CS 160

User Interface Design

Fall 2015

INTRODUCTION

27 AUG 2015

ERIC PAULOS
www.paulos.net

UNIVERSITY OF CALIFORNIA Berkeley

TOPICS FOR TODAY

Introductions

Enrollment

Course Overview

Project Description

Course Mechanics

Assignments

CS160 FALL 2015

Please sign in

http://teaching.paulos.net/cs160_FL2015/gobears.html

Enrollment....

AM session will end a bit early TODAY...

http://teaching.paulos.net/
cs160_FL2015/gobears.html

CS 160 Lecture 1 Sign-in

Your username (**paulos@berkeley.edu**) will be recorded when you submit this form. Not **paulos**?
Sign out
* Required

Name *

Email *

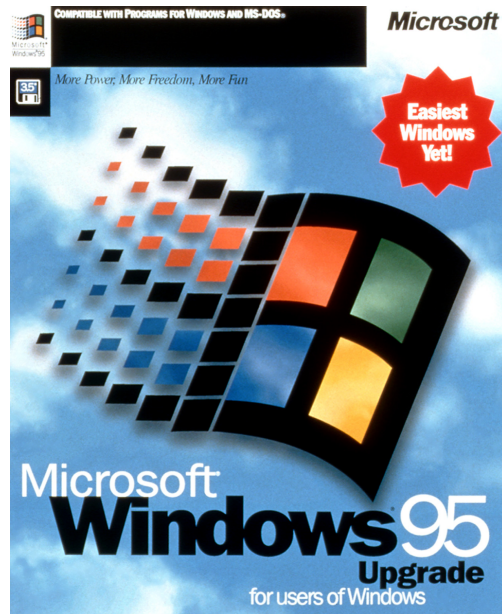**Student ID** *

Enrollment Status *

*

☐ By checking this box, I acknowledge that I have attended the first lecture and am not filling this form out remotely.

ERIC PAULOS

PROFESSOR

processor: **Intel Pentium (66 MHz)**
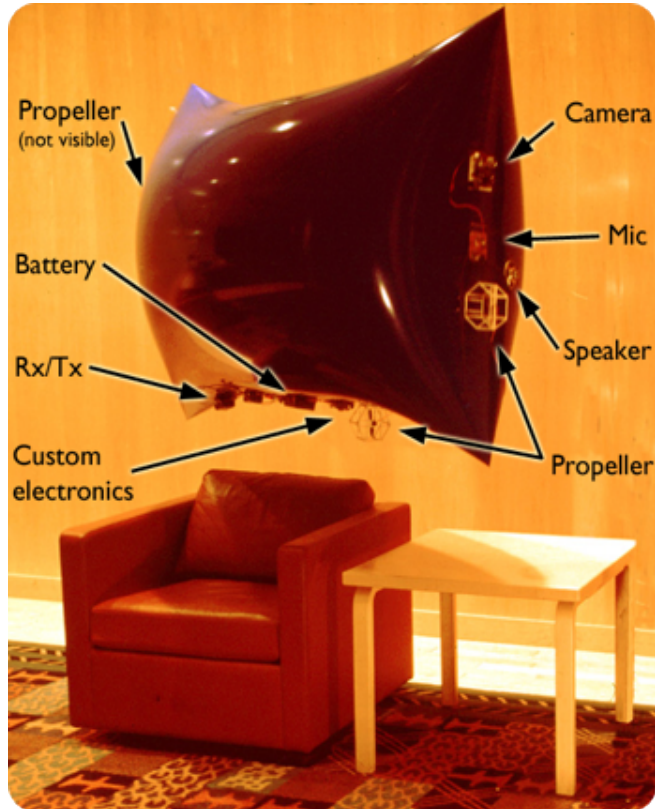
browser: **Mosaic**

