FIT3081
Image processing

Unit Guide

Semester 1, 2012

Last updated: 28 Feb 2012

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FIT3081 Image processing - Semester 1, 2012

This unit covers fundamental techniques in image processing. Topics include image representation and enhancement, thresholding, image algebra, neighbourhood operations on images, Fourier methods, edge detection, feature extraction and representation, shape, texture, segmentation, classification, restoration, image compression, and colour and multiband image processing.

Mode of Delivery

Sunway (Day)

Contact Hours

2 hrs lectures/wk, 1 hr laboratory/wk, 1 hr tutorial/wk

Workload

- Lectures: Two 1 hour lectures per week
- Tutorial: 1 hour tutorials starting week 2
- Lab Session: 1 hour session starting week 2

and up to an additional 8 hours in some weeks for completing lab and project work, private study and revision.

Unit Relationships

Prohibitions

CSE3314

Prerequisites

FIT2004 (or CSE2304) and FIT2014 (or CSE2303)

Chief Examiner

Mr Loke Kar Seng

Campus Lecturer

Clayton

Sid Ray

Sunway

Loke Kar Seng

Tutors

Sunway

Loke Kar Seng

Academic Overview

Outcomes

At the completion of this unit students will have -
Developed the ability to:

- understand the processes of image formation, acquisition, processing and analysis;
- develop programs for manipulating grey level, colour and multi-spectral images; and
- use standard image processing software;
- undertake computer analysis of medical, remotely-sensed, document, and other images.

Developed attitudes that enable them to:

- understand the role of visual information processing and analysis; and
- apply the theory and methods in practical problem solving.

Developed the skills to:

- write programs to carry out basic image processing tasks such as image denoising, image filtering and segmentation of an image in its constituent parts or objects;
- write programs to carry out advanced image processing and analysis tasks such as image segmentation, image, image classification, image data mining, and robotic vision; and
- build a software system for processing and analysis of image data.

Demonstrated the communication and teamwork skills necessary to:

- function as an image processing specialist in a group which is involved in developing a major software system; and
- produce appropriate documentation.

Graduate Attributes

Monash prepares its graduates to be:

1. responsible and effective global citizens who:

a. engage in an internationalised world
b. exhibit cross-cultural competence
c. demonstrate ethical values

critical and creative scholars who:

a. produce innovative solutions to problems
b. apply research skills to a range of challenges
c. communicate perceptively and effectively

Assessment Summary

Examination (3 hours): 70%; In-semester assessment: 30%

Assessment Task	Value	Due Date
Assignment 1	10%	Week 6, Thursday
Assignment 2	20%	Week 12, Thursday
Examination 1	70%	To be advised

Teaching Approach

Lecture and tutorials or problem classes

This teaching and learning approach provides facilitated learning, practical exploration and peer learning

Feedback

Our feedback to You

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through SETU, Student Evaluation of Teacher and Unit. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, and on student evaluations, see:
http://www.monash.edu.au/about/monash-directions/directions.html
http://www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this unit

If you wish to view how previous students rated this unit, please go to
https://emuapps.monash.edu.au/unitevaluations/index.jsp

Required Resources

Please check with your lecturer before purchasing any Required Resources. Prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

Software

- Java Development Kit
- Netbeans

These are freely available from:

JDK - http://www.oracle.com/technetwork/java/javase/downloads/jdk6-jsp-136632.html

Netbeans -http://netbeans.org/

Prescribed text(s)

Prescribed texts are available for you to borrow in the library.

Gonzalez and Woods. (2001). *Digital Image Processing*. (2nd) Prentice-Hall.

Examination material or equipment

Writing tools

Unit Schedule

Week	Activities	Assessment
0		No formal assessment or activities are undertaken in week 0
1	Image Processing Fundamentals; Arithmetic Operations on Images	
2	Introduction to Image Enhancement Techniques; Linear Stretching	
3	Spatial Filtering Methods; Sharpening Filters	
4	Histogram Equalization; Line and Edge Detection	
5	Image Thresholding; Image Segmentation Methods	
6	Clustering-Based Image Segmentation; Region Growing; Splitting and Merging	Assignment 1 due Thursday this week
7	Texture Characterization; Co-occurrence Matrices; Entropy-Based Thresholding	
8	Image Filtering in Frequency Domain	
9	Image Data Compression	
10	Image Representation and Description	
11	Image Recognition I	
12	Image Recognition II	Assignment 2 due Thursday this week
	SWOT VAC	No formal assessment is undertaken SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/ academic/education/assessment/ assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your MUSO (Blackboard or Moodle) learning system.

