

# **CSI 60: User Interface Design, Prototyping and Evaluation**

Prof: John Canny  
GSI: Anuj Tewari

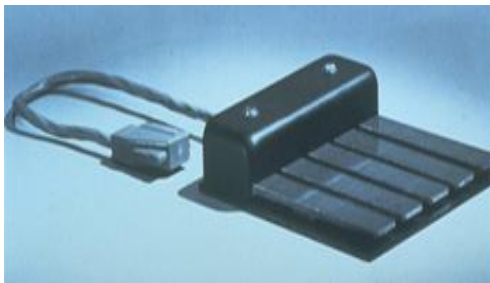
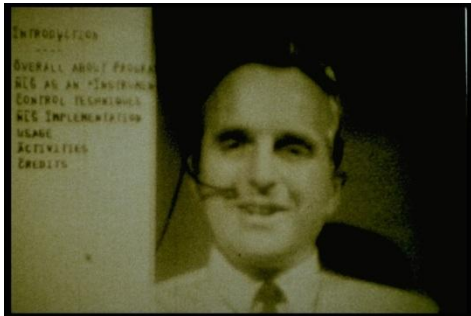
# Theme for this semester: Mobile apps



# Where we were (1968)

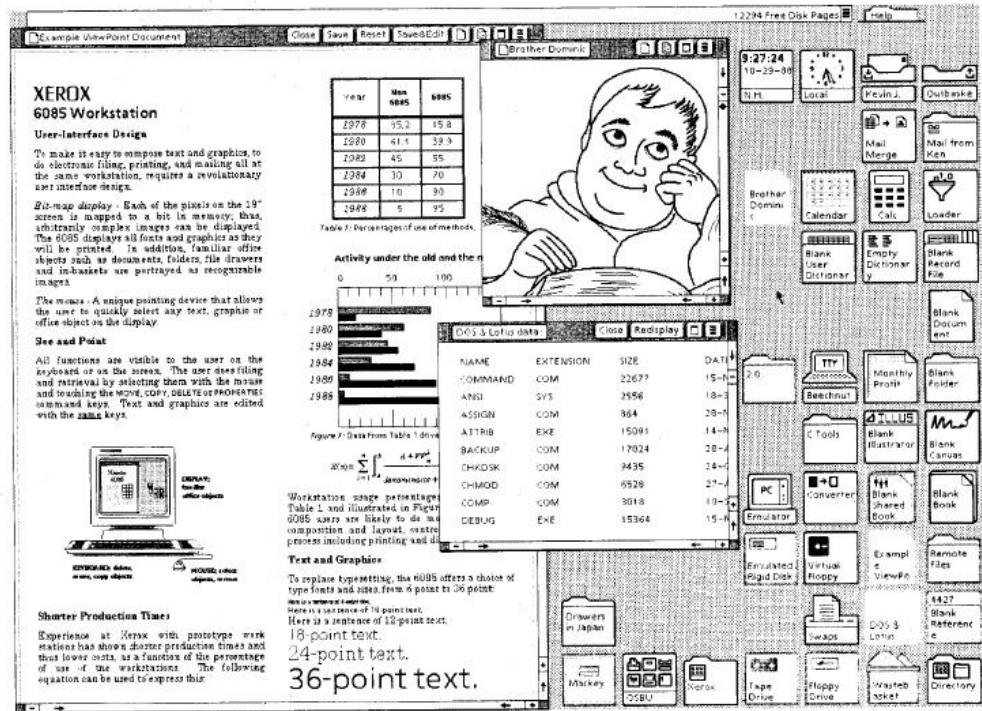
## Engelbart demo, NLS (oNLine System)

- Video screen, chording keyboard, mouse, videoconferencing, hyperlinking, word processing, email
- User studies



Video: 10:54 – 17:00

# Where we were (1981)



Xerox Star: Bitmapped display, windows, icons, menus, pointer, desktop, direct manipulation, WYSIWYG ...

Video: 1:11 – 8:20



# Where we are now



# Where we are now



Buttons, screens, but also acceleration, gyroscopes, voice input, vibration output.

