CS 160 User Interface Design

Spring 2016

CS160

USER INTERFACE DESIGN

SPRING 2016

INTRODUCTION

20 JAN 2016

ERIC PAULOS
www.paulos.net

UNIVERSITY OF CALIFORNIA Berkeley

TOPICS FOR TODAY

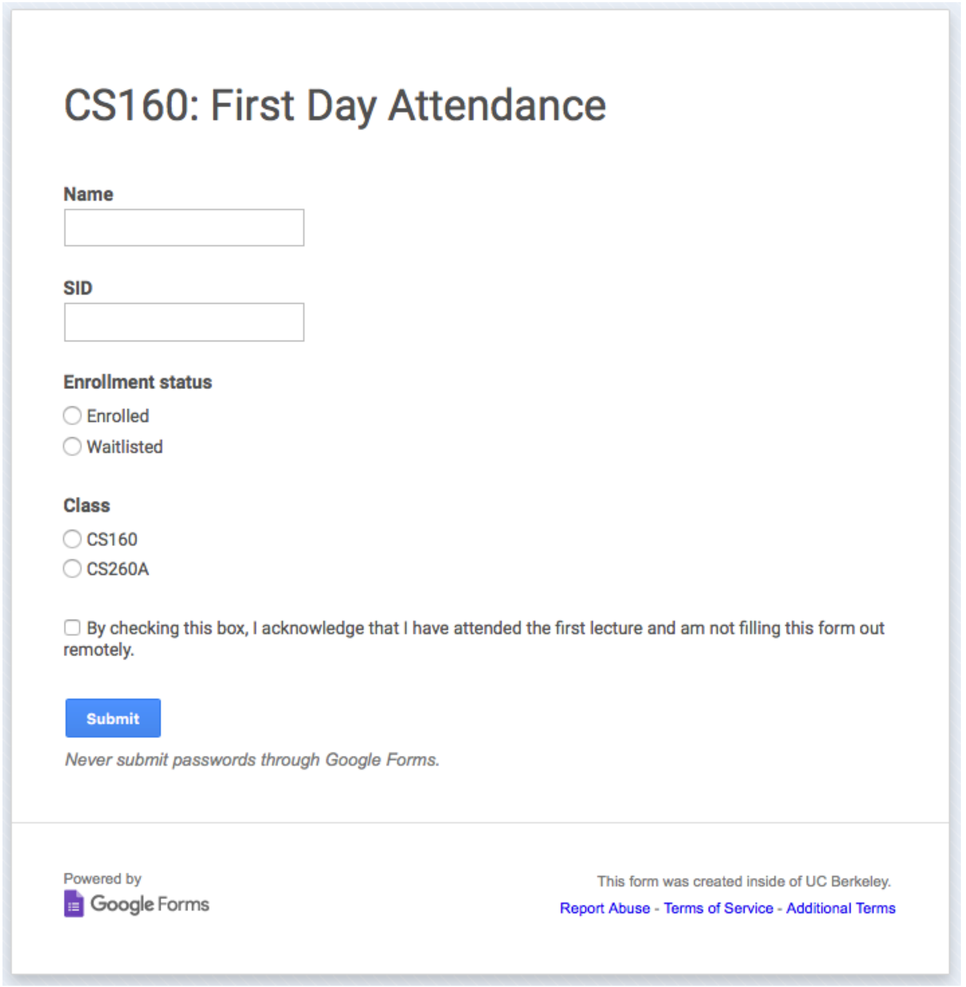
- Introductions
- Enrollment
- Course Overview
- Project Description
- Course Mechanics
- Assignments

CS160 SPRING 2016

Please sign in

http://tiny.cc/cs160sp15

Enrollment....



CS160: First Day Attendance

Name

SID

Enrollment status

- Enrolled
- Waitlisted

Class

- CS160
- CS260A

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

Submit

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ERIC PAULOS
PROFESSOR

PERSONAL TELEPRESENCE 1995

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>
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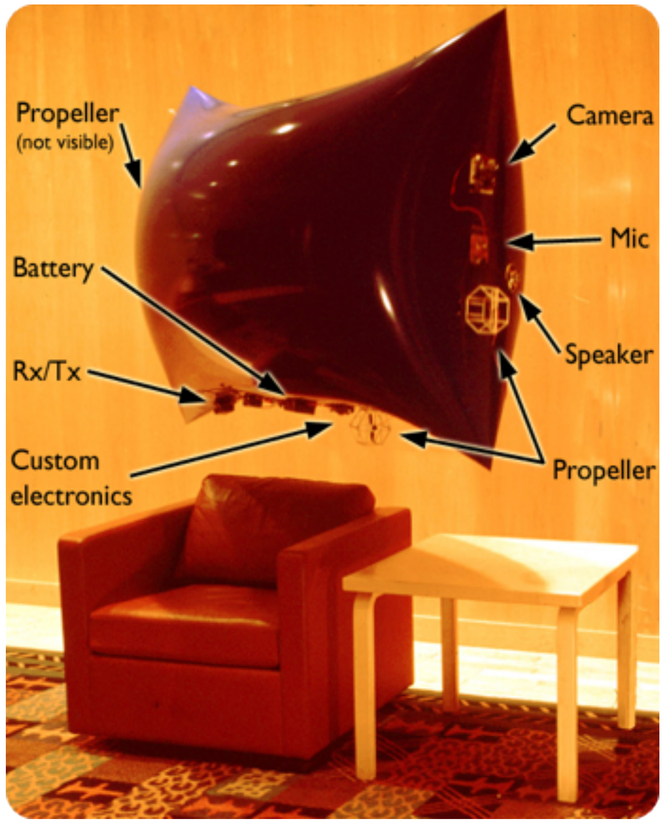
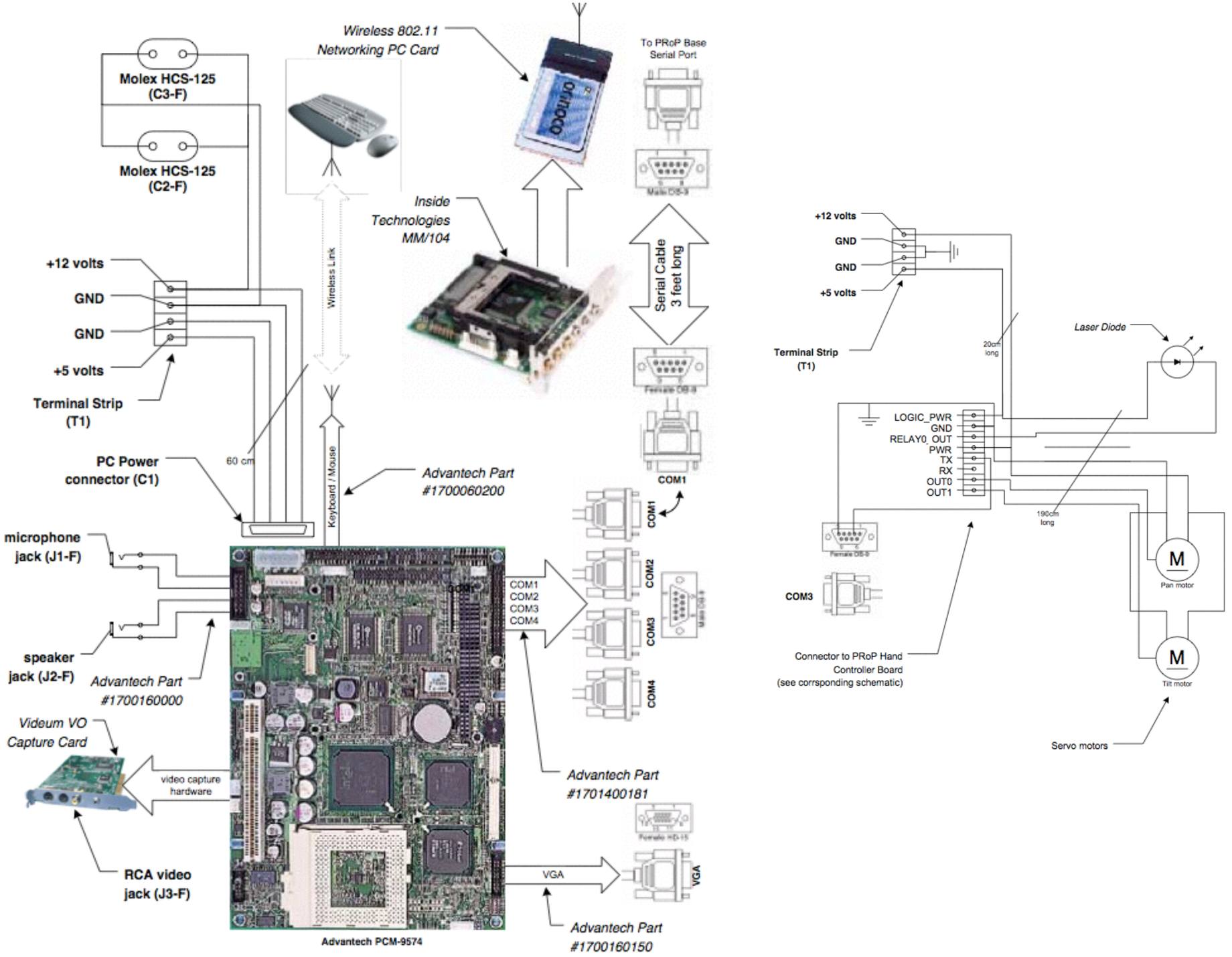


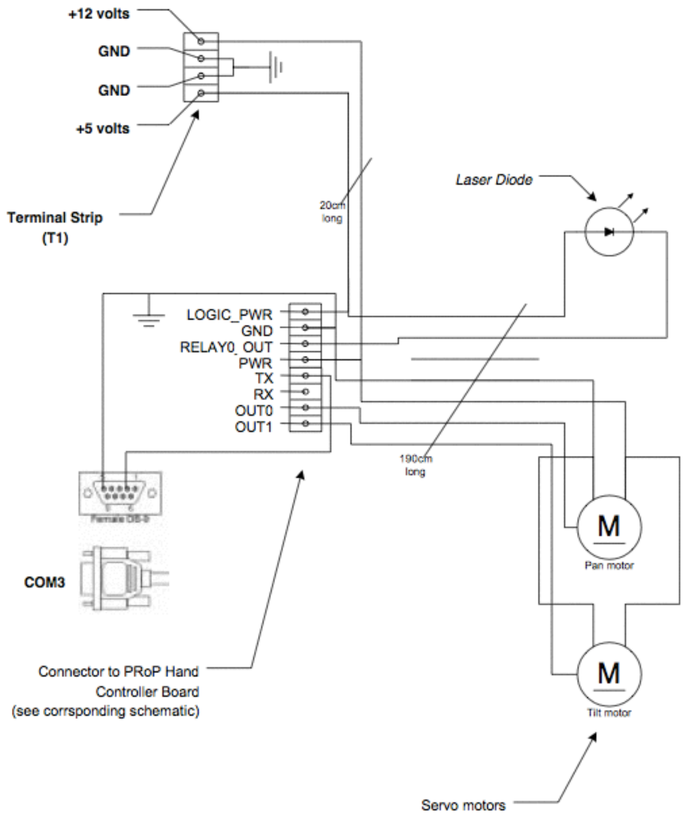
PRoPs
1993-2000


CAP. 8,000 LBS.


