



UC Berkeley EECS
Lecturer
Gerald Friedland

The Beauty and Joy of Computing

Lecture #5

A Computer Science Research Field: Multimedia Computing



WHAT HAPPENS TO CALLS RECORDED FOR "QUALITY ASSURANCE"?

Audio Analysis tools do emotion and speech recognition in order to suggest solutions to the call center agent.

<http://money.cnn.com/2014/09/15/technology/enterprise/att-customer-service/index.html>



Recap: Abstraction

- What's this?



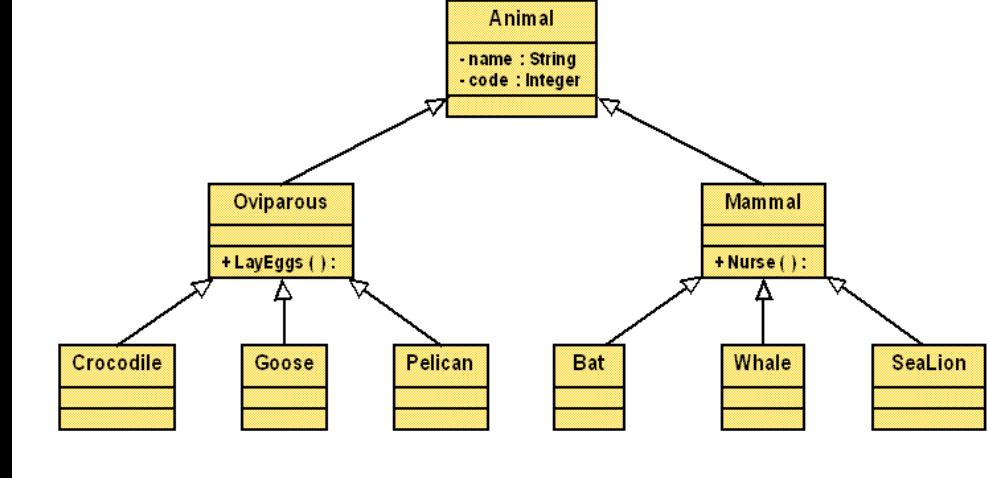
Photo: Qyd,
Wikipedia

- Abstraction: A fish
- Detail: **Humuhumunukunukuapua'a**



Recap: Object-Oriented Programming

- **Classes form a hierarchy through inheritance**
- **The higher the class (superclass) in the hierarchy, the more abstract.**
- **Inheritance saves code**
 - Hierarchical classes
 - E.g., Bat special case of mammal, a special case of animal
- **Object is instance of class (embodiment in memory)**
 - Many concrete bats flying around



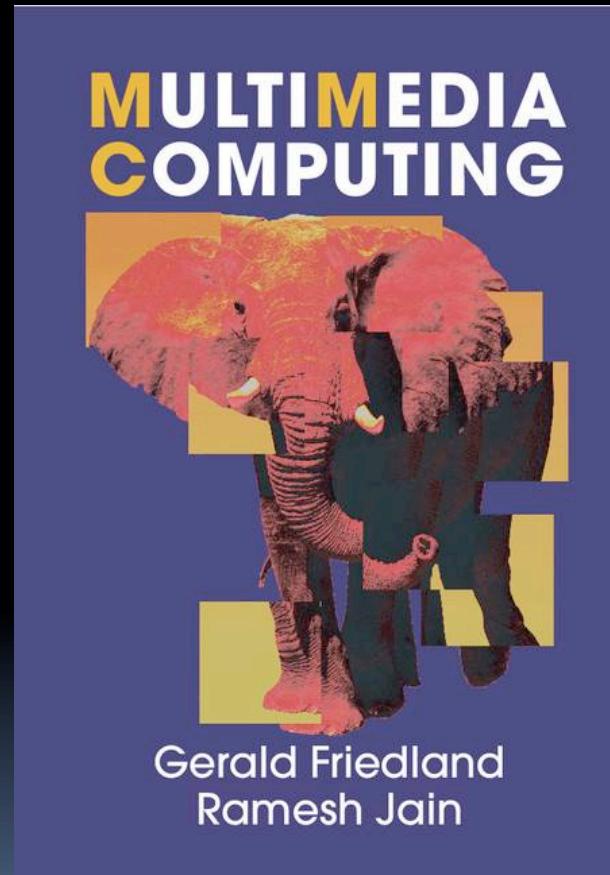
<http://www.ccs.neu.edu/research/demeter/personalities/luis/example/>





What is Multimedia Computing?