search engine: **Lycos**

social networking: **The Well / Usenet**

mobile platform: **Palm Pilot**

```
00fe7  info-cpm at BRL, AUTREY-HUNLEY a    fa.info-cpm         17-Jul-82 07:25
00fe8  Help with hard disk and SDS syst    fa.info-cpm         17-Jul-82 10:30
00fe9  Cursor movement                     fa.editor-p         17-Jul-82 10:42
00fea  Rings and food                      net.games.rogue     17-Jul-82 10:45
00feb  Super natural Bug?                  net.games.rogue     17-Jul-82 10:57
00fec  VW Joke                             net.auto.vw         17-Jul-82 11:50
00fed  Did you hear about                  net.jokes           17-Jul-82 12:29
00fee  Re: VAX UNIX magtape lockout - (    net.unix-wizar      17-Jul-82 12:36
00fef  SF-LOVERS Digest   V6 #17           fa.sf-lovers        17-Jul-82 13:13
00ff0  IT                                1 net.nlang          17-Jul-82 13:53
00ff1  Public domain programs in commer    fa.info-cpm         17-Jul-82 15:12
00ff2  6502 simulator                      fa.info-cpm         17-Jul-82 15:19
00ff3  Who's Crazier? (Take 2)             net.misc            17-Jul-82 17:20
00ff4  Bladerunner and The Bradbury        net.movies          17-Jul-82 17:33
00ff5  bad saves                           net.games.rogue     17-Jul-82 18:32
00ff6  CP/M ED.COM 1.4                      fa.info-cpm         17-Jul-82 19:21
00ff7  Number theory problem               net.general         17-Jul-82 19:37
00ff8  kids...                             net.jokes           17-Jul-82 19:38
00ff9  CP/M ED 1.4                          fa.info-cpm         17-Jul-82 20:19
00ffa  Epson Modification                  net.micro           17-Jul-82 20:30
00ffb  Netnews spreads to BTL Indian Hi    net.news.newsite    17-Jul-82 21:02
00ffc  x**x**x**x... : Where did I go w  1 net.math           17-Jul-82 21:09
00ffd  [Steven E. Hills:  Epson Modific    fa.info-terms       17-Jul-82 21:21
news>
```
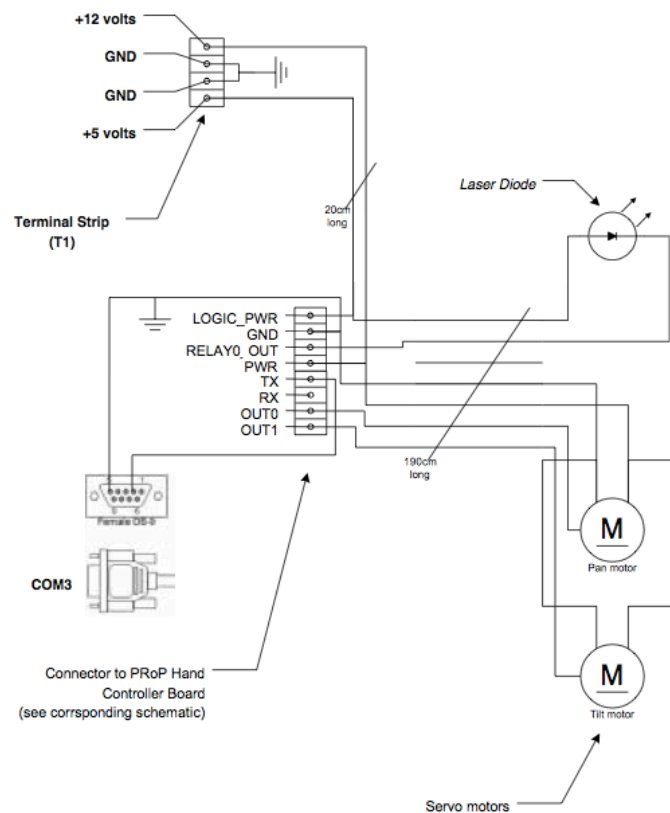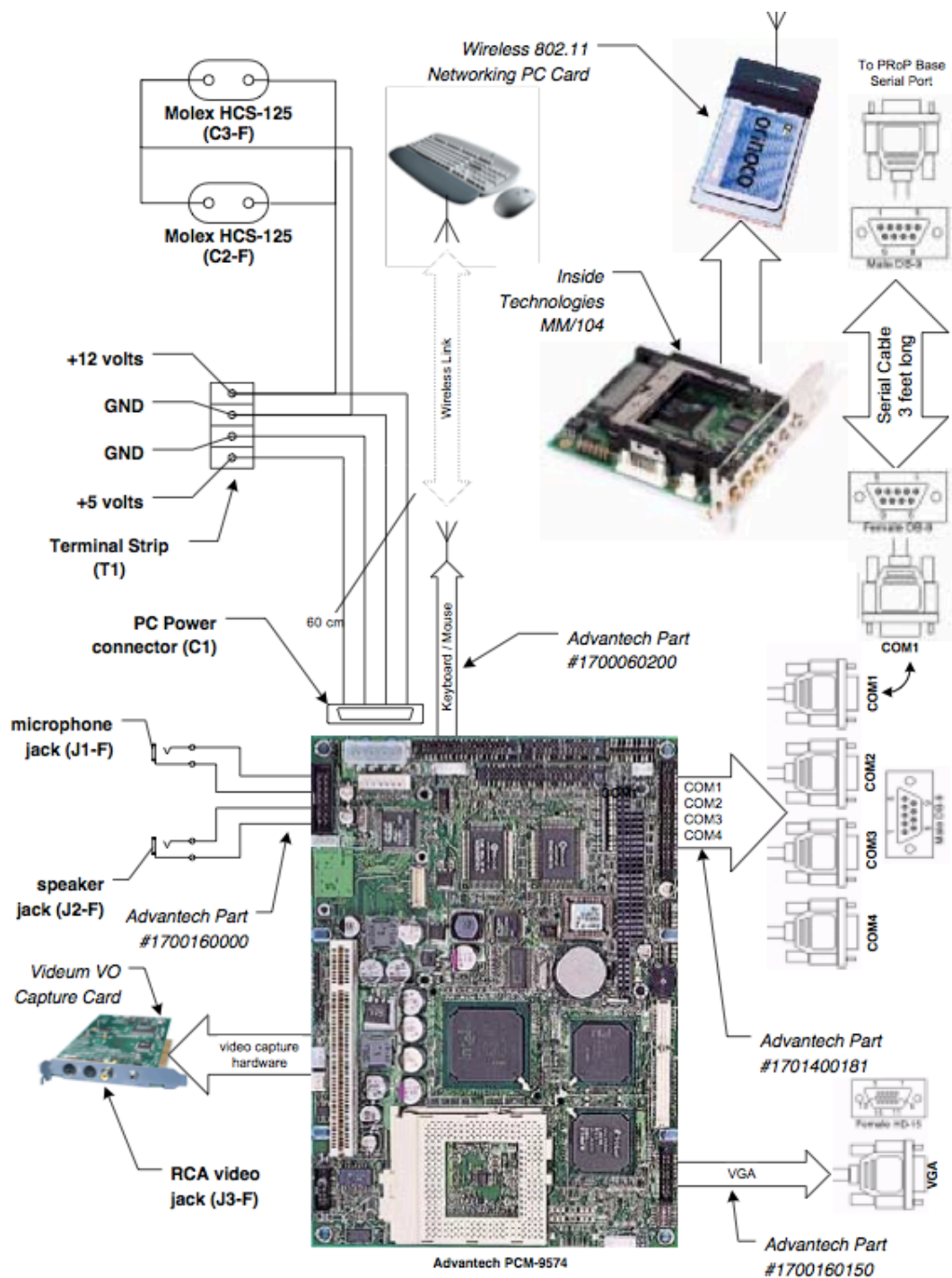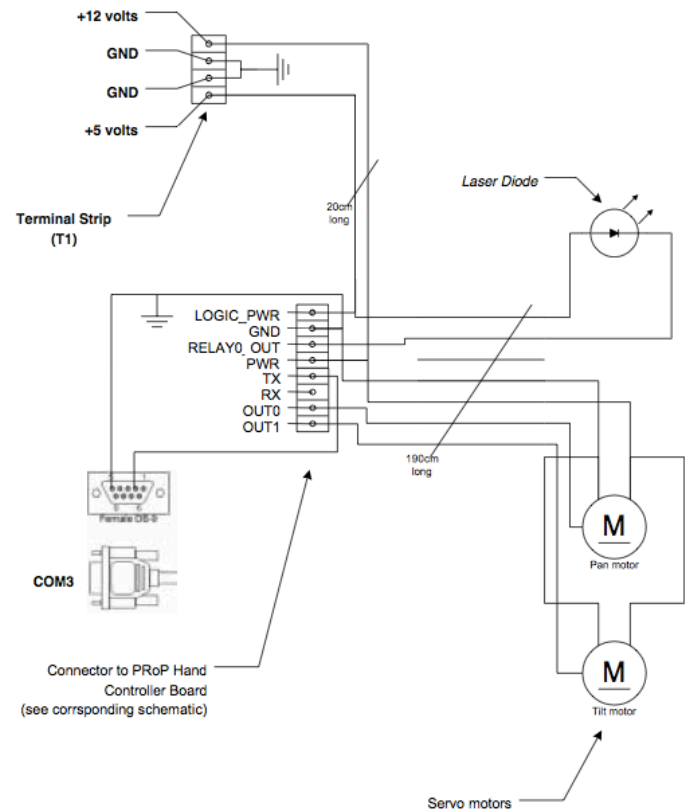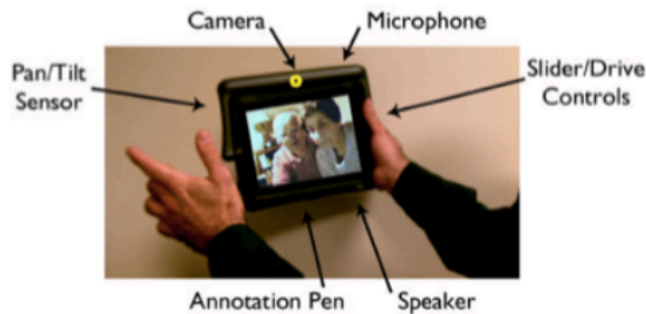
PRoPs
1993-2000

