

CMP446: Computer Vision



Lecture 1: Introduction

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Fall 2012

Introductions

- Mohamed Alaa El-Dien Aly
- BS Computer Engineering 2003
- MS Computer Engineering 2005
- PhD Electrical Engineering 2011
- Google
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Agenda

- What is Computer Vision?
- Applications
- Topics Covered
- Course

Acknowledgments

- Some slides adapted from:
 - James Hays: <http://www.cs.brown.edu/courses/cs143/>
 - Richard Szelisky and Steve Seitz:
<http://www.cs.washington.edu/education/courses/cse576/08sp/>

What is Computer Vision?



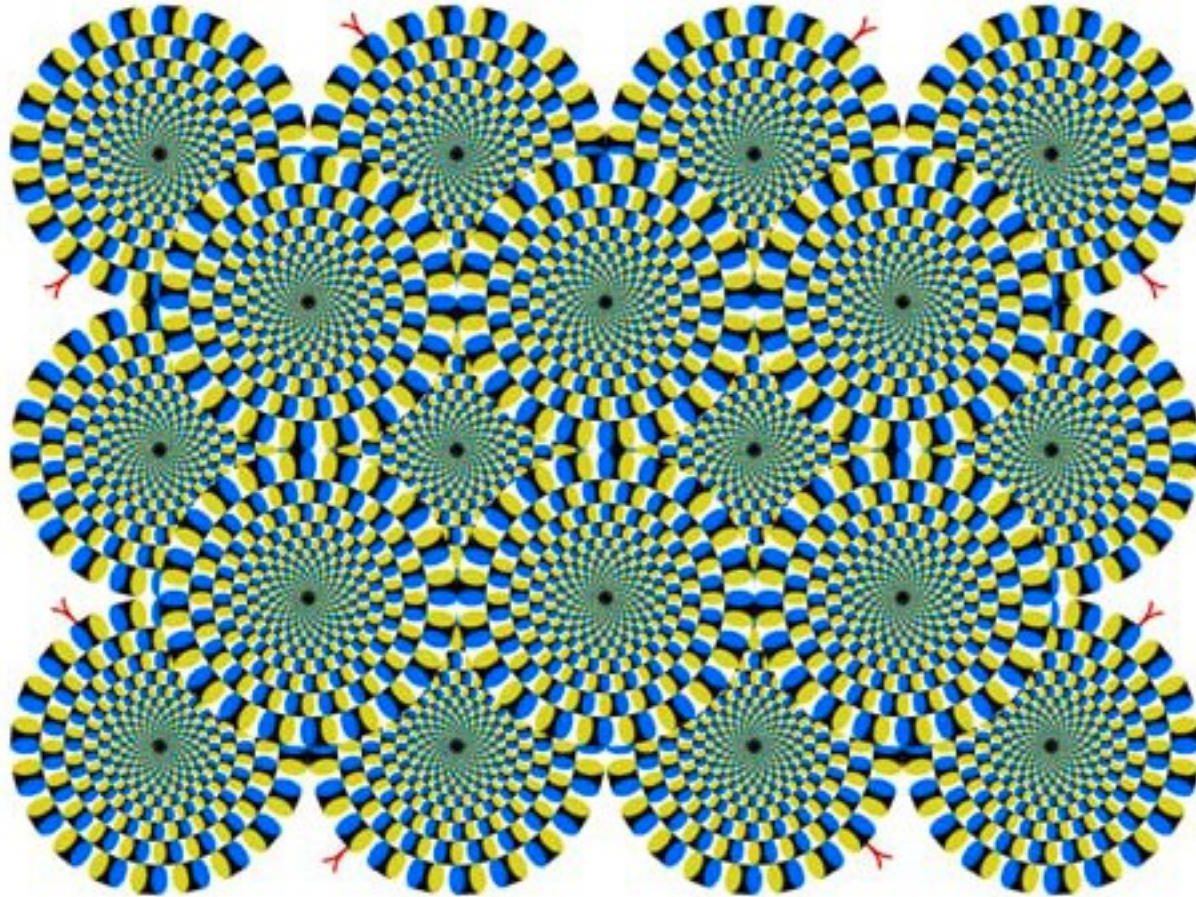
What is Computer Vision?



