What Makes Usable Software

LBSC 690: Jordan Boyd-Graber

September 24, 2012

Adapted from Jimmy Lin’s Slides
Goals

- Input Devices
- Operating Systems: The foundations of interactions
- Quick Introduction to HCI
  - Connect the design of everyday objects with computer interfaces
  - Articulate what makes an object well or poorly designed
  - Learn about metaphors in modern interfaces
- Understand how to evaluate systems
- Understand principles of good Web site design
Outline

1. Operating Systems
2. Types of Input Devices
3. User-Centered Design
4. Interface Paradigms
5. Information Architecture
A Brief History of Operating Systems

Unix
  - BSD
    - Mac OS
    - NeXT
      - OS X
        - iPhone
        - Tivo
        - Android
  - Linux
  - OS/2
  - DOS
    - Windows
      - Windows NT
      - Windows XP
      - Windows 95
      - Windows 7
  - Windows NT
  - Windows XP
  - Windows 7

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What does an OS do?

- More and more . . .
- Boot
- Provide an interface
- Manage programs & memory
- Drivers
Boot

Taking a computer from “off” to “on”

1. Send power from power supply to everything else (fan starts whirring)
2. BIOS starts
3. Power on self-test (POST): bus, RAM, cards, etc. (beeps and screen messages)
4. POST results compared to last good boot
5. Search a bootable device
6. Load boot information into memory, hand off

Operating System

1. Load drivers (more later)
2. Verify user
3. Establish network connections
Way to interact with user
In Linux, many choices “Window Manager”
More on this next week
We’ll use both in this class
Management

- Programs
  - Way to launch programs
  - Way to end programs
  - Multitasking (**scheduling**)
  - Application switching

- Memory
  - Move HD information into memory (**caching**)
  - Limit how much RAM a program uses
  - Make programs think they have a computer to themselves
Drivers

- Provide way for software to talk to hardware
- Supplied by manufacturer based on “rules” provided by OS
- Need a driver for every piece of hardware you bring home (sometimes OS already has driver)
  - Video card
  - Camera
  - Printer
  - Network card
Outline

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Input Devices

- Keyboard
- Mouse
- Camera
When you press a key, it completes a circuit
Each individual keypress is sent to computer as a special code
Operating system interprets interrupts and responds
A spring or piece of plastic restores key position
First keyboards mimicked the depth you had to press a typewriter key (now much thinner)
Circuits printed on a single board
Mouse

- Patented in 1970 by Douglas Englebart
- First had wheels that directly rolled on surface
- Replaced soon by balls, which then turned two orthogonal wheels
- Then replaced by tiny integrated cameras
Camera

- Filters restrict amount of light getting to each cell
- As photons strike the cell, a voltage is created (charge can “bleed”)
- Voltage is converted into a binary number (e.g. between 0 and 255)
- What does mega pixel mean?
Other Input Devices

- Scanner
- Keyboard
- Microphone
- Radio frequency identification (RFID) reader
- Magstrip reader
- Tablet
- Joystick, guitar, wiimote
- Touchpad
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What is HCI?

Human Computer Interaction

Field concerned with the . . .

- Design
- Implementation
- Evaluation

of usable systems.
Human Action Cycle

Only small fraction of cycle is physical
Design Concepts

- Visual affordance
- Visible Constraints
- Mapping
- Causality
- Transfer effects
- Idioms
- Metaphors
- Cultural associations
- Individual differences
The perceived and actual properties of the object that determine how it should be used

Purpose should be obvious from appearance

- Chair for sitting
- Table for placing things on
- Knobs for turning
- Slots for inserting things into
- Buttons for pushing
- Computers for ???
Handle is for lifting, but this is for scrolling?
- Can you edit text?
- Affordances for resizing window?
- Handle: graphic or interface?
- Button is for pressing, but what does it do?
Supreme Court orders hearing for condemned man

By Richard Panettieri
The surprising move is the first of its kind in nearly 50 years. Seven trial witnesses recanted testimony in the 1989 slaying.

Boy’s death exposes gaps in county child welfare system
State might take action to jail more drug offenders
Firefighters making headway in California wildfires

Date growers scurry to fill Ramadan orders
By Raja Adbulkarim
Good thing the fruit freezes well. The shifting timing of the Muslim holy month means this year it’s out of sync with the Southern California date harvest.
Constraints

Knob
Push or pull?

Bar
Push, but which side?