Wireless 802.11
Networking PC Card

To PRoP Base
Serial Port

Molex HCS-125
(C3-F)

Molex HCS-125
(C2-F)

Inside
Technologies
MM/104

Serial Cable
3 feet long

Male DB-9

+12 volts

GND

GND

+5 volts

Terminal Strip
(T1)

PC Power
connector (C1)

60 cm

Keyboard / Mouse

Wireless Link

Advantech Part
#1700060200

Female DB-9

COM1

microphone
jack (J1-F)

speaker
jack (J2-F)

Advantech Part
#1700160000

Videum VO
Capture Card

video capture
hardware

RCA video
jack (J3-F)

Advantech PCM-9574

COM1
COM2
COM3
COM4

COM1

COM2

COM3

COM4

Male DB-9

Advantech Part
#1701400181

VGA

Female HD-15

Advantech Part
#1700160150

+12 volts

GND

GND

+5 volts

Terminal Strip
(T1)

20cm
long

Laser Diode

LOGIC_PWR
GND
RELAY0_OUT
PWR
TX
RX
OUT0
OUT1

190cm
long

Female DB-9

COM3

Connector to PRoP Hand
Controller Board
(see corrsponding schematic)

M

Pan motor

M

Tilt motor

Servo motors

+12 volts
GND
GND
+5 volts

Terminal Strip
(T1)

20cm
long

Laser Diode

LOGIC_PWR
GND
RELAY0_OUT
PWR
TX
RX
OUT0
OUT1

190cm
long

Female DB-9

COM3

Connector to PRoP Hand
Controller Board
(see corrsponding schematic)

Pan motor

Tilt motor

Servo motors

PRoP

PEBBLES

Care-O-bot

Co-Worker   Care-O-bot 2

RP-7

TiLR

Giraff

ConnectR

Care-O-bot 3

QA   Texai   Roti   R.Bot-100

Robosem   EngKey   VGo   QB   Luna   AVA   Jazz Connect   TELO

Beam   Double   RP-VITA   HELO

1980
1994
1997
1998
2002
2003
2005
2006
2007
2008
2009
2010
2011
2012

1995   **2012**

Camera   Microphone

Pan/Tilt Sensor   Slider/Drive Controls

Annotation Pen   Speaker

PRoPs as shown in 1995 (left column) for remote instruction, communication, and with a tablet interface. These same usage models and interfaces 17 years later (right column) in Double Robotics 2012 tele-robotic product.
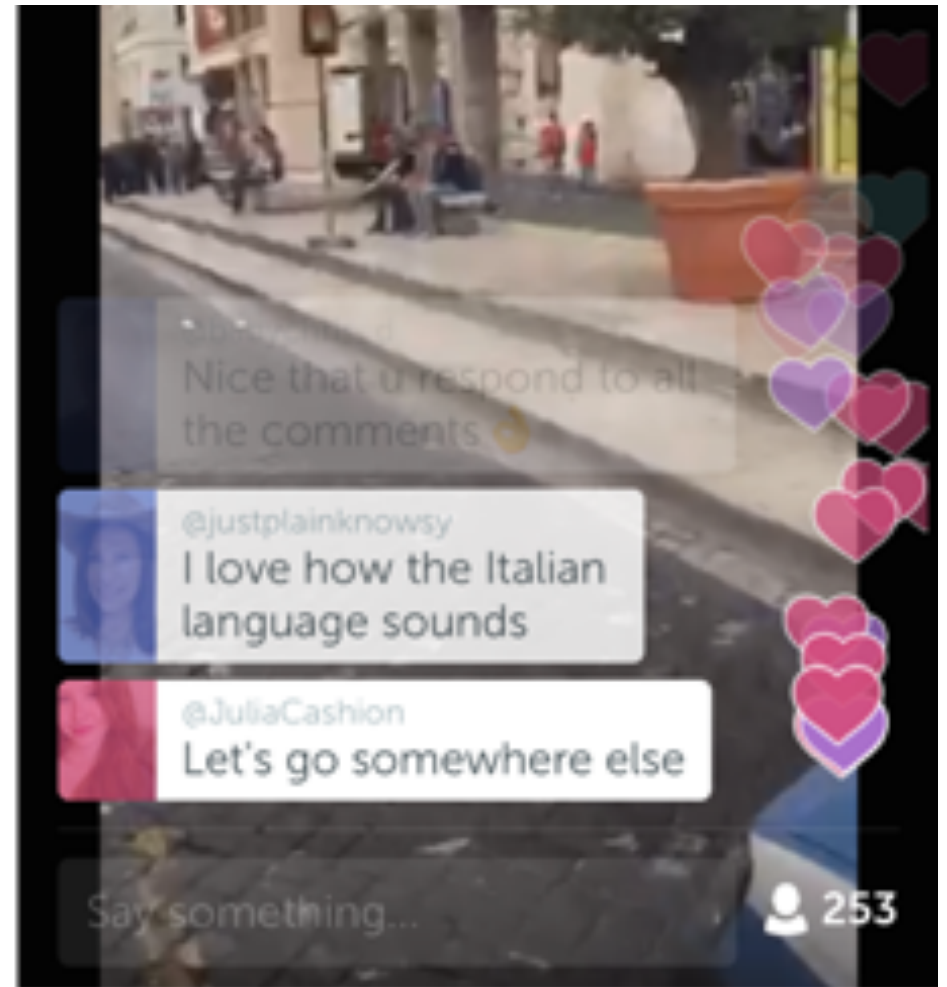
The Tele-Actor interface from 2000 (left) showing collaborative communication and voting to direct a remote user's actions over live video and (right) the current interface for Twitter's Periscope from 2015 where a remote user receives instructions and "heart" votes as feedback to direct their actions.
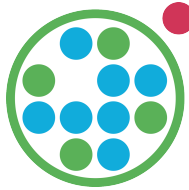
URBAN ATMOSPHERES