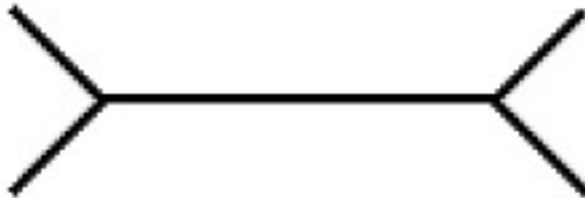
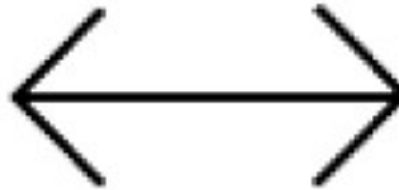
What is Computer Vision?

Make computer understand
images and videos like
humans!

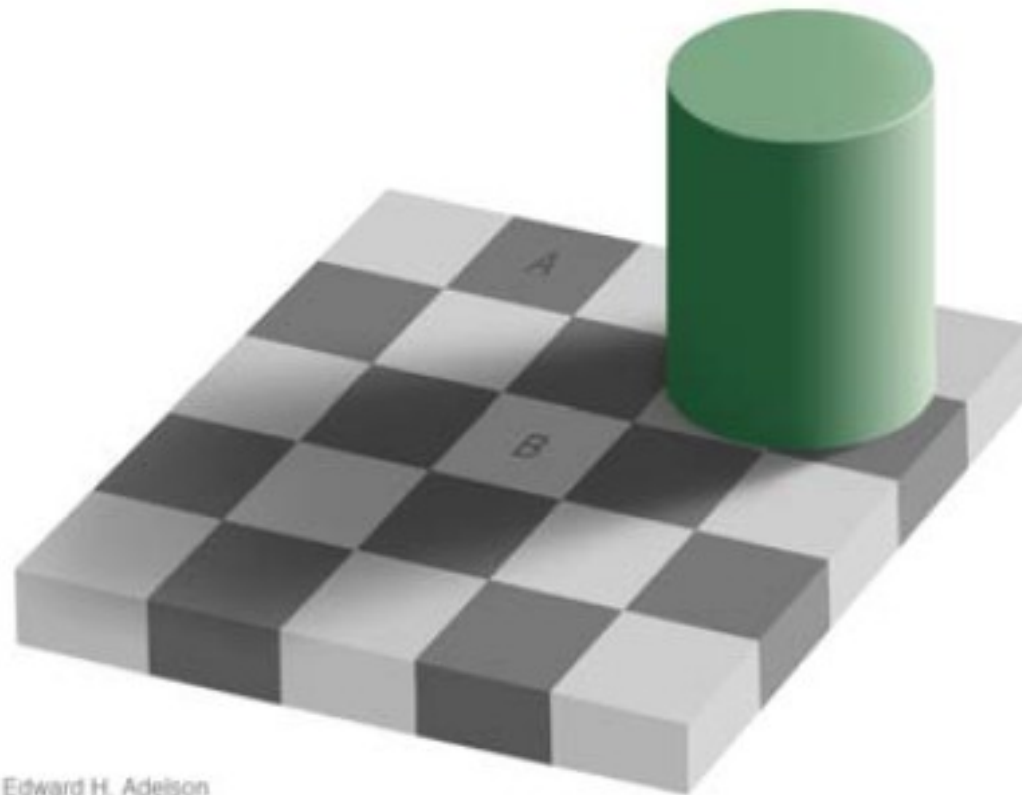
Human Perception



Human Perception



Human Perception

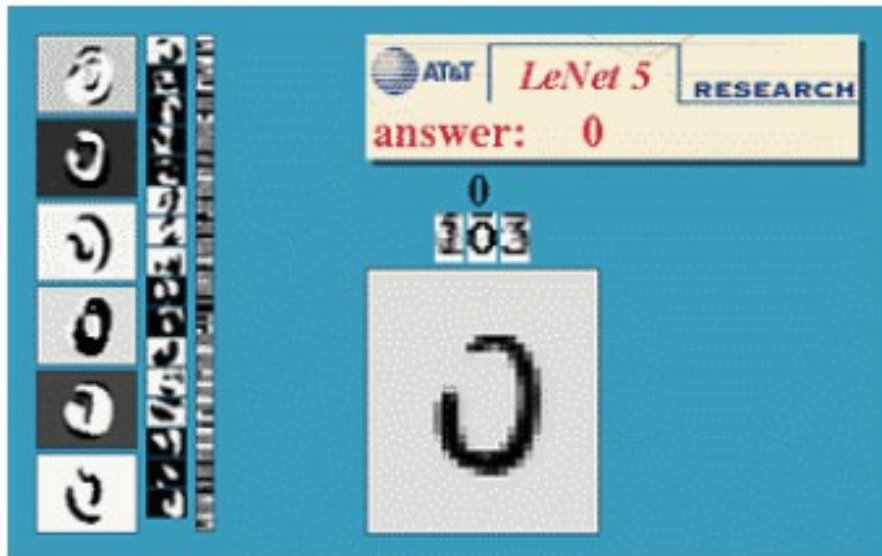


Edward H. Adelson

Computer Vision Applications

- OCR (Optical Character Recognition)
- Machine Inspection
- Retail Theft Prevention
- 3D Model Building
- Medical Imaging
- Automotive Safety
- ...

OCR



Digit recognition, AT&T labs

<http://www.research.att.com/~yann/>



License plate readers

http://en.wikipedia.org/wiki/Automatic_number_plate_recognition

Face Detection



Smile Detection

The Smile Shutter flow

Imagine a camera smart enough to catch every smile! In Smile Shutter Mode, your Cyber-shot® camera can automatically trip the shutter at just the right instant to catch the perfect expression.



[Sony Cyber-shot® T70 Digital Still Camera](#)

