CEG4316 Digital Image Processing Fall 2013

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Schedule:

Tue LEC	11:30-13:00 KED B004
Fri LEC	13:00-14:30 KED B004
Thur LAB	16:00-17:30 SITE 2060
Fri TUT	08:30-10:00 SITE 2052
WED Consultation	13:30-15:30 CBY A512

Text: E. Dubois, *CEG4316 Digital Image Processing Course Notes*.

References:
Y. Wang, J. Ostermann and Y.-Q. Zhang, *Video Processing and Communications*, Prentice-Hall, 2002.
R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, 3rd edition, Prentice Hall, 2008.
R.C. Gonzalez, R.E. Woods and S.L. Eddins, *Digital Image Processing Using MATLAB*, Pearson Prentice Hall, 2004.
MATLAB Image Processing Toolbox User's Guide.
D. Hanselman and B. Littlefield, *Mastering MATLAB*, Pearson 2012.

Grading:

20% Assignments and quizzes: Three assignments, to be handed in on the due-date specified. There will be a 5% penalty for each day late, and no assignment will be accepted after three working days (sometimes a shorter time may be specified). Solutions will be posted around three days after the due-date. There will be three closed-book quizzes during tutorials based on the written assignments and previous tutorials.

20% Laboratory: Computer experiments to be carried out with MATLAB during weekly lab sessions. Three reports with methods used, results obtained, and MATLAB code, to be handed in on the due-date specified. There will be a 5% penalty for each day late; however, report submission is mandatory.

20% Midterm exam: Closed-book exam, 80 minutes in length.

40% Final exam: Closed-book exam, 3 hours in length.

Objectives of the Course:

The purpose of this course is to provide the *theoretical* and *practical* basis required for the understanding and design of image processing and image communication systems. The basics of signal and system theory for still and time-varying images will first be presented. Then the representation and reproduction of color in images will be studied. Methods to represent images efficiently will then be covered, and finally the task of image compression will be studied. At the end of the course, the student should be able to understand many current technical papers in the image processing literature as well as the basic principles of operation of most image compression standards. Case studies will be presented, especially in the context of the acquisition, processing and display of images from digital cameras. Specifically, how can the raw data acquired by a camera CCD sensor be converted to a JPEG image with small file-size that displays a highly accurate rendition of the original scene?

Course Outline:

1. Introduction
   - scope and objectives of the course
   - overview of issues in image processing and communication
   - survey of some applications

2. Two- and three-dimensional signals and systems
   - continuous space(-time) signals and systems
   - discrete space(-time) signals and systems
   - sampling of continuous space(-time) signals
   - examples of multidimensional FIR filters
   - changing the sampling structure of an image

3. Light and color
   - light
   - colorimetry
   - luminance and chromaticity
   - important color representations

4. Image representations
   - spatial-domain representations
   - vector-space representations
   - bases for image representation, discrete cosine transform (DCT)
   - local bases: block DCT and wavelet representations

5. Image Compression
   - principles
   - quantization
   - image quantization
   - quantization of transform coefficients
   - binary code assignment
   - lossless compression of multilevel images
   - moving-image compression (motion compensation, MPEG)

NOTES

- As per Faculty requirements, attendance at lectures, labs and tutorials is mandatory and will be noted. As per academic regulations, students who do not attend 80% of these may not be allowed to write the final examinations.
- All components of the course (i.e., laboratory reports, assignments, etc.) must be fulfilled; otherwise you may receive an INC as a final mark (equivalent to an F). This is also valid for a student who is taking the course for the second time.
- Be aware of academic fraud regulations, found at this link: http://www.engineering.uottawa.ca/downloads/pdf/FacultyRegulationsEnglish2008.pdf. Please take note that although the webpage on academic fraud regulations dates back to 2003-2005, the regulations have remained the same and still apply.