اصول پردازش تصویر

Principles of Image Processing

مصطفی کمالی تبریزی

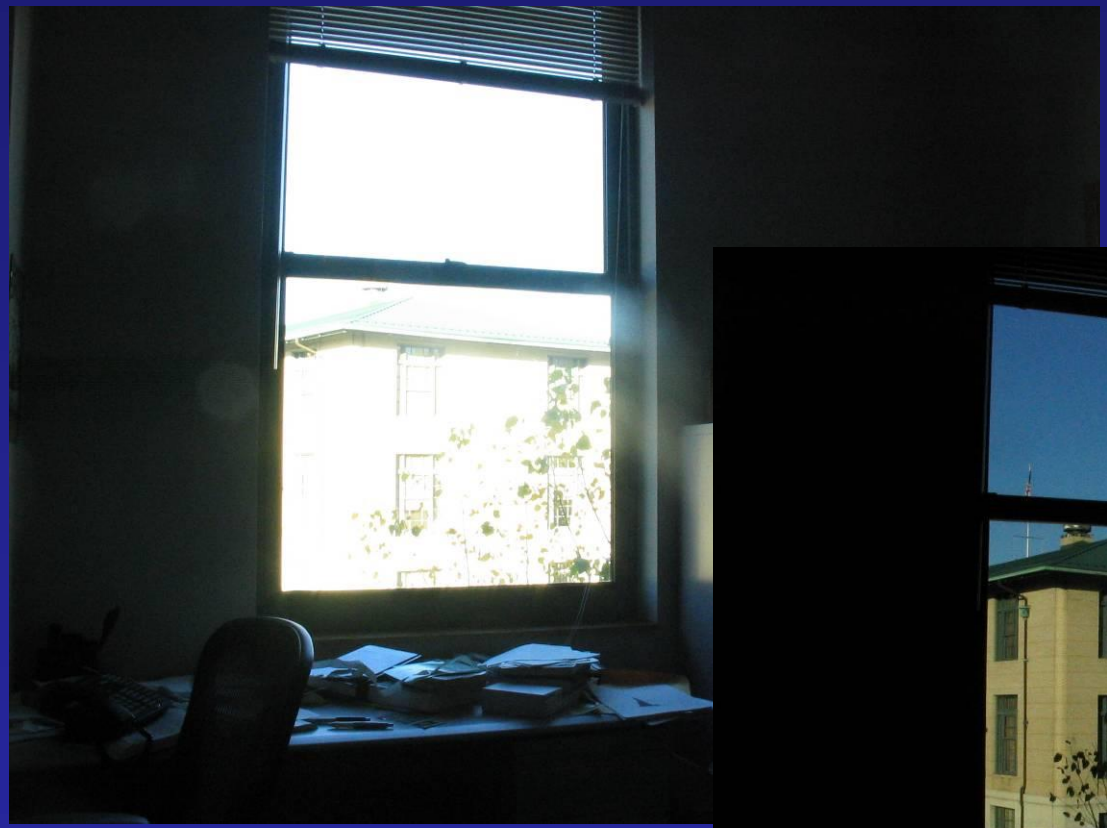
۱۳ دی ۱۳۹۹

جلسه سیم

More Topics

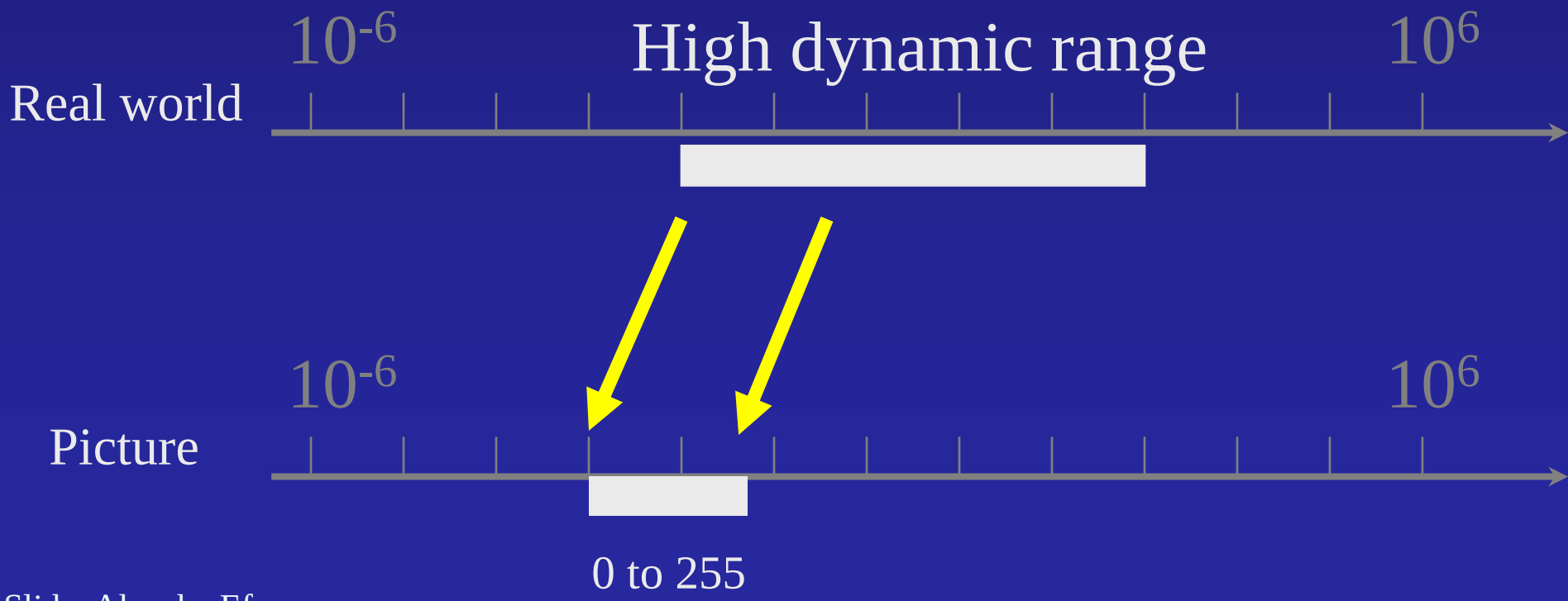
High Dynamic Range Imaging (HDR)

Why HDR?