3D Modeling

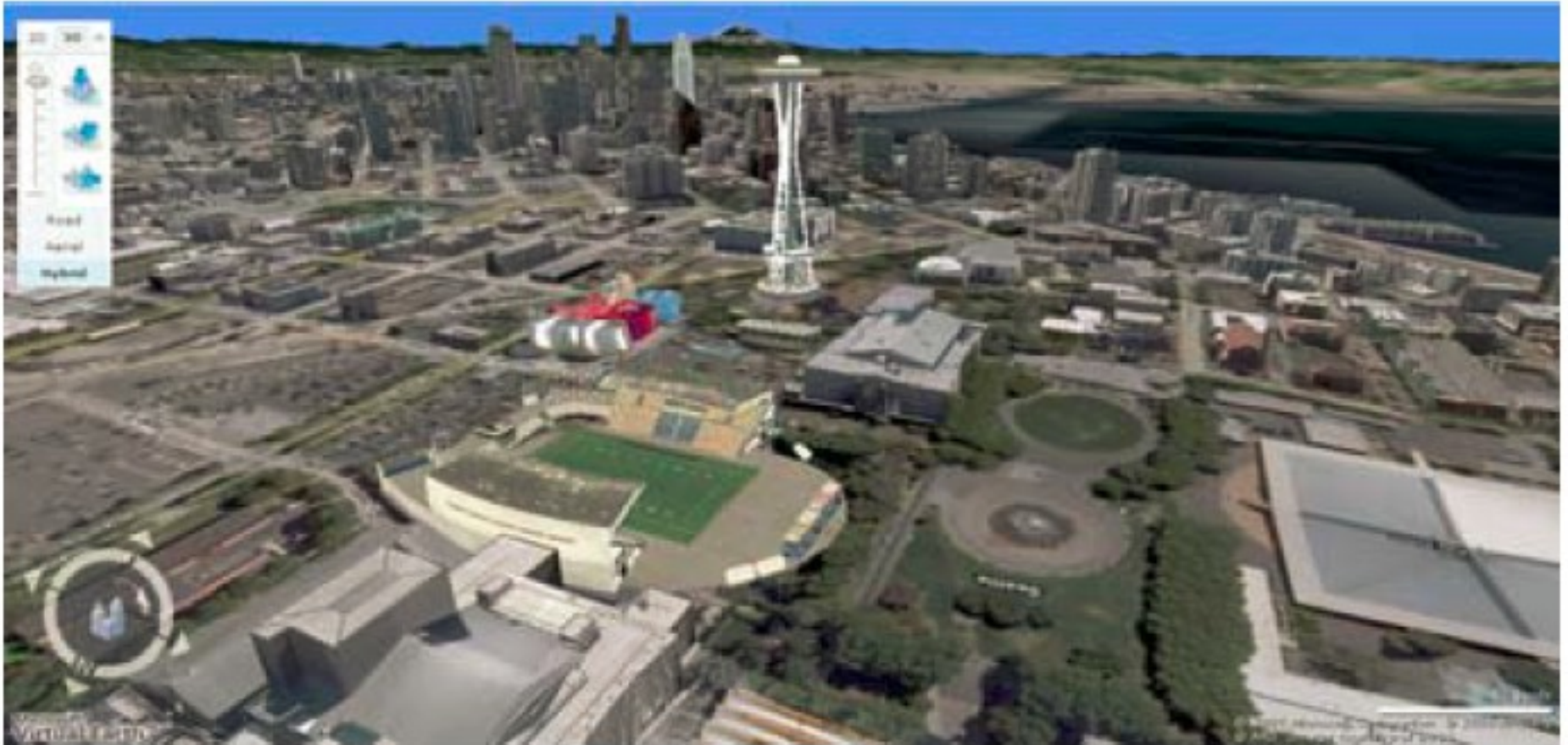


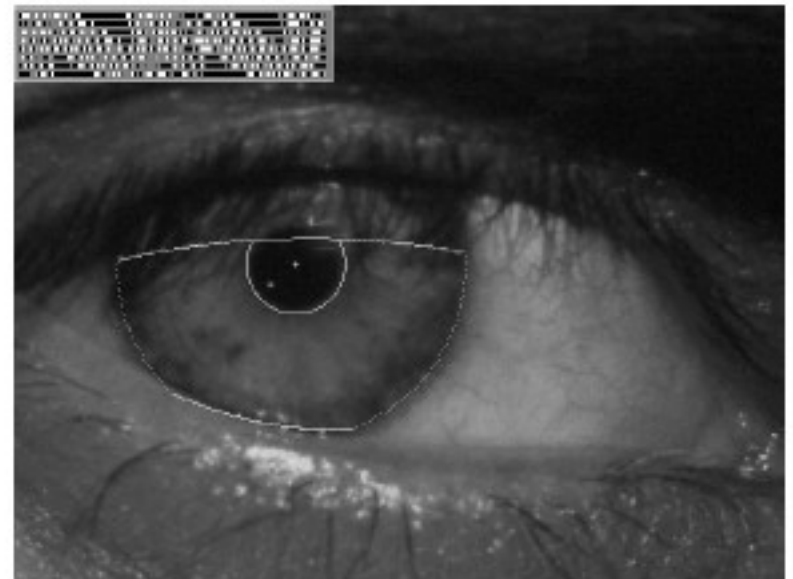