Asymmetric Bar
Push right hand side.
Constraints
Constraints
Cup Holder

Caller: Hello, is this Tech Support?
Tech: Yes, it is. How may I help you?
Caller: The cup holder on my PC is broken and I am within my warranty period. How do I go about getting that fixed?
Tech: I’m sorry, but did you say a cup holder?
Caller: Yes, it’s attached to the front of my computer.
Tech: Please excuse me if I seem a bit stumped, its because I am. Did you receive this as part of a promotional, at a trade show? How did you get this cup holder? Does it have any trademark on it?
Caller: It came with my computer, I don’t know anything about a promotional. It just has 4X on it.
Mapping
What makes a Wii fun?
Causality

- Humans will draw connections even if none exist (post hoc, ergo propter hoc)
- Thus, actions should have immediate feedback
- User should be in control - no random events
- Placebo buttons: Often pressed repeatedly
Transfer Effects
Transfer Effects

Douglas Adams

First we thought the PC was a calculator. Then we found out how to turn numbers into letters with ASCII and we thought it was a typewriter. Then we discovered graphics, and we thought it was a television. With the World Wide Web, we’ve realized it’s a brochure.

- **Keyboard layout**
  - Qwerty keyboard: designed to prevent jamming of keyboard
  - Dvorak keyboard (1930s): possibly faster

- **Layout of number pads**
  - Calculator vs. keyboard
  - Traditional telephone vs. fancy cell phones
Transfer Effects

The Dvorak Keyboard  www.Dvorak-keyboards.com

Left Hand A Much Easier, Faster way to type. (see inside) Right Hand

! @ # $ % ^ & * ( ) { } [ ] \ 

` " < > P Y F G C R L ? _

A O E U I D H T N S - : ;

Q J K X B M W V Z

The lines on the diagram guide your fingers while learning.
Idioms

- People learn idioms that work in a certain way
  - Red means danger
  - Green means safe
- Idioms vary in different cultures
  - Light switches:
    - America: down is off
    - Britain: down is on
  - Faucets
    - America: counter-clockwise on
    - Britain: counter-clockwise off
  - Have you tried crossing a street in London?
Metaphor

Examples

- Desktop
- Folder
- Trash Can
  - To eject a disk on a Mac, you had to drag it to the trash
  - Did this erase it?
- Window

- Usually good; allow transfer effects
- When do metaphors go bad?
  - Breaking rules: recycle bin placed on desktop
  - Metaphor is teacher (what if your system can do more?)
  - Bad metaphors may lead to bad design
Cultural Influence of Icons

- Because a trash can in Thailand may look like this

- a Thai user is likely to be confused by this

- Sun found their email icon problematic for urban dwellers
Individual Differences

- Disabilities
- Skill sets
- Unexpected outcomes
Individual Differences: Disability

- How can blind users navigate a webpage?
  - Text to speech, describing images (ALT tag)
  - Skimming actions with descriptive link text (don’t put more info “here”)
- Other disabilities, e.g. aphasia
  - Users neglect right hand side of screen
  - Cannot necessarily read text
- With mobile devices, more users are similarly constrained
- Moral: degrade gracefully
Individual Differences: Skill sets

- **Beginners**
  - Make basic operation easy
  - Offer lots of help
  - Don’t overload with options

- **Frequent users**
  - Allow for shortcuts
  - Don’t distract with help

- **Power users:** customization and respect

- **Rule of Thumb:** Design for 95% of population, not average user
Your assumptions may not match users
Use case might be different from what you intended
Moral: Keep things as simple and general as possible
Outline

1. Operating Systems
2. Types of Input Devices
3. User-Centered Design
4. Interface Paradigms
5. Information Architecture
- **Windows, Icon, Menu, Pointing Device**
WIMP

- Windows, Icon, Menu, Pointing Device
WIMP

- Windows
- Icon
- Menu
- Pointing Device
- Windows, Icon, Menu, Pointing Device
WIMP

- Windows, Icon, Menu, Pointing Device
- More information displayed at once
- Good for multitasking
- Shows users what’s possible
- Easy introduction
CLI

- Easy to implement
- Sometimes it’s all you’ve got (remote system, broken system)
- Good for repeated actions
- Difficult to know what’s possible
- Requires memorization of syntax
- Comparison to “oral history” (Stephenson)
Each command is a word (no spaces)
Some commands just are (whoami, pwd)
Some commands take optional arguments (ls)
Some commands have a single argument (cd)
Some commands only can take two arguments (cp)
Some commands can take many arguments (wc, grep)
- Bigger programs are invoked in the same way
- emacs, vi, sqlite3 (subject of HW3)
1. Operating Systems

2. Types of Input Devices

3. User-Centered Design

4. Interface Paradigms

5. Information Architecture
Information Architecture

- The design of an “information space” to facilitate access to content
- Consists of two components:
  - Static design
  - Interaction design
Different principles of organization

- Logical: inherent structure (chronological, alphabetical, )
- Functional: by task
- Topical: by subject
- Demographic: by user

