CS160: User Interface Design, Prototyping and Evaluation

Prof: John Canny
GSIs: Pablo Paredes
Anuj Tewari
Where we were (1968)

Engelbart demo, NLS (oNLine System)

- Video screen, chording keyboard, mouse, videoconferencing, hyperlinking, word processing, email
- User studies
Where we were (1981)

Xerox Star: Bitmapped display, windows, icons, menus, pointer, desktop, direct manipulation, WYSIWYG …
Where we are now
Where we are now

Home and media control through voice, video
Whole-body interaction

Microsoft Kinect

Whole-body interaction via 3D computer vision for gaming.
On Mobile Devices
And on Web Browsers

Google Maps

Google Search Bar

Google Calendar

Angry Birds for Chrome
Theme for this semester: Web Applications

Interfaces (and applications) which the user interacts with via a web browser.

• Better interactivity, streamlined workflow, without the need to install a client program.
• The front-end of many cloud services.
• Highly portable – the experience is similar (or different!) across devices.
Brief History

• “Hotjava” browser followed but is soon replaced by Java applet support in other browsers.

Telerobotic camera control using client-side scripting
Brief History

• 1996: Macromedia Introduces Flash (later bought by Adobe)
• Much richer experiences, animation, sound, games.
• The web as an art form.

One web crawl (2011) found Flash files on 30-40% of all websites
Web Interfaces History

1998: XML becomes the defacto standard for web app. communication.
SOAP messages, DOM, improve and simply app. design.
2005: The term “Ajax” is coined by Jesse James Garrett to describe the suite of technologies in use for web interfaces. Google Maps is created (acquisition from Where2 Tech.)
Web Interfaces History

2001-????: SVG (Scalable Vector Graphics) standard – 2014?
1995-2000: PHP evolves to public release
1996: CSS style sheet standard published
1997-2000: HTML 4 Standard
1999-2006: XHTML standard
2004-????: HTML 5 standard
2002: Microsoft ASP.NET released
2004: Ruby on Rails released
Web Interfaces Challenges

HTML5

Taxonomy & Status (December 2011)
- W3C Recommendation
- Candidate Recommendation
- Last Call
- Working Draft
- Non-W3C Specifications
- Deprecated W3C APIs

By Sergey Mavrody 2011 | CC Attribution-ShareAlike 3.0
# Web Interfaces Challenges

## HTML Cheat Sheet [Browser Support]

<table>
<thead>
<tr>
<th>Browser Version</th>
<th>Supported</th>
<th>Partially Supported</th>
<th>No Support</th>
<th>Overall Support</th>
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<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td>36%</td>
</tr>
</tbody>
</table>
User Interface Design

We’re studying the science of UI design, and a little of the art.
The Impact of Design

Apple Form Factor Evolution
1976 through 2007

This is a visual representation of most of the products Apple has launched. This image documents the ever-changing form factor and industrial design of Apple’s products, not every single model number or slight change made to a previous model. Enjoy.
This course is about the science of **Usability**.

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

This semester the focus is **Web Interfaces**.

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.
Platform: Web Interfaces

We wont constrain your project beyond the theme, but there will be programming assignments with specific tools.

These will likely include

• AJAX
• XML/SOAP/DOM
• Scripting languages
• Ruby on Rails
• Adobe/Apache Flex
• Scala/LIFT/Comet
Instructor: John Canny

Professor in EECS
Joined Berkeley in 1987

Work in HCI, Education, Health, Data Mining
Language learning games
Persuasive technologies
Mobile applications
Name: Pablo Paredes

Areas: Behavior Change Technology
  – Focus on inner circle and long term engagement
Engaging CBT (Cognitive Therapy)
Machinima, Narrative and Gaming
Tangible devices for emotion
  – Happy Cube
  – Tangible devices for calming technologies

Advisor: John Canny
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 Mechanics
- Course Overview
- Project Description
Course Mechanics
**TAs, Office Hours, Sections**

**Teaching Assistants**
- Pablo Paredes, Anuj Tewari: EECS grad students

**Office Hours**
- John Canny: MW 2:30-3:30, in 637 Soda Hall
- Also by appointment

**Sections**
- Friday 10-11AM, 11-12N, 405 Soda Hall (this week)
- Friday 1-2PM, 320 Soda
- Will cover new material. You should attend!
Reaching Us

Email: cs160@imail.eecs.berkeley.edu

- Mail sent here will get the fastest response
- Please avoid mailing us directly
Admission: Course Petition

• Due by this Weds, bring to next class
• All waitlisted students should submit
• Information will determine admission

We’re looking for diversity – i.e. qualified non-majors as well as majors.
http://bid.berkeley.edu/cs160-fall12/
Link from John Canny’s page
Link for CS160 from EECS instructional page
Create Wiki Account

Your 1st assignment (due by this Weds)
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 you class participation grade
Content

This is a design-oriented course which focuses on several skills:
- User-centered design, needs analysis etc.
- Problem formulation
- Brainstorming
- Rapid prototyping and iterative design
- Usability evaluation
- Interactive system design and programming
Grading

Class participation (5%)
Individual (non-programming) assignments (15%)
Pair Programming Assignments (15%)
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
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
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 it's not for all engineers.
Interface Design Cycle

Design → Prototype → Evaluate → Design
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

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

CS247, Stanford, 2006
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

http://www.laurasmith.info/UsabilityTest.jpg
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. It's 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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These non-technical skills become more important the further you go in your career.
Pair Programming Assignments
Pair Programming Teams

Pair programming is an agile Software Engineering technique where two people work together on the same program. Goal is to add “another set of eyes” Spot bugs early Support peer learning

In this course it allows us to include compulsory programming assignments without assuming advanced programming skills

You will need to find a programming partner by next Monday. Email us if you need help.
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: Web Interfaces

• Plenty of design freedom
• Be careful not to over-design
  – Simplicity is the best design principle
  – “one-size-fits-all” is rarely true across devices
• You’re designing an interactive **prototype** – you don’t need to implement much (or any) back-end functionality.
Inspiration: Dropbox

With Dropbox, your files are always in sync.
Inspiration: Social Media
Inspiration: Input

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

• IBM Websphere voice
• IBM “Watson” voice service
Next Time

The Design Cycle and Brainstorming


- The Perfect Brainstorm. The Art of Innovation. Kelley

  Will need username/password for this one