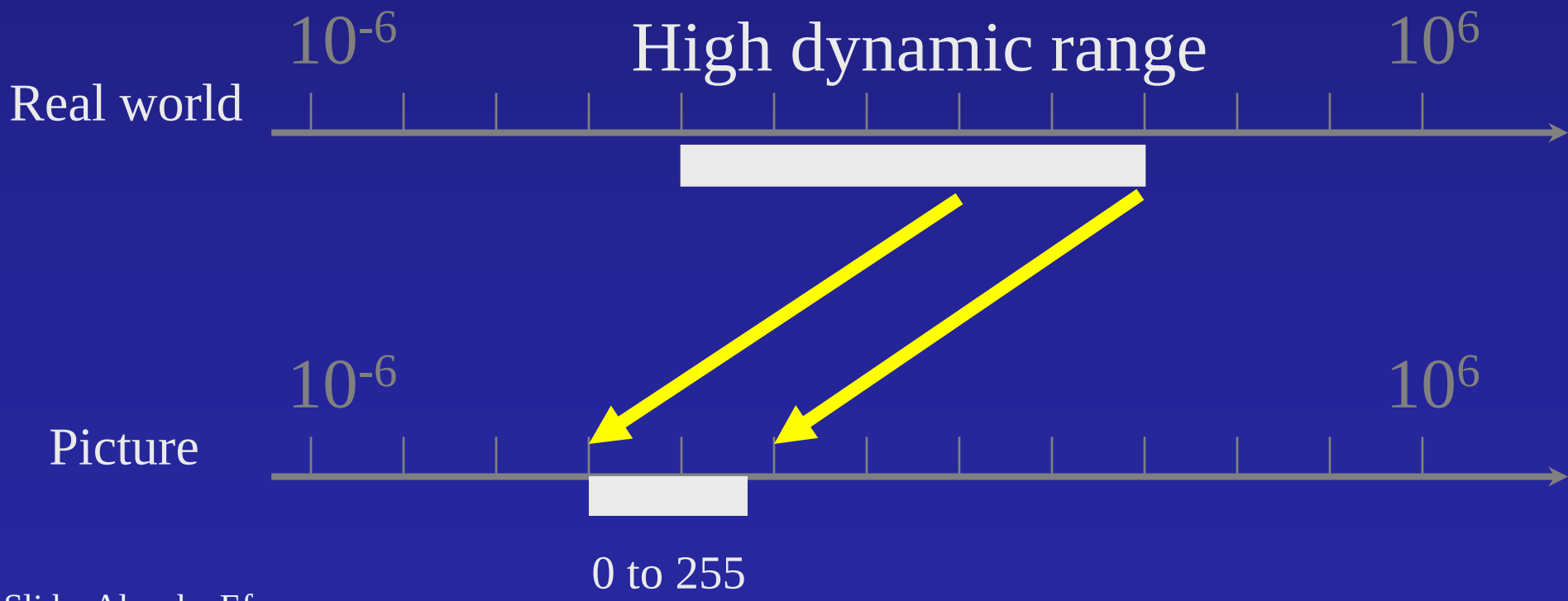
Slide: Alyosha Efros

Long Exposure



Slide: Alyosha Efros

Short Exposure



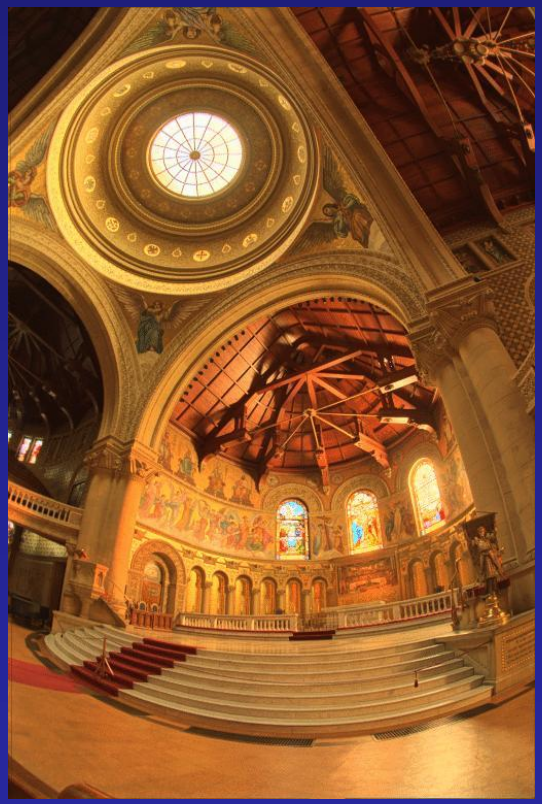
Slide: Alyosha Efros

Varying Exposure

Slide: Alyosha Efros

What do *we* see?

Vs.



Slide: Alyosha Efros

Deblurring and Deconvolution

Different types of blur

- Camera shake
  - User moving hands
- Scene motion
  - Objects in the scene moving
- Defocus blur [NEXT WEEK]
  - Depth of field effects

Slide: Rob Fergus

Slide: Rob Fergus

Slide: Rob Fergus

Removing Camera Shake from a Single Photograph

Rob Fergus, Barun Singh, Aaron Hertzmann,
Sam T. Roweis and William T. Freeman

Massachusetts Institute of Technology
and
University of Toronto

Slide: Rob Fergus

Overview

Joint work with B. Singh, A. Hertzmann, S.T. Roweis & W.T. Freeman

Original

Our algorithm

Slide: Rob Fergus

Close-up

Original

Naïve sharpening

Our algorithm

Slide: Rob Fergus

Detecting Fakes

Video Magnification

Imperceptible Motions and Changes





[Liu et al. 2005]

[Wu et al. 2012]

