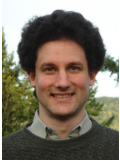


Computer Vision (CSE 455)

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Web Page

- <http://www.cs.washington.edu/education/courses/cse455/12au/>

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?



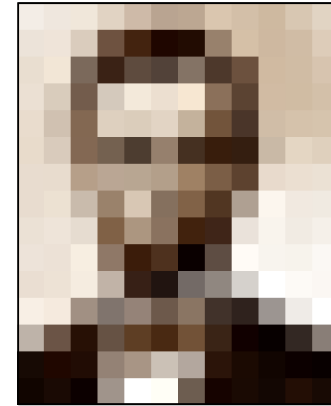
Terminator 2

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?



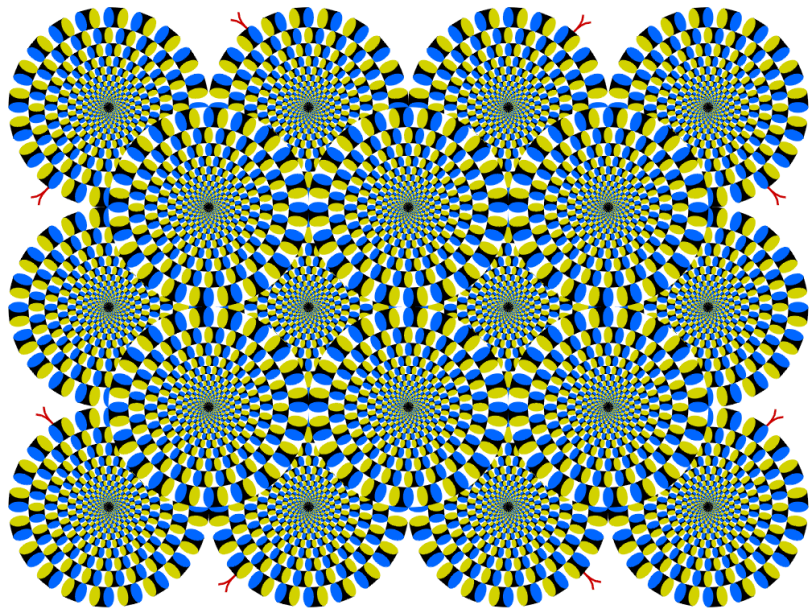
Yes and no (but mostly no!)

- 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

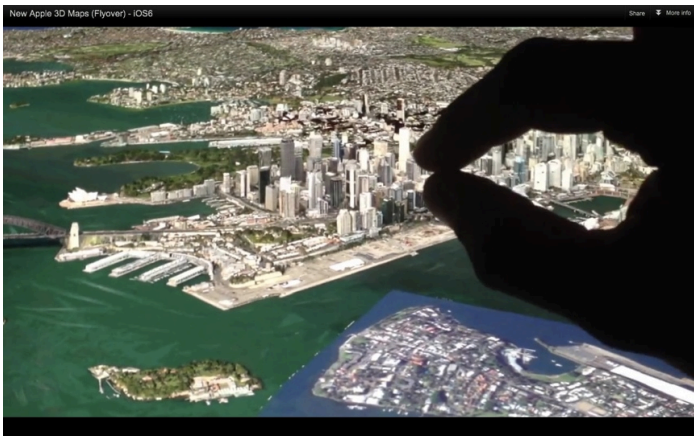


Image from Apple's [3D Maps \(Flyover\)](#)
(see also: [Google Maps GL](#), [Google Earth](#))

Motion capture



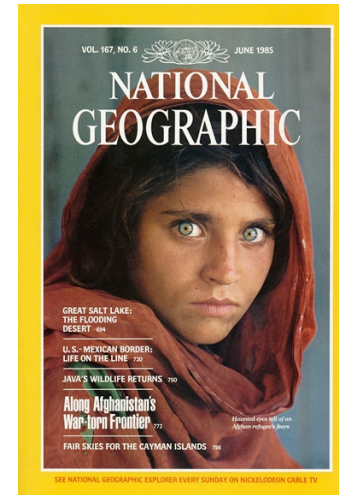
Microsoft's Xbox Kinect

Face detection



Most digital cameras detect faces

Face recognition

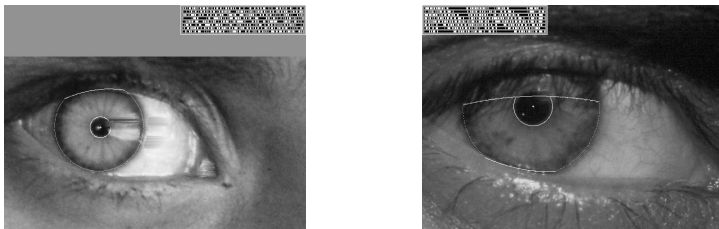


Who is she?