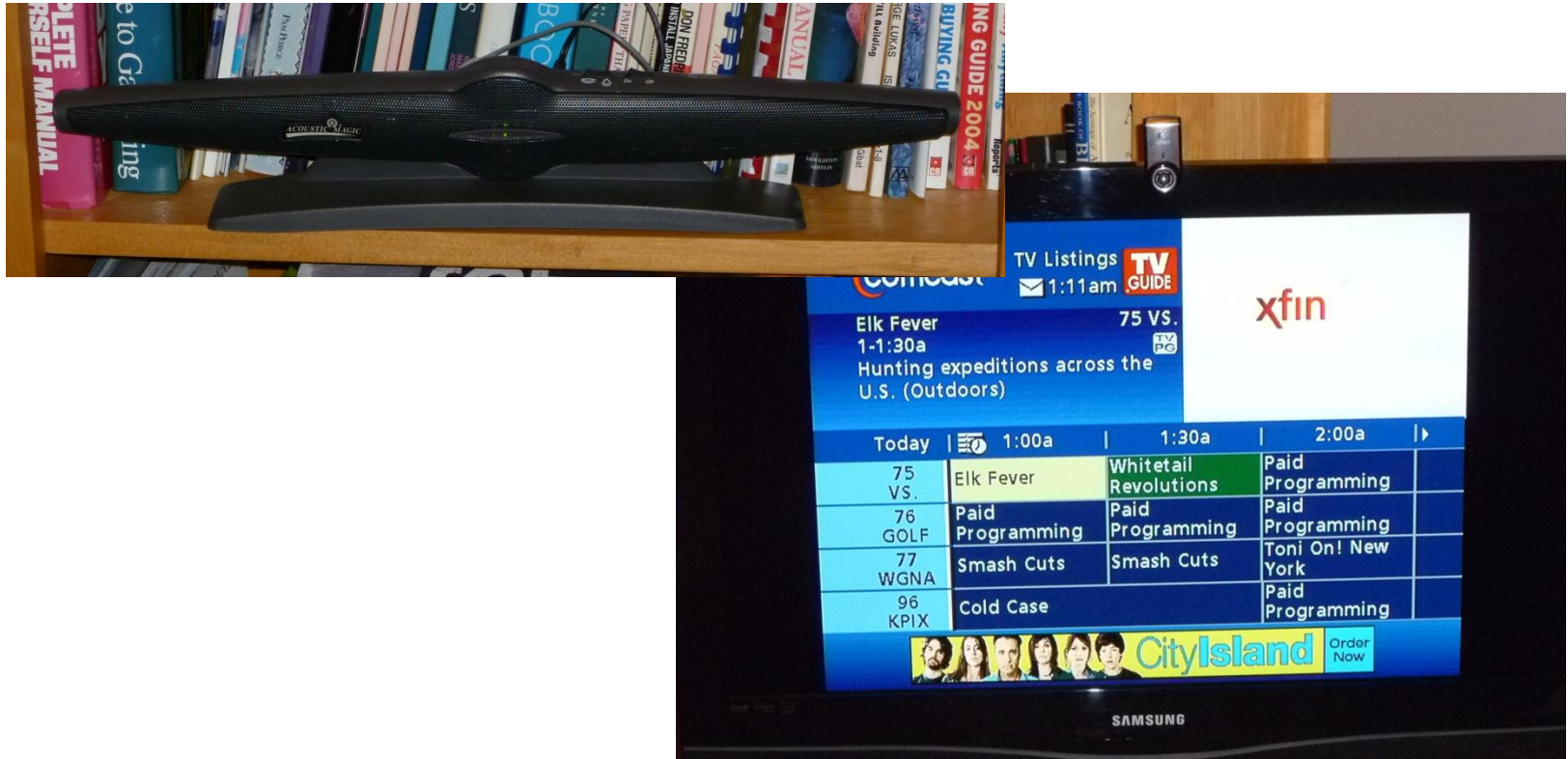


# Where we are now



Toys with sensors, motors, vision, networking

# Where we are now



Home and media control through voice, video



# Where we are now



Tablets, media players, game consoles.

Touch interaction, voice, movement, GPS

# Coming soon



Microsoft Kinect

Whole-body interaction via 3D computer vision for gaming.

# User Interface Design

We're studying the science of UI design, not the art.





# Top selling smartphones in Q4, 2009:

1. RIM – BlackBerry Curve
2. Apple – iPhone 3G S
3. Motorola – DROID
4. Apple – iPhone 3G
5. RIM – BlackBerry Pearl
6. RIM – BlackBerry Bold
7. RIM – BlackBerry Storm

Moral: Capturing everyone's attention is an art.  
Capturing market share is still largely a science.

# This course

Is about the science of **Usability**.

It's also about the process of **user-centered design**.

This semester the focus is **mobile applications**.

The goal is not to build a working system, but an  
“interactive prototype.”

Emphasis is on rapid prototyping and user testing to  
avoid obvious and not-so-obvious mistakes.

# Preferred Platform: Android

Full-featured, open architecture, familiar tools  
(Java, Eclipse)

State-of-the-art interaction

- Multi-touch input
- GPS
- Accelerometer
- Bluetooth
- Audio
- Camera support





# Archos 5

We can provide 1 per group if needed.

Archos 5 16GB Tablet:

- 5" Touch screen (not multitouch)
- Accelerometer
- GPS
- Mic + speaker
- Bluetooth + WiFi
- No cell service, but BT DUN to a tetherable smartphone
- Android 1.6