Slide: Derek Hoiem

MAGNIFIED Imperceptible Motions and Changes



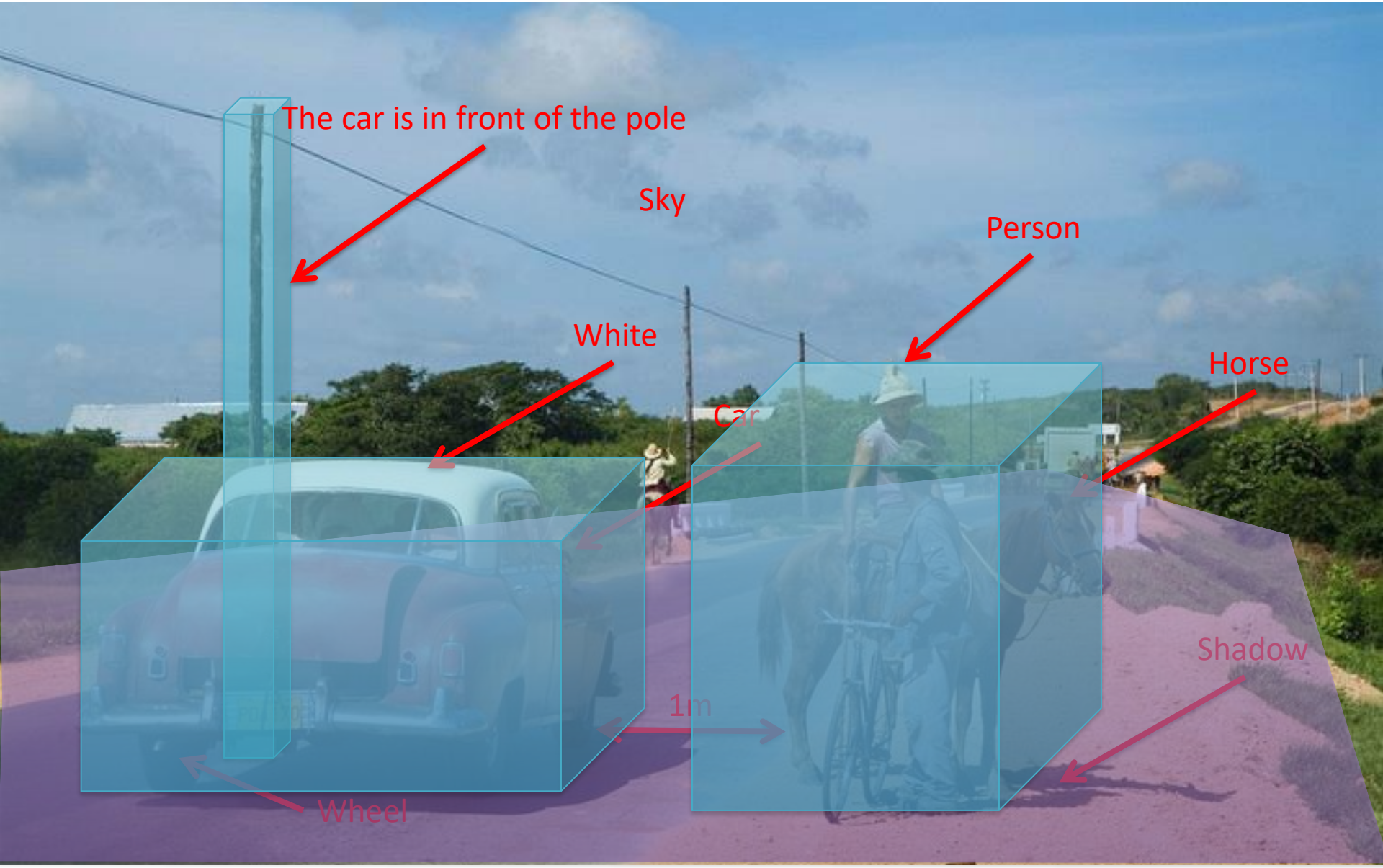



[Liu et al. 2005]

[Wu et al. 2012]

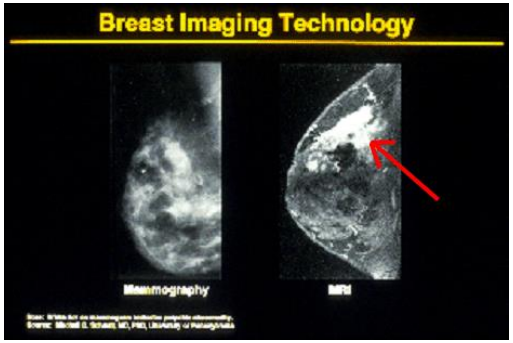
Slide: Derek Hoiem

Computer Vision


The car is in front of the pole
Sky
Person
White
Horse
Car
Shadow
1m
Wheel

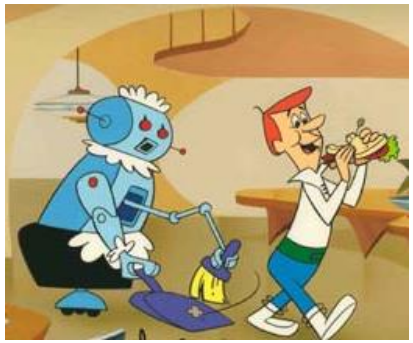
Computer Vision Matters

Safety



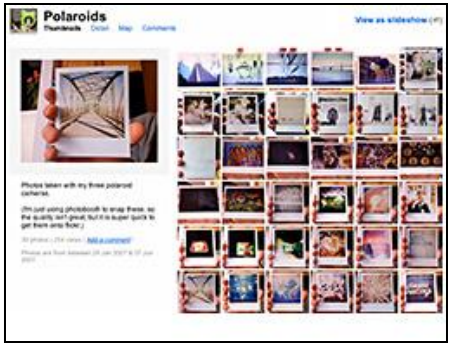
Health

Security



Comfort

Fun



Access

How vision is used now

- Examples of state-of-the-art

Earth viewers (3D modeling)