Eric Paulos
Chris Beckmann
Elizabeth Goodman
RJ Honicky
Ben Hooker
Tom Jenkins
August Joki
Chris Myers
Ian Smith
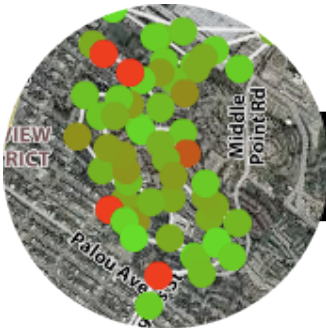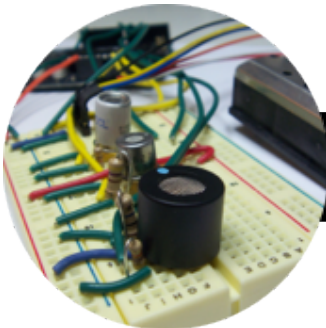Parul Vora
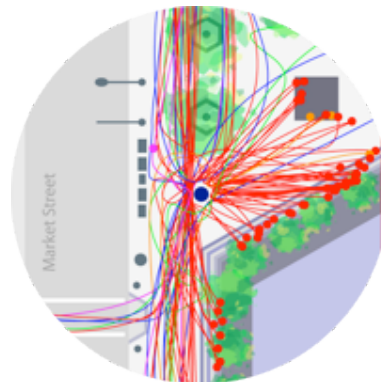
intel Research

living environments lab

a collaborative research laboratory
focusing on the critical intersection of
human life, our living planet, and technology

Citizen Science

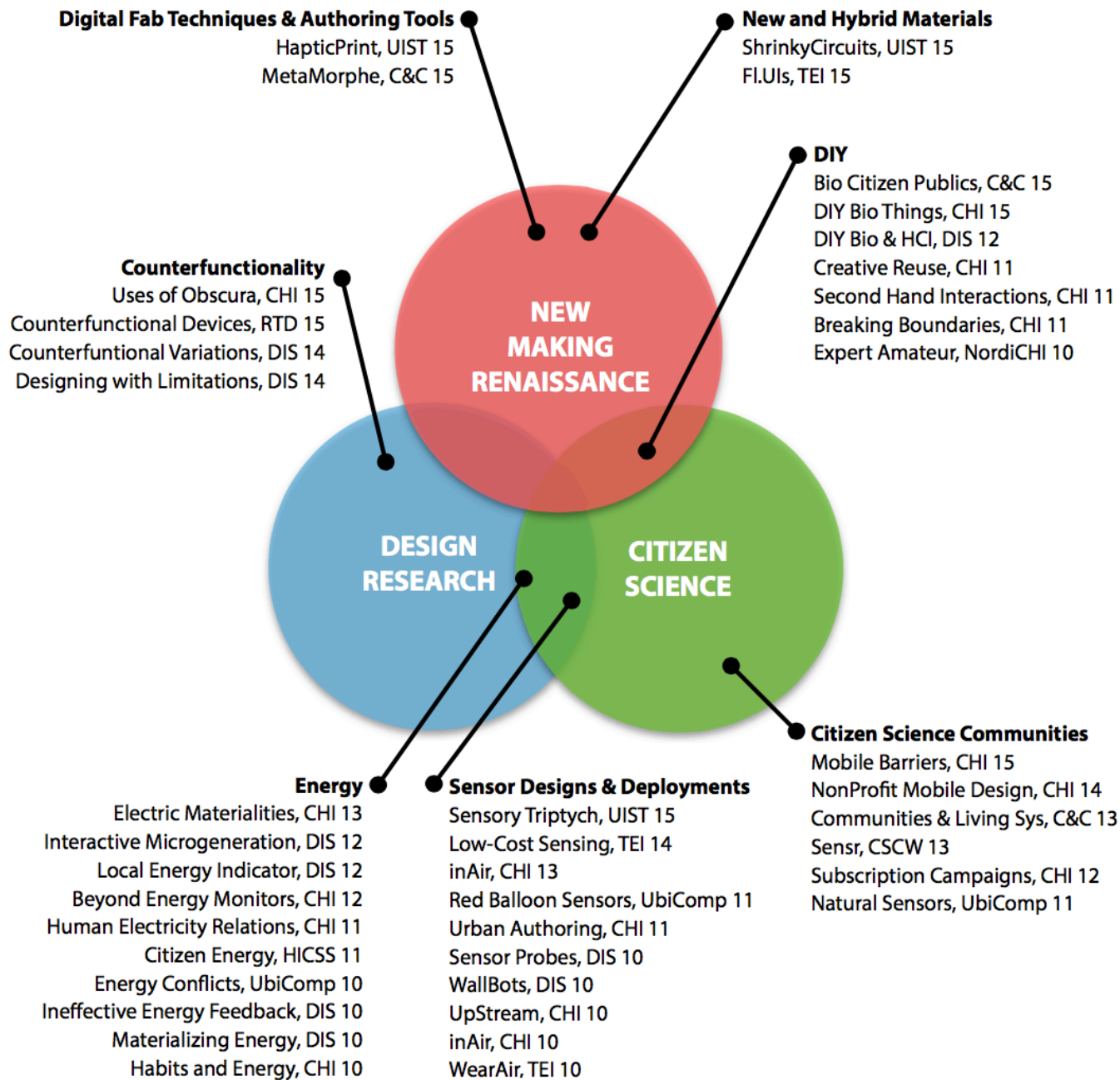Energy Materiality

DIY Culture

Collaborative Consumption

Spectacle Computing

Micro Volunteerism

HYBRID ECOLOGIES LAB

New Making Renaissance

Fashioning Fashionables

Digital Fab Techniques & Authoring Tools
HapticPrint, UIST 15
MetaMorphe, C&C 15

New and Hybrid Materials
ShrinkyCircuits, UIST 15
Fl.UIs, TEI 15

DIY
Bio Citizen Publics, C&C 15
DIY Bio Things, CHI 15
DIY Bio & HCI, DIS 12
Creative Reuse, CHI 11
Second Hand Interactions, CHI 11
Breaking Boundaries, CHI 11
Expert Amateur, NordiCHI 10

Counterfunctionality
Uses of Obscura, CHI 15
Counterfunctional Devices, RTD 15
Counterfuntional Variations, DIS 14
Designing with Limitations, DIS 14

NEW MAKING RENAISSANCE

DESIGN RESEARCH

CITIZEN SCIENCE

Citizen Science Communities
Mobile Barriers, CHI 15
NonProfit Mobile Design, CHI 14
Communities & Living Sys, C&C 13
Sensr, CSCW 13
Subscription Campaigns, CHI 12
Natural Sensors, UbiComp 11

Energy
Electric Materialities, CHI 13
Interactive Microgeneration, DIS 12
Local Energy Indicator, DIS 12
Beyond Energy Monitors, CHI 12
Human Electricity Relations, CHI 11
Citizen Energy, HICSS 11
Energy Conflicts, UbiComp 10
Ineffective Energy Feedback, DIS 10
Materializing Energy, DIS 10
Habits and Energy, CHI 10

Sensor Designs & Deployments
Sensory Triptych, UIST 15
Low-Cost Sensing, TEI 14
inAir, CHI 13
Red Balloon Sensors, UbiComp 11
Urban Authoring, CHI 11
Sensor Probes, DIS 10
WallBots, DIS 10
UpStream, CHI 10
inAir, CHI 10
WearAir, TEI 10

CESAR TORRES

GSI

DIANE WANG   GSI

TRICIA FU   GSI

JINGYI LI   GSI

JASPER O' LEARY

GSI

SARINA GROSS

Reader

ERIC QUACH   Reader

MATTHEW WALIMAN Reader

THIS COURSE

Is about reliably building very good interactive systems

The goal is not to build a working system, but an **interactive prototype**

We place emphasis on **fieldwork**, **rapid prototyping** and **user testing** to find the right design and avoid obvious and not-so-obvious mistakes.

