Ministry of Higher Education
El-Shorouk Academy
Higher Institute for Computer & Information Technology

Department : Computer Sciences
Instructor : Dr. Abdellatief Hussein Abouali
Reviewer : Dr. Mohamed Mostafa

Acad. Year : 2016 / 2017
Term : First
Year : 4th
No. Questions : 4
Date : 21/11 /2016
Time Allowed : 60 Min

4105 Computer Vision (Mid Exam)

Try questions (1,2) and one of (3,4)

Question 1 (3.5 points)

Clarify the following terms in the context of computer vision: Connected Region, Ideal Filters, Sampling and quantization, Image resolution and memory requirement, nonlinear enhancement filters, Digital Image Discrete Cosine Transform, and Gray Levels Slicing

Question 2 (3.5 points)

The following is the histogram of and 8-bit gray image:-

Gray level	70	100	110	116	120	150	170	180
Gray count	10	10	100	500	1000	400	100	80

Find the enhanced histogram after applying contrast stretching which maps 100 to 50 and 170 to 220? Write a program to perform the same process staring from reading and displaying the original ending by displaying and saving the enhanced image.

Question 3 (3 points)

Using N8 neighboring and connectivity set {1, 2,3}, find the connected labels in the following matrix:-

1	0	4	0	1	4	1
8	2	0	7	5	1	2
1	0	4	0	1	4	3
4	3	0	6	5	1	2
1	0	4	0	1	4	1
6	3	0	3	5	1	7
4	1	7	4	0	5	1

Question 4 (3 points)

0	5	10+j3	1+j2
5	7	1+j4	0
0	5	3+j7	5+j3
0	5	2+j3	3+j3

The above matrix is the Fourier transform of an image matrix. Apply an ideal low pass filter with cut off frequency equal 1.5. Find the total power after filter. Then find the fp(3,3) 'the enhanced pixel of indices 3,3'.

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Department : Computer Sciences
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Acad. Year : 2016 / 2017
Term : First
Year : 4th
No. Questions : 4
Date : 8 /1 /2017
Time Allowed : 120 Min

4105 Computer Vision (Final Exam)

Try questions 1, 2, and one of (3,4)

Question 1 (30 points)

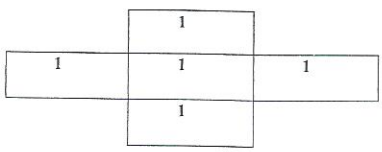
Clarify the following terms in the context of computer vision:
Image matrix, distance metrics, connectivity, histogram specification, filters boarder's treatments, Butterworth high pass filter, edge based segmentation, object boundary finding, object representation, morphology erosion, and feature extraction.

Question 2 (30 points)

The following is an image matrix quantized to 128 levels (0 to 127), find the equalized histogram. Use the equalized histogram to find out Otsu's threshold. Use Otsu's threshold to get the binary image matrix with object labeled 1(dark background). Apply Opening, and closing on the binary image. then Use crack codes to describe the found object.

0	10	10	10	10	10	0	0	10
0	10	10	10	10	10	8	0	10
0	10	10	10	100	100	100	100	10
8	10	100	10	96	100	100	100	10
0	10	10	10	103	100	0	100	0
0	10	10	10	110	103	96	100	10
0	10	10	10	110	103	100	110	10
10	10	10	10	0	0	0	0	10
13	0	13	13	13	13	13	0	0

The structure element



Question 3 (20 points)

A classifier uses the nearest neighbor with Euclidian distance to differentiate between three classes. The features used are Discrete Cosine Transform based, DCT. The considered features in sequence are DCT (0, 0), DCT (1, 0), DCT (0, 1). The classes representatives out of the training are (0, 4, 10), (-10, 30, 17), and (18, 20, -16) for classes 1, 2, 3 consequently. Find out the class of the object that has the following image matrix?

	0	1	2	3
0	0	0	10	10
1	0	4	0	0
2	10	5	3	5
3	0	0	5	0

Write a program to perform the same steps you did.

Question 4 (20 points)

For a given image matrix of resolution M x N x Q, explain the process and write a complete program to perform THREE out of the following:-

a- Sobel-x differential filter.
b- Median filter.
c- Histogram equalization.
d- Contrast contraction.
e- Smoothing by earthling lowest two planes.

Make any assumptions you may need clear.