Take advantage of metaphors

- Organizational: e.g., e-government
- Physical: e.g., online grocery store
- Functional: e.g., cut, paste, etc.
- Visual: e.g., octagon for stop
Static Design

Home Page

- About Us
  - What is DTIC
  - UAC Mission

- Products / Services
  - Offerings
  - IACs
  - Ordering TATs

- Resources
  - Downloads
  - TEMS
  - Multimedia

September 24, 2012
Designing CRAPpy Pages

- **Contrast**: make different things different
  - to bring out dominant elements
  - to mute lesser elements
  - to create dynamism
Designing CRAPpy Pages

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Designing CRAPpy Pages

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- **Proximity**: make effective use of spacing
  - to group related elements
  - to separate unrelated elements
Screen Design: Ebay

![Ebay Screen Design](image_url)
Ayn Rand’s Literature of Capitalism

Published: September 15, 2007

One of the most influential business books ever written is a 1,200-page novel published 50 years ago, on Oct. 10, 1957. It is still drawing readers; it ranks 38th on Amazon.com’s best-seller list. (“Winning,” by John P. Welch Jr., at a breakeven 534 pages, is No. 132.)

The book is “Atlas Shrugged,” Ayn Rand’s glorification of the right of individuals to live entirely for their own interest.

For years, Rand’s message was attacked by intellectuals with whom her circle labeled “do-gooders,” who argued that individuals should also work in the service of others. Her book was dismissed as an homage to greed. Gene Woll described its philosophy as “nearly perfect in its immorality.”

But the book attracted a coterie of fans, some of them top corporate executives, who dared not speak of its impact except in private. When they read the book, often as college students, they now say, it gave form and substance to their inchoate thoughts, showing there is no conflict between private ambition and public benefit.

“I know from talking to a lot of Fortune 500 C.E.O.’s that ‘Atlas Shrugged’ has had a significant effect on their business decisions, even if they don’t agree with all of Ayn Rand’s ideas,” said John A. Allison, the chief executive of BB&T, one of the largest banks in the United States.
Screen Design: New York Times

Navigation

Banner Ad

Content

Another Ad

Popular Articles
Screen Design: Amazon
Chess analogy: a few simple rules that disguise an infinitely complex game

The three-part structure
  - Openings: many strategies, lots of books about this
  - Middle game: nebulous, hard to describe
  - End game: well-defined, well-understood

Information navigation has a similar structure!

Middle game is underserved
Opening Moves
Opening Moves
Opening Moves

![Image of a dating service website](image-url)

**匹配. com**

It's Okay to Look™

I'm a: man seeking women

Between ages: and

Near zip code: 

Start Looking Now

FREE! Portrait Toolkit™
And Your's Guide to Match.com™

The 6 Month Guarantee

NEW! matchMobile
Try Match.com on your mobile

Dr. Phil's Dating Insights
FREE Video Preview

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FREE Video Preview

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Entertainment Interval: Love, Faith, Sobriety, Recovery, Expedite Hotels, Homes

Done
Endgame

Match.com - Find Singles at the World's Largest Online Dating Personal Service - Mozilla Firefox

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To the world you're one person but to one person you might just be the world.

Active within 24 hours
27-year-old woman
Silver Spring, Maryland, United States
Seeking men 22-35 within 50 miles of Colesville, Silver Spring, Maryland, United States

Relationships: Never Married
Have kids: None
Want kids: Someday (2)
Ethnicity: White / Caucasian
Body types: Curvy
Height: 5'4" (167cm)
Religion: Christian / Other
Smokes: No Way
Drinks: Social drinker, maybe one or two

More of My Photos

About me and who I'm looking for

I just moved to the DC Metro area from the great state of Texas. I've had a few serious relationships in the past and dated but timing is everything. I'm looking for someone who's down to earth and has goals in life. I want someone who can make a candlelit dinner or take me to a ball game. I like a good sense of humor and a nice smile.

Done

< previous photo next photo >
click here for a 3 Day FREE Trial Go>
Middle Game
Middle Game
Interaction Patterns

- Drive to content
- Drive to advertisement
- Move up a level
- Move to next in sequence
- Jump to related
Recap: Goals for Today

- Understand what devices provide input to a computer
- Understand basic principles of HCI
  - Connect the design of everyday objects with computer interfaces
  - Articulate what makes an object well or poorly designed
  - Learn about metaphors in modern interfaces
- Understand how to evaluate systems
- Understand principles of good Web site design
Your boss wants you to revamp the library’s webpage. Here’s his big idea: when you first come to the webpage, you’ll see a picture of a teenager sitting on the floor surrounded by books. Each book has the name of one of the site’s existing pages, and when users click on a the picture, it takes them to the appropriate page. Is this possible? How hard is it? How would you do it? Is it a good idea?