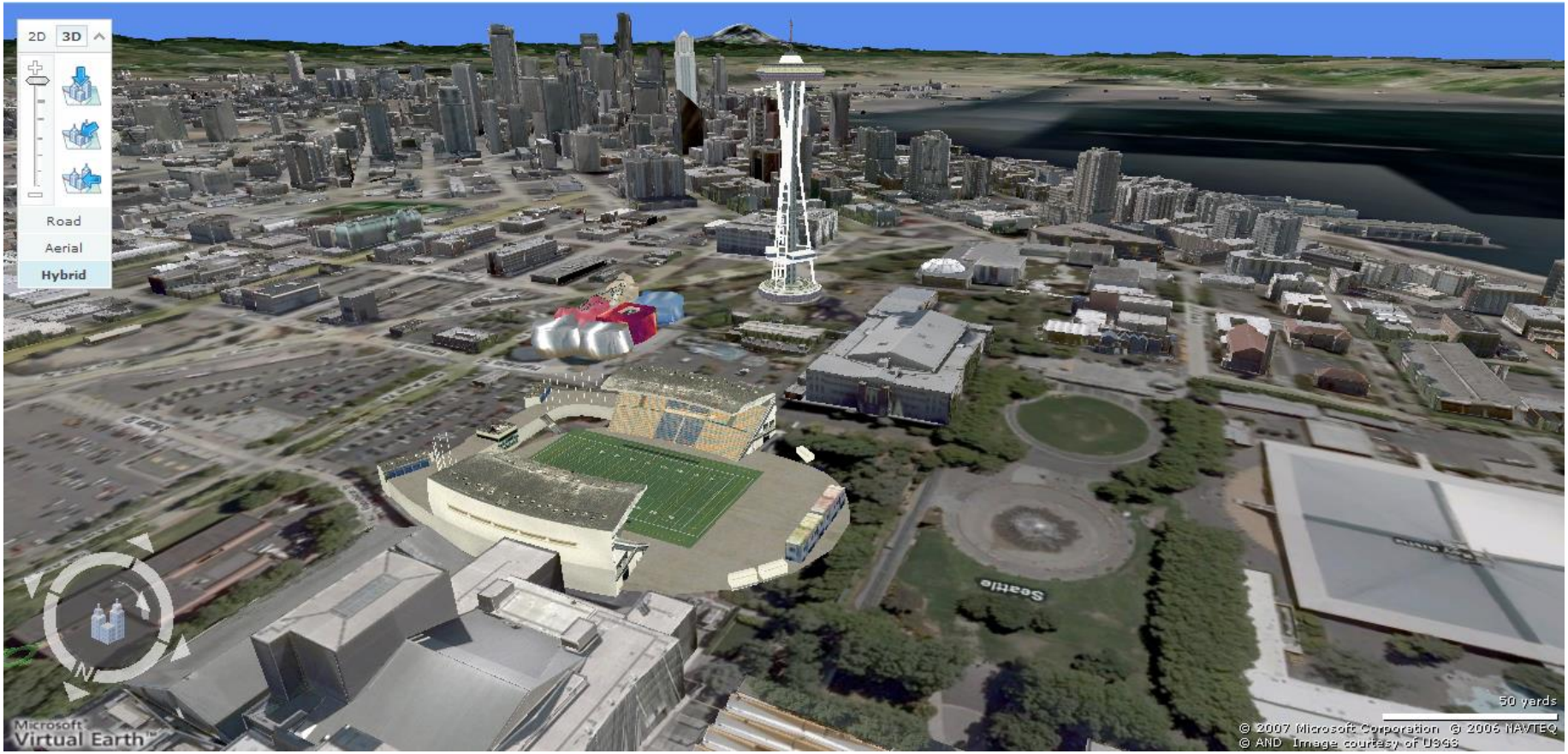