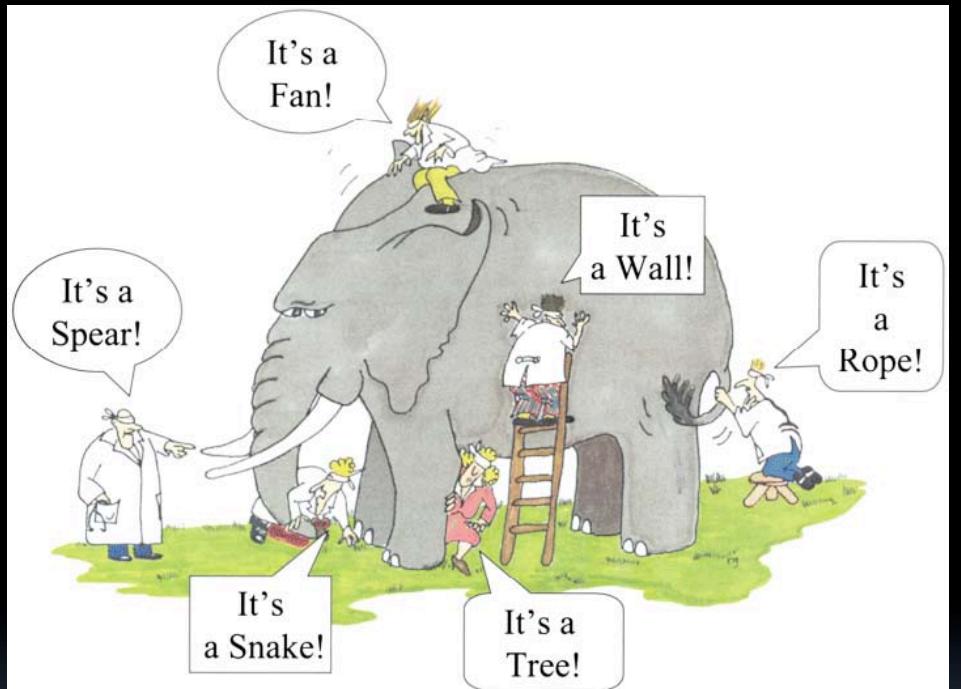
- **Multi:** More than one
- **Media:** (Digital) document created for human consumption
- **Multimedia Computing:** Computing with documents created for human consumption
 - Text document with images
 - Videos
- **Research at ICSI**
 - multimedia.icsi.berkeley.edu





Holistic Approach

- **Documents are created, consumed, processed, and understood as a combination of media.**
- **Otherwise: It's like only looking at the images and not the text of a book.**
- **Involves many disciplines: Computer Vision, Audio Analysis, Networking,...**



G. Friedland, R. Jain: "Multimedia Computing", Cambridge University Press, August 2014.



How many senses does a human have?



- a) 1
- b) 2
- c) 3
- d) 5
- e) More than 5

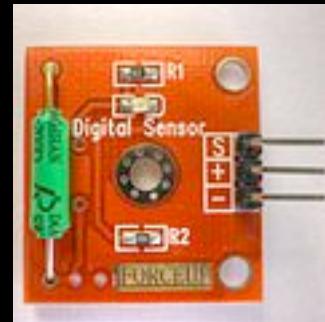


Image from: <http://sblearninggarden.org/wp-content/uploads/2014/02/Exploring-the-5-Senses.pdf>

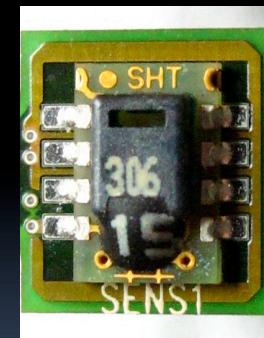


How many senses does a computer have?

- Computer can connect to sensors.
- Sensors transform physical properties into numbers.
- Hundreds of different types of sensors exists:
 - voltage, position, speed, radiation, temperature,...