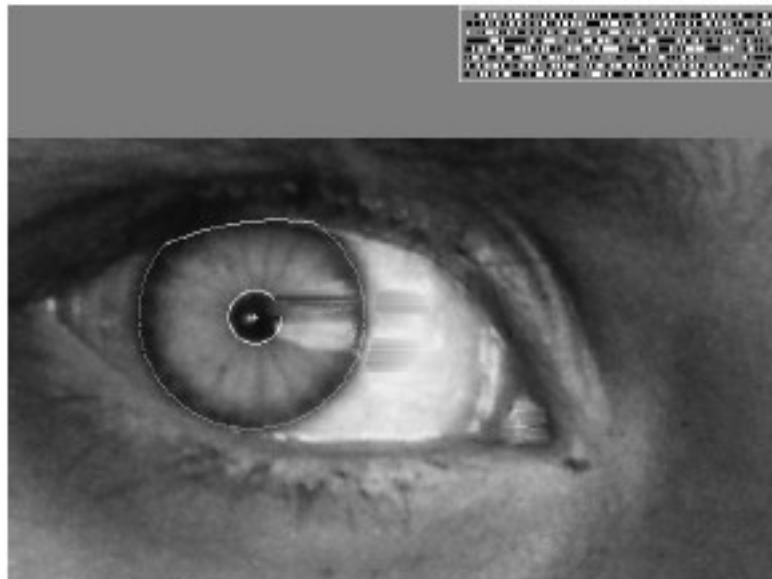
Image from Microsoft's [Virtual Earth](#)
(see also: [Google Earth](#))

