Course Code: CoE4TN3
Course Title: Image Processing
Project Outline: academic year 2004-2005, term 2

For the project component of the image-processing course, every student is supposed to complete a small project. The principal objectives of completing a project are: (1) students gain practical experience on how to manipulate images, and (2) students develop a sense of how image processing solutions are prototyped in software. For the project, students should use C programming language or a combination of C and MATLAB.

The project is worth 20% of the final grade, broken down as follows:

Overall Project	10%
Report	10%

Possible Project Topics:

- Image restoration - blurred images, noisy images using inverse filtering, iterative methods, statistical modeling and recovery (Wiener filtering)
- Image encoding - DPCM, transform applications (DFT, FFT, WHT, DCT, Hotelling), Huffman codes.
- FFT, WHT, or DCT for filtering/compression
- Histogram modification - apply and compare different methods
- Histogram specification
- Histogram stretch
- Local histogram equalization
- Histogram equalization and direct histogram specification using VGA/mouse
- Program to enhance portions of an image, e.g. blow up in size and improve contrast
- Frequency domain filtering
- Zooming algorithm using different interpolation methods
- Removal of blur from uniform linear motion
- High frequency enhancement techniques
- Sharpen and unsharp masking
- Roberts, Sobel and Canny edge detectors
- Color image processing
- Image coloring enhancement for X-ray images
- Arithmetic coding for compression
- Differential coding 1-D and 2-D
- Homomorphic filtering
- Morphological image processing (opening, closing, hit-or-miss transformation)
- DCT for compression - JPEG algorithm
- Different techniques for image segmentation
- A list of some other possible projects can be found on the web page of the book: http://www.imageprocessingplace.com/

- Other related topics of your choice

Due dates:

February 10th: 1 page project proposal
Project reports are due at the end of the semester.

Suggested Project Process:

1) Find a subject of your interest
2) Define C function(s) to implement
3) Code and debug your function(s)
4) Test your functions on some images
5) Compare and contrast your results to other similar results and analyze results using appropriate metrics, tabulate or plot, etc (if applicable)
6) Write report, include images

NOTE: Links to some image databases are available at the web page of the textbook (http://www.imageprocessingplace.com/).

FORMAT FOR SUBMITTING PROJECT REPORTS
Because projects are in addition to course work, it is suggested that project reports be kept short and be organized in a uniform manner to simplify grading. The following format achieves these objectives.

Page 1. Cover Page.

Project title
Course number
Student's name
Date
Abstract (not to exceed 1/2 page)

Page 2: Technical discussion. One to two pages (max). This section should include the techniques used and the principal equations (if any) implemented.
Page 3 (or 4): Discussion of results. One to two pages (max). A discussion of results should include major findings in terms of the project objectives, and make clear reference to any images generated.
Results: Includes all the images generated in the project. Number images individually so they can be referenced in the preceding discussions.
Appendix: Includes listings of all programs. Standard routines and other material obtained from other sources should be acknowledged by name, but their listings should not be included.
Layout. The entire report must be in standard sheet size format (8.5 x 11 inches in the U.S.). All sheets should be stapled in three locations to form a binding booklet-like

support on the left margin. Alternatively, sheets can be assembled using a commercial plastic binding product with a clear plastic cover.

A note on program implementation: As noted earlier, the objective of the project is to teach the student how to manipulate images and how to implement image processing techniques in software. There are numerous packages that perform some of the functions required to implement the projects. However, the use of "canned" routines as the only method to implement an entire project is discouraged. For example, if the students are using MATLAB and the Image Processing Toolbox, a balanced approach is to use some of MATLAB's functions and complement them in C. A good example is using MATLAB to read and save an image into a matrix which is then used by an image processing application (e.g., edge detection) developed in C.