GUARDIAN
SF Weekly
SF Weekly


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
Wireless Link
Serial Cable
3 feet long
+12 volts
GND
GND
+5 volts
Terminal Strip
(T1)
60 cm
PC Power
connector (C1)
Keyboard / Mouse
Advantech Part
#1700060200
COM1
microphone
jack (J1-F)
speaker
jack (J2-F)
Advantech Part
#1700160000
COM1
COM2
COM3
COM4
Videum VO
Capture Card
video capture
hardware
RCA video
jack (J3-F)
Advantech Part
#1701400181
VGA
Advantech Part
#1700160150
Advantech PCM-9574
+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
COM3
M
Pan motor
M
Tilt motor
Connector to PRoP Hand
Controller Board
(see corrsponding schematic)
Servo motors


End


+12 volts
GND
GND
+5 volts
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(T1)
20cm
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LOGIC_PWR
GND
RELAY0_OUT
PWR
TX
RX
OUT0
OUT1
190cm
long
COM3
Connector to PRoP Hand
Controller Board
(see corrsponding schematic)
M
Pan motor
M
Tilt motor
Servo motors

1980

1994

PRoP

1997

PEBBLES

1998

Care-O-bot

2002

Co-Worker

Care-O-bot 2

2003

RP-7

2005

TiLR

2006

Giraff

2007

ConnectR

2008

Care-O-bot 3

2009

QA

Texai

Roti

R.Bot-100

2010

Robosem

EngKey

VGo

QB

2011

Luna

AVA

Jazz Connect

TELO

2012

Beam

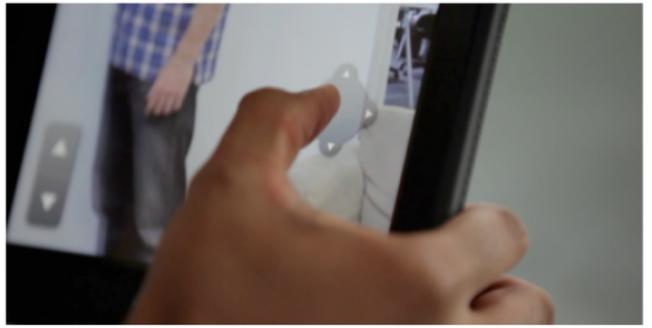
Double

RP-VITA

HELO

1995

2012



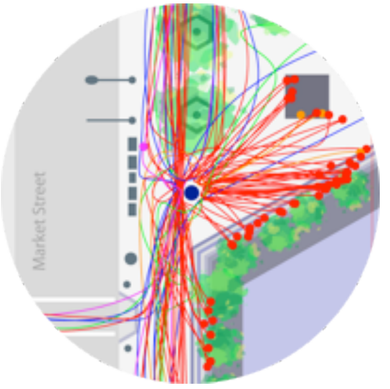
PRoPs as shown in 1995 (left column) for remote instruction, communication, and with a tablet interface. These same usage models and interfaces 17 years later (right column) in Double Robotics 2012 tele-robotic product.

URBAN ATMOSPHERES

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

intel Research


NOKIA


Market Street

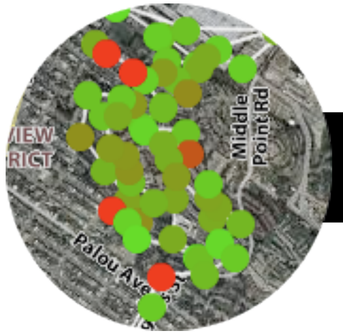

i hate PORTLAND
i love PORTLAND


042


FEELS LIKE...?

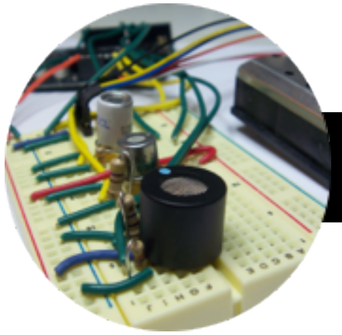
living environments lab

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

HYBRID ECOLOGIES LAB

tactical research at the intersection of invention, disruption, and critique of our emerging technological society

www.hybrid-ecologies.org

NEW MAKING RENAISSANCE • FASHIONING FASHIONABLES
CITIZEN SCIENCE • CRITICAL MAKING • DISRUPTIVE BIO
COUNTERFUNCTIONALITY • EPIDERMAL ELECTRONICS

SKINTILLATES
fashionable, interactive, wearable tattoos integrated directly on the skin

joanne lo

HAPTIC PRINT
design tools to easily modify the feel of passive 3D model with tactility, compliance, and mass distribution

césar torres • tim campbell

MY PART
personal, portable, low-cost, accurate airborne particle counting

rundong tian • christine dierk

META MORPHE
design tools to enable users to easily transform static 3D models into re-formed, re-made, and re-imagined customized personal artifacts

césar torres

SENSORY TRIPTYCH TOYS
sensory technologies for children that encourage a new engagement metaphors

rundong tian • chris myers

ERIC PAULOS

JAMES PIERCE
JOANNE LO
CESAR TORRES

RUNDONG TIAN
CHRISTINE DIERK
CHRIS MYERS

CITRIS INVENTION LAB

JACOBS INSTITUTE FOR DESIGN INNOVATION

Berkeley

FL.UIS
fluid user interfaces (Fl.UIs) are liquid-based touch surfaces that use computer vision to detect and interpret a range of tactile user inputs

césar torres • tim campbell

SHRINKY CIRCUITS
sketching, shrinking, and formgiving for electronic circuits

joanne lo

COUNTERFUNTIONAL DEVICES
resistance as a design technique to create artifacts that work by not quite working

james pierce

BIO-ELECTRIC HYBRIDS
promoting scientific literacy through biological citizen publics, personal genetics, and open biology tools

stacey kuznetsov

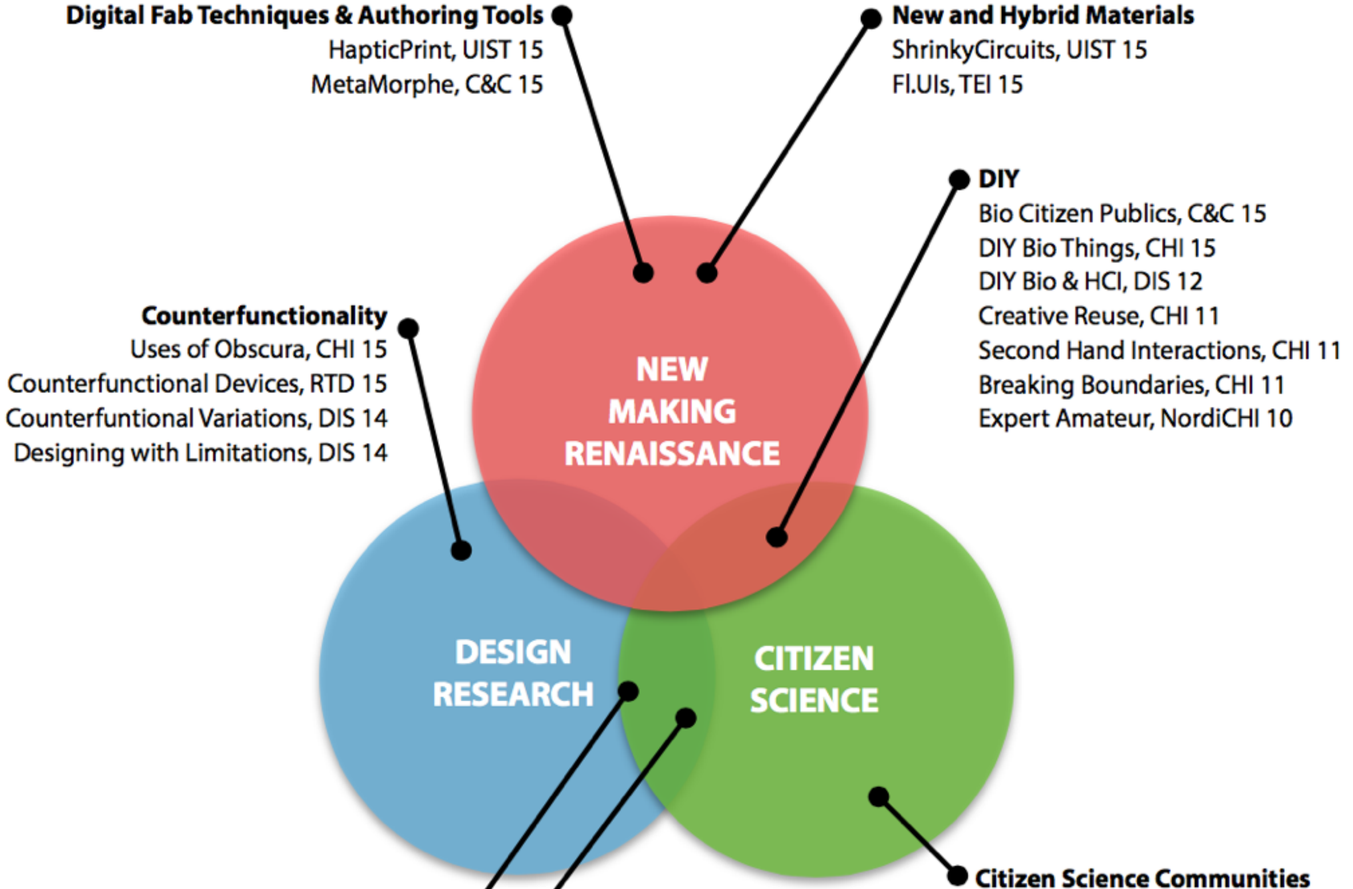
FAB SENSE
inertial sensing rings for activity inferencing and tutorial creation

tim campbell • jonathan harper

ENERGY PARASITES
handcrafted objects that harvest small bits of energy across public landscapes

SENSR
a flexible tool for authoring mobile citizen science campaigns

sunyoung kim



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

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

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

JINGYI LI

Head GSI

PEGGY CHI

GSI

GSI

JASPER O' LEARY

GSI

SHANA HU

GSI

SARINA GROSS

Head Reader

Reader

MATTHEW WALIMAN

NEIL KUMAR

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.

