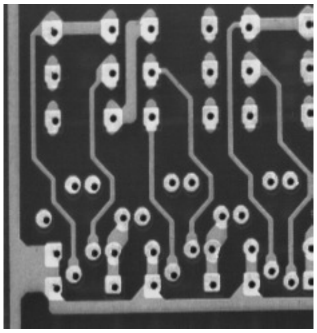

Fig. 8: Original Gazete Image

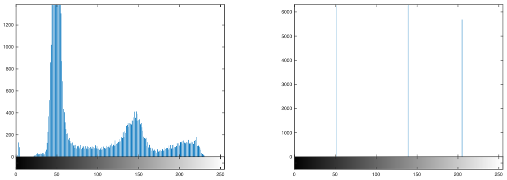

Fig. 9: Histogram of Original Image-Result Image

Because of the histogram has 3 peak values, we set number of cluster to 3 in order to look only gray distance.

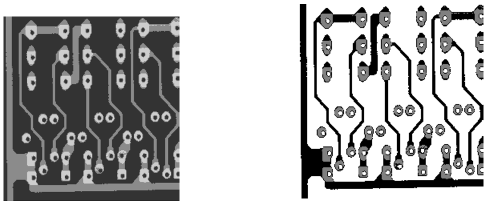

Fig. 10: Result Image-Segmented Parts,N=3,(gray)

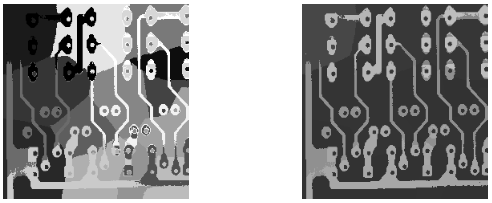

Fig. 11: N=20,(x,y,gray)

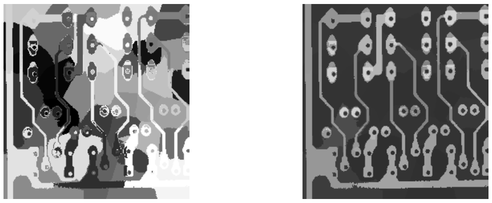

Fig. 12: N=45,(x,y,gray)

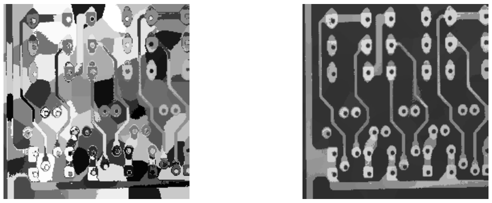

Fig. 13: N=90,(x,y,gray)

When we look [x y gray] and N=20, we can detect local circle, when N=90 each circle belongs to different cluster so we differentiate each circle.

C. *starfish.bmp*

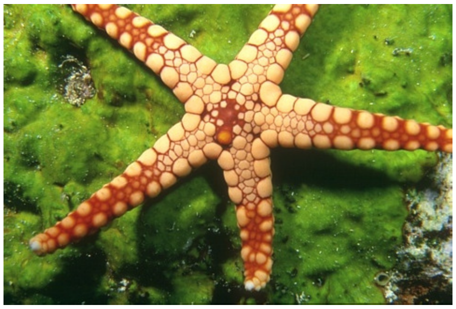

Fig. 14: Original Starfish Image

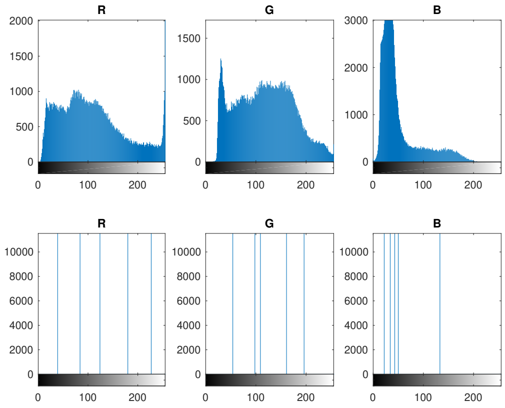

Fig. 15: Histogram of Original and Segmented Image

We decided to take N=5 by looking the histogram of R,G,B values seperately. We obtained the segmentation below:

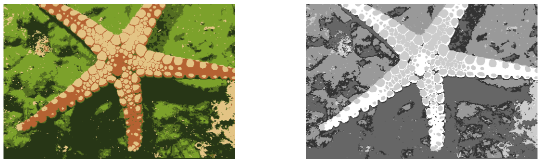

Fig. 16: Result Image-Segmented Parts,N=5,(R G B)