Tilt Sensor
Nevit Dilmen (Wikimedia Commons)

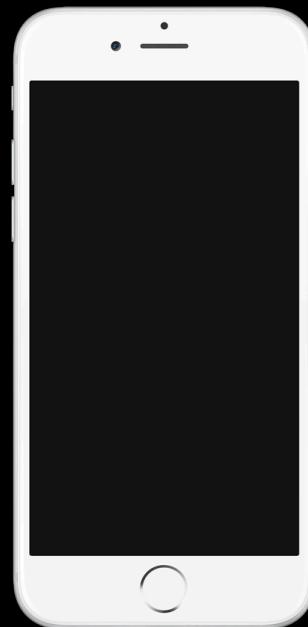


Humidity Sensor
wdwd (Wikimedia Commons)



Sensors for Multimedia Documents

- **Documents are usually created using:**
 - Text (keyboard)
 - Electronic Pens
 - Cameras
 - Microphones
- **Most documents, using a combination of them.**
Hence called Multimedia Documents



iPhone 6
Rayyuk (Wikimedia Commons)

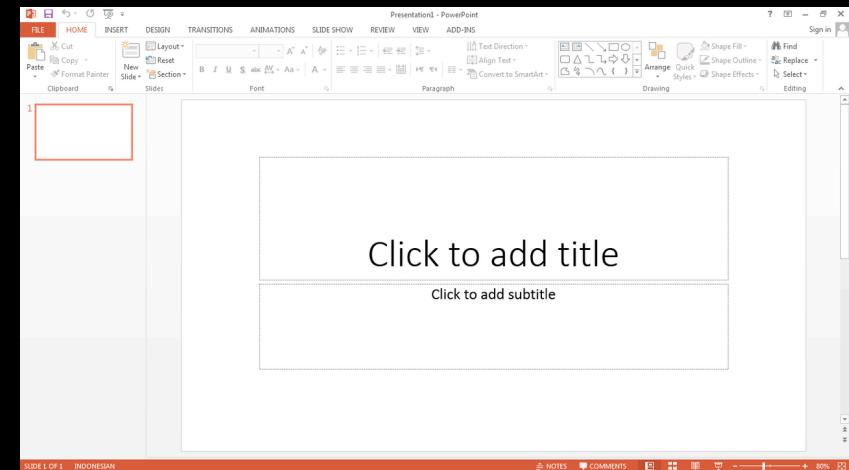
Has 11 types of sensors!





Multimedia Computing...

- ...is a research area that works on creating programs to help with the
 - Creation,
 - Processing
 - Analysis
 - Consumption
- of multisensory documents.



"Microsoft PowerPoint 2013 Default Screen"

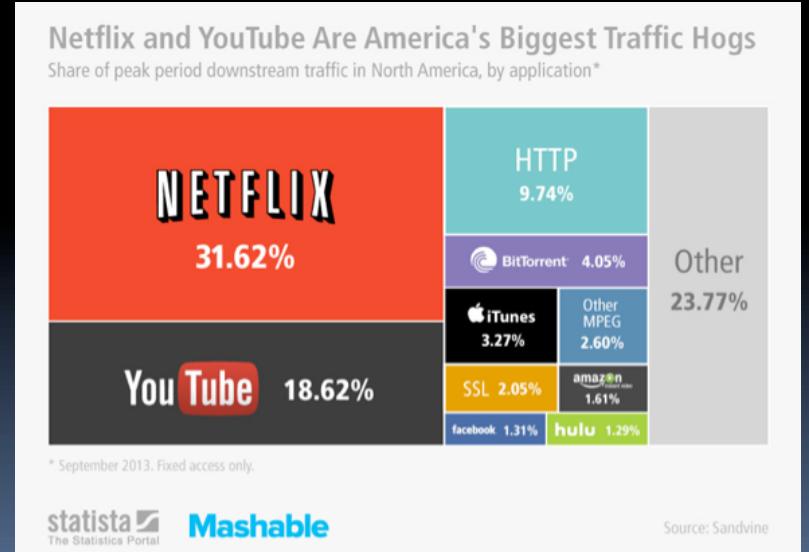
Malikussaid Rayyuk (Wikimedia Commons)

Multimedia documents address several senses at once and therefore can be processed better by the brain!