# Instructor: John Canny

## Professor in EECS

Joined Berkeley in 1987

## Work in HCI, Education, Health Tech

Language learning games

Persuasive technologies

Mobile applications



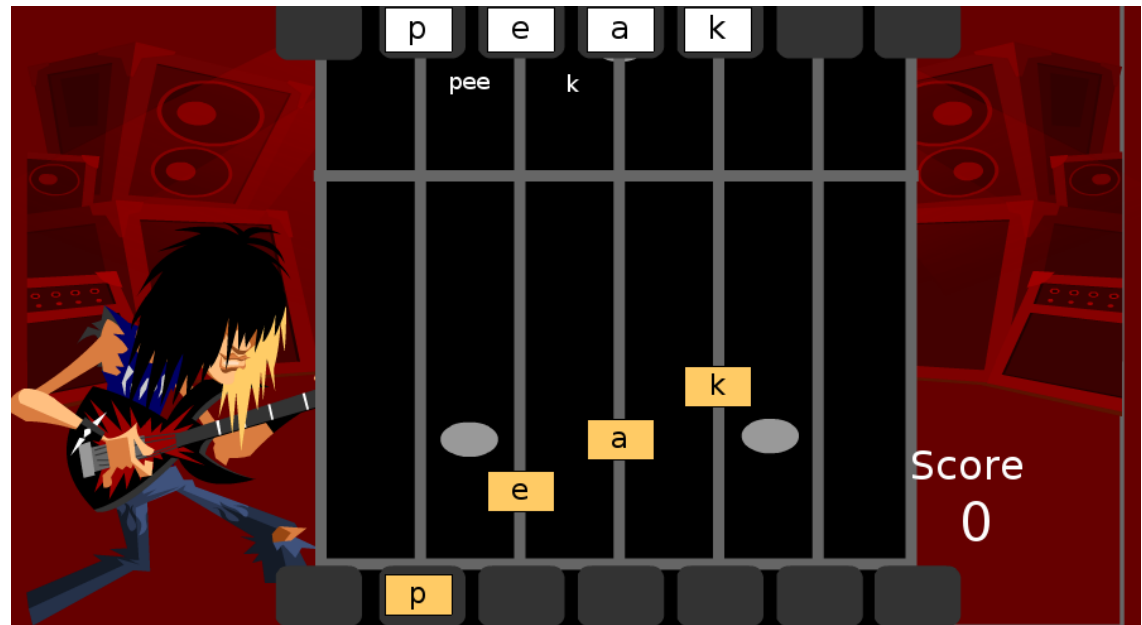
# GSI

Name: Anuj Tewari

Areas of interest:  
Educational technology,  
Speech recognition,  
Game design

Research topic: Speech  
and Pronunciation  
Improvement via  
Games, for Hispanic  
Children

Advisor: John Canny





# Topics

- Course Overview
- Project Description
- Course Mechanics

# Course Overview

# Human-Computer Interaction (HCI)

## Human

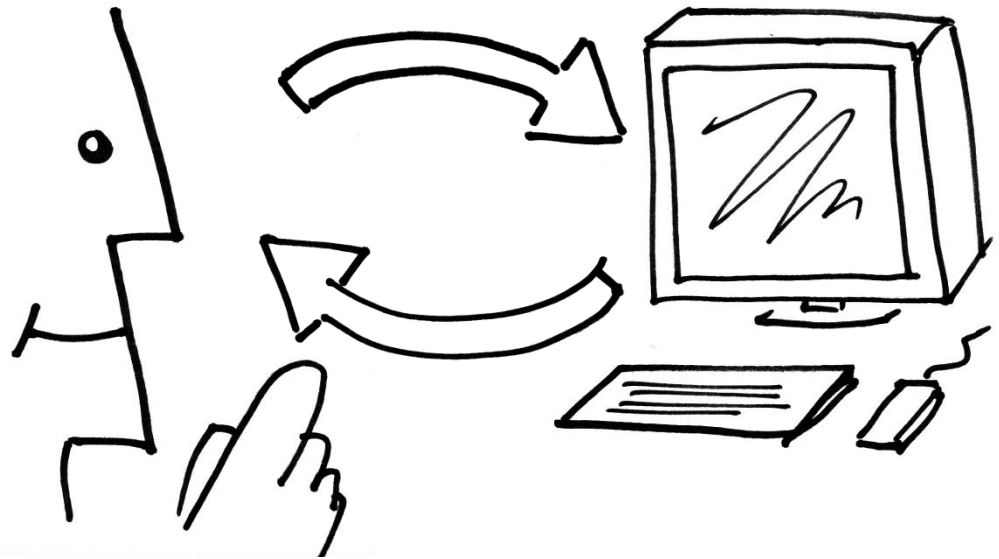
- User of program
- Others (friends, collaborators, coworkers)

## Computer

- Machine program runs on
- Often split: clients & servers

## Interaction

- User tells the computer what they want
- Computer communicates results



# User Interfaces (UIs)

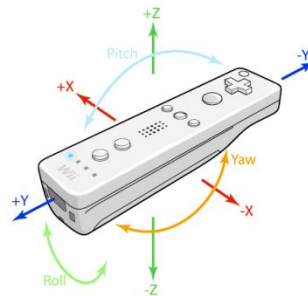
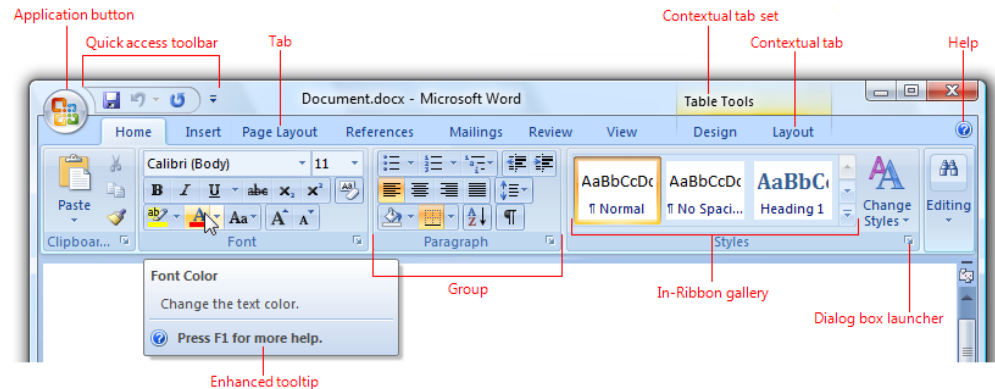
Part of application that allows

