Department of Computer Science

Summative Coursework Set Front Page

Module Title: **Image Analysis**
Module Code: **CS3IA16**
Lecturer responsible: **Dr Hong Wei**
Type of Assignment: **Technical report**
Individual / Group Assignment: **Group work**
Weighting of the Assignment: 3**5%**
Page limit/Word count: **5 pages A4 (excluding cover sheet and appendix)**
Expected hours spent for this assignment: **6 hours for each member excluding learning hours**

Items to be submitted: **the report in PDF with commented code + contribution sheet**
Work to be submitted on-line via Blackboard Learn by: **27/10/2023**
Work will be marked and returned by: 15 working days after the submission deadline

NOTES

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 hand work in 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 Support Centre *before* the deadline, or as soon as is practicable afterwards, explaining why.

1. Assessment classifications

First Class (>= 70%)	The coursework demonstrates: • Exceptional understanding of the principles of image enhancement • Solid knowledge of used techniques/algorithms for image enhancement and excellent technique skills in implementing these algorithms in both spatial and frequency domains • Comprehensive analysis of results from the implemented algorithms • Excellent presentation of the report
Upper Second (60-69%)	The coursework demonstrates: • Good and deep understanding of the principles of image enhancement • Appropriate use of algorithms to enhance images in both the spatial and frequency domains • Good technical skills in implementing these algorithms with result comparisons • Clear presentation of the report
Lower Second (50-59%)	The coursework demonstrates: • Basic understanding of the principles of image enhancement • Basic use of algorithms to enhance images in both the spatial and frequency domain • Moderate technical skills in implementation • Clear presentation of the report
Third (40-49%)	The coursework demonstrates: • Satisfactory understanding of the principles of image enhancement • Satisfactory use of algorithms to enhance images • Satisfactory technical skills in implementation
Pass (35-39%)	The coursework demonstrates: • Satisfactory understanding of the principles of image enhancement • Satisfactory knowledge to enhance images
Fail (0-34%)	The coursework fails to demonstrate understanding of image enhancement techniques and skills in implementing these techniques

2. Effort allocation sheet

You are required to work on the coursework in a group of members. Each group will submit an effort allocation sheet along with the report and workable code. The effort allocation sheet is shown below.

Group: x (x = 1, 2, ……, N)

Name (printed)	Contribution (in %)	Note (briefly explain the contribution)	Signature

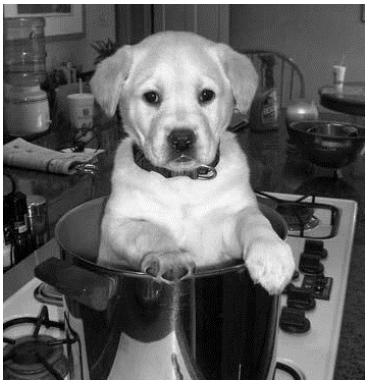
The ideal situation to the contribution (in %) is that all members in the group make full efforts towards the completion of the coursework (fully learned from the coursework exercise), and are allocated 100% as contribution. Otherwise, the true contribution is expected, such 80%, 50%, 20%, etc.

3. Assignment description

This coursework assignment aims to enhance your understanding of techniques used for image enhancement in both spatial and frequency domains. Images used in this assignment can be downloaded in .bmp format from the Blackboard site under: Assessment -> Coursework assignment 1: image enhancement -> Images for assignment 1.

The original grey level image (dogOriginal.bmp) and distorted/noisy image (dogDistorted.bmp) are given in Figures 1(a) and 1(b), respectively. It is known that the distortion is caused by combination of periodic noise and random noise. You are required

- to develop algorithms in both frequency and spatial domains to improve the quality of the distorted image by removing/reducing the noise; and
- to evaluate the result by using the measure of Mean Square Error (MSE).



(a) Original image

(b) Noisy image

Figure 1. Dog images

4. Assignment submission requirements

A formal report in PDF is required. It is expected that the following sections/contents are included in the report.

- Abstract
- Introduction
- Methodology
- Results and discussion
- Conclusion
- Appendix

The original code (with detailed comments) should be attached at the end of the report as an appendix. You may implement your algorithms in any programming language, *e.g.* C/C++, Matlab, Java, Python, *etc.* When using Matlab/OpenCV functions in the implementation, you need to clearly explain relevant techniques. The report should also include (with descriptive materials) the processes that show how you carry out the tasks.

Additional information

To produce the formal report, you may refer to the "CS Style Guide for reports", which is placed on the Blackboard under "Teaching materials".

Front page of the submission

(*the following are compulsory)*

Module Code:

Assignment report Title:

Student number (e.g. 25098635):

Date (when the work completed):

Actual hrs spent for the assignment:

Assignment evaluation (3 key points):

5. Marking scheme

The report will be marked in 100 as the full mark. The distribution of the 100 marks is listed below. For each element, you need to present evidence to show you complete the task.

Topic	**Sub-topic**	**Details**	**Mark out of 100**
Remove the periodic noise in the frequency domain	FFT or DFT transform	Process + implementation (commented code)	5
		Evidence of the image transformed into the frequency domain and indication of the noise in your resulted image	5
	Design frequency domain filters to remove the periodic noise (marks awarded to complexity, originality, and comparisons)	Design + process + implementation (commented code)	20
		Evidence of the noise removed/reduced with discussions	15
Remove the random noise in the spatial domain	Design filters, *e.g.* low-pass, median filters, etc. to remove/reduce the random noise (marks awarded to complexity, originality, and comparisons)	Design + process + implementation (commented code)	20
		Evidence of the noise removed/reduced with discussions	15
Calculate the MSE		MSE results + discussions	10
Report presentation	Organisation and structure: abstract, introduction, methodology, discussion, and conclusion. Readability, quality of figures and tables.		10