CS160

USER INTERFACE DESIGN

SPRING 2016

INTRODUCTION

20 JAN 2016

ERIC PAULOS
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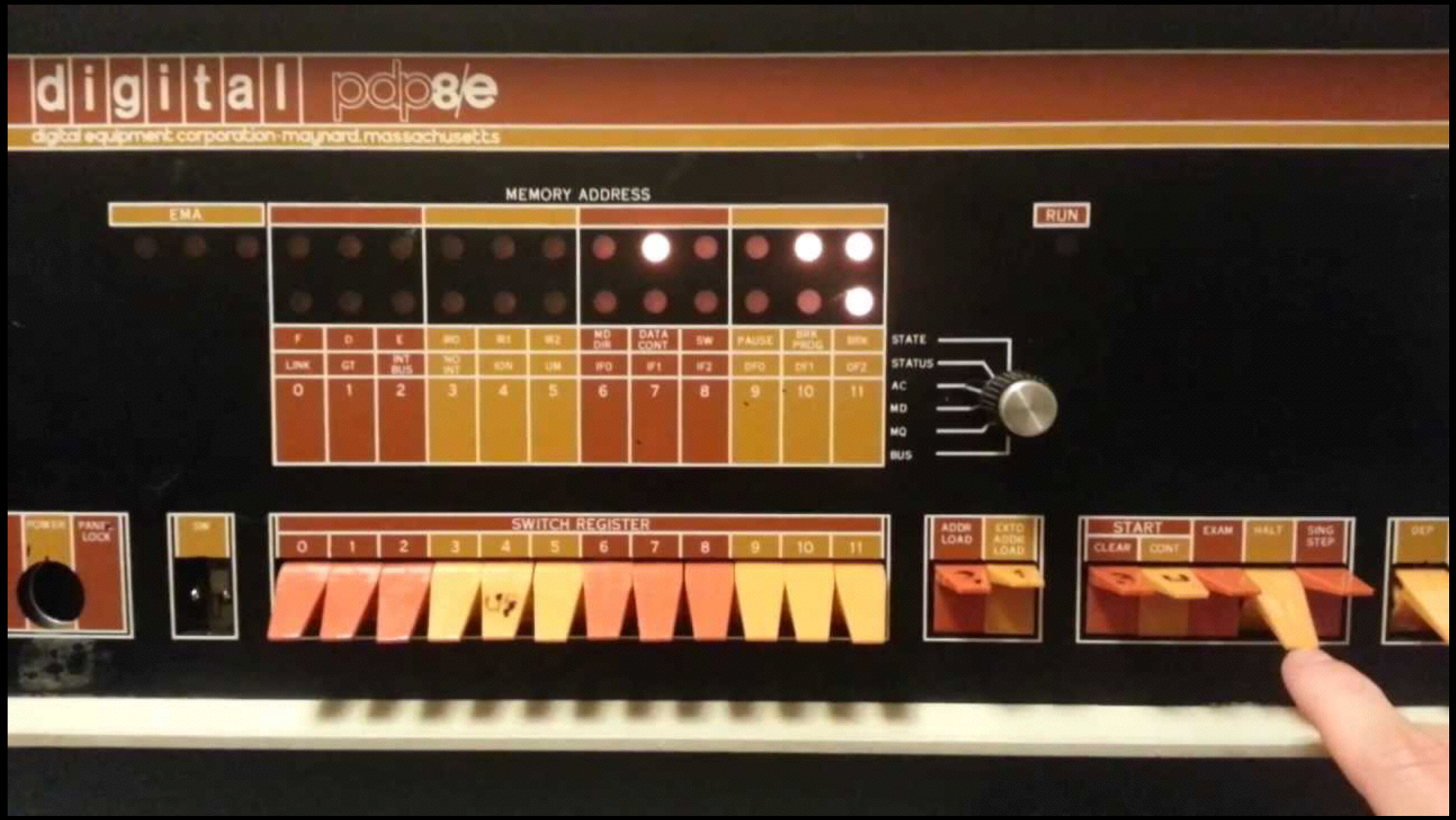
UNIVERSITY OF CALIFORNIA Berkeley