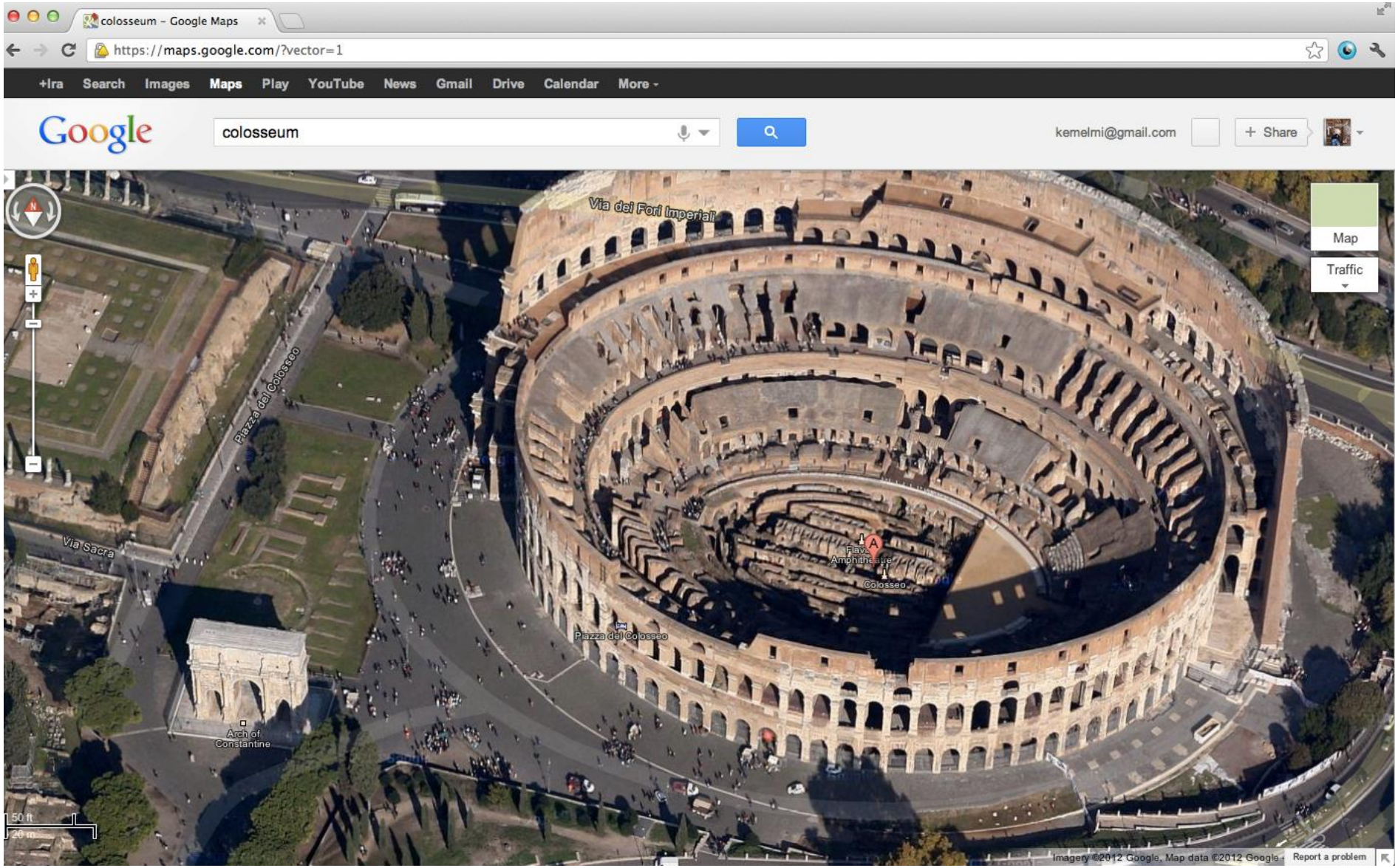