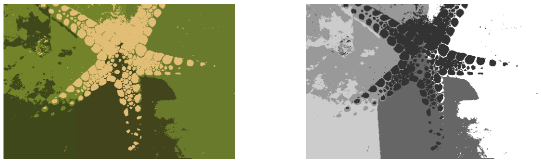

Fig. 17: Result Image-Segmented Parts,N=5,(x y R G B)

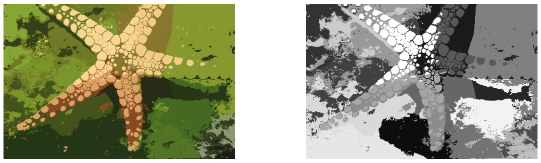

Fig. 18: Result Image-Segmented Parts,N=20,(x y R G B)

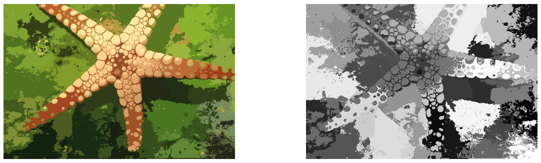

Fig. 19: Result Image-Segmented Parts,N=45,(x y R G B)

The histogram of R component has 4 peak value, G component has 5 peak values, B component has 3 peak values. So we decided to set N=5.

For [x y R G B], when N=5, the [x y] values are more dominant so the algorithm clustered image as their position mostly. When N=45, we are able to select all circle component of starfish seperately.

II. Question-2

Gauss

Fig. 20: Original Segment-Segmented from Noisy Image

	Goodness(%)
left-top	99.73
right-top	99.59
bottom	99.93

Horse

Because the background consist of two main different RGB values, for instance the flowers and grass have different RGB values so in order to maximize the performance, we used 2 seeds for background and then we merged them.By this way, for instance, the performance for small-horse increased from82% to 90%. Also, we applied some threshold offset to increase performance, this part is explained in matlab code.

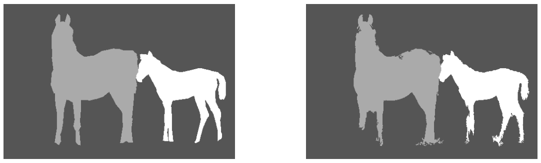

Fig. 21: Original Segment-Segmented from Noisy Image

	Goodness(%)
small-horse	90.37
big-horse	91.46
background	96.97

III. Question-3

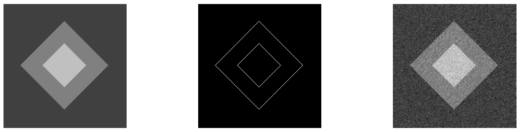

Fig. 22: Diamond-Ground_Truth-Noise Addded

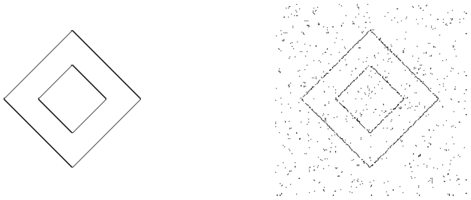

Fig. 23: Sobel with Original-Noisy

Fig. 24: Canny with Original-Noisy

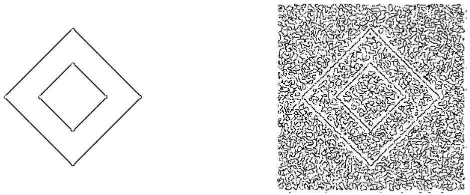

Fig. 25: LoG Method with Original-Noisy

	Performance for Original Image(%)	Performance for Noisy Image(%)
sobel	91	63
log	96	78
canny	100	97

Canny is the best for both original and noisy image. On the other hand sobel is the worst edge function that can be easily seen from our performance table. In my opinion, this performance test is not a good test for the detection of edge. If the result of the edge function say that everywhere is edge, the performance will be 100%, however we know that it is not a good edge detection algorithm. We should rearrange the performance test that penalize the result when it says there is an edge but actually there is not.

IV. Question-4

Edges that foundedn by applying Hough Transform is below:

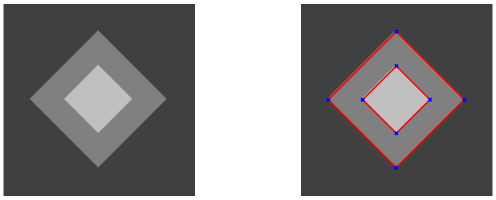

Fig. 26: Emphasized edges on diamond image by Hough Transform