digital pdp8/e
digital equipment corporation · maynard, massachusetts
MEMORY ADDRESS
EMA
RUN
F
D
E
IRD
IR1
IR2
MD DIR
DATA CONT
SW
PAUSE
BRK PROG
BRK
LINK
GT
INT BUS
NO INT
ION
UM
IFD
IF1
IF2
DFD
DF1
DF2
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1
2
3
4
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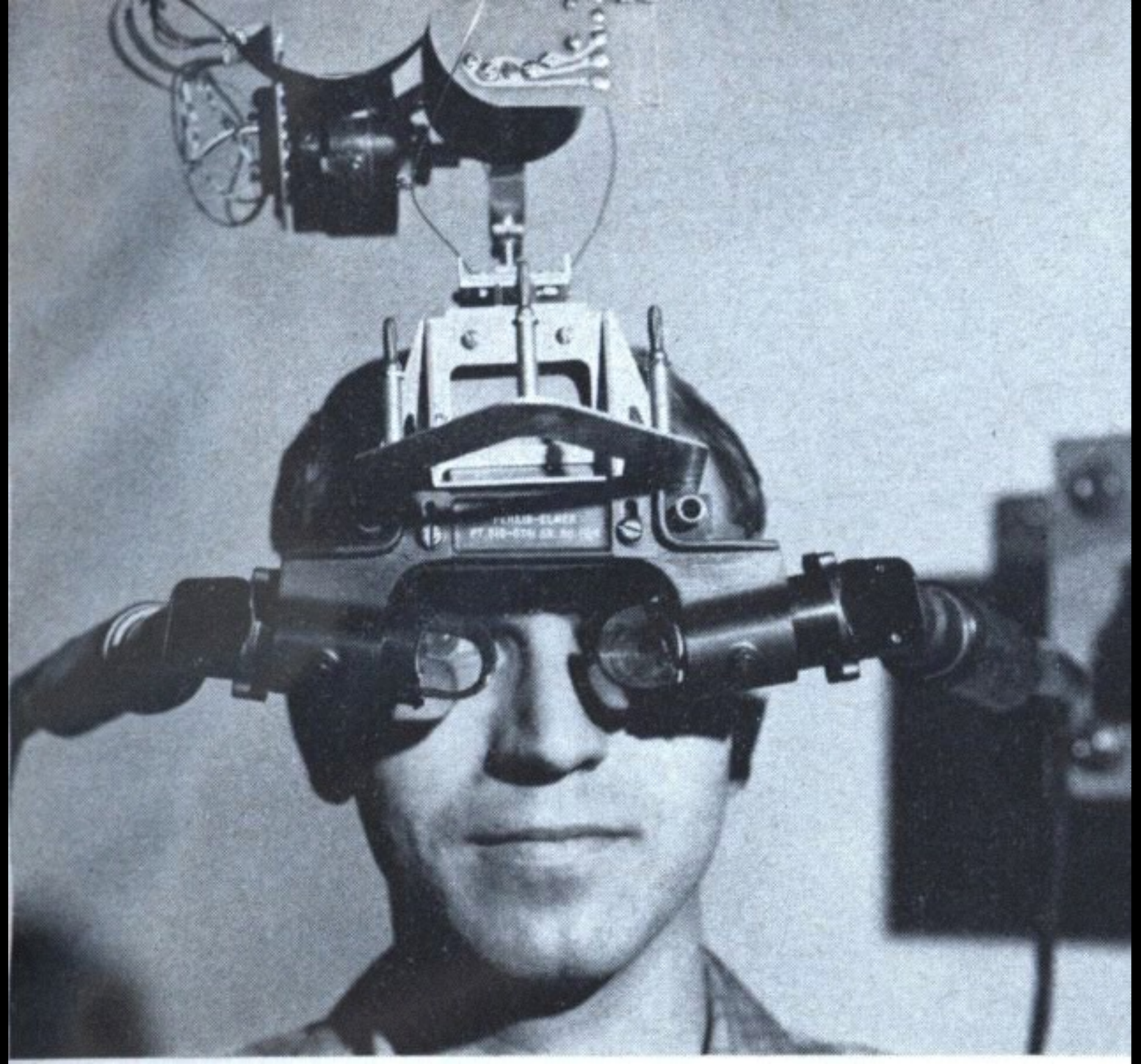
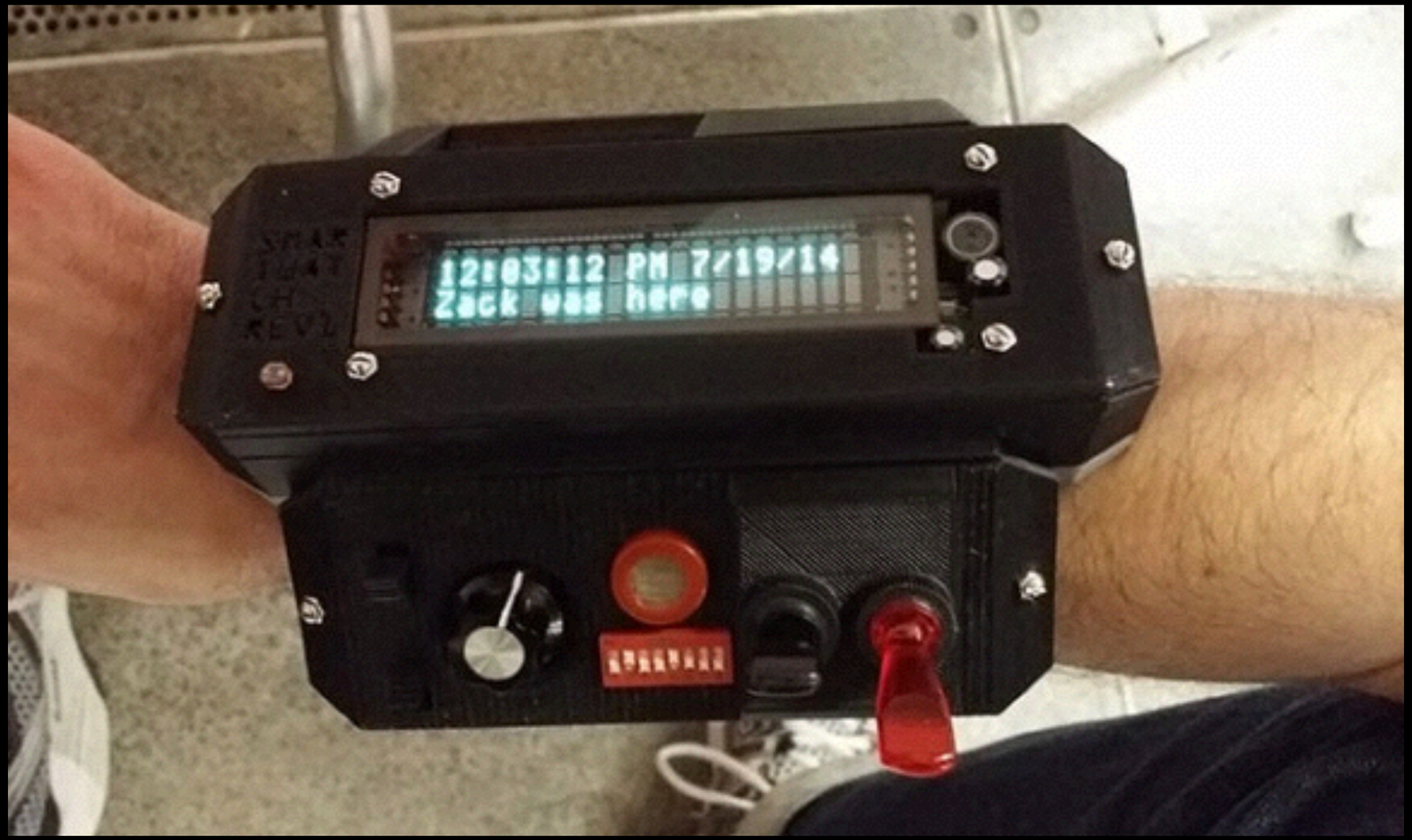
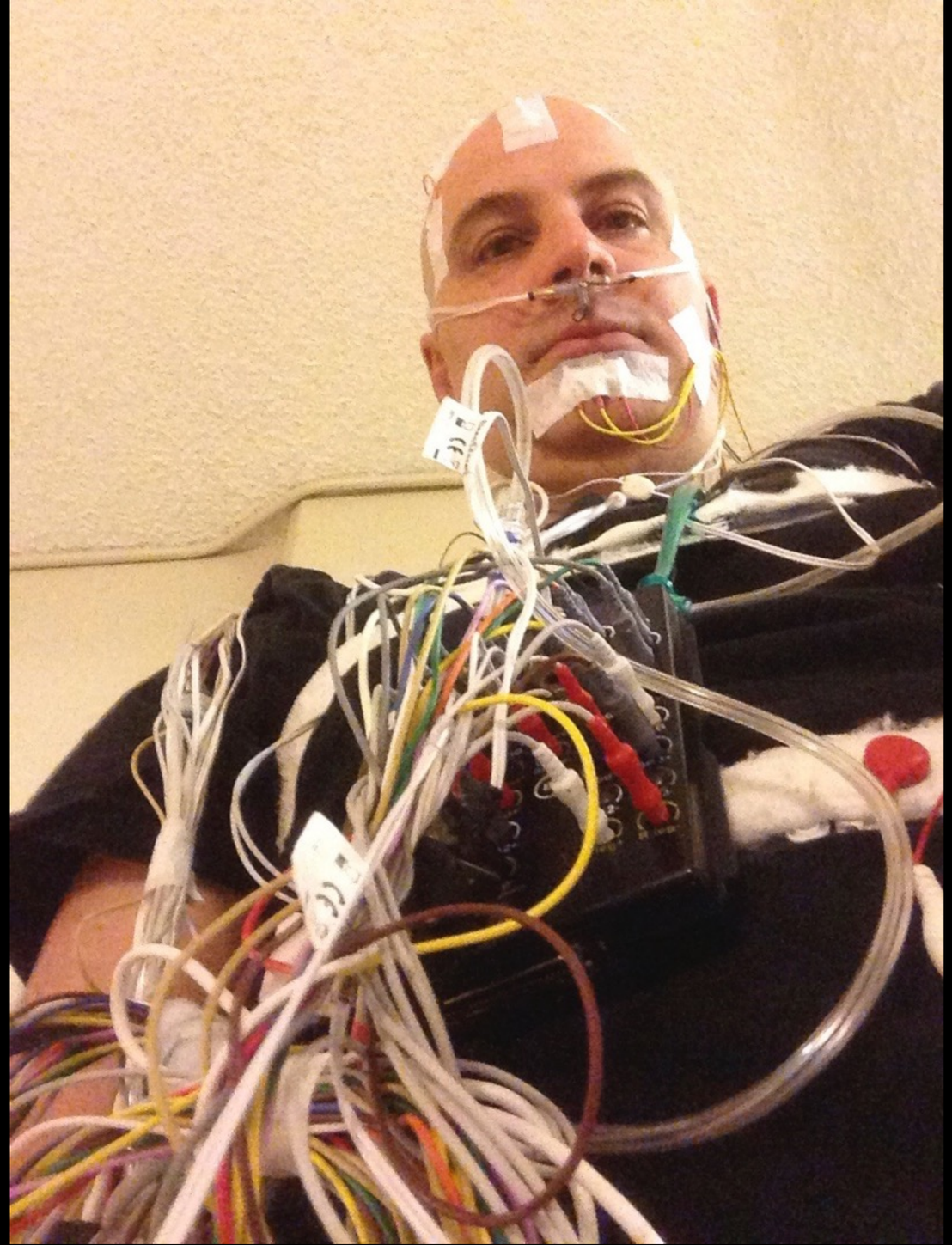
7
8
9
10
11
STATE
STATUS
AC
MD
MQ
BUS
POWER
PANEL LOCK
SW
SWITCH REGISTER
ADDR LOAD
EXTD ADDR LOAD
START
CLEAR
CONT
EXAM
HALT
SING STEP
DEP




12:03:12 PM 7/19/14
Zack was here



SMART WATCH


Activity
MOVE
EXERCISE
STAND
Tue
9
15:00


SFO → JFK
Departs 10:05pm

2014

MOTO 360

MOTO 360

THIS COURSE

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

ANDROID

studio

COMPUTER REQUIREMENTS

Full Adobe Creative Suite

Sufficient memory and disk space to run Adobe products, Android Studio and emulators

There will be class accounts for campus lab

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 not are required to own an Android phone. However….
- At least one member in each group (to be set in week 4) will need 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 team's work.
- You cannot use a Tablet running Android
- Check withe the GSIs and on Piazza if you are unsure

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 have been 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 4)

28 Jan — will revisit enrollment

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 16 March** in class

Second half of semester will be studio classes

Mandatory attendance in Studio (more on this later)

There will be a final Critique during RRR week — exact date soon

There is no final

YOU MUST SIGN IN TODAY BY END OF CLASS (4:00 PM)