Image from Microsoft's Virtual Earth
(see also: Google Earth)

Google's 3D Maps
Structure Estimation from Tourist Photos

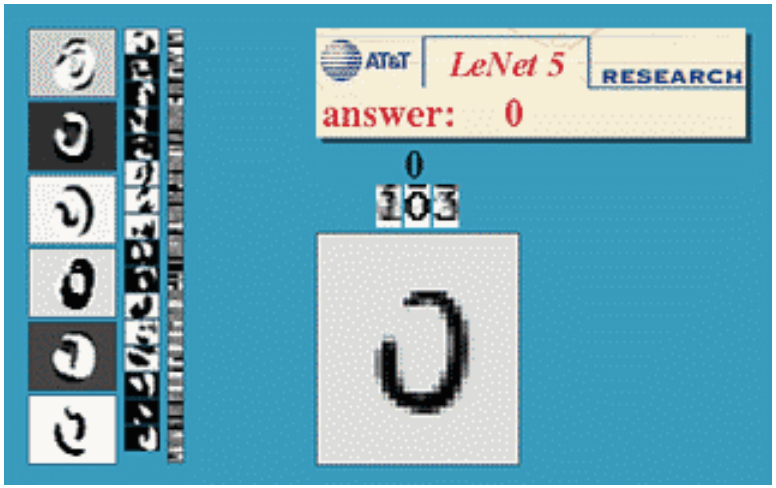


Apple's 3D Maps

Optical Character Recognition (OCR)