Example: Video Search

- With more sensors -> More Multimedia Documents
- YouTube receives 100 hours of video per minute!
- Consumer-Produced Videos largest data source in the Internet. Larger than:
 - All webpages (text)
 - All emails ever written
 - Human genome
 - All professional videos
- Today most of the traffic is videos!





Example: Video Search Doesn't Work!

Google "giving directions to a location"

Web Images Maps Videos News More Search tools

3 results (0.13 seconds)

Ad related to "giving directions to a location" ①

Maps & Driving Directions
driving-directions.easymaps.co/ Enter Address Or Location. Free Maps & Directions w/Toolbar!

Key considerations for all maps from the Course Creating a Map with Illu...
www.lynda.com > ... > Creating a Map with Illustrator
Are you giving directions to a location, or general information about the area. How much of the area should ...
▶ 4:30

Community Helpers - SlideServe
www.slideserve.com/kagami/community-helpers Aug 3, 2012
This will help with giving directions to a location. Materials: Our maps A step by step direction route on chart ...

PPT – A Study on Wearable Computing PowerPoint presentation | free to download - PowerShow.com
www.powershow.com/.../A_Study_on_Wearable_Computing_powerpoi... Technology which allows for the human and ... The concept of wearable computers attempts to bridge the 'interaction gap' ... Sprout. Spot. 17 /18. Conclusion .

Stay up to date on these results:
• [Create an email alert for "giving directions to a location"](#)

Ads ①

Driving Directions & Maps
www.maps-directions.org/Directions Enter Starting Point & Destination. Get Directions. Quick & Easy.

YP.com Maps and Directions
www.yellowpages.com/ Find & Discover Local Businesses on YP.COM

Directions To And From
www.getdrivingdirections.co/Directions Enter Address or Driving Location. Driving Directions & Maps w/Toolbar

Accept Online Donations
www.securegive.com/OnlineGiving Embed the SecureGive Share button into your website to grow your giving today!

Location Maps
www.myhomemsn.com/ Get Access To Maps & Directions. Make MSN Your Homepage Today.

Map Quest Directions
shopping.yahoo.com/Books Great Deals on Map Quest Directions Shop Now and Save. Yahoo Shopping

