Computer Vision (CSE 455)

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Web Page

- http://www.cs.washington.edu/education/courses/cse455/12wi/

Handouts

- signup sheet
- intro slides
- image filtering slides

Today

- Intros
- Computer vision overview
- Course overview
- Image processing

Readings for this week

- Forsyth & Ponce, chapter 7 (in reader, available at UW Bookstore in the CSE textbook area)
- Mortensen, Intelligent Scissors (online)

What is computer vision?

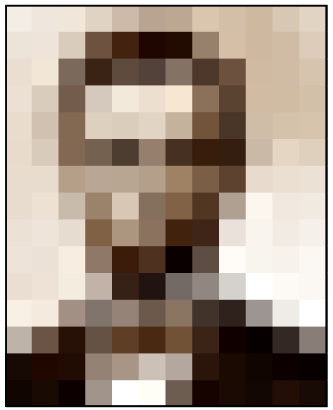
What is computer vision?

Terminator 2

Every picture tells a story

Goal of computer vision is to write computer programs that can interpret images

What do computers see?



slide by Larry Zitnick

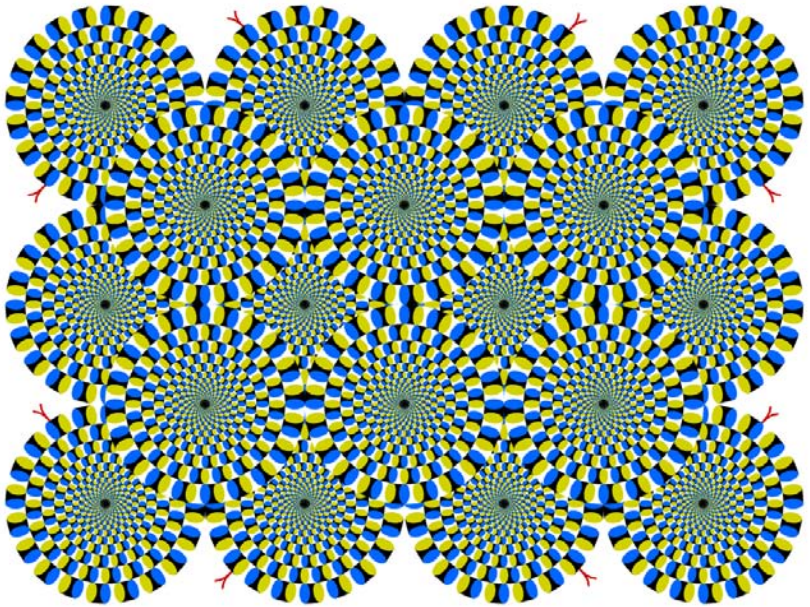
Can computers match (or beat) human vision?

Yes and no (but mostly no!)

- humans are much better at “hard” things
- computers can be better at “easy” things

Human perception has its shortcomings…

Sinha and Poggio, *Nature*, 1996



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Current state of the art

The next slides show some examples of what current vision systems can do

3D Maps

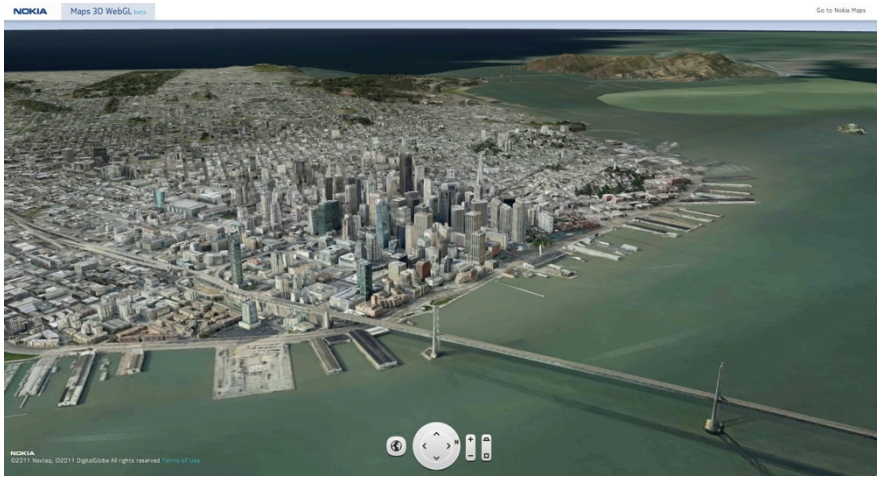


Image from Nokia's Maps 3D WebGL
(see also: Google Maps GL, Google Earth)

