EE795: Computer Vision and Intelligent Systems

Spring 2012
TTh 17:30-18:45 WRI C225

Lecture 01
130122

http://www.ee.unlv.edu/~b1morris/ecg795/

Outline

- Course Syllabus
- Computer Vision Overview

Course Information

- Website
  - http://www.ee.unlv.edu/~b1morris/ecg795/
- Textbook
  - Computer Vision: Algorithms and Applications, Richard Szeliski
  - http://szeliski.org/Book/

Grading

- Final 30%
- Project 30%
  - Propose a project
  - Write a conference style paper (use Latex)
  - Presentation during last week of class
- Homework 40%
  - Programming assignments that can be completed in Matlab or OpenCV
  - OpenCV will probably be easier for the final project

What is Computer Vision?

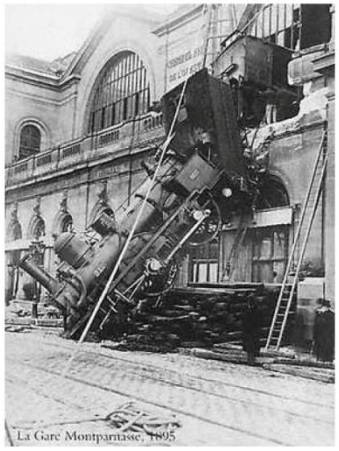
- Hanauma Bay, Hawaii

What is Computer Vision?

- Goal is to develop algorithms and programs that can interpret and understand images
  - Image can be a single image or come from a video
- Must bridge the gap between what we see and what a computer “sees”

Why is Computer Vision Difficult

- Humans are very skilled with vision
  - We are designed with vision as our primary sensory input
  - It comes naturally
- Computers operate on numbers and do not have contextual clues we have wired in our brains



What we see

0	3	2	5	4	7	6	9	8
3	0	1	2	3	4	5	6	7
2	1	0	3	2	5	4	7	6
5	2	3	0	1	2	3	4	5
4	3	2	1	0	3	2	5	4
7	4	5	2	3	0	1	2	3
6	5	4	3	2	1	0	3	2
9	6	7	4	5	2	3	0	1
8	7	6	5	4	3	2	1	0

What a computer sees

Humans vs. Computers

- Computers can't currently beat humans
  - Humans are much better at "hard" things
  - Computers can be better at "easy" things

- Computers are computational device so must be given memory and learn
- If the task requires lots of attention it may be better suited for a computer
  - Surveillance
  - Automotive blind spot detection
  - Searching for a face in a crowd

Scope of Computer Vision

- Very broad
- Cfp for the Computer Vision and Pattern Recognition (CVPR) conference:

• Motion and Tracking • Stereo and Structure from Motion • Shape-from-X • Color and Texture • Segmentation and Grouping • Image-Based Modeling • Illumination and Reflectance Modeling • Shape Representation and Matching • Sensors • Early and Biologically-Inspired Vision • Computational Photography and Video	• Object Recognition • Object Detection and Categorization • Video Analysis and Event Recognition • Face and Gesture Analysis • Statistical Methods and Learning • Performance Evaluation • Medical Image Analysis • Image and Video Retrieval • Vision for Graphics • Vision for Robotics • Applications of Computer Vision

Examples of State-of-the-Art

Autonomous Cars

- Google Car
- http://www.youtube.com/watch?v=-3ulKUJtZ30

Augmented Reality

- Google Glasses
- http://www.youtube.com/watch?v=JSnB06um5r4

- http://www.youtube.com/watch?v=fhFzStkoE0

3D Structure

- http://www.youtube.com/watch?v=UwBd1RbKljk

Robotics

- http://www.youtube.com/watch?v=c3Cq0sy4TBs

Panoramas

- http://www.youtube.com/watch?v=zVlO3PAYM-Q