Course Update Information

Jan 29 (Tuesday), 2013. First class meet of our course.

Course Objectives

Computer vision has a rich history of fundamental work on stereo and visual motion, which has dealt with the problems of 3D reconstruction from multiple images, and structure from motion from video sequences. Recently, in addition to these traditional problems, the stereo and motion information presented in multiple images or a video sequence is also being used to solve several other interesting problems, for example, large-scale scene modeling, video mosaicing, video segmentation, video compression, video manipulation and video surveillance. This is sometimes summarized as video computing. Computer vision is playing an important and somewhat different role in solving these problems in video computing than the original image analysis approach in the early days of vision research. The course "Computer Vision" will include advanced topics in video computing as well as fundamentals in stereo and motion.

Course Syllabus and Tentative Schedule (mm/dd)

(Spring 2013 academic calendar)

Part I. Computer Vision Basics

I-1. Introduction: What, Why and How (pptx slides) [printable PDF]
I-2. Image Formation: Digital Image Basics (pptx slides) [printable PDF] (Assignment 1)
I-3. Image Enhancement (slides) (Assignment 2) (lecture notes on feature extraction:I-3 and I-4)
I-4. Edge Detection: (slides)
Part II. 3D Computer Vision

II-1. Camera Models (slides) (lecture notes) (Assignment 3)
II-2. Camera Calibration (slides) (lecture notes) -
   (Problem Definition: the Tools You Must Know),
   (Direct Approach: Divide and Conquer),
   (Projective Matrix Approach: All in One )
II-3. Stereo Vision (slides) (lecture notes) (Assignment 4)
   (Problem Definition & Epipolar Geometry) ,
   (Correspondence Problem & Reconstruction Problem)
II-4. Visual Motion - (slides) (lecture notes)
   (The Motion Field of Rigid Motion) , Project Discussions & Exam Review
   (Optical Flow Approach & Feature-based Approach)

Part III. Exam, Projects and Project Presentations

III-1. Exam
III-2. Exam Discussions; Student Project Presentations (1)
III-3. Student Project Presentations (2)

Textbook and References

Main Textbook:

In the form of Lecture Notes and Slides; will be provided by the instructor

Reference Textbook:


Supplements:
   Online References and additional readings when necessary.

Grading and Prerequisites

The course will accommodate both graduate and senior undergraduate students with background in computer science, electrical and computer engineering, or applied mathematics. Students who take the course for credits will be required to finish 4 assignments (40%), one midterm exam (40%), and one programming project (20%, including submit a report and give a small presentation to the class at the end of the semester). The topics of the projects will be given in the middle of the semester and will be related to the material presented in the lectures.

Students are required to have a good preparation in both mathematics (linear algebra/numerical analysis) and advanced programming.