CSCE 4240 Digital Image Processing

Instructor: Bill Buckles
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Semester: Spring 2020
Time: 4:00pm-5:20pm TTh
Place: DP B192
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Course Description

Introduction to algorithms, mathematical tools, and various digital image applications. Gray level and multispectral image manipulation will be discussed. Students will work in teams to solve a significant image processing problem

Learning Outcomes

By the end of the course you will

- Be familiar with 2-D/3-D signals, sampling and filtering
- Be familiar with sensor modality and digital encoding
- Be able to filter and enhance images in the spatial domain and frequency domain
- Be able to perform image restoration
- Be able to perform region and edge segmentation
- Be able to design algorithms for object recognition

Course Requirements

Attendance: Attendance is mandatory. Lectures, videos, and class discussions will contain vital information needed to do well on exams.

Textbook: *Digital Image Processing*, 4th Ed., Rafael Gonzalez and Richard Woods, Pearson Pub., 2018, ISBN-13:9780133356724

Grading:

Projects 25%
Exams I and II 20% each
Homework 10%
Attendance 5% (based on pop quizzes)
Final 20%

A: 90-100; B: 80-89; C: 70-79; D: 60-69; F: <60 (raw final grades will be curved)

Prerequisites: Probability theory, Calculus, Data structures, Proficiency with C/C++, Java, Python, or Matlab.

Disabilities Accommodation:

The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

Meeting	Topic
1	T1. Introduction (Chapters 1 and 2)
	a. The light spectrum
2	b. Image representation – sampling and quantization
	c. 3-D images
	d. Image algebra
3	T2. Spatial filtering (Chapter 3)
	a. Intensity transformations
4	b. Histogram equalization
	c. Spatial convolution
5	d. Smoothing and sharpening
	e. Hough transforms (Chapter 10)
6	T3. Filtering in the frequency domain (Chapter 4)
	a. Linear systems (not in text)
	b. Fourier transform
	c. Sampling and aliasing
7	d. Special filters (ideal highpass/lowpass, Gaussian highpass/lowpass, Laplacian, unsharp masking)
8	T4. Wavelets (Chapter 7)
	a. Discrete wavelet transforms and subbands
	b. The Haar transform
	c. Multiresolution analysis
9	MIDTERM EXAM
10	T5. Image restoration (Chapter 5)
	a. Types of noise
	b. Special filters (median, bandreject, bandpass)
11	c. Wiener filters
	d. *Image quality assessment (not in text)*

12	T6. Color (Chapter 6)
	a. Representation and color models
	b. Histograms
13	c. Smoothing and sharpening
	d. Segmentation and edge detection
14	T7. Morphological operations (Chapter 9)
	a. Erosion, dilation, opening, closing
	b. Hole filling and extracting connecting components
15	T8. Image segmentation (Chapter 10)
	a. Thresholding
16	b. Taxonomies (region growing/splitting, supervised/unsupervised)
	c. Watersheds
17	T9. Object recognition (Chapter 12)
	a. Fourier descriptors
18	b. Texture
19	PROJECT REPORTS
20	PROJECT REPORTS
21	REVIEW