SMART WATCH

INCOMING CALL
Tracy Webb

2014

MOTO 360

THIS COURSE

This semester we focus on **smart watch** and **mobile** applications

REQUIREMENTS

- CS160 is an upper division course
- You will work extensively on one significant programming project.
- To participate fully in this course, you are required to have taken CS61B or have equivalent knowledge.
- We will assume that you are familiar with Java and are comfortable coding a large-scale project.
- You are required to own an Android phone running at least Android version 5.0 (lollipop) that can be used for development, deployment, documentation, and evaluation of your work.
- Cannot use a Tablet running Android

ANDROID PHONE SHOPPING

Phones must be running at Android version 5.0 (lollipop).

No Tablets, must be an Android phone.

No-Contract Android 5.0+ Recommendations

Model	Price (Approx.)	Carrier	Retailer
Motorola Moto E	$60	Verizon	Amazon
HTC Desire 526	$70	Verizon	BestBuy
LG Leon LTE	$70	T-Mobile	BestBuy
Samsung Galaxy J1	$80	T-Mobile	Amazon
LG Tribute Duo	$100	Sprint	Amazon

ENROLLMENT

How do I get into this class?

OVERSUBSCRIBED BY 100+ STUDENTS

We are scaling CS160 by 2X

Design and project centric courses don't scale well

Waitlist … VERY UNLIKELY

Everyone needs to fill out a Group Petition (Due week 3)

IMPORTANT!!!!!

Roughly first half of semester will be lectures (some required attendance – see syllabus)

Some lectures will be video recorded

There will be a midterm on 22 Oct in class

Second half of semester will be studio classes

Mandatory attendance in Studio (more on this later)

There will be a final Critique on 10 Dec (No final)

YOU MUST SIGN IN TODAY BY END OF CLASS (2:30PM) &

ATTEND AND SIGN IN TO SECTION ON FRIDAY

IF YOU DON'T WE'LL DROP YOU

CAUTION

BE VERY CAREFUL IN OPERATING THIS MACHINE

IF THIS IS NOT THE CLASS FOR YOU...

PLEASE DROP IMMEDIATELY!

...GIVE OTHERS A FAIR CHANCE TO GET IN

COURSE OVERVIEW

HCI, UI, Usability, Iterative Design

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HUMAN-COMPUTER INTERACTION (HCI)

Human

- End-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
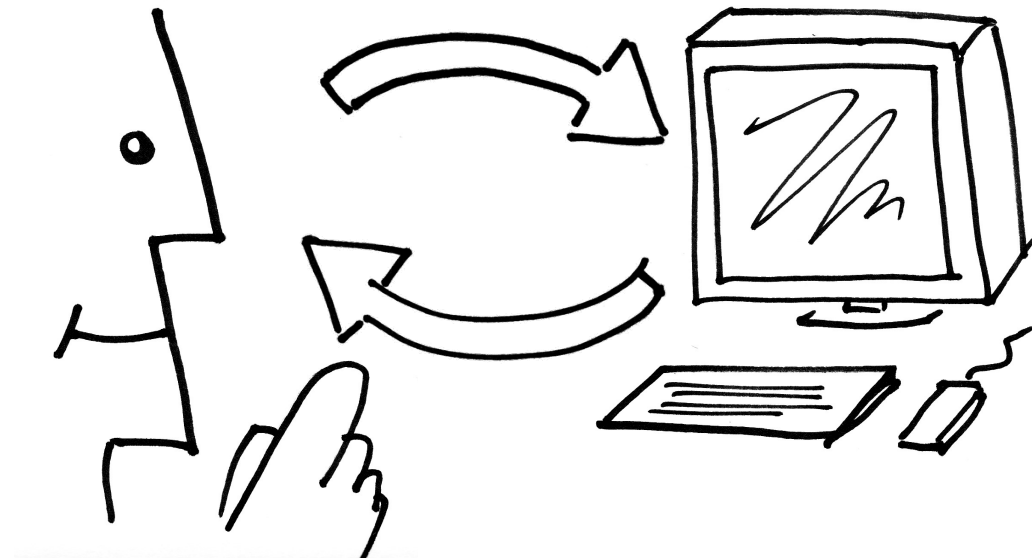
USER INTERFACES (UI)

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
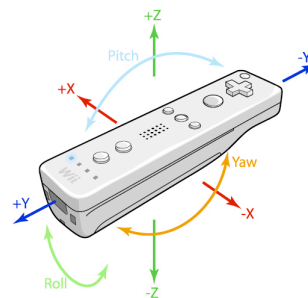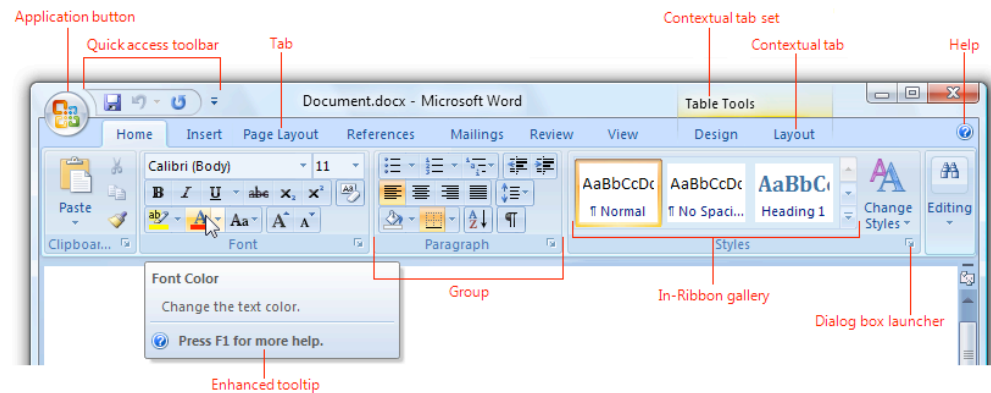
WHY STUDY USER INTERFACES?