- People to interact with computer
- Computer to communicate results

Can include hardware design

- Buttons, sliders, other sensors

HCI =  
design, prototyping,  
implementation & evaluation  
of UIs



<http://www.reactable.com>

# Why Study User Interfaces?

Major part of work for most commercial programs

- Approximately 50%

You will work on software for a market

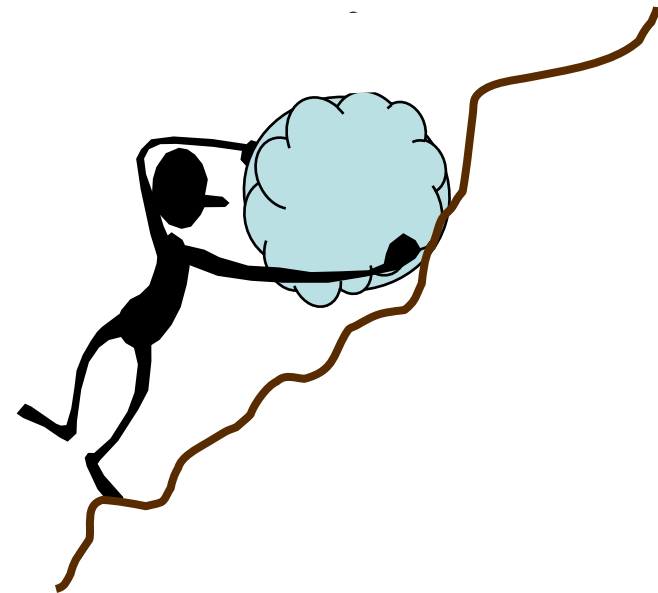
- Intended for people other than yourself

Bad user interfaces cost

- Money (5%↑ satisfaction → up to 85%↑ profits)
- Lives

User interfaces hard to get right

- People are unpredictable





# Life-Threatening Errors

- 1995 American Airlines jet crashed into canyon wall, killing all aboard
  - On approach to **Rozo** airport in Colombia
  - Pilot skipped some of the approach procedures
  - Pilot typed in “**R**” and system completed full name of airport to **Romeo**
  - Guidance system executed turn at low altitude to head for Romeo airport
  - 9 seconds later plane struck canyon wall



- Is the pilot to blame?

[http://en.wikipedia.org/wiki/American\\_Airlines\\_Flight\\_965](http://en.wikipedia.org/wiki/American_Airlines_Flight_965)

# What is Usability?

## Intuitive

- The design should seem natural

## Ease of learning

- Faster the second time and so on...

## Productivity

- Perform tasks quickly and efficiently

## Minimal error rates

- If they occur, good feedback so user can recover

## High user satisfaction

- Confident of success

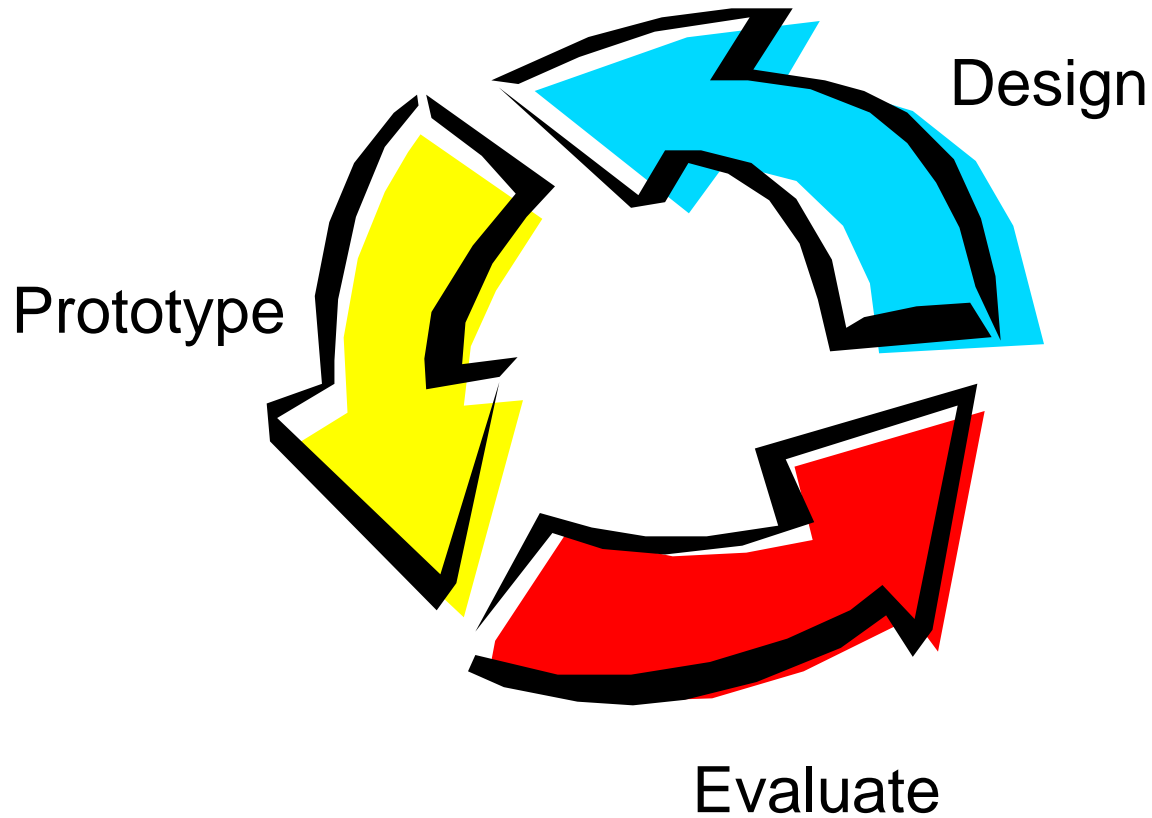
# Who Builds Interfaces?

