ENSC 460/895- Image Processing and Analysis

Instructor: Mirza Faisal Beg

Course description

This course aims to give a broad background into techniques used in image processing and analysis. The topics covered include image transforms, image interpolation, enhancement and filtering in spatial and frequency domains, image segmentation and brief introduction to rigid and non-rigid image registration. The depth of emphasis for the topics covered will be flexible and tailored depending on the students intended area of applications.

Outline of topics covered

- Image Enhancement/filtering in spatial and frequency domains, Convolution, blurring, sharpening, Fourier, FFT, Hough and other transforms
- Image restoration and inverse filtering
- Introduction to Color Image Processing
- Geometric Transformations on Images: Rigid and Non-rigid registration techniques Image Interpolation - Survey of existing interpolation techniques such as nearest-neighbor, bi-linear, cubic convolution, spline-based.
- Morphological image processing
- Image Segmentation: Thresholding, Region based segmentation, Bayesian segmentation.

Pre-requisites

Proficiency expected with calculus and linear algebra concepts such as differentiation, integration, chain rule, Taylor's series, matrix operations such as inverse, singular value decomposition, pseudo-inverse, working knowledge of differential equations. Also required is a proficiency in C++ which is the language for turning in assignments. You are welcome to use MATLAB for checking your answers against built in functions. Library/classes for reading JPEG images in C++ will be provided.

Course Text

The textbook for the course is Digital Image Processing, Second Edition by Rafael Gonzalez and Richard Woods. Published by Prentice Hall, ISBN 0201180758. The tentative course plan is to cover Chapters 2, 3, 4, 5, 6, 9 and 10 atleast and possibly other material. Notes will also be provided for topics that are not covered in the book or which need additional reading material.

Reference books:

- Fundamentals of Digital Image Processing by Anil Jain, Prentice Hall, ISBN 0133361659.
- Digital Image Processing by Kenneth Castleman, Prentice Hall, ISBN 0132114674.

Grading Policy

ENSC 460: 25% Final, 25%Midterm, 40% Homework, 10% Final Project. ENSC 895: 25% Final, 15%Midterm, 30% Homework, 30% Final Project. A+(93-100), A(85-93), A-(80-85), B+(73-80), B(65-73), B-(60-65), C(50-60).