*The results show that in today's applications, an average of **48% of the code** is devoted to the user interface portion.*

The average time spent on the user interface portion is 45% during the design phase, 50% during the implementation phase, and 37% during the maintenance phase.

— Myers & Rosson, CHI'92

WHY STUDY USER INTERFACES?

Major part of work for "real" programs (approx 50%)

You will work on "real" software
Intended for people other than yourself

Bad user interfaces cost
Money, Lives, Votes, …

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

WHO BUILDS INTERFACES?

Ideally a team of specialists

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

INTERFACE DESIGN CYCLE
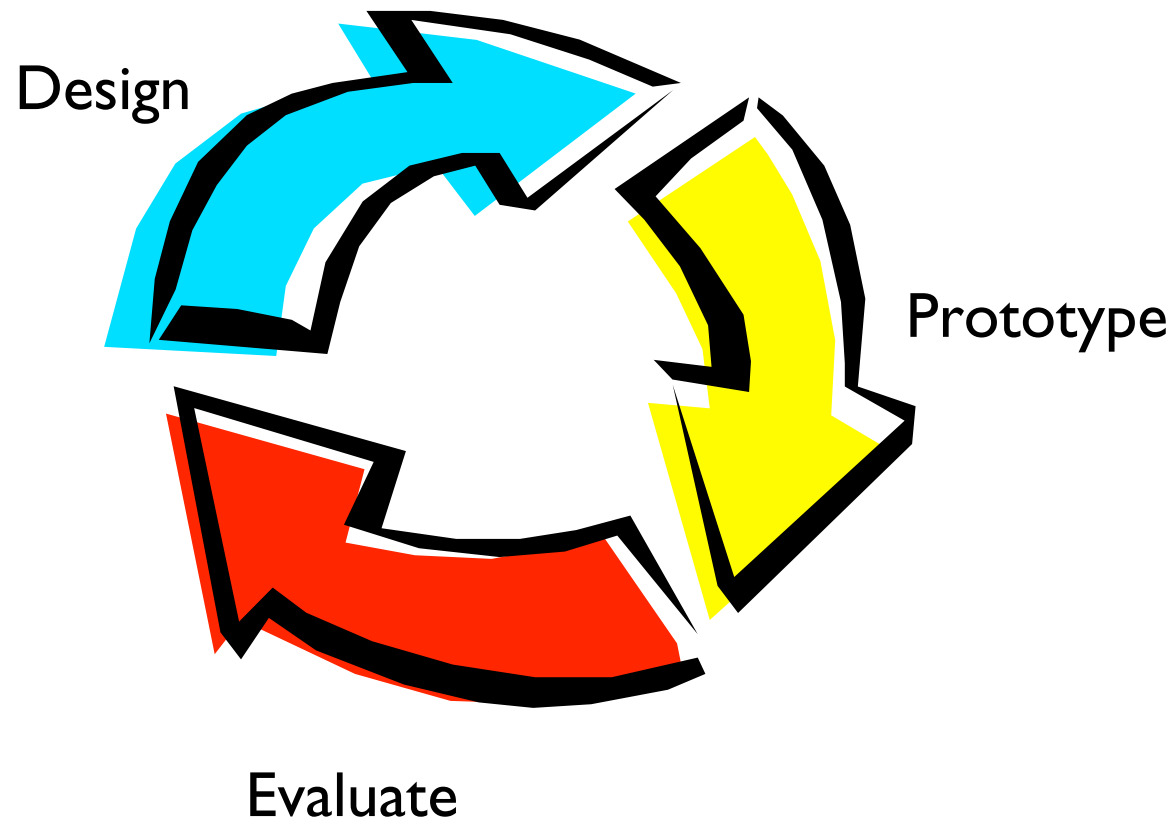
BUILDING SUCCESSFUL INTERFACES

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

RAPID PROTOTYPING

Build a mock-up of design (or more!)

Low fidelity techniques

Paper sketches
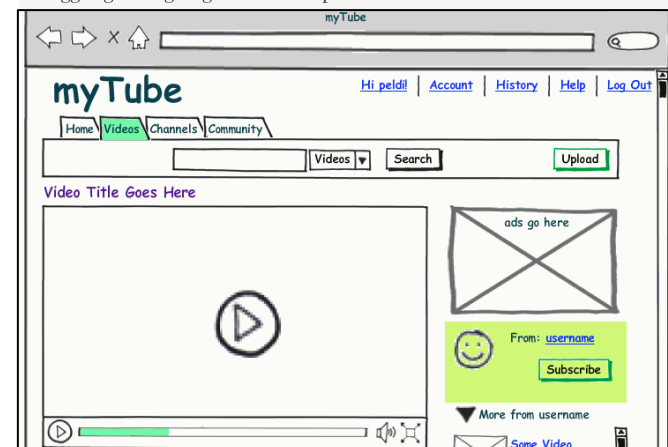
Cut, copy, paste

Video segments

Interactive prototyping tools

HTML, Flash, Javascript,
Visual Basic, C#, etc.

UI builders

Interface Builder, Visual Studio, NetBeans
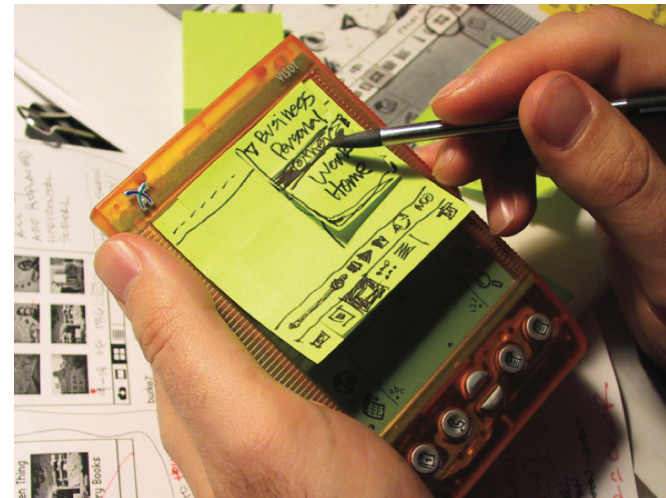
Moggridge, Designing Interactions, p.704