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles
(http://www.infotech.monash.edu.au/resources/staff/edgov/policies/assessment-examinations/unit-assessment-hu

Assessment Tasks

Participation

- **Assessment task 1**

  Title:
  > Assignment 1

  Description:
  > Programming and Analysis for Image Processing Tasks

  Weighting:
  > 10%

  Criteria for assessment:
  > 1. Satisfactory implementation according to the requirements of the assignment.
  >
  > 2. Structure, modularity and efficiency of code
  >
  > 3. Ease of use of program user interface
  >
  > 4. Evidence of testing

  Due date:
  > Week 6, Thursday

- **Assessment task 2**

  Title:
  > Assignment 2

  Description:
  > Programming and Analysis for Image Processing Tasks

  Weighting:
  > 20%

  Criteria for assessment:
  > 1. Satisfactory implementation according to the requirements of the assignment.
  >
  > 2. Structure, modularity and efficiency of code
  >
  > 3. Ease of use of program user interface
  >
  > 4. Evidence of testing

  Due date:
  > Week 12, Thursday

Examinations

- **Examination 1**

    Weighting:
    70%
    Length:
    3 hours
    Type (open/closed book):
    Closed book
    Electronic devices allowed in the exam:
    None

Assignment submission

It is a University requirement
(http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-procedures.html) for
students to submit an assignment coversheet for each assessment item. Faculty Assignment
coversheets can be found at http://www.infotech.monash.edu.au/resources/student/forms/. Please check
with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the
online assignment submission, hand-in a hard copy, or use an online quiz).

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the VLE site for
this unit, which you can access via links in the my.monash portal.

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special
consideration process:
http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html.

Returning assignments

Students can expect assignments to be returned within two weeks of the submission date or after
receipt, whichever is later.

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:
http://policy.monash.edu.au/policy-bank/academic/education/index.html

Key educational policies include:

- Plagiarism
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html)
- Assessment
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/assessment-in-coursework-po
- Special Consideration
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/special-consideration-policy.h
- Grading Scale
  (http://www.policy.monash.edu/policy-bank/academic/education/assessment/grading-scale-policy.html)
- Discipline: Student Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-discipline-policy.html)
- Academic Calendar and Semesters (http://www.monash.edu.au/students/key-dates/);
- Orientation and Transition (http://www.infotech.monash.edu.au/resources/student/orientation/);
  and
- Academic and Administrative Complaints and Grievances Policy
  (http://www.policy.monash.edu/policy-bank/academic/education/management/complaints-grievance-policy.
- Codes of Practice for Teaching and Learning
  (http://www.policy.monash.edu/policy-bank/academic/education/conduct/suppdocs/code-of-practice-tea

Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at www.monash.edu.au/students. For Sunway see http://www.monash.edu.my/Student-services, and for South Africa see http://www.monash.ac.za/current/

The Monash University Library provides a range of services and resources that enable you to save time and be more effective in your learning and research. Go to http://www.lib.monash.edu.au or the library tab in my.monash portal for more information. At Sunway, visit the Library and Learning Commons at http://www.lib.monash.edu.my/. At South Africa visit http://www.lib.monash.ac.za/.

Academic support services may be available for students who have a disability or medical condition. Registration with the Disability Liaison Unit is required. Further information is available as follows:

- Website: http://monash.edu/equity-diversity/disability/index.html;
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1 Gallery Building (Building 55), Monash University, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Sunway Campus
- Telephone: 03 9905 5704, or contact the Student Advisor, Student Commuity Services at 03 55146018 at Sunway

Other

READING LIST

Recommended Reading

R. C. Gonzalez and R. E. Woods, Digital Image Processing using MATLAB, Prentice Hall, 2004. A. K. Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1990. W. Niblack, An Introduction to Digital Image Processing, PHI, 1986. D. H. Ballard and C. M. Brown, Computer Vision, Prentice-Hall, 1982. M. D. Levine, Vision in Man and Machine, McGraw?-Hill, 1995. R. Jain, R. Kasturi, and B. G. Schunck, Machine Vision, McGraw?-Hill, 1995. C. Watkins, A. Sadun, and S. S. Marenka, Modern Image Processing: Warping, Morphing, and Classical Techniques, Academic Press, 1993. H. R. Myer and A. R. Weeks, The Pocket Handbook of Image Processing Algorithms in C, Prentice-Hall, 1993. S. E. Umbaugh, Computer Vision and Image Processing: a practical approach using CVIPtools, Prentice Hall PTR, 1998.