



Please make a zip file named HW3_stdno_lastname and upload in cw. For practical exercises complete files Q1.py and Q2.py and a report file in pdf format is needed. Briefly explain about the problem and your solution, show and justify your results and use relative paths. Feel free to contact me (yas.boreshban@gmail.com) if you have any questions.

Theoretical

Q1. The 8-graylevel 64×64 image (1) is given. It is desired to transform this image into a new image (2), as special below. Draw desired transformation and resulting histogram. (20 points)

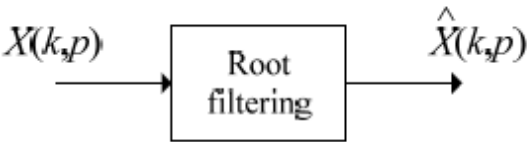
Intensity Image 1	Probability Image 1	Intensity Image 2	Probability image 2
0	0.19	0	0
1	0.25	1	0
2	0.21	2	0
3	0.16	3	0.15
4	0.08	4	0.2
5	0.06	5	0.3
6	0.03	6	0.2
7	0.02	7	0.15

Q2. Consider the Image 'I' below and the filters 'F'. (15 points)

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

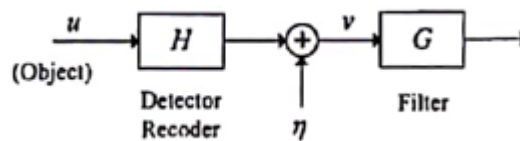
- Correlate the image 'I' with the filter 'F' above and compute the output image. Extending border values outside with 0s (Zero-padding).
- Apply a 3 by 3 median filter to the same image 'I' to produce a 3 by 3 output image, again assume zeros outside of the image (Zero-padding).

Q3. Explain how root filtering enhances an image. (10 points)



$$\hat{X}(k, p) = |X(k, p)|^\alpha \exp(j\theta(k, p)), \quad 0 \leq \alpha \leq 1$$

Q4. Given wiener filter in bellow: (20 points)



- Show that the wiener filter doesn't restore the power spectral density of the object.
- Show that the wiener filter restore the power spectral density of the object, when $S=1/2$.

Practical

Q1. Histogram Equalization and matching (20 points)

- Write a function **histEqualizate** which takes a grayscale image **lena.jpg**, and applies histogram equalization on the entire image.
- Write a function **histMaching** which takes an input image and a reference image and applies histogram Matching on the input image by matching the histogram with that of the reference image. Use **eye.png** and **eyeref.png** (converted to grayscale) as input and reference image respectively.

Q2. Image Restoration (15 points)

The image **Degraded.jpg** has been degraded in some way. Try to find out what kind of degradation has been applied on the image and try to restore it. The original image before degradation is **Clean.jpg**. clearly explain what you did to restore the image.