EE 396: Advanced Topics in Signal Processing
(aka Mathematical Models in Computer Vision)

Introduction and Course Information

Course Website: http://vision.ucla.edu/~ganeshs/dsp_course/

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What is Computer Vision?

The science and technology of constructing engineering systems to infer properties of a 3D environment from images, e.g., measurements of light projected to an imaging plane.
Visual Search

http://www.google.com/mobile/goggles/
Autonomous Navigation

Google’s modified Toyota Prius uses an array of sensors to navigate public roads without a human driver. Other components, not shown, include a GPS receiver and an inertial motion sensor.

**LIDAR**
A rotating sensor on the roof scans more than 200 feet in all directions to generate a precise three-dimensional map of the car’s surroundings.

**VIDEO CAMERA**
A camera mounted near the rear-view mirror detects traffic lights and helps the car’s onboard computers recognize moving obstacles like pedestrians and bicyclists.

**RADAR**
Four standard automotive radar sensors, three in front and one in the rear, help determine the positions of distant objects.

**POSITION ESTIMATOR**
A sensor mounted on the left rear wheel measures small movements made by the car and helps to accurately locate its position on the map.

Source: Google

[Image: Autonomous Driving]


Medical Studies

http://news.bbc.co.uk/2/hi/health/4319952.stm
Course Topics

1. Image Denoising
2. Image Segmentation / Object Detection
3. Image Registration / Matching
Course Emphasis

Emphasis of this course will not be a particular application, but

1. Creating mathematical models for a problem
2. Analyzing assumptions in these models
3. Creating computational algorithms
Image Denoising

Estimate (true) image without nuisances/noise from noisy image
Image Segmentation and Object Detection/Extraction

Divide image into objects of interest / non-interest
Image Registration/Matching

Find (if possible) correspondence of points between two images or how one image is deformed to the other