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

EVALUATION

Evaluate analytically (no users)
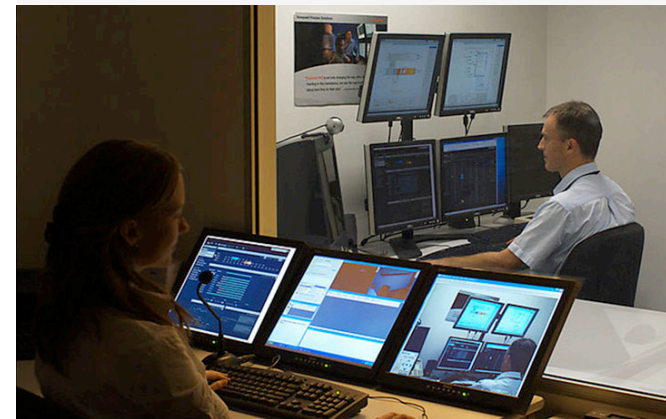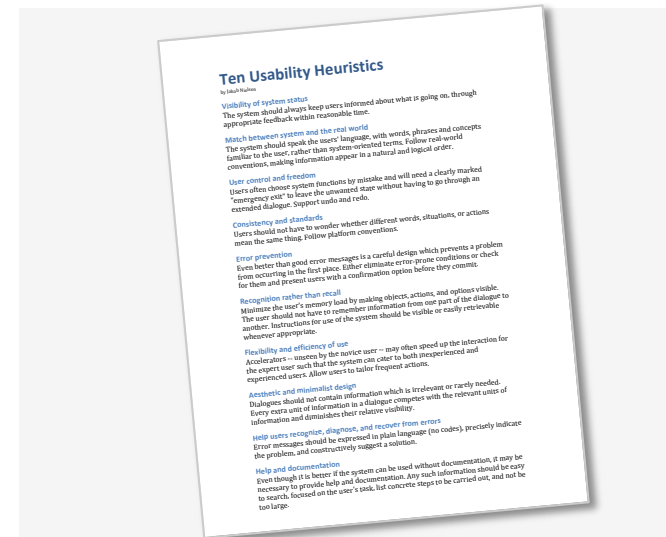
Test with real target users

Low-cost techniques
expert evaluation
walkthroughs

Higher cost
Controlled usability study

Ten Usability Heuristics
By Jakob Nielsen

http://www.laurasmith.info/UsabilityTest.jpg

GOALS OF THE COURSE

Learn to design, prototype, evaluate interfaces

- Discover tasks of prospective users
- Cognitive/perceptual constraints that effect design
- Techniques for evaluating an interface design
- Importance of iterative design for usability
- Technology used to prototype & implement UI code
- How to work together on a team project
- Communicate your results to a group

Many of these will be key aspects of your future jobs

CS160 AND THE CS CURRICULUM

Most courses for learning algorithms and technology

Compilers, operating systems, databases, etc.

CS160 concerned with

design, implementation & evaluation

We assume you are comfortable programming

Technology as a tool to evaluate via prototyping

CLASS PROJECT OVERVIEW

Smartwatch and Mobile Applications Developed in Teams

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THEME: MOBILE APPLICATIONS

Smartwatch and Mobile applications are different:
- Small (Round) Screens
- Different tasks (local search, not word processing)
- I/O constraints (slow text entry, small ocular angle, fat fingers, etc)
- Input opportunities: Sensing
  (touch, orientation, acceleration, location, camera)
- Hands free interaction
- Always on and available
- Portability
- Context of use
- Internet connectivity

COURSE PLATFORM: ANDROID

- First coding assignments can be completed in the emulator
- Android Studio (Java and Android SDK)

- Assignment Types:
- **PROG**: Programing assignments to help you get up to speed on working with Android and Android Wear Watch
- **DESIGN**: Design assignments to allow you to explore the HCI material in practice unrelated to a specific hardware platform
- **FEED**: Feedback about groups and teamwork
- **PROJECT**: The main team based assignment

TEAMS

Groups will form in Week 5

- 4-5 students to a team
- You'll work with students with different skills/interests
- Names of students who drop after 22 Sept will be forwarded to next semesters CS160 instructor

Cumulative

- Apply several HCI methods to a single interface

COURSE MECHANICS

Office Hours, Sections, Course Website, bCourses, Hackster.io, Assignments

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CS160 HAS A HEAVY WORKLOAD

PREREQUISITES

You must be comfortable with programming.
Individual programming assignments require you to
write code in Java with the Android SDK.

You must be able to attend one of the sections.

You must commit to working with your assigned team
on your group project.

OFFICE HOURS, SECTIONS

Office Hours

See our course webpage:

http://hci.berkeley.edu/cs160

Sections

Friday …. Did you vote?

Section starts TOMORROW

Bring your laptop to section

SECTIONS FOR FIRST WEEK

Topic: Installing the Android SDK and working with the Android Emulator

i.e. - how to get started with your programming homework

Attend a section this Friday (TOMORROW)

Which section: Fill out the doodle poll (see Piazza)

Section assignments after Friday

Vote for section you would like to attend (see Piazza)

CS160 FALL 2015

AM Sign-in

http://teaching.paulos.net/cs160_FL2015/gobears.html

PMSign-in

http://goo.gl/forms/f7g27B7Ndm

CLASS WEBSITE:

TEACHING.PAULOS.NET/CS160

READINGS

Readings are very important to the class

Make sure you do the reading before class.

Midterm will include topics only covered in readings

Readings will be posted on bCourses and Website

Online reading discussions (ongoing assignment)

You must post one substantial answer or comment per lecture, **before** class. We will not accept late comments. Comments are the **major factor in your class participation grade**.

Your reading response should be posted using the assignment tool on bCourses

REACHING US

Questions about course material, assignments:

Piazza

Grades and Assignments:

bCourses

Private questions:

If other students will benefit from an answer,
ask publicly on Piazza. If it's personal, use Piazza private
messaging feature.

Do not email us directly

ASSIGNMENTS

Several individual programming assignments during first half of semester. Goals:

- Make sure you have the skills to implement your group project
- Individual performance metric

Design assignments

- Practice design and evaluation
- Also an individual performance metric

Group project assignments throughout semester

ASSESSMENT

The goal of CS160 is to teach you to design and evaluate interfaces

Specific assessment guidelines will be given in each assignment

Good communication expected in oral & written presentations

Groups self-assess participation
(you evaluate your team mates and vice versa).

GRADING

20% Participation (Attendance, Reading responses, class, bCourses)

20% Individual Programming & Design Assignments

25% Midterm

35% Project Assignments

POLICIES

Late Assignments

- Most assignments will be due before class on the due date
- Group assignments will not be accepted late
- Individual assignments lose 33% per day (weekends count)

Cheating (official)

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

MORE ON ATTENDANCE

There are 8 required classes this semester

How many classes do you miss? What is the highest grade you can get in this class...if you get perfect score on everything else:

- 0	highest potential grade 100%	A
- 1	highest potential grade 97.5%	A
- 2	highest potential grade 95%	A
- 3	highest potential grade 92.5%	A-
- 4	highest potential grade 90%	A-
- 5	highest potential grade 87.5%	A-
- 6	highest potential grade 85%	B+
- 7	highest potential grade 82.5%	B
- 8	highest potential grade 80%	B-

CS160
USER INTERFACE DESIGN
FALL 2015

ASSIGNMENTS

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ASSIGNMENTS ARE ON THE SCHEDULE

Syllabus

26 AUG · WEEK 1

AM Introduction (REQUIRED)

Slides

The first day of class will be held in Sibley Auditorium.

