

Assignment 2- Image Processing

Department of Electrical Engineering & Electronics

Dec 2020, Ver. 1.0

Assignment Specifications

Module(s)	ELEC319
Semester	1
Level	Y3
Weight	15%
Tools needed	MATLAB (ver. 2015 or above), or MATLAB online
Work	Individual
Subject(s) of relevance	L8, L9, L10 and L11 of module ELEC319
Assessment method	Answers of each question as shown
Submission method	Single Word document as per the template given at the end of this document
Submission deadline	Sun 10 th Jan 2021 by midnight (23:59)

Important Instructions:

- You should submit a single Word document through VITAL with your responses to the questions as per the template provided at the end of this document. For each question, you need to provide the answer in two parts:
 - Part I** should contain the code (use font `Courier New` and colour-coded text for reasons of code readability) with proper MATLAB comments (using %) on each step. The code must be provided as **text** only, **not** screenshots, so that Turnitin can check the similarity index. **If you provide the code as screenshots, you will get zero immediately.**
 - Part II** should contain the results with proper comments.
- Try to be as brief and concise as possible. Use MATLAB ready commands and functions wherever possible. The code you provide must be **YOUR OWN**, not copied from others, websites,...etc.

Important: Departmental penalty rules for late submissions and plagiarism/collusion will be applied.

Question 1 (5%): Image Noise Filtering

- 1- Read the test image “cameraman.tif”. Add noise to it (use **imnoise** MATLAB command to add “Poisson” noise and choose suitable parameters for it). **(1 Mark)**
- 2- Develop a simple algorithm to calculate the signal-to-noise ratio (SNR) of the noisy image in dB. **(1 Mark)**
- 3- Use Gaussian filtering to de-noise the image. Find the SNR of the resulting image after de-noising. Hint: use **imgaussfilt** MATLAB command and choose suitable parameters for it. **(1 Mark)**
- 4- Wiener filtering is an important method in image de-noising. It uses a pixel-wise adaptive Wiener method, which is based on statistics estimated from a local neighbourhood of each pixel in the image. Use **wiener2** MATLAB command to de-noise the noisy image and choose suitable parameters for it. Find the SNR of the resulting image after de-noising in this case. **(1 Mark)**
- 5- Show a figure with four plots (using subplot command) that contains the original image (before adding noise), the noisy image, the de-noised image using Gaussian filter and the de-noised image using Wiener filter. The title of each individual plot should contain the SNR value. **(1 Mark)**

You are expected to generate an output similar to that shown in Figure 1 (Note: The numbers shown above the images are for illustration purposes only, so you are not required to get the same numbers).

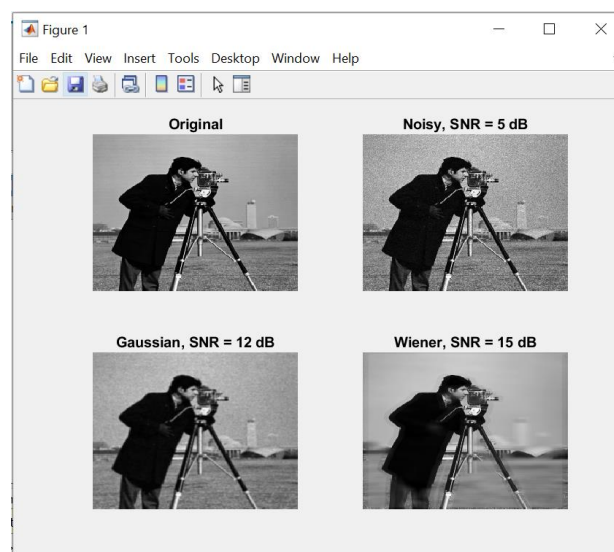


Figure 2. Example of Question 1 output

Question 2 (4%): Image Enhancement with histogram equalisation

- 1- Read the RGB test image “board.tif”.
- 2- Convert it from RGB to a format that separates intensity values from color components. **(1 Mark)**
- 3- Perform histogram equalisation on the converted image. **(1 Mark)**
- 4- Convert the resultant image back to RGB. **(1 Mark)**
- 5- Show a figure with four plots (using subplot command) that contains the original image (in step 1), the converted image (in step 2), histogram-equalised image (in step 3), and the resultant (final) RGB image (in step 4). **(1 Mark)**

Question 3 (6%): Image Segmentation, edge detection and edge enhancement

- 1- Read the test image “building.tif”.
- 2- It is required to detect (segment) straight line edges in the image. Use the necessary steps, methods, algorithms and commands provided in image segmentation, edge detection and edge enhancement lectures to perform this task. **(5 Marks)**
- 6- Show a figure with two plots (using subplot command) that contains the original image and the resulting segmented image with the straight line edges detected. **(1 Mark)**

Prepared by: Dr Ali Al-Ataby

Appendix: Submission Template:

Assignment 2 – ELEC319 Image Processing

Student Name:

Student ID:

Question 1:

Part I (MATLAB code (copied and pasted as text) with comments (%)):

Part II (results and comments):

Question 2:

Part I (MATLAB code (copied and pasted as text) with comments (%)):

Part II (results and comments):

Question 3:

Part I (MATLAB code (copied and pasted as text) with comments (%)):

Part II (results and comments):