Ideally a team of specialists

- graphic designers
- interaction / interface designers
- technical writers
- marketers
- test engineers
- software engineers
- customers

Some engineers become very good at user-centered design, but its not for all engineers.

# Interface Design Cycle



# Building Successful Interfaces

1. Task analysis & contextual inquiry
2. Rapid prototyping
3. Evaluation
4. Iteration: Back to 1

# Task Analysis & Contextual Inquiry

- Observe existing practices
- Create scenarios of actual use
- Create models to gain insight into work processes



CS247, Stanford, 2006

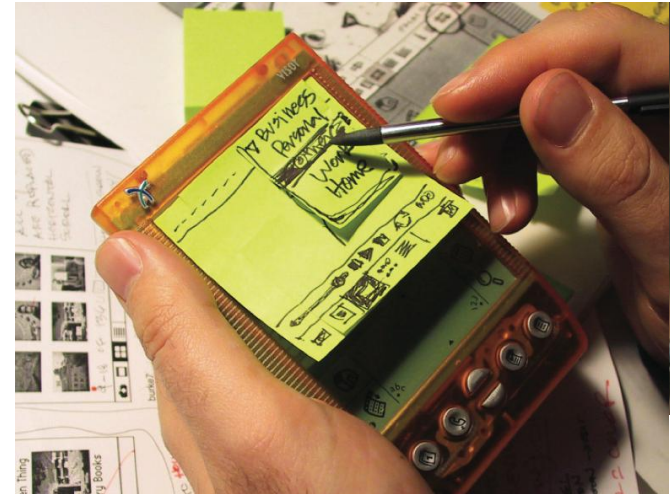


<http://www-personal.umich.edu/~chrisli/m2.html>

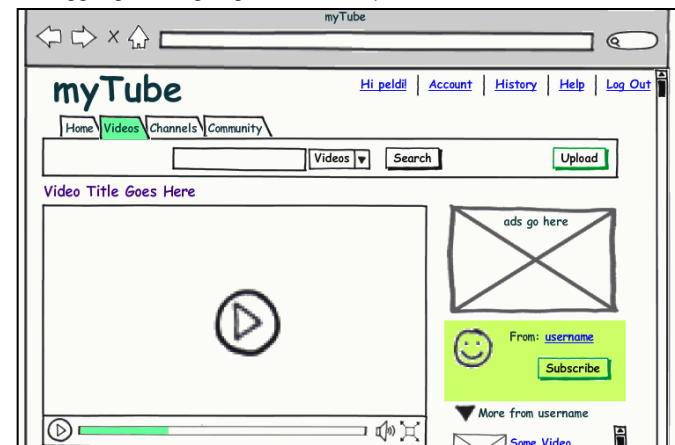


# Rapid Prototyping

- Build a mock-up of design (or more!)
- Low fidelity techniques
  - Paper sketches
  - Cut, copy, paste
  - Video segments
- Interactive prototyping tools
  - HTML, Flash, Javascript, Visual Basic, C#, etc.
- UI builders
  - Interface Builder, Visual Studio, NetBeans



Moggridge, Designing Interactions, p.704



<http://www.balsamiq.com/products/mockups/examples#wiki>

# Evaluation

Evaluate analytically (no users)

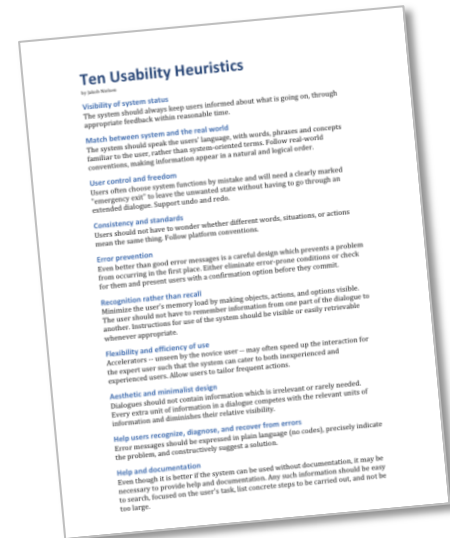
Test with real target users

Low-cost techniques

- expert evaluation
- walkthroughs

Higher cost

- Controlled usability study



# Building Successful Interfaces

- Task analysis & contextual inquiry
- Rapid prototyping
- Evaluation
- Iteration

Evaluation brings **real users** into the design loop.

Design stays **user-centered** throughout the process.

# Why not simulate the user?

People have certainly tried. Its useful in certain special cases, e.g. pointing and typing evaluation.

For most applications, people are far too complex to simulate. Behavior depends on just about every external factor.

Users are their own best simulation.  
In fact they are ground truth...



