


The Beauty and Joy of Computing

Lecture #5

A Computer Science Research Field: Multimedia Computing




UC Berkeley EECS
Lecturer
Gerald Friedland

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

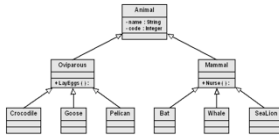
- Abstraction:** A fish
- Detail:** Humuhumunukunuaipua'a

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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

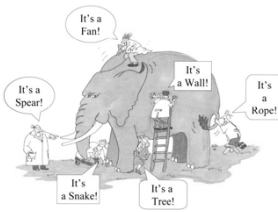


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Holistic Approach

- 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?

snaps.berkeley.edu

- 1
- 2
- 3
- 5
- More than 5


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

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lbc snap.berkeley.edu

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 Dilmel (Wikimedia Commons)




Humidity Sensor
wdwd (Wikimedia Commons)

UC Berkeley "The Beauty and Joy of Computing": Multimedia Computing (7)

lbc snap.berkeley.edu

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!

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Multimedia Computing...

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



"Microsoft PowerPoint 2013 Default Screen"
Malikussaid Rayyuk (Wikimedia Commons)

of multisensory documents.

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

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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!




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Example: Video Search Doesn't Work!

Google "giving directions to a location"

2 results (0.13 seconds)

Ad related to "giving directions to a location"

Maps & Driving Directions
giving-directions.easyprint.co.uk
Enter Address Or Location. Free Maps & Directions w/Toolbar!

Key considerations for all maps from the Course Creating a Map with It -> www.yrds.com ... -> Creating a Map with It -> ...
Are you giving directions to a location, or general information about the area. How much of the area should ...

Community Helpers - SlideShare
www.slideshare.net/communityhelpers
Aug 3, 2012
This will help with giving directions to a location. Materials: Our Maps A Map by step direction route on sheet ...

PPT - A Study on Wearable Computing PowerPoint presentation | free to download - SlideShare offers you your www.powerpoint.com. JA Study on Wearable Computing powerpoint - website to grow your giving today!
Technology which allows for the human and ... The concept of wearable computers intended to bridge the interaction gap -> Sprink, Spik, 17 JIR Conclusion

Stay up to date on these results:
• Create an email alert for "giving directions to a location".

Ads

Driving Directions & Maps
www.drivingdirections.com/Directions ->
Enter Starting Point & Destination
Get Directions, Quick & Easy

Ypoom Maps and Directions
www.ypoom.com ->
Find & Discover Local Businesses on YPOOM

Directions To And From
www.givingdirections.com/Directions ->
Enter Address or Driving Location
Driving Directions & Maps w/Toolbar

Accept Online Donations
www.securegive.com/OnlineGiving ->
Enter Address or Driving Location
Driving Directions & Maps w/Toolbar

Location Maps
www.givingdirections.com ->
Get Access To Maps & Directions, Maps Made Your Homepage Today

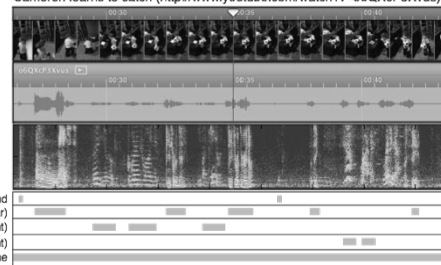
Map Quest Directions
shopping.yahoo.com/Books ->
Great Deals on Map Quest Directions
Shop Now and Save. Yahoo Shopping
See your ad here

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Video Search Using Audio Patterns

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



Ball sound

Male voice (near)

Child's voice (distant)

Child's whoop (distant)

Room tone

Research Performed at ICSI

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An Experiment

Listen!

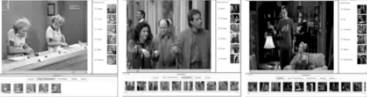


- Which city was this recorded in?

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




Joke-O-Mat: Browsing Sitcoms Punchline by Punchline



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Research Performed at ICSI

UC Berkeley "The Beauty and Joy of Computing" : Multimedia Computing [14]



Summary

Multimedia.icsi.berkeley.edu

- 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!

UC Berkeley "The Beauty and Joy of Computing" : Multimedia Computing [14]