School of Systems Engineering

Assessed Coursework Assignment Brief

Module code: SE3IA11

Lecturer responsible: Dr. Hong Wei

Coursework description: Image enhancement

Work to be submitted on-line via Blackboard by 10:30 am on: 9th Nov 2015

Work will be marked and feedback returned by: 30th Nov 2015

NOTES:

This coursework should be submitted on-line through Blackboard Learn. **[Specify the format here e.g. pdf, if necessary.]**

By submitting this work you are certifying that it is all your own work and that use of material from other sources has been properly and fully acknowledged in the text. You are also confirming that you have read and understood the University's Statement of Academic Misconduct, available on the University web-pages.

If your work is submitted after the deadline, *10%* of the maximum possible mark will be deducted for *each* working day (or part of) it is late. A mark of zero will be awarded if your work is submitted more than 5 working days late. You are strongly recommended to submit work by the deadline as a late submission on one piece of work can impact on other work.

If you believe that you have a valid reason for failing to meet a deadline then you should complete an Extenuating Circumstances form and submit it to the Student Information Centre *before* the deadline, or as soon as is practicable afterwards, explaining why.

MARKING CRITERIA
There are two questions in the assignment. Q1 takes 70% and Q2 30%.

Question 1: 70%

Topic	**Sub-topic**	**Details**	**Mark out of 70**
Remove the periodic noise	FFT or DFT transform	Implementation + coding	10
		Showing results in the frequency domain with the noise	5
	Design frequency domain filters to remove the periodic noise	Design + implementation + coding +comparison	20
		Showing the results and discussion	5
Remove random noise	Algorithm design + implementation + coding	Design various filters, eg. low-pass, median filters…, and comparison	20

		Display results and discussion	5
Calculate the error + discussion			5

Question 2: 30%
It is expected that students develop algorithms in different colour spaces to add colours in the gray level image for improving the visualization. (Note: the developed approaches could be semi-automated.)

Topic	**details**	**Mark out of 30**
Colour space 1, eg. RGB	Algorithm design (may consider segmentation…, and to assign values to each pixel by R, G, B)	5
	Implementation + coding	5
Colour space 2, eg. HSI	Algorithm design (may consider segmentation…, and to assign values to each pixel by H, S, I)	5
	Implementation + coding	5
Result comparison	Display results and make comparisons	5
Discussion	Give observations	5

ASSIGNMENT DETAILS

Coursework assignment 1- image enhancement

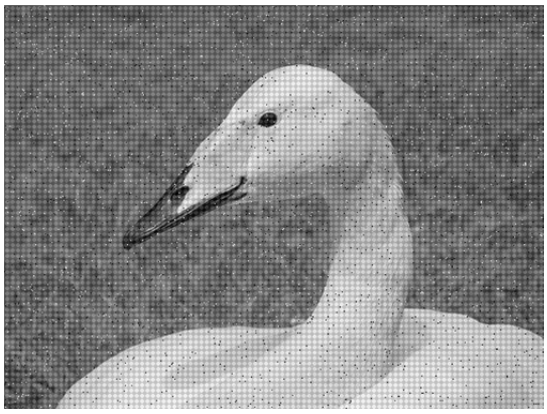
This coursework assignment aims to enhance your understanding of techniques used for image enhancement in both the spatial and frequency domain. All images used in this assignment can be downloaded in .bmp format from the Blackboard site under Course SE3IA11SEMIP12 > Assignments > Images for assignment 1.

There are two exercises in this assignment. Exercise 1 counts 70% of the mark, and Exercise 2 counts 30% of the mark.

1. The original grey level image (swanOriginal.bmp) and distorted image (swanNoise.bmp) are given in Figures 1(a) and 1(b), respectively. It is known that the distortion is caused by combination of random noise and periodic noise. You are required
    - to develop algorithms in both spatial domain and frequency domain to improve the quality of the distorted image by removing the noises; and
    - to evaluate your results by comparison of the restored images (after applying your algorithms to the distorted image) with the original image by estimation of the average mean square error.

    (You may present findings from the exercise in the report.)

(a) Original image



(b) Distorted image

Figure 1. Swan images

2. The restored image (after noise removal) in Exercise 1 is a gray level image (without colour). You are asked to add colours to the image. Develop algorithms for this purpose, and explain why you think this will improve the visualization of the image.

   Hints to Exercise 2: to conduct this task, the knowledge is not restricted by lectures within this module. You may refer to relevant books, papers, and websites to find solutions. The process may not be 100% automated (however if you could do so, it would be better). You may use a manual method to segment the image, and then add colours to each segment with your algorithms.

A formal report is required (maximum 6 A4 pages excluding preamble and appendices). It should include (with descriptive material) all the details of the processes that show how you carried out the tasks. You may implement your algorithms in any language, *e.g.* C/C++, Matlab, Java, *etc.* The original code (with detailed comments) should be attached at the end of the report. Limited Matlab/OpenCV functions may be used in the implementation with underlying techniques explained clearly.