# Goals of the Course

## **Learn to design, prototype, evaluate interfaces**

- Discover needs and preferences of real customers
- Cognitive/perceptual constraints that effect design
- Building and rapidly evolving interactive systems
- Techniques to test and evaluate a product
- How to work together on a team project
- Communicate your results effectively

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- How to work together on a team project
- Communicate your results effectively

These non-technical skills become more important the further you go in your career.



# **Project Description**

# Teams

Each of you will individually propose an application idea

- We follow a studio model to help you think outside the box
- Learning and working with others is central to the course

## Groups

- 4 or 5 students to a team
- Work with students with different skills/interests

## Cumulative

- Apply several HCI methods to a single interface

# Theme: Mobile Applications

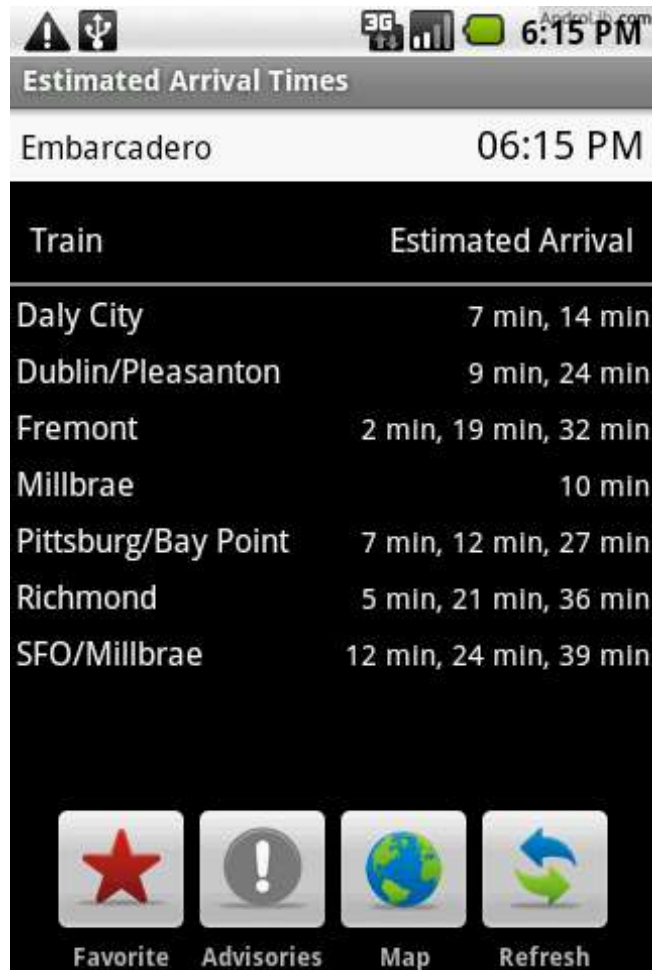
- Mobile applications are different:
  - Different tasks (local search, not word processing)
  - I/O constraints (slow text entry, few pixels)
  - Input opportunities: Sensing (orientation, acceleration, location, camera)
  - Internet connectivity

# Course Platform

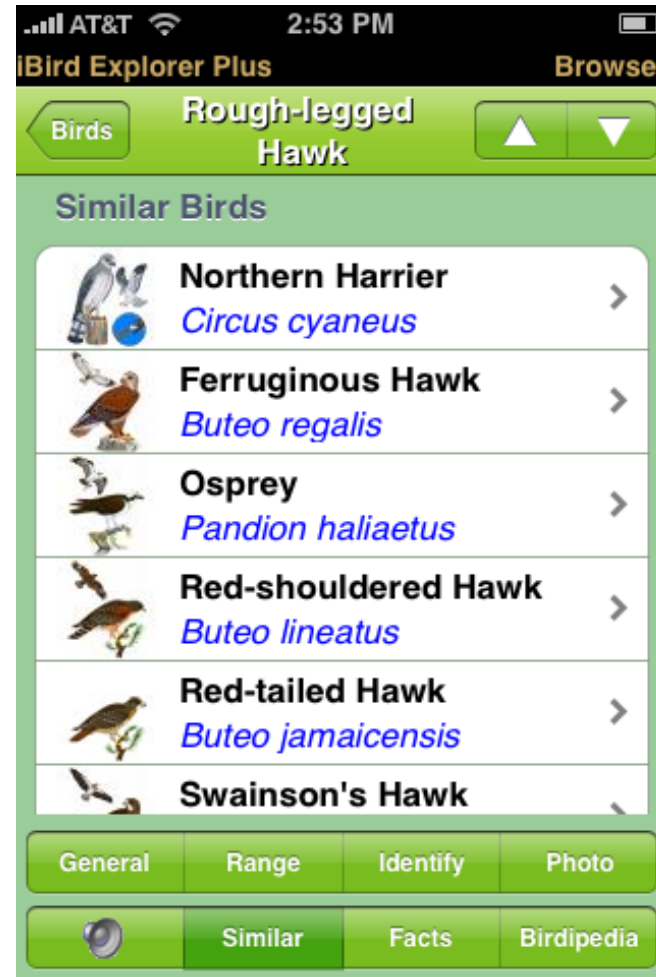
- Android Device, Wiimote
  - We have loaner devices (one Archos 5 per team), or use your own.
  - Development tools work on all platforms (Windows, Mac, Linux) – use your own or lab machine.
  - Coding assignments first on emulator, then on real device.