Retail Safety



LaneHawk by *Evolution Robotics Retail*

Vision Based Biometrics



Automatic Login



Fingerprint scanners on many new laptops, other devices



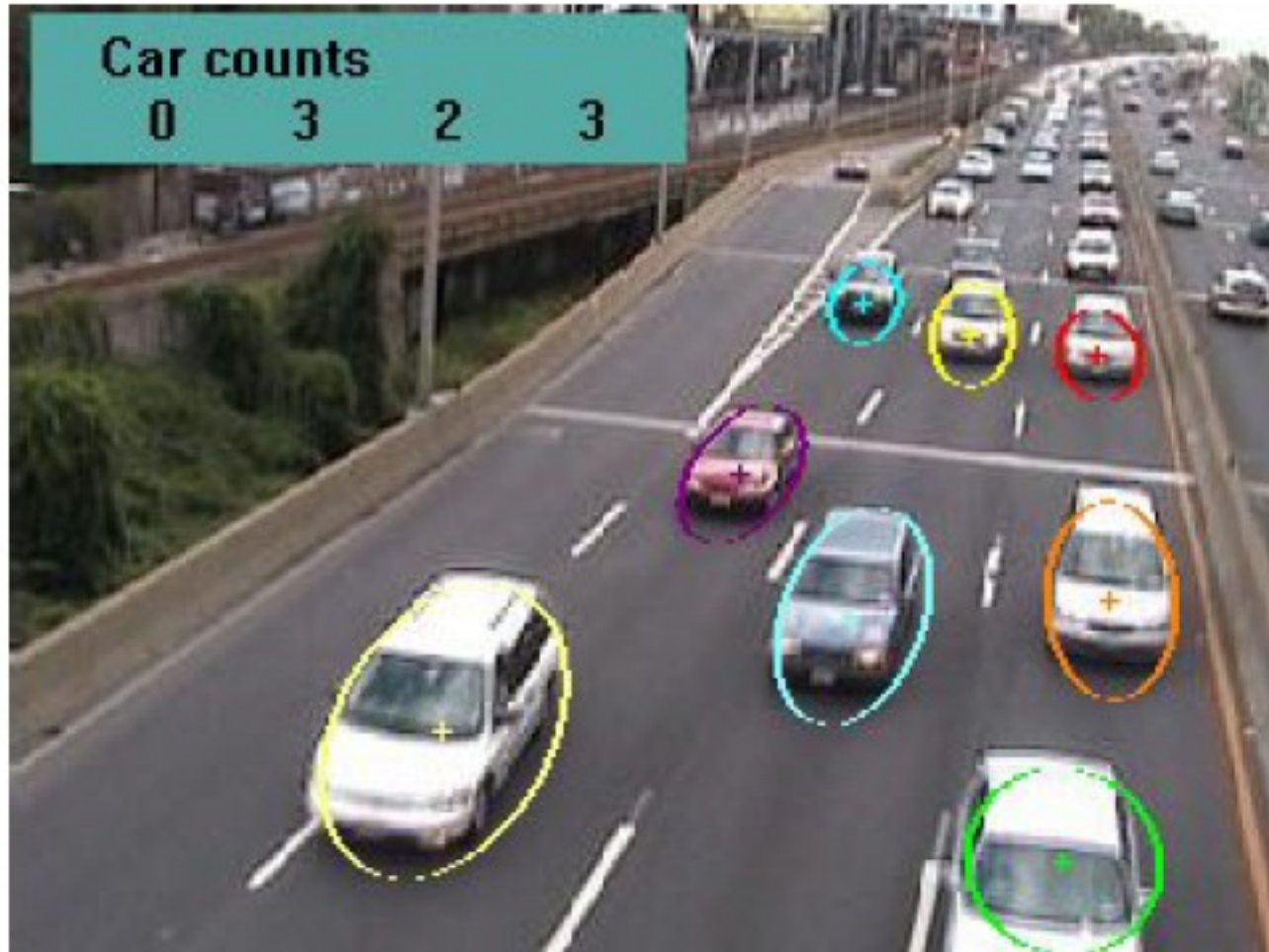
Face recognition systems now beginning to appear more widely
<http://www.sensiblevision.com/>

