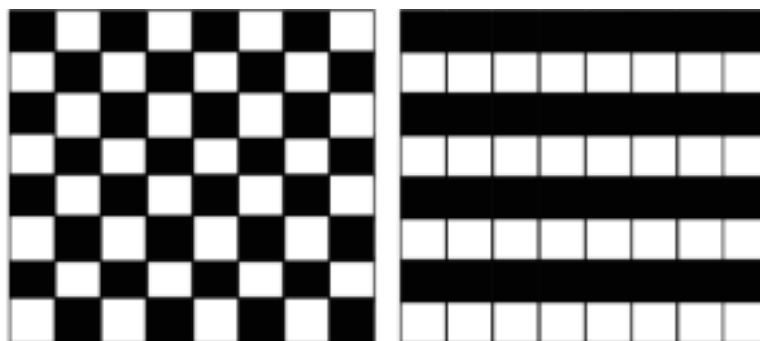


MID SEM- Total marks(20)

Course: Image Processing Date: 22 July 2023

1. Answer only in pen and paper then click photo to convert into pdf and upload.
 2. Write your name and roll number also.
 3. Please show all computations. No marks for direct answers.
 4. Google classroom is the only submission portal. E-mail (or any other method) submission will NOT be accepted.
 5. Penalties for late assignment submission — 10% of the total marks awarded will be deducted for every 10 minutes.
 6. Keep camera on and mic unmute.
1. (4 points) Answer the following questions for the two images given below each of dimension 8x8 below:
1. What would be the relation between the histograms of the two images? Show by drawing.
 2. If each image is convolve using a 3x3 box kernel, would the histograms of the two images will be equal or not ? Please explain your answer briefly and also draw histograms.



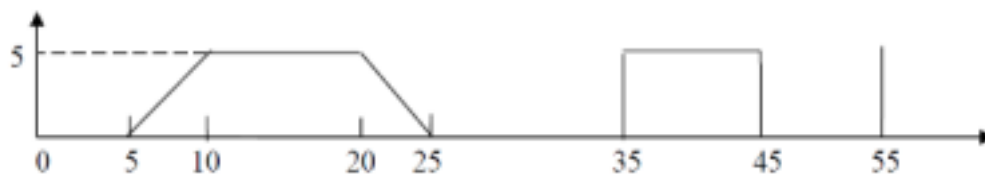
2. (3 points) Consider the Image 'I' below and the filters 'F' and 'L'.
1. Convolve the image 'I' with the filter 'F' above and compute the output image (use zeros padding if necessary and round down the output pixel values to the nearest integer).

2. Apply a 3 by 3 median filter to the output image generated in (b) to produce a 3 by 3 output image, again assume zeros outside of the image. 3. Show that convolving the laplacian using 'L' with the image 'I' is equivalent (except for a proportional factor) to locally subtracting a five point local mean from each original value of the image.

'I'			'F'			'L'		
1	1	1	0	1/8	0	1	1	1
1	8	1	1/8	1/2	1/8	1	8	1
1	1	1	0	1/8	0	1	1	1

3. (6 points) Laplacian operator uses the 2nd order derivative, to estimate the magnitude of the spatial variation at a point. A popular method based on Laplacian for enhancing the image quality is called "high-frequency emphasis".

1. Write a 1x3 mask for implementing Laplacian operator, is often implemented in the 1-D spatial domain.
2. Write the equation for implementing "high-frequency emphasis" using Laplacian operator and the corresponding mask.
3. Suppose the input signal $f(x)$ has the following shape:

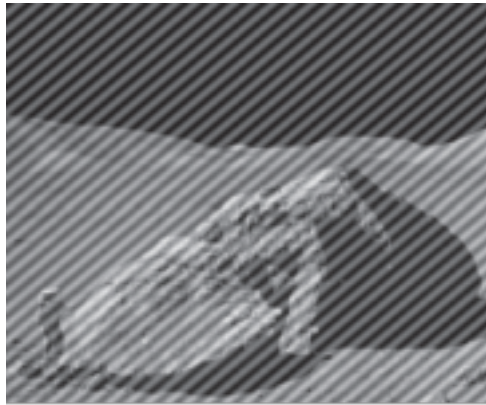


- (a) Write and plot the intensity value after application on the above signal values.
- (b) Write and plot the intensity value using mask derived in (b).
- (c) Discuss how does the "high-frequency emphasis" takes place.

4. (2 points) Given a noisy image and its filtered version below. 1. What

type of filtering is used here and why.

2. Provide a step-by-step process to obtain image B from image A.



(A)



(B)

5. (2.5 points) In the given matrix, use row and column indices of black points. With the help of Hough transformation.

Black				
		Black		
				Black

1. Transform from image space into parameter space.

2. Show if these points are collinear or not.

3. Find the equation of line.

6. (2.5 points) Consider the image segment shown below[8] Page 3

1. Let $v=0,1$ and compute the length of shortest 4,8 m path between p,q (here p and q are the notation whose value is 1) with appropriate figures Please compute and show clearly.

3	1	2	1q
2	2	0	2
1	2	1	1
1p	0	1	2