

CS 555 – Visual Processing

Course Description

This course will introduce the visual information processing from Computer Science point of view. Topics include the fundamental theory and Techniques of image representation and modeling, image enhancement, image restoration, image transforms, image reconstruction from projections, and image compression. This course will also introduce algorithms developed in computer science applications such as object recognition (biometrics), robotic vision, multimedia, and bioinformatics.

Prerequisites: CS240, Math304 or equivalent courses.

Textbooks Recommended

We will be using the following major books as references:

* [1] Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing. Prentice-Hall. 2008 (ISBN: 0-13-168728-x). (third edition).

* Some supplemental materials will be handed out in the class.

Course Requirements

Your grade will be based on the following criteria:

* Programming Assignments - 48%.

* Term Project - 48% (including proposal presentation, project presentation, and project paper report)

* Class attendance – 4%

Course Syllabus:

08/26

Introduction

Class Notes (1) and Ch.1

08/28

Programming for Image processing

Sample for Windows Programming

Sample for Unix Programming

Program Handout

09/02

Visual Information fundamentals
Class-notes (2) and Ch.2

09/04

Image Enhancement
Class-notes (4) and Ch.3
Assignment 1
Sample solutions

09/09

Research Case Study on Scalable edge enhancement
Case study notes (5)

09/11

Filter and Scale Space
Ch.3 and class notes

09/16

Ch.3 and Ch.10.1.3
Term Project Specification
Term Project Topics

9/18

Image transformation
Ch.4 and Ch.8.5.2 class notes
Assignment 2
Sample solutions

9/25

Ch.11.4; Ch.10.2.2

10/2

Color Theory
Ch.6 and class notes

10/7 and 10/9

Assignment 3
Images
Sample solutions

10/14

Project Proposal Presentation

10/16

Project Proposal Presentation

Name List

Project proposal due

10/21

Image segmentation, description and representation.

Ch.11.1, 11.2

Class notes

Supplemental notes (deformable template)

10/23

Active Contour

Region description

Supplemental notes (active contour)

Ch.11.5, 12.3.3

10/28

Morphological image processing

Ch.9

Class notes

10/30

Morphological image processing

Assignment 4

11/4

Pattern recognition

Ch.12

Class notes

11/6

Pattern recognition and motion detection, tracking (optical flow)

11/11

Image and video compression H.264;

Ch.11.3.4

Class notes

11/13

Multi-resolution processing and wavelet

Ch.8 and Class notes

11/18

Cont'd and Image Restoration

Class notes;

11/20

Computer vision introduction (knowledge based vision, 3D construction, stereo vision)

Ch.7 and Class notes

11/25

Cont'd

11/27

No class (thanksgiving)

12/2

Project Presentation/Demonstration

Name list for final presentation

12/4

Project Presentation/Demonstration

12/9

Project Presentation/Demonstration

12/11

Project Presentation/Demonstration

Project report due on December 15 by 10:00pm.