Object Recognition on Mobile



Google Goggles

Traffic Safety and Surveillance



Automotive Safety

The image is a screenshot of the Mobileye website. At the top left is the Mobileye logo, which consists of a stylized 'M' with three horizontal lines above it, followed by the word 'Mobileye' in a blue, italicized font. Below the logo is a navigation bar with links: 'About Mobileye', 'Press Room', 'Contact Us', 'Manufacturer Products', 'Consumer Products', and 'Partners'. Below the navigation bar is a main banner with a blue background. The banner features a top navigation bar with 'manufacturer products' (selected) and 'consumer products'. The main text in the banner is 'Our Vision. Your Safety.' Below this text is a top-down view of a car with three yellow beams of light emanating from it, labeled 'rear looking camera', 'side looking camera', and 'forward looking camera'. Below the banner are three product tiles. The first tile is titled '> EyeQ Vision on a Chip' and shows a green printed circuit board with a square chip. The second tile is titled '> Vision Applications' and shows a silhouette of a pedestrian walking on a road, with text 'Road, Vehicle, Pedestrian Protection and more'. The third tile is titled '> AWS Adva Warn' and shows a circular sensor unit on a stand with a yellow car icon and a green light.

Motion Capture



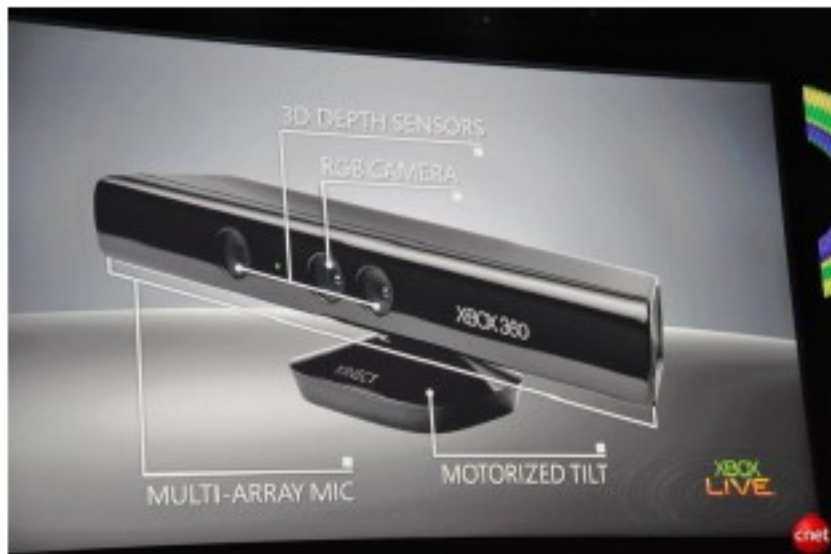
Pirates of the Caribbean, Industrial Light and Magic