IF YOU DON'T WE'LL DROP YOU

http://tiny.cc/cs160sp15


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

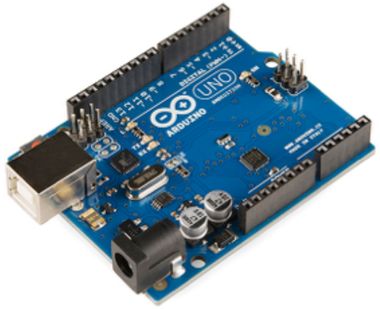
COURSE OVERVIEW

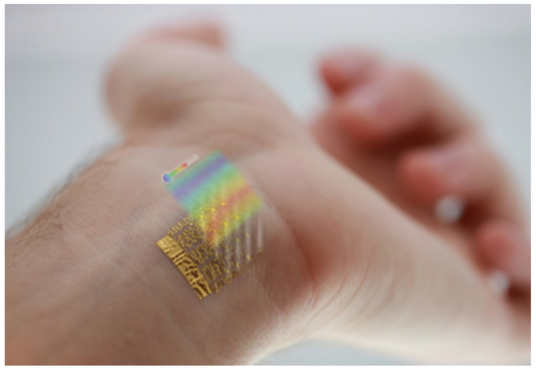
HCI, UI, Usability, Iterative Design

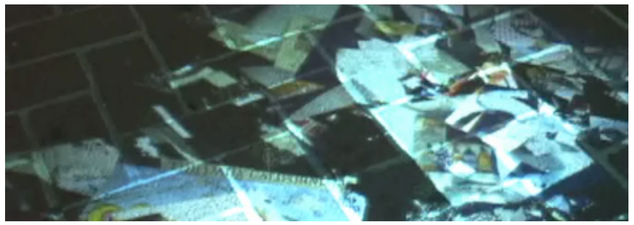
HUMAN

COMPUTER

INTERACTION







Björn Hartmann

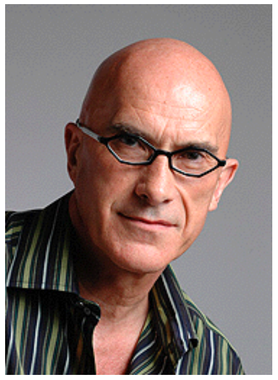
Eric Paulos

John Canny

Marti Hearst

Kimiko Ryokai

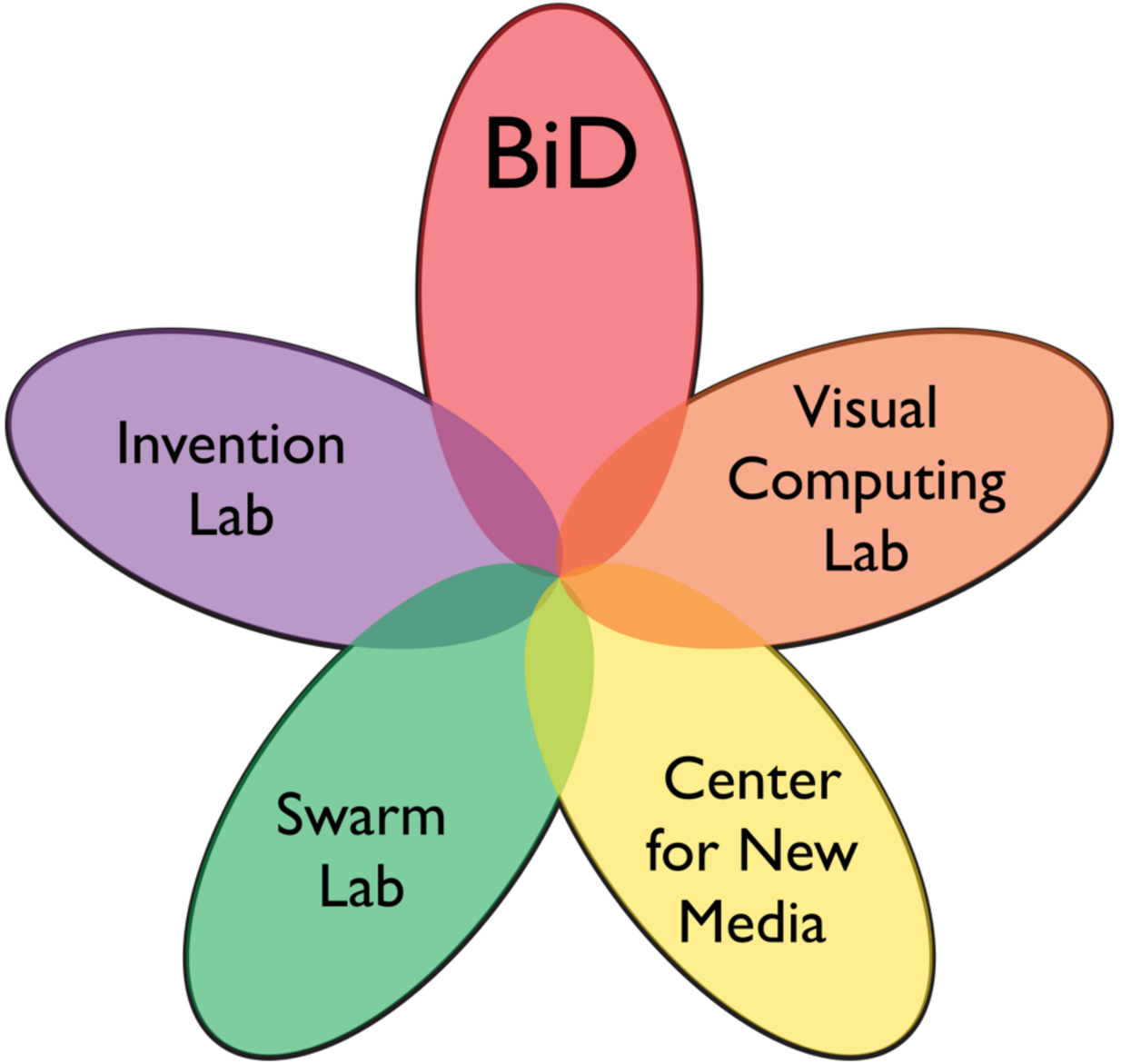
Tapan Parikh



Paul Wright

Armando Fox

Alice Agogino


BiD
Invention Lab
Visual Computing Lab
Swarm Lab
Center for New Media

JACOBS INSTITUTE FOR DESIGN INNOVATION

Educating leading innovators at the intersection of design and technology

Jacobs Hall Maker Pass

HUMAN-COMPUTER INTERACTION (HCI)

Human

End-user of program

Others (friends, collaborators, coworkers)