Technology to convert scanned docs to text

- If you have a scanner, it probably came with OCR software



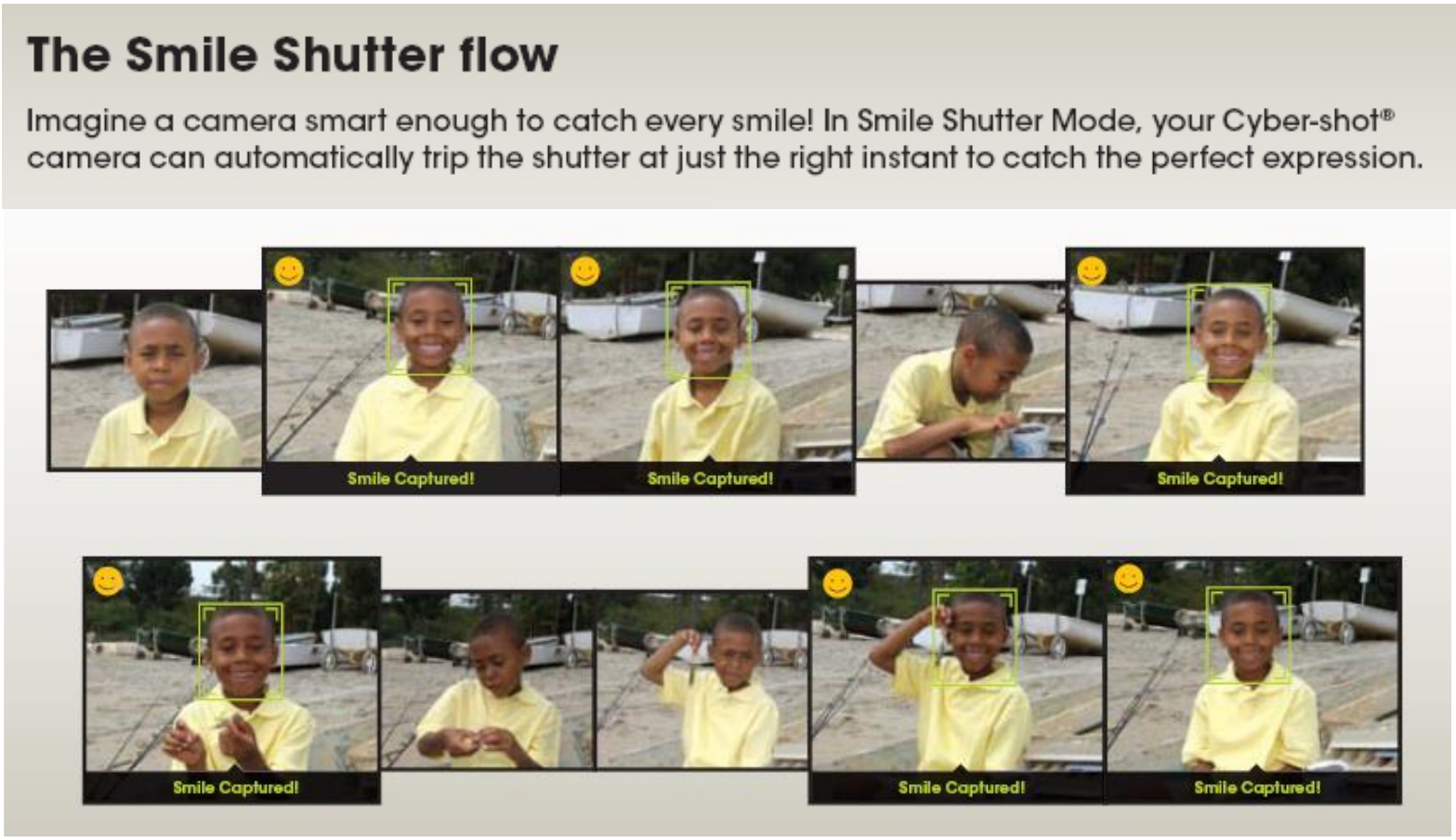
Digit recognition, AT&T labs

License plate readers
http://en.wikipedia.org/wiki/Automatic_number_plate_recognition