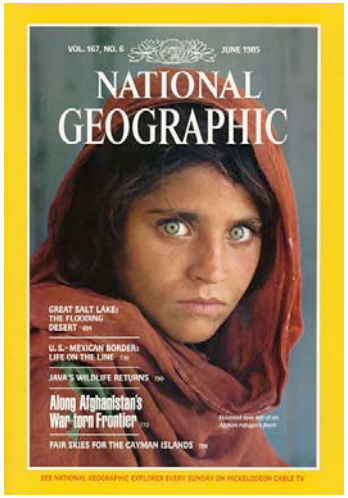
Motion capture

Microsoft's XBox Kinect

Face detection

Most digital cameras detect faces

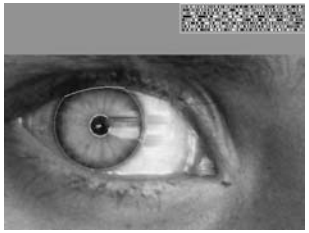
Face recognition

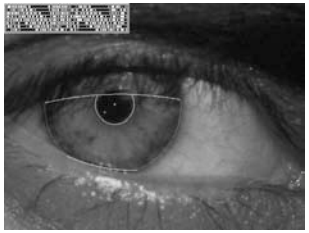


Who is she?

Vision-based biometrics

"*How the Afghan Girl was Identified by Her Iris Patterns*" Read the story





Object recognition

Google Goggles
Bing Vision

Special effects: shape capture

The Matrix movies, ESC Entertainment, XYZRGB, NRC

Sports

Sportvision first down line
Nice explanation on www.howstuffworks.com

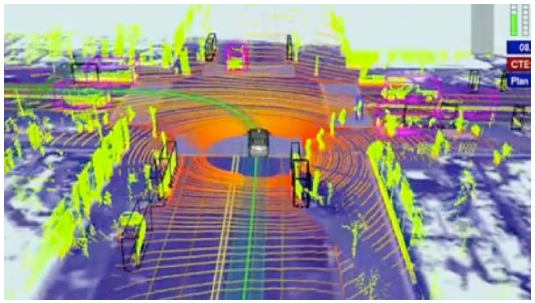
Smart cars

Slide content courtesy of Amnon Shashua

Mobileye

- Vision systems currently in high-end BMW, GM, Volvo models

Self-driving cars



"Our self-driving cars have now traveled nearly 200,000 miles on public highways in California and Nevada, 100 percent safely. They have driven from San Francisco to Los Angeles and around Lake Tahoe, and have even descended crooked Lombard Street in San Francisco. They drive anywhere a car can legally drive."

- Sebastian Thrun, Google

Robotics

NASA's Mars Spirit Rover
http://en.wikipedia.org/wiki/Spirit_rover

http://www.robocup.org/

Current state of the art

You just saw examples of current systems.

- Many of these are less than 5 years old

This is a very active research area, and rapidly changing

- Many new apps in the next 5 years

To learn more about vision applications and companies

- David Lowe maintains an excellent overview of vision companies
  - http://www.cs.ubc.ca/spider/lowe/vision.html

This course

http://www.cs.washington.edu/education/courses/cse455/12wi/

Project 1: intelligent scissors

David Dewey, 455 02wi

Project 2: panorama stitching

http://www.cs.washington.edu/education/courses/455/08wi/projects/project2/results.html

Oscar Danielsson, 455 06wi

Project 3: 3D shape reconstruction

Vermeer's *Music Lesson*

Reconstructions by Criminisi et al.

Project 4: Face Recognition

Grading

Programming Projects (70%)

- image scissors
- panoramas
- 3D shape modeling
- face recognition

Midterm (15%)

Final (15%)

General Comments

Prerequisites—*these are essential*!

- Data structures
- A good working knowledge of C and C++ programming
- Linear algebra
- Vector calculus

Course does ***not*** assume prior imaging experience

- computer vision, image processing, graphics, etc.