Computer

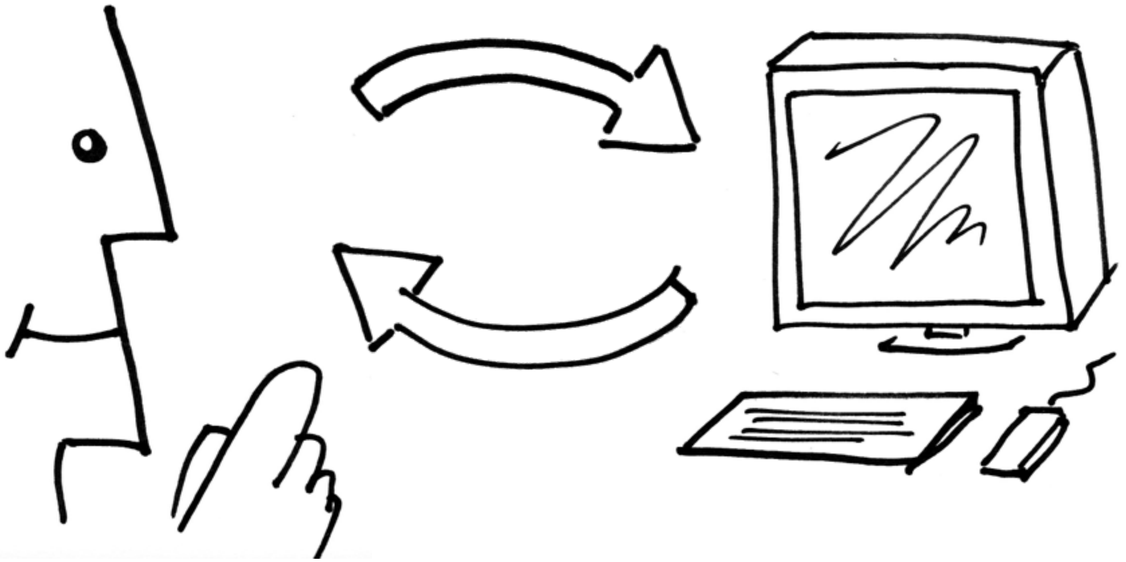
Machine program runs on

Often split: clients & servers

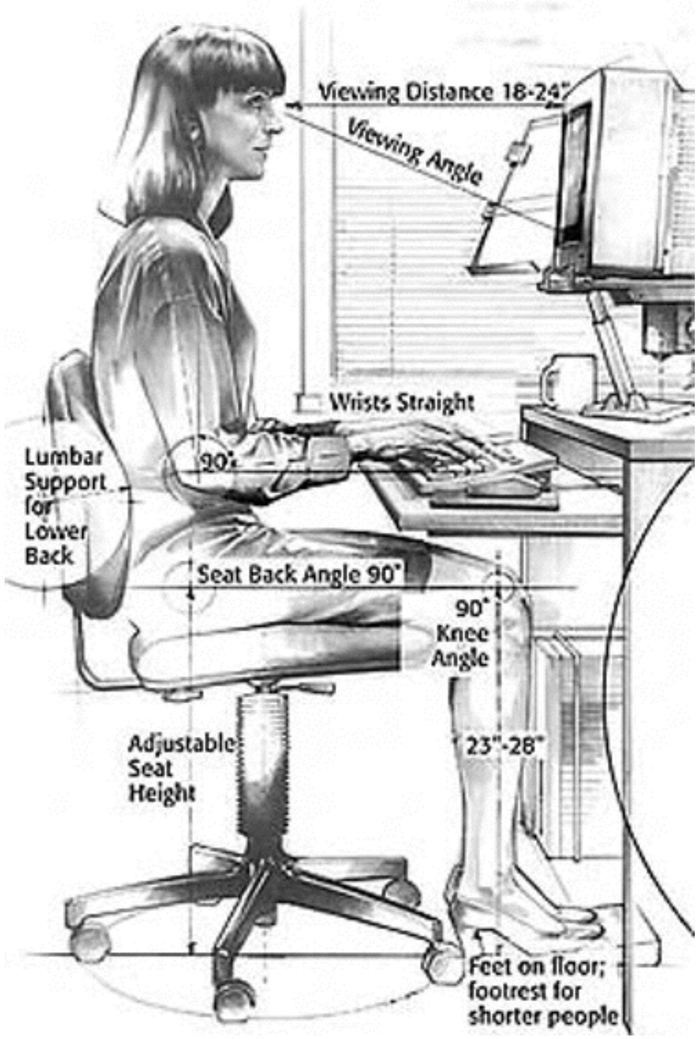
Interaction

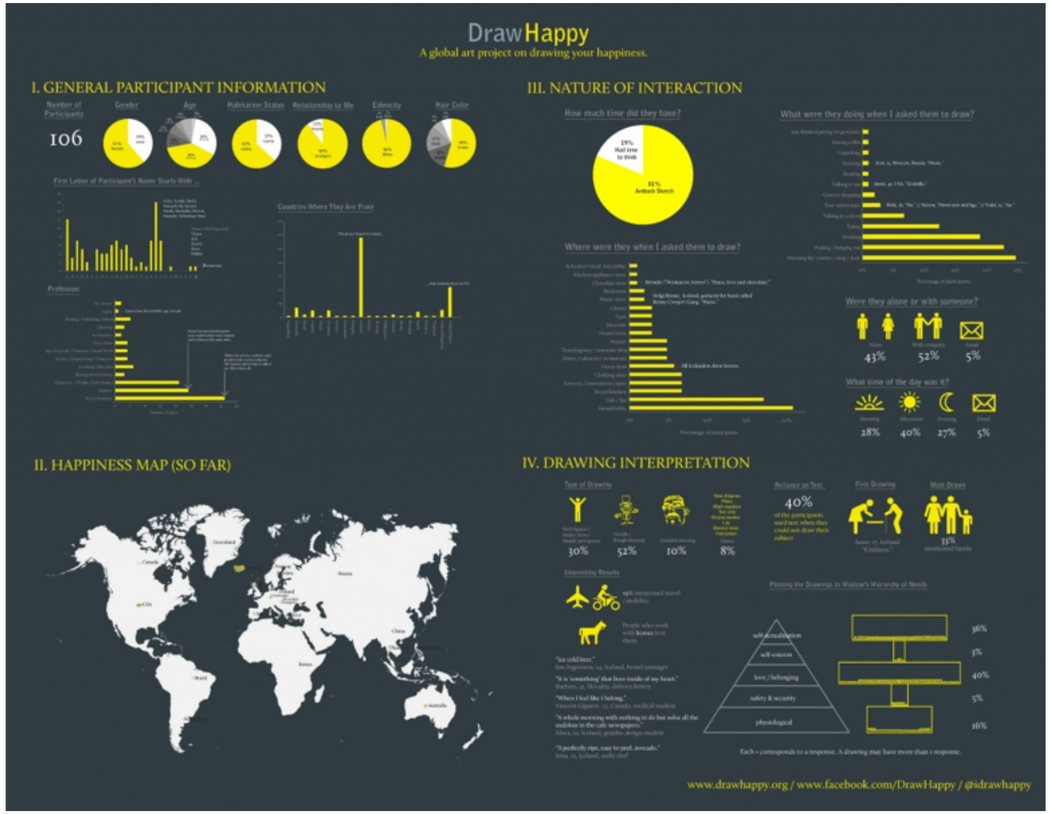
User tells the computer
what they want

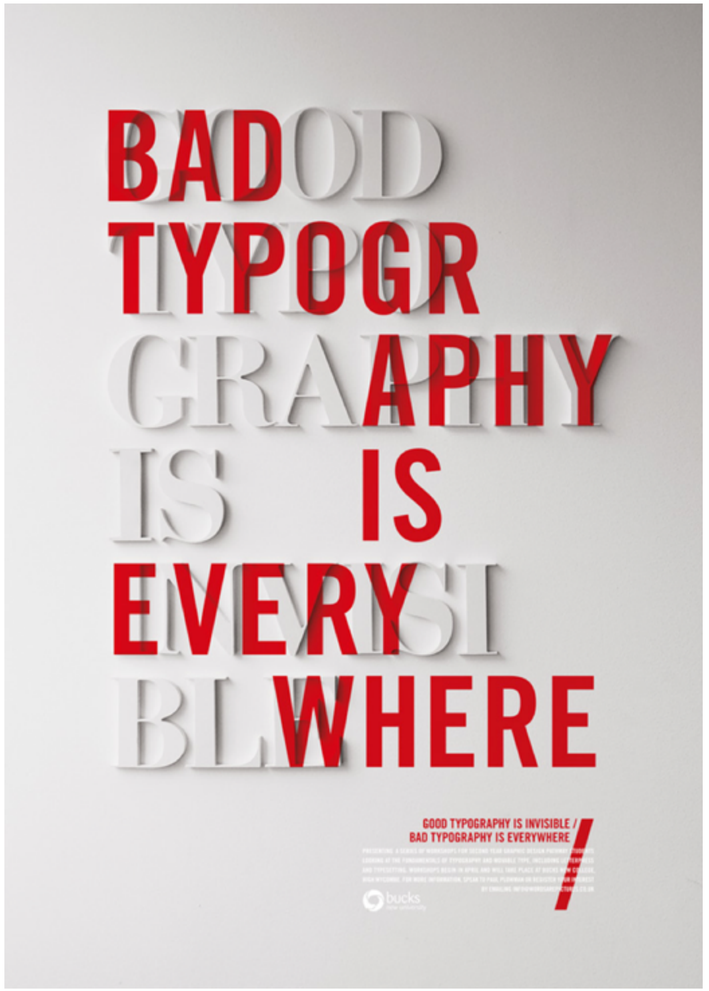
Computer communicates results

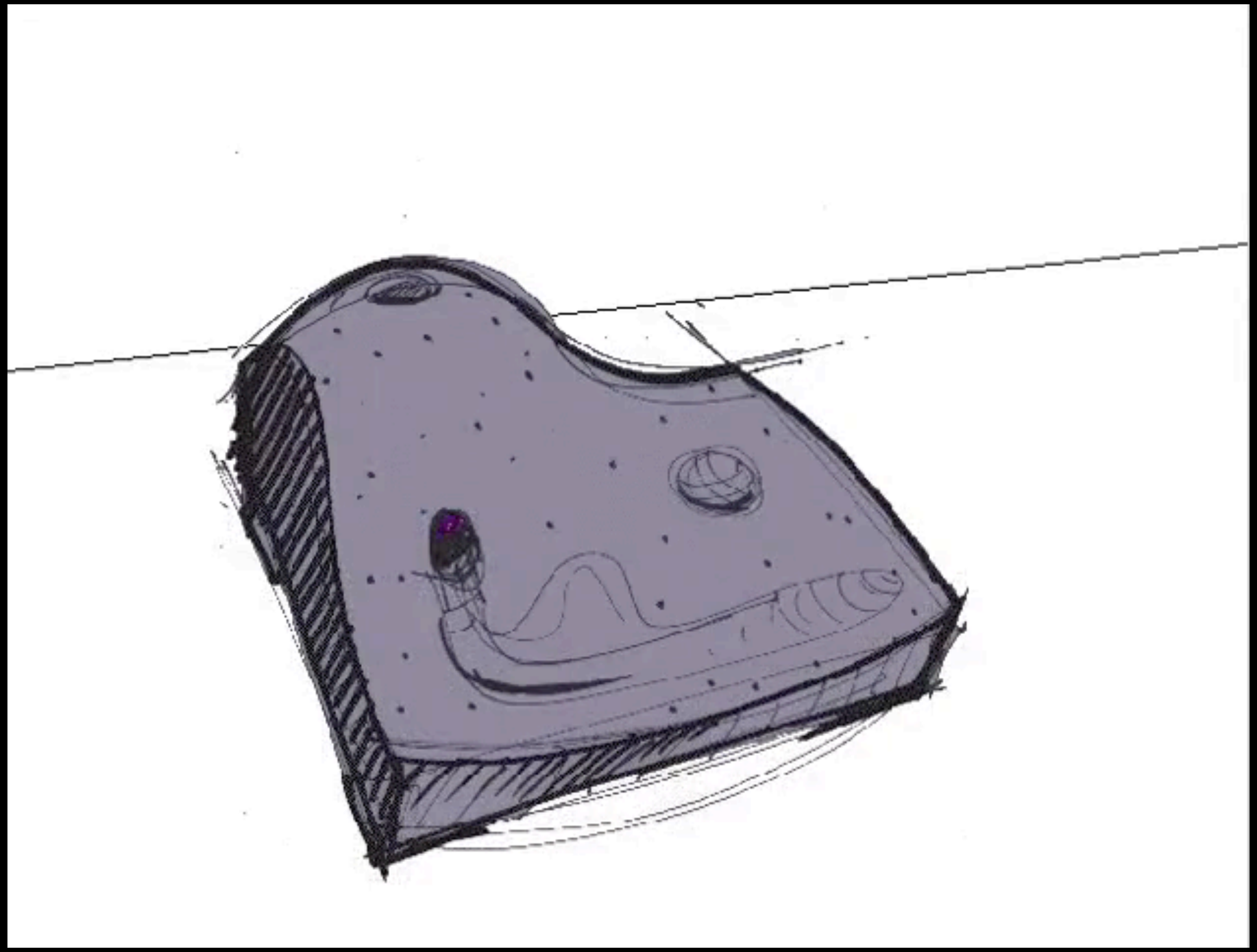


HUMAN FACTORS + DESIGN

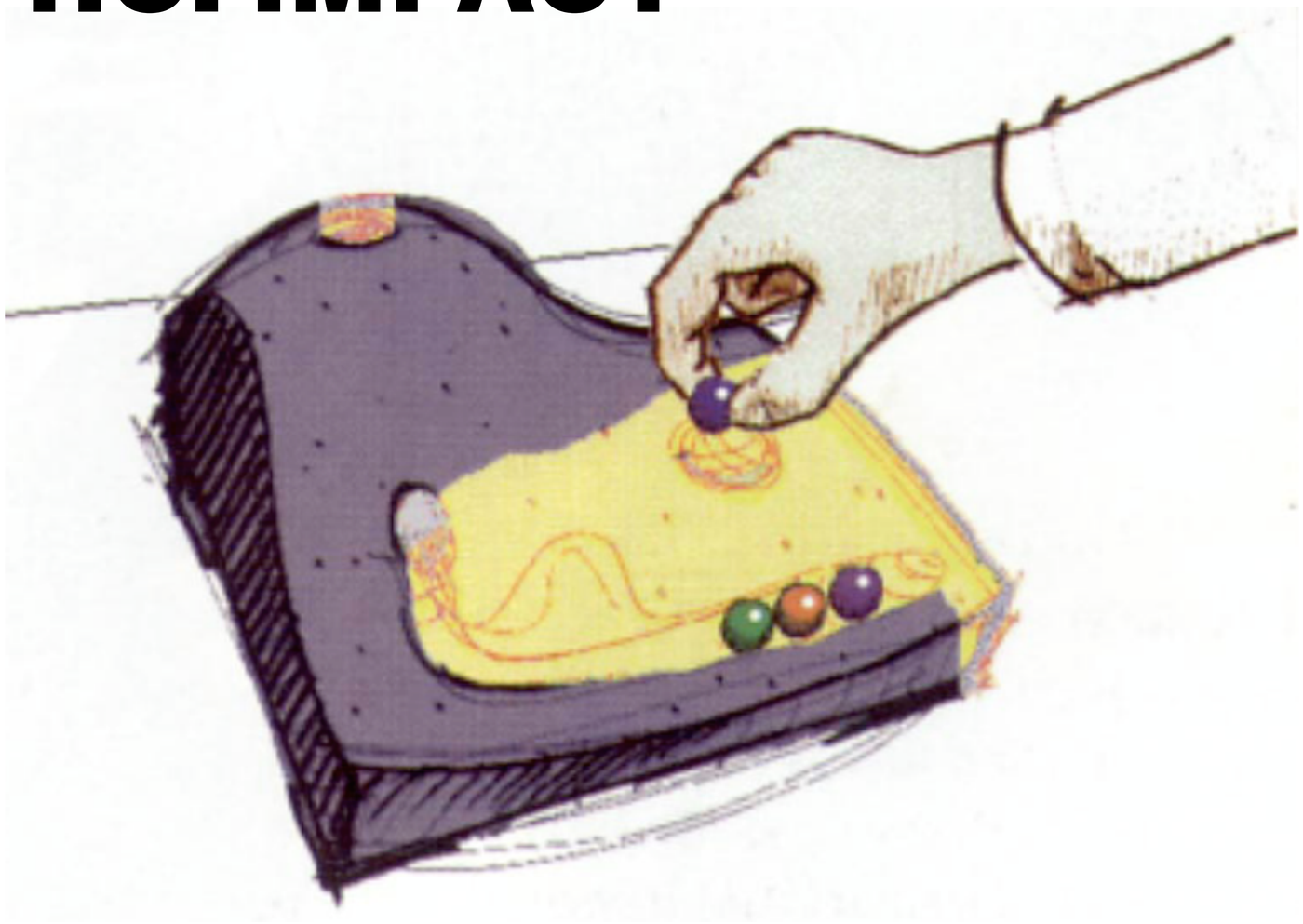


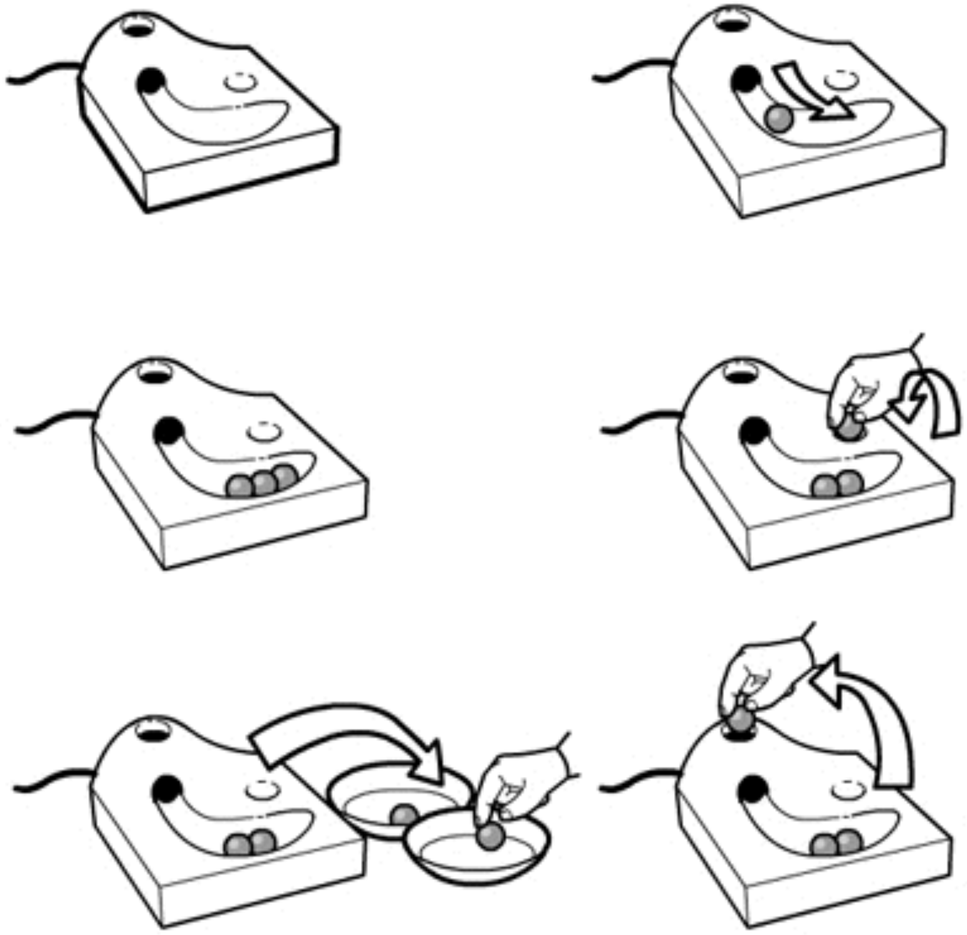






HCI IMPACT





Marble Answering Machine
by Durell Bishop
student at the Royal College of Art (1992)

USER INTERFACES (UI)

Part of application that allows

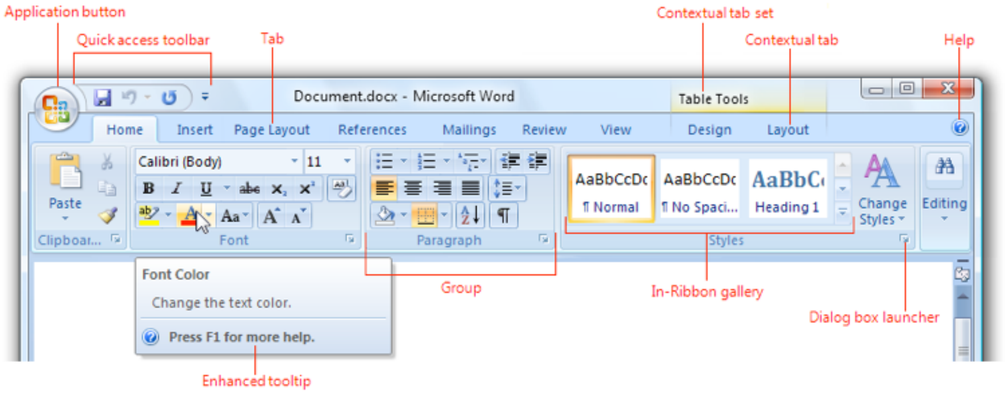