Assignment: Reading Response (due before class on Thur 03 Sep)

Assignment: PROG 01: You Animal! (due by 11:59pm on 11 Sep)

Assignment: DESIGN 01: Watches in the Wild (due before class 10 Sep)

PM Wearable Computing (REQUIRED)

Slides

Section: Android Introduction

03 SEP · WEEK 2

AM The Design Cycle, Brainstorming, and Critique

Slides

Reading: Rogers, Y., Sharp, H., & Preece, J. (2011). Interaction Design: Beyond Human-Computer Interaction (3rd ed. ed.), pp- 9-18.

Reading: History of the Smart Watch Literature Review

PM Storyboard, Scenarios, and Personas

Slides

Reading: How to Run a Design Critique by Scott Berkun

Reading: How to Give and Receive Criticism by Scott Berkun

Reading: Chapter 4: Analyzing User Research in Designing the iPhone User Experience: A User Centered Approach to Sketching and Prototyping

ASSIGNMENT: READING RESPONSE

Due Tue, before class.

Reading is posted on bCourses

Respond to prompt on bCourses about the reading (text)

Will be graded

3 = excellent

2 = good

1 = poor

0 = no answer

0 3   S E P   ·   W E E K   2

AM The Design Cycle, Brainstorming, and Critique

Slides
Reading: Rogers, Y., Sharp, H., & Preece, J. (2011). Interaction Design: Beyond Human-Computer Intera...
Reading: History of the Smart Watch Literature Review

Reading Response (2 Sep)

Read:

Rogers, Y., Sharp, H., & Preece, J. (2011). Interaction Design: Beyond Human-Computer Interaction ⤴ (3rd ed. ed.), pp- 9-18.

Interaction design chap 1.pdf 📄 ⤴

Prompt:

Think about a recent frustrating experience you have had interacting with a digital device or system. Discuss how one or more of the four elements of the design interaction process (p. 15) could have improved the design.

DESIGN 01: WATCH IN THE WILD

The **goal of this assignment is to introduce you to iterative design.**

That way, during the main course project, the steps of the design process will be more familiar.

You will

observe and interview users

brainstorm

prototype

get feedback

PROG 01: YOU ANIMAL

PROG 01: You Animal

In your first assignment you will learn how to:

- Install the Android SDK and developer tools
- Start programming with the Android SDK
- Build a simple Android application and test it in the emulator

You will build an **animal years** app

You know how it goes. You're having coffee with your friends when suddenly the age old debate breaks out - "So how old are you in hippopotamus years?" Luckily, you have your trusty **You Animal** converter app that you built in CS160. You can enter your current age (in human years) and automatically be given your age if you were a dog, cat, kangaroo, or even hippopotamus.

You will submit your source code, the executable, **screenshots and a narrated video**. It is your responsibility to ensure that the executable has all the resources it needs to execute.

Instructions

1. **Choose a development machine**: You should be able to do development on your own laptop and we

PROG 01: YOU ANIMAL

The main view should be the age converter.

- Provide a text field for entering an age in human years and a radio button to select the target animal age
- Provide a text field for showing the converted value (target animal age)
- Provide a button to update the converted value

This is by no means a brilliant design for an animal age converter. You are free to design your own app provided that it has the functionality as enumerated above.

Source Animal

- ◉ Human
- ○ Dog
- ○ Cat

Age in Years 25

Target Animal

- ○ Human
- ◉ Dog
- ○ Cat

Age in Years 6.86813186813
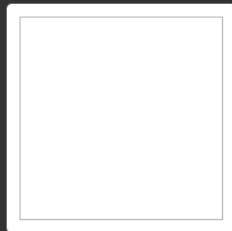
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User Interface Design
By Eric Paulos, Fall 2014, UC Berkeley

CS160 Course at UC Berkeley

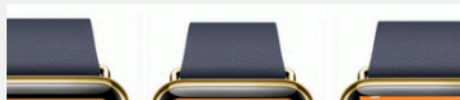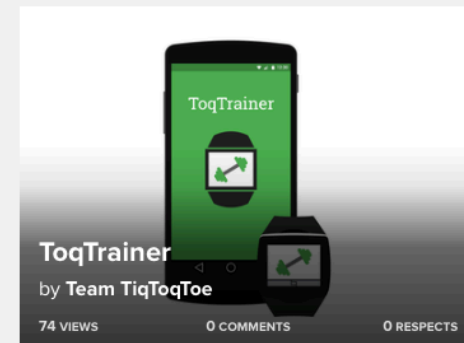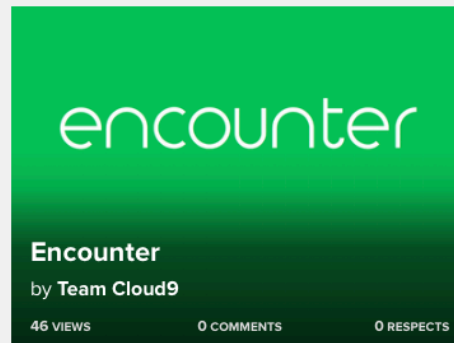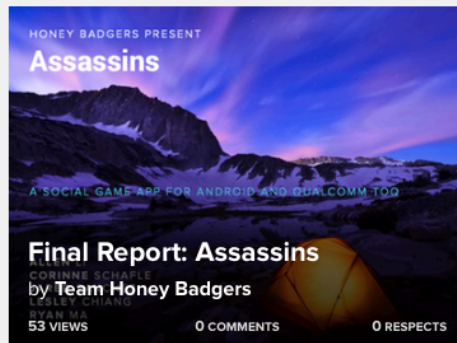⊙ Berkeley, CA, United States

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Assignment: Final Report

HONEY BADGERS PRESENT
Assassins

A SOCIAL GAME APP FOR ANDROID AND QUALCOMM TOQ

Final Report: Assassins
CORINNE SCHAFLE
LESLEY CHIANG
RYAN MA
by **Team Honey Badgers**
53 VIEWS   0 COMMENTS   0 RESPECTS

encounter

Encounter
by **Team Cloud9**
46 VIEWS   0 COMMENTS   0 RESPECTS

ToqTrainer

ToqTrainer
by **Team TiqToqToe**
74 VIEWS   0 COMMENTS   0 RESPECTS

IF THIS IS NOT THE CLASS FOR YOU...

PLEASE **DROP IMMEDIATELY!**

...GIVE OTHERS A FAIR CHANCE TO GET IN

CS160: USER INTERFACE DESIGN

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