# Inspiration: Design for a Particular User



Bart Rider Android App



iBird

# Inspiration: Location-based Apps



RedFin iPhone App



Navigon Mobile Navigator



RunKeeper

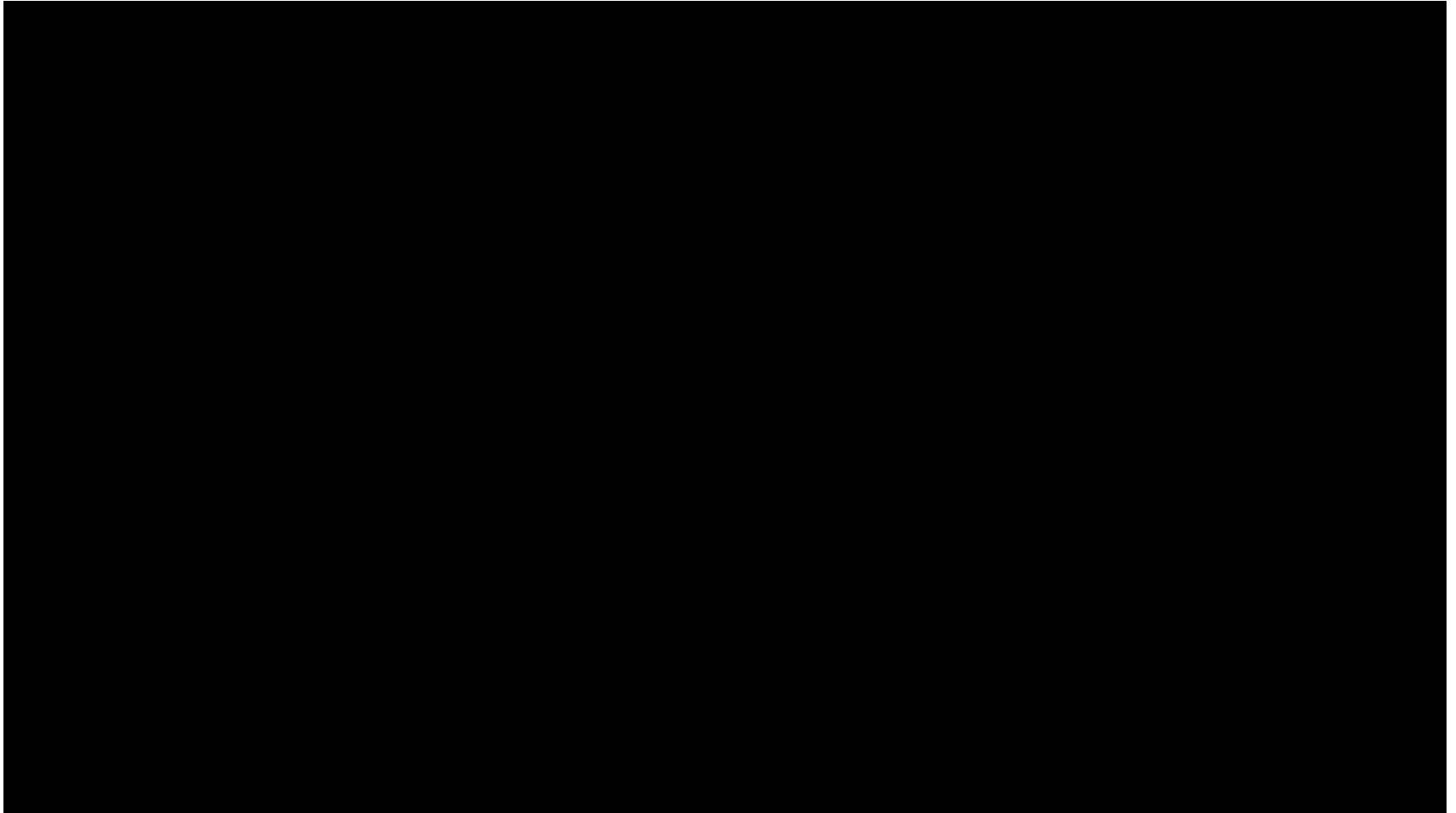


# Inspiration: Input



Google Voice Search - <http://www.youtube.com/watch?v=y3z7Tw1K17A>

# Inspiration: Input



# Inspiration: Input

<http://www.youtube.com/watch?v=cjnPwV6yP6o>

# **Course Mechanics**

# **TAs, Office Hours, Sections**

## **Teaching Assistant**

- Anuj Tewari: EECS grad student

## **Office Hours**

- John Canny: W 2:30-3:30pm, in 637 Soda Hall
- Anuj: Thursday 3:00PM-4:00PM in 354/360 Hearst Mining
- Also by appointment

## **Sections**

- Friday 10-11AM, 11-12N, 405 Soda Hall (first week)
- Will cover new material. You should attend!

# Reaching Us

**Email:** [cs160@imail.eecs.berkeley.edu](mailto:cs160@imail.eecs.berkeley.edu)

- Mail sent here will get the fastest response
- Please avoid mailing us directly



# Class Wiki

The screenshot shows a web browser displaying the CS160 Class Wiki page. The page title is "User Interface Design". The main content area features a large "CS160" watermark and the text "User Interface Design". Below the text is a row of nine mobile application screenshots. The page includes a navigation sidebar on the left with links for "Main page", "Community portal", "Current events", "Recent changes", "Tips and Tricks", and "Help". A search box is located below the navigation sidebar. The page also has a "toolbox" section with links for "What links here", "Related changes", "Upload file", "Special pages", "Printable version", and "Permanent link". The top of the page shows the user "John Canny" and links for "my talk", "my preferences", "my watchlist", "my contributions", and "log out". The bottom of the page shows a Windows taskbar with various application icons and a system tray with the time "2:40 AM" and date "8/30/2010".