Face detection

- Most digital cameras detect faces (and more)
  - Canon, Sony, Fuji, …

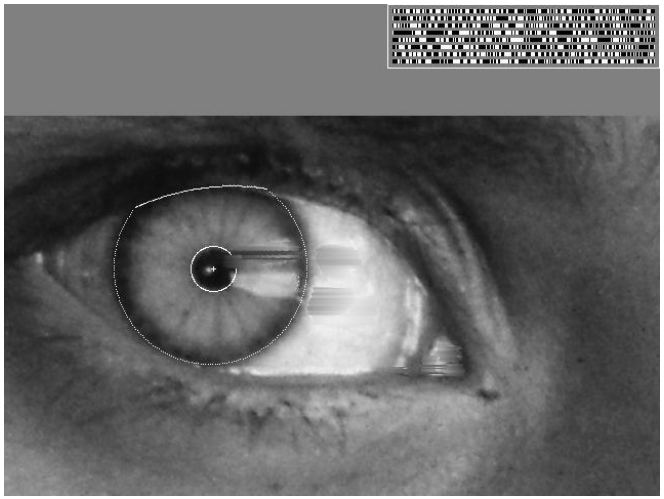
Smile detection

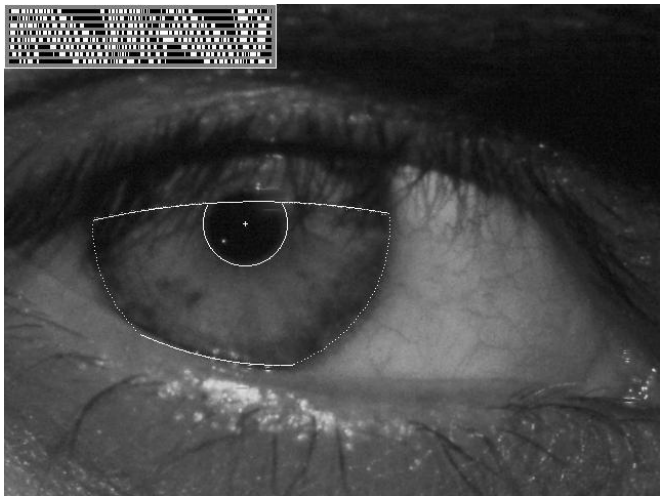


Sony Cyber-shot® T70 Digital Still Camera

Vision-based biometrics

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





Shopping without checkout

Object recognition (in supermarkets)

LaneHawk by Evolution Robotics
“A smart camera is flush-mounted in the checkout lane, continuously watching for items. When an item is detected and recognized, the cashier verifies the quantity of items that were found under the basket, and continues to close the transaction. The item can remain under the basket, and with LaneHawk, you are assured to get paid for it… “

Object recognition (in mobile phones)

Point & Find, Nokia

Google Goggles

Smart cars

- Mobileye: vision systems currently in many cars

http://mobileye.com/technology/applications/vehicle-detection/forward-colision-warning/
http://mobileye.com/technology/applications/pedestrian-detection/pedestrian-collision-warning/

"Subaru thinks cameras are better than radar cruise"
http://www.roadandtrack.com/new-cars/news/a6852/subaru-camera-controlled-cruise/

Google cars

Google in talks with Ford, Toyota and Volkswagen to realise driverless cars

http://www.theatlantic.com/technology/archive/2014/05/all-the-world-a-track-the-trick-that-makes-googles-self-driving-cars-work/370871/

Ford acquires SAIPS for self-driving machine learning and computer vision tech

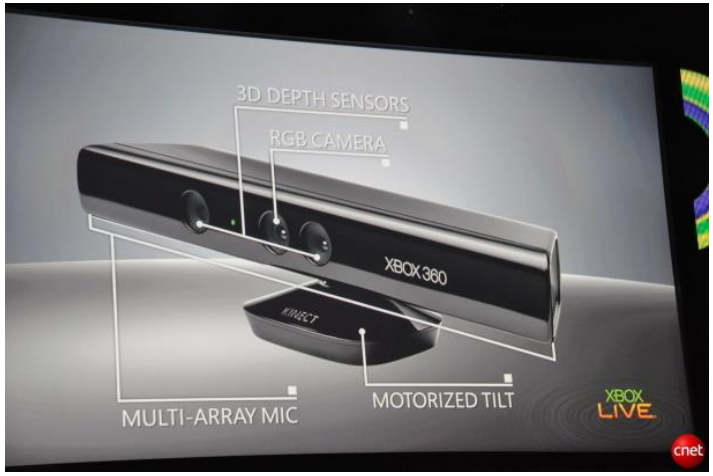
Posted Aug 16, 2016 by **Darrell Etherington** *(@etherington)*

Ford outlined a few of the ways it's aiming to ship driverless cars by 2021, and part of the plan involves acquisitions. CEO Mark Fields revealed at a press event in Palo Alto today that the automaker acquired SAIPS, an Israeli company focusing on machine learning and computer vision. It's also partnering exclusively with Nirenberg Neuroscience, to bring more "humanlike intelligence" to machine learning components of driverless car systems.

SAIPS' technology brings image and video processing algorithms, as well as deep learning tech focused on processing and classifying input signals, all key ingredients in the special sauce that makes up autonomous vehicle tech. This company's expertise should help with on-board interpretation of data captured by sensors on Ford's self-driving cars, and turning that data into usable info for the car's virtual driver system. SAIPS' offerings include detection of anomalies, persistent tracking of objects detected by sensors, and much more. The company's past clients include HP and Trax, but its partner group doesn't appear to have included much in the way of driving-specific applications.

Interactive Games: Kinect

- Object Recognition: http://www.youtube.com/watch?feature=iv&v=fQ59dXOo63o
- Mario: http://www.youtube.com/watch?v=8CTJL5lUjHg
- 3D: http://www.youtube.com/watch?v=7QrnwoO1-8A
- Robot: http://www.youtube.com/watch?v=w8BmgtMKFbY



Any comments?