People to interact with computer

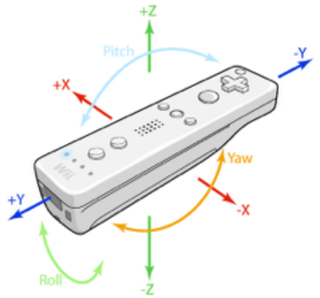
Computer to communicate results

Can include hardware design

Buttons, sliders, other sensors

HCI = design, prototyping, implementation & evaluation of UIs





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?

LIFE-THREATENING ERRORS

A320 used a single display for two different descent modes:

Vertical Speed (VS) Mode and

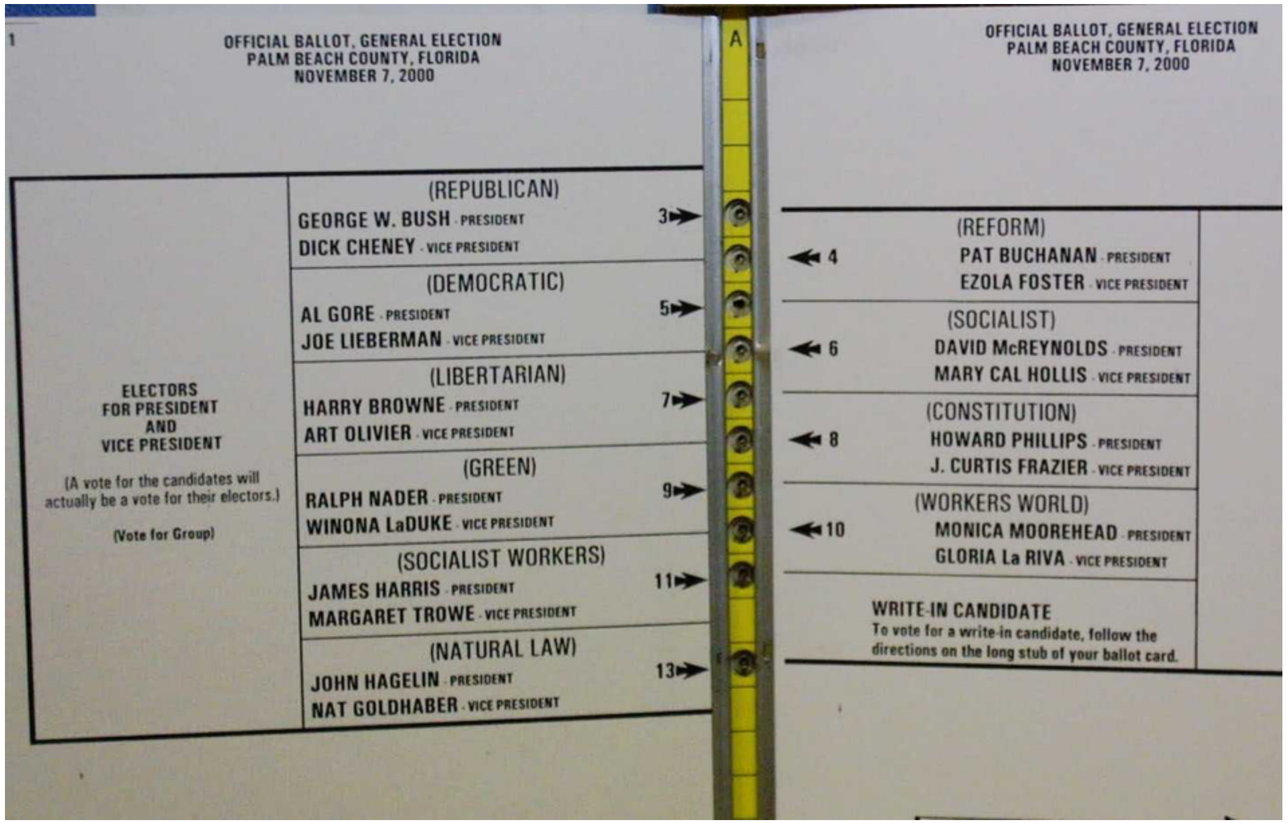
Flight Path Angle (FPA) Mode

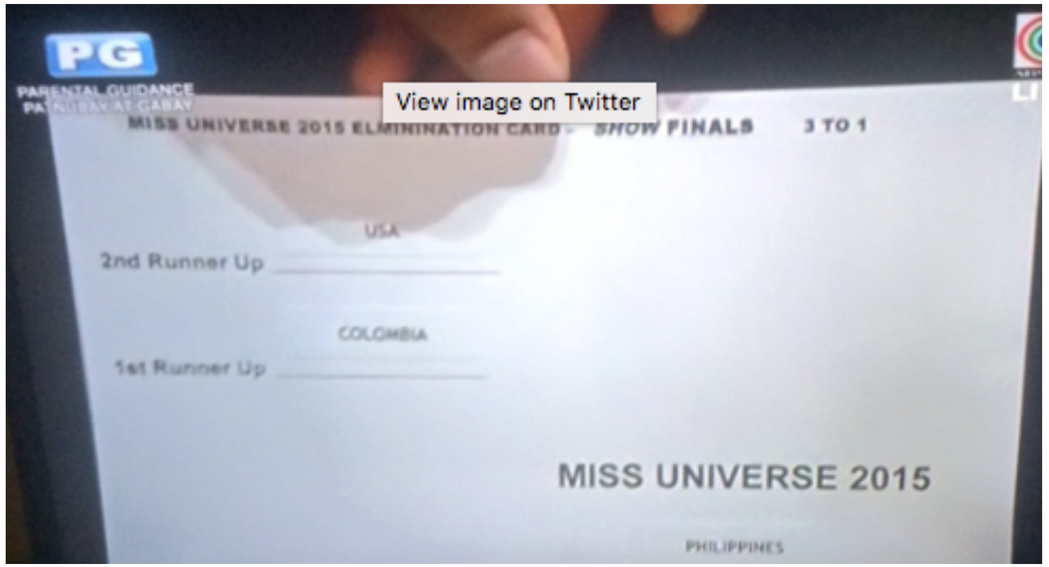
The display showed FPA as two digits separated by a decimal point, and VS as just two digits (and both had a minus sign where their values were negatives).