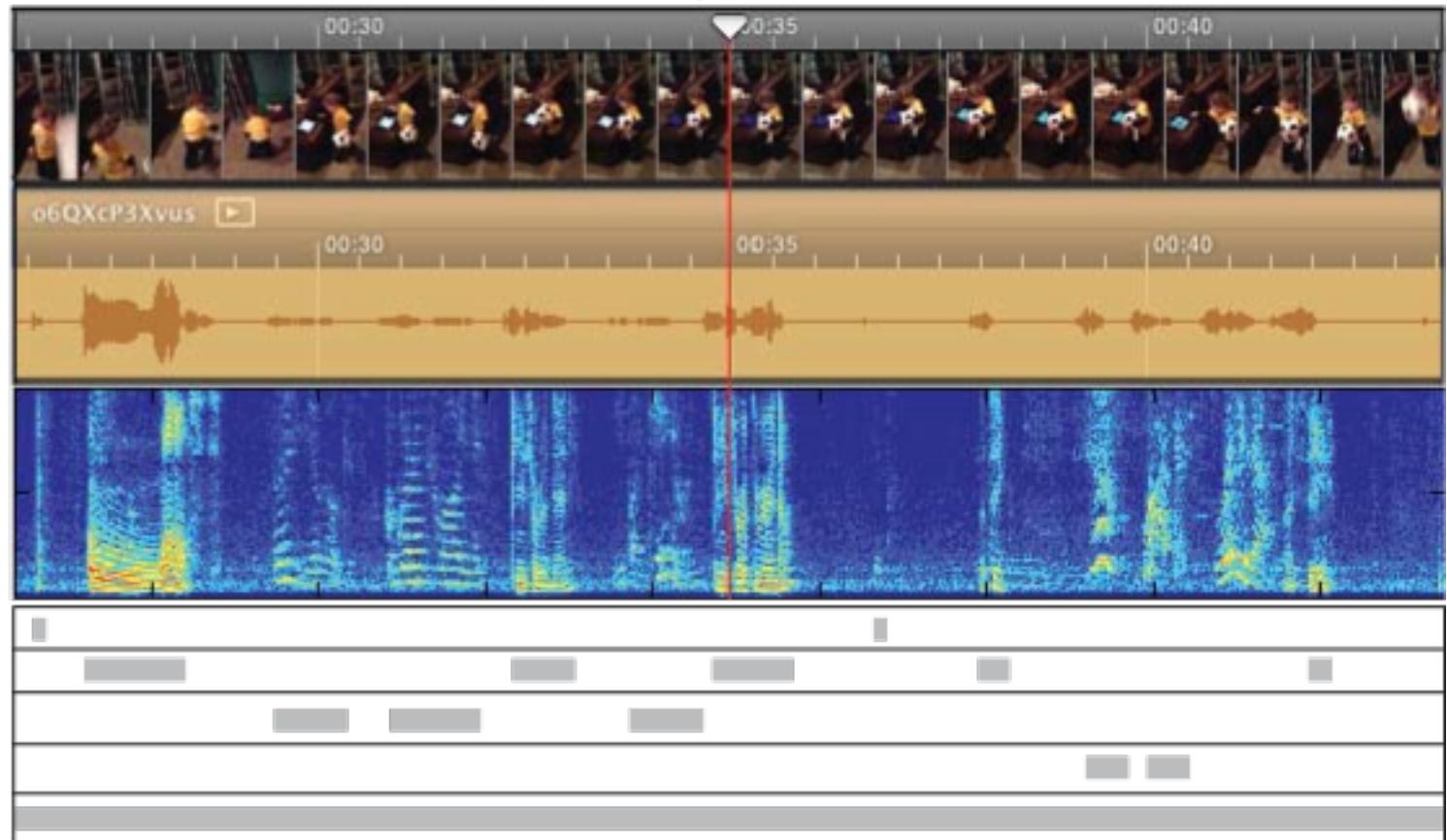
See your ad here »





Video Search Using Audio Patterns

Cameron learns to catch (<http://www.youtube.com/watch?v=o6QXcP3Xvus>)

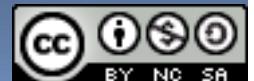


Research Performed at ICSI



UC Berkeley "The Beauty and Joy of Computing" : **Multimedia Computing (12)**

Friedland





INTERNATIONAL
COMPUTER SCIENCE
INSTITUTE

An Experiment

Listen!



- Which city was this recorded in?

Pick one of: Amsterdam, Bangkok, Barcelona, Beijing, Berlin, Cairo, CapeTown, Chicago, Dallas, Denver, Duesseldorf, Fukuoka, Houston, London, Los Angeles, Lower Hutt, Melbourne, Moscow, New Delhi, New York, Orlando, Paris, Phoenix, Prague, Puerto Rico, Rio de Janeiro, Rome, San Francisco, Seattle, Seoul, Siem Reap, Sydney, Taipei, Tel Aviv, Tokyo, Washington DC, Zuerich



<https://www.youtube.com/watch?v=1qfa84Ulm5s>

Example: Video Navigation

The screenshot shows the Joke-O-Mat interface. At the top left is the ICSI logo with binary code and the text "INTERNATIONAL COMPUTER SCIENCE INSTITUTE". The main title "Joke-O-Mat: Browsing Sitcoms Punchline by Punchline" is displayed in large purple text. Below the title are three video thumbnails. The first thumbnail shows two women at a table. The second thumbnail shows a group of people standing together. The third thumbnail shows a man standing and a woman sitting on a couch. Each thumbnail has a vertical sidebar with navigation links and a horizontal bar with small thumbnail previews.

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Research Performed at ICSI

UC Berkeley "The Beauty and Joy of Computing" : **Multimedia Computing (14)**

Friedland





Summary

- **Beauty and Joy of Computing? You bet!**
- **Multimedia documents convey Information better**
- **Multimedia Computing is everywhere: We are creating and consuming documents on a day-to-day basis.**
- **Interdisciplinary field!**
- **Biggest Big Data!**
- **Many future opportunities!**
 - Send me email for a visit at ICSI!