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](http://www.howstuffworks.com) on www.howstuffworks.com

Smart cars

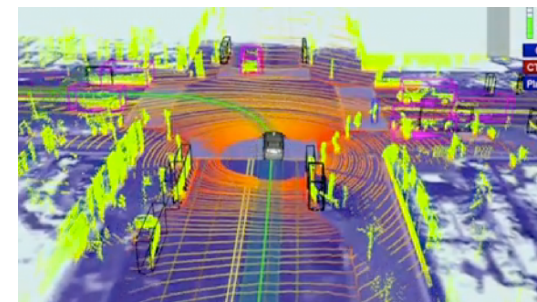
Slide content courtesy of Amnon Shashua

The screenshot shows a website interface with a navigation bar for 'manufacturer products' and 'consumer products'. The main heading is 'Our Vision. Your Safety.' Below it is a top-down view of a car with three camera views: 'rear looking camera', 'side looking camera', and 'forward looking camera'. To the right is a 'News' section with articles about 'Mobileye Advances Technologies Power Volvo Cars World First Collision Warning With Auto Brake System' and 'Volvo: New Collision Warning with Auto Brake Helps Prevent Rear-end'. Below the car view are three product highlights: 'EyeQ Vision on a Chip' with an image of a chip, 'Vision Applications' for 'Road, Vehicle, Pedestrian Protection and more' with an image of a pedestrian, and 'AWS Advance Warning System' with an image of a car. A 'Events' section lists 'Mobileye at Equi Auto, Paris, France' and 'Mobileye at SEMA, Las Vegas, NV'.

Mobileye

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

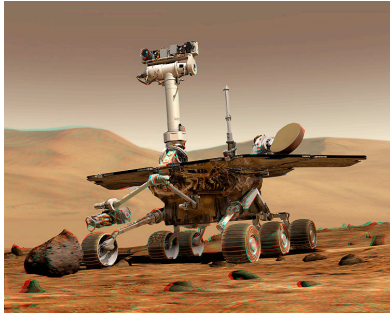
Self-driving cars



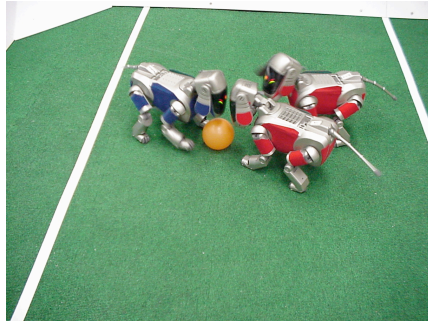
"Our self-driving cars have now traveled nearly 200,000 miles on public highways in California and Nevada, 100 percent safely. They have driven from San Francisco to Los Angeles and around Lake Tahoe, and have even descended crooked Lombard Street in San Francisco. They drive anywhere a car can legally 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/cse455/12au/>

Project 1: intelligent scissors



David Dewey, 455 02wi

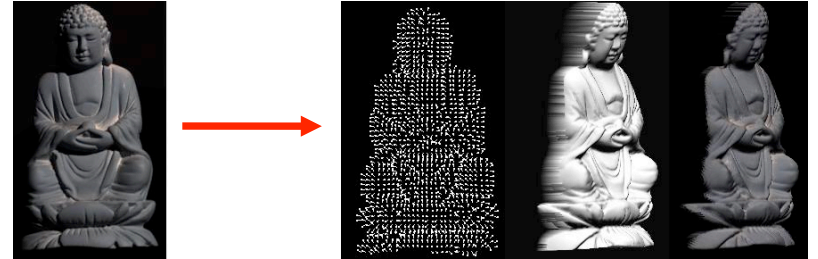
Project 2: panorama stitching

<https://www.cs.washington.edu/education/courses/cse455/12wi/projects/project2/voting/3.html>



Jungryul Choi & Daseul Lee, 455 12wi

Project 3: 3D shape reconstruction



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.