User interface Design, Prototyping & Evaluation  
CS160 Fall 2010

navigation

- Main page
- Community portal
- Current events
- Recent changes
- Tips and Tricks
- Help

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

Find: scale Next Previous Highlight all Match case

Done

John Canny my talk my preferences my watchlist my contributions log out

## Main Page

# CS160

## User Interface Design

CS 160 is an introduction to Human Computer Interaction (HCI). You will learn to prototype, evaluate, and design a user interface. You will be expected to work within a group of four or five students in this project-based course. The project topic will be proposed by your group, and your implementation will be tailored to your users' needs based on interviews with them.

In contrast to most of the other CS classes at Berkeley, CS160 does not focus on particular algorithmic techniques or computer technologies. Instead, you will make use of technology to develop your applications, and you will acquire some expertise in the development environment you choose. The focus of the course is on developing a broad set of skills needed for user-centered design. These skills include ideation, needs assessment, communication, rapid prototyping, algorithmic implementation and evaluation.

**Project Theme:** This semester, projects will focus on **mobile applications**. Mobile applications present unique opportunities (e.g., location sensing) and challenges (e.g., input). Your team will be developing applications using Google's Android SDK. You can use your own phone, but we will also have a number of Archos 5 Tablets that you can borrow for the semester. We will also use Wii

<http://bid.berkeley.edu/cs160-fall10/>

# Create Wiki Account

Your 1<sup>st</sup> assignment (due by this Weds)

Creating a New Account - Cs160-sp08 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://vis.berkeley.edu/courses/cs160-sp08/wiki/index.php/Creating\_a\_New\_Account

Google Search

Maneesh Agrawala my talk my preferences my watchlist my contributions log out

## User Interfaces

cs160 Spring 2008

navigation

- Main Page
- Community portal
- Current events
- Recent changes
- Random page
- Help
- Donations

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

## Creating a New Account

To participate in the discussion on this wiki you will need to create an account.

- Please use your full name as your user name.** Note that your username can contain a space between the first and last name.
- Include a valid email address when you create the account as shown in the example below.
- Follow [this link](#) to make your account.

Afterwards, please add some descriptive information about yourself on your personal page -- click your login name (next to the person icon) at the top of the page to access your personal page. Here is an example from [my page](#).

Example of creating an account. Make sure to use your full name as your user name as well as a valid email address.

### Log in / create account

#### Create account

Already have an account? [Log in](#).

Username:

Password:

Retype password:

E-mail \*:

Real name \*:

Remember me

\* E-mail (optional): Enables others to contact you through your user or user\_talk page without needing to reveal your identity.  
\* Real name (optional): if you choose to provide it this will be used for giving you attribution for your work.

# Assignment 2: Course Petition

- Due by this Weds, online submission
- Both **enrolled and waitlisted** students have to submit
- Information **will determine admission**

# Assignment 3: Individual Project Idea

- **Due** by 5pm **Wednesday**, Sept 8; 5pts
- Start gathering ideas now! Project should be:
  - Exciting to you!
  - Creative!
  - Consider the needs of a well-defined target user group
  - Include sketches to visualize your ideas
- Grading details on the web (20 points total)
- Description must be posted to wiki by 5pm on 9/8

# Assignment 4: Tip Calculator

**Due** before class **Monday**,  
Sept 13; 5pts

Instructions on wiki.

Summary:

- Set up your Android environment
- Build a simple interactive App.
- Submit your binary and source to us.



# Readings

Readings are very important to the class

- Make sure you do the reading *before class*
- Midterm/Final will include things only in readings

Most readings will be posted on wiki

- Require username/password:

Online reading discussions (ongoing assignment)

- Must post *one substantial comment* per lecture
- We will **not** accept late comment
- Will be the major factor in your class participation grade

# Grading

**Class participation (10%)**

**Individual assignments (20%)**

**Group project (50%)**

**Midterm (20%)**

Score distribution is high with small variance. So every point counts! Make sure you turn in all the reading comments.

# Policies

## Late Assignments

- Most assignments will be due before class on the due date
- Group assignments will not be accepted late
- Individual assignments lose 20% per day

## Cheating (official)

- Will get you an **F** in the course
- More than once can get you dismissed from Cal



# Assessment

Goal of cs160 is to teach you to *design* and *evaluate* interfaces

- There is often **more than one good design**
- But, there are also **lots and lots of poor designs**
- Be critical of your own work (point out pros and cons)
- As in many design disciplines, grading will be qualitative

Specific assessment guidelines will be given in each assignment

Good **communication** expected in oral & written presentations

Groups **self-assess** participation

- Should monitor it throughout the project
- Meet with us as soon as problems emerge

# Next Time

## The Design Cycle and Brainstorming

- [The Task-Centered Design Process](#). *Task-Centered User Interface Design*. Chap 1. Lewis & Rieman
- [The Perfect Brainstorm](#). *The Art of Innovation*. Kelley  
Will need username/password for this one