To the right is an image of the display showing an FPA of -2.8′. I wasn’t able to find a picture of the display in VS mode, but you can see from the pictures in this study how similar the two displays are – nearly impossible to tell apart.

LIFE-THREATENING ERRORS

OTHER CONSEQUENCES OF BAD DESIGN



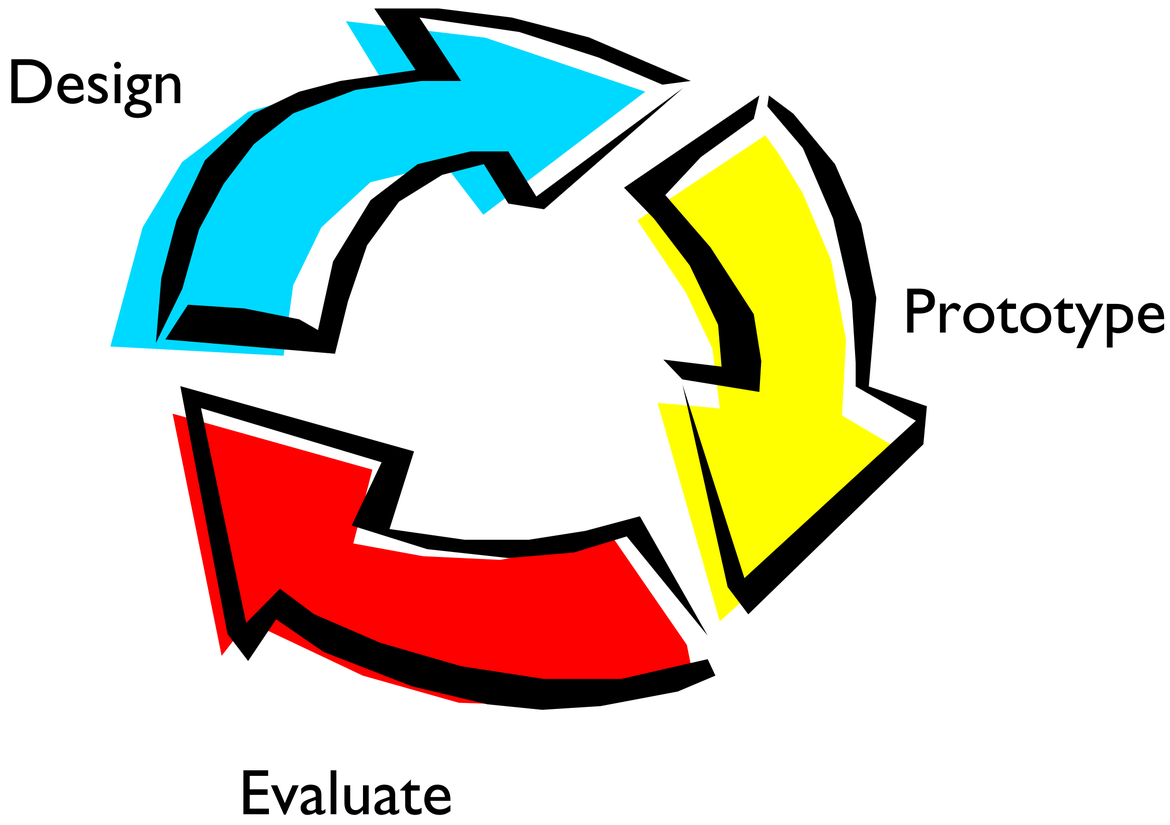


WHO BUILDS INTERFACES?

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

Task analysis & contextual inquiry

Rapid prototyping

Evaluation

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

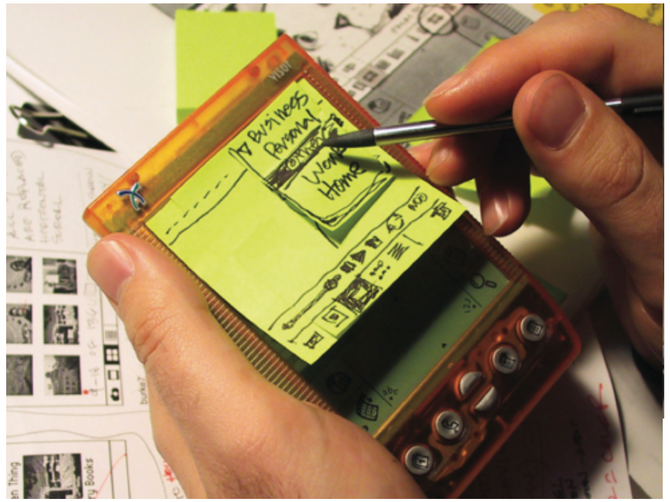
Video segments

Interactive prototyping tools

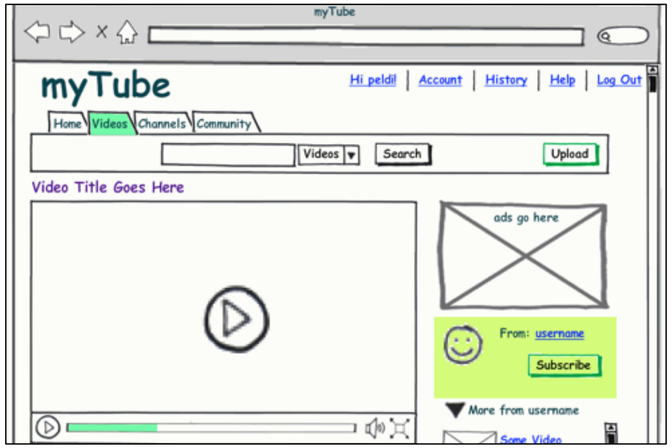
HTML, Framer, Javascript,
Visual Basic, C#, etc.

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

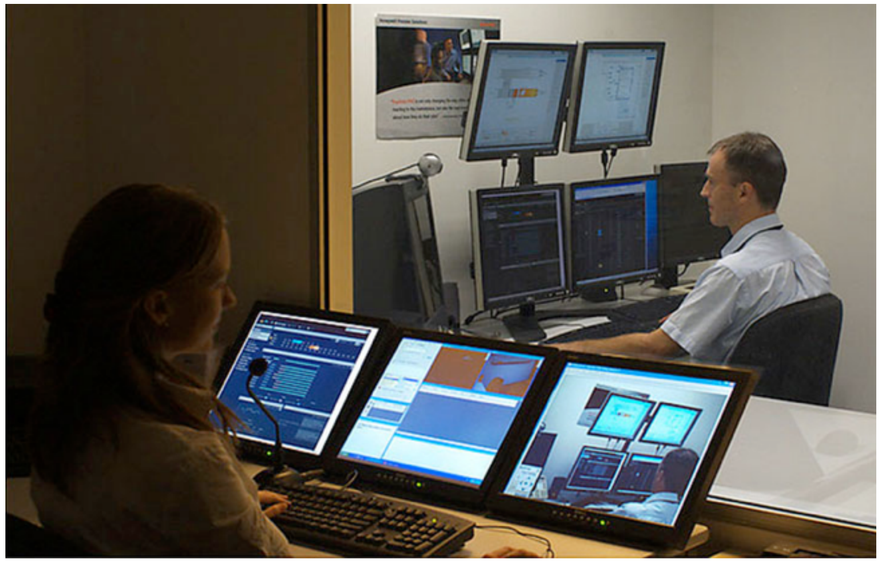
Low-cost techniques

expert evaluation

walkthroughs

Higher cost

Controlled usability study



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

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

Do not wait to drop!

Cumulative

Apply several HCI methods to a single interface

COURSE MECHANICS

Office Hours, Sections, Course Website, bCourses, Assignments

CS160 HAS A HEAVY WORKLOAD

PREREQUISITES

You must be comfortable with programming.

Individual programming assignments require you to write code 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://teaching.paulos.net/cs160_SP2016

Sections

Friday ....

Section starts TOMORROW

Bring your laptop to section

Download and install Android Studio

Read Piazza info before section

SECTIONS FOR FIRST WEEK

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

Stay tuned … we will update which sections are going to be held

CS160 FALL 2015

Today's Attendance Sign-in...

http://tiny.cc/cs160sp15

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 respond to the reading prompt **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, Piazza)

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 points as follows:

1 min — 24 hours: -10% (weekends count)

24 hours — 48 hours: -20%

48 hours — 72 hours: -40%

Cheating (official)

Will get you an F in the course

More than once can get you dismissed from Cal

MORE ON ATTENDANCE

There are several required classes/sections this semester

They will be posted on Piazza and our class website at least two weeks before the class. Some we can alert you to right now (this is not a complete list):

Today — Hey you made it…great job!

22 Feb — In class brainstorm

16 Mar — Midterm … obviously

30 Mar

4 Apr

6 Apr

11 Apr

13 Apr

18 Apr

20 Apr

25 Apr

ASSIGNMENTS

ASSIGNMENTS ARE ON THE SCHEDULE

Syllabus

WEEK 1

20 Jan Introduction (REQUIRED)

Slides
Assignment: Reading Response (due before class on 25 Jan)
Assignment: PROG 01: TBA (due by 11:59pm on 5 Feb)
Assignment: DESIGN 01: Watches in the Wild (due before class 3 Feb)

Section: Android Introduction

WEEK 2

25 Jan Wearable Computing (REQUIRED)

Slides

27 Jan 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

ASSIGNMENT: READING RESPONSE

Due Mon, before class.

Reading is posted on bCourses

Respond to prompt on bCourses about the reading (text)

Will be graded

2 = good

1 = partial

0 = no answer

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: CRUNCH TIME

IF THIS IS NOT THE CLASS FOR YOU…

PLEASE DROP IMMEDIATELY!

…GIVE OTHERS A FAIR CHANCE TO GET IN