Sports



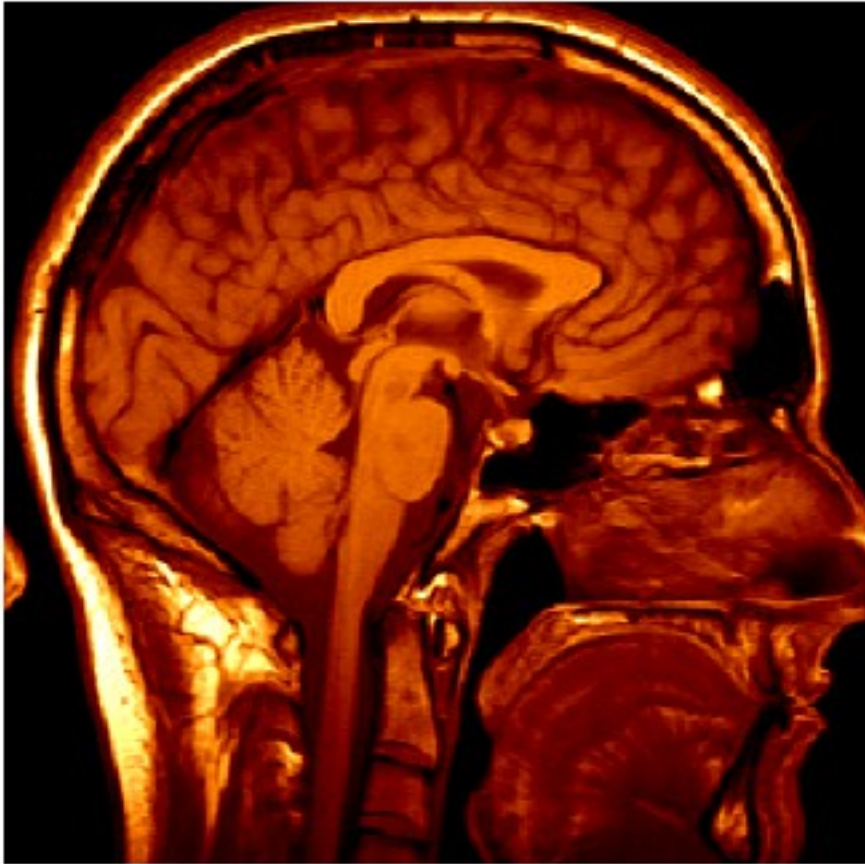
Sportvision first down line

Interactive Games



Xbox Kinect

Medical Imaging



3D imaging
MRI, CT



Image guided surgery
[Grimson et al., MIT](#)

Topics

- Image Formation
- Filtering
- Feature Detection and Matching
- Segmentation
- Camera Calibration
- Structure from Motion
- Stereo
- Recognition

Course

- Homeworks
 - Programming
 - Arabic Wikipedia Article
- Project
- Final
- Textbooks:
 - *Computer Vision: Algorithms and Applications*, Richard Szeliski. Freely available at <http://szeliski.org/Book/>
 - *Computer Vision: A Modern Approach*, Forsyth and Ponce.

Skills

- C++ development under Linux
- OpenCV
- Math
- Wikipedia!