ECE 4310/6310 Introduction to Computer Vision
Fall 2022

Objective

The purpose of a computer vision system is to take data (usually in the form of one or more images) and produce information. For example, a computer vision system might inspect bottles for proper volumes, identify abnormal tissue in a medical image, recognize a fingerprint, or tell an automated door when it is safe to close. This course teaches the mainstream theories of computer vision used to build such systems. Several examples (such as optical character recognition) are implemented in assignments.

Upon successful completion of the course, students will be able to apply mainstream computer vision theories in the engineering (design, implementation, testing and debugging) of modern devices and systems. Graduate students will additionally be ready to apply computer vision to advanced research problems within the focus areas of intelligent systems and computer systems architecture.

Suggested Text

CVonline: http://homepages.inf.ed.ac.uk/rbf/CVonline/
Image Processing, Analysis, and Machine Vision, by Sonka, Hlavac and Boyle, third edition, Cengage Learning, 2007.
Computer Vision: Algorithms and Applications, by Szeliski, Springer, 2011.
We will make use of journal papers and other sources throughout the semester.
The course web site is http://www.cecas.clemson.edu/ahoover/ece431/.

Professor

Dr. Adam Hoover
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656-3377
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office hours walk-in anytime, or by appointment

Topics

Machine vision sensors and paradigms (1 week)
Image processing basics (histograms, smoothing, convolution, edge detection) (2 weeks)
GUI event-driven programming (1.5 weeks)
Segmentation, region properties and algorithms (2 weeks)
Matched filters, ROC curves and evaluation (2 weeks)
Active contours (snakes), energy minimization (1.5 weeks)
Tsai's camera calibration model and method, system latency (2 weeks)
Accelerometers and gyroscopes, motion data, activity recognition (1 week)
Object modeling and recognition (1 week)
Range cameras, 3D data, and surface segmentation (1 week)

Grading

ECE4310: 100% eight labs (12.5% each)
ECE6310: 80% eight labs (10% each), 20% semester project

Attendance, Academic Integrity, Access Accommodations

This course follows all the procedures outlined in the ECE Common Course Syllabus.