What Makes Usable Software

LBSC 690: Jordan Boyd-Graber

September 24, 2012

COLLEGE OF
INFORMATION
STUDIES

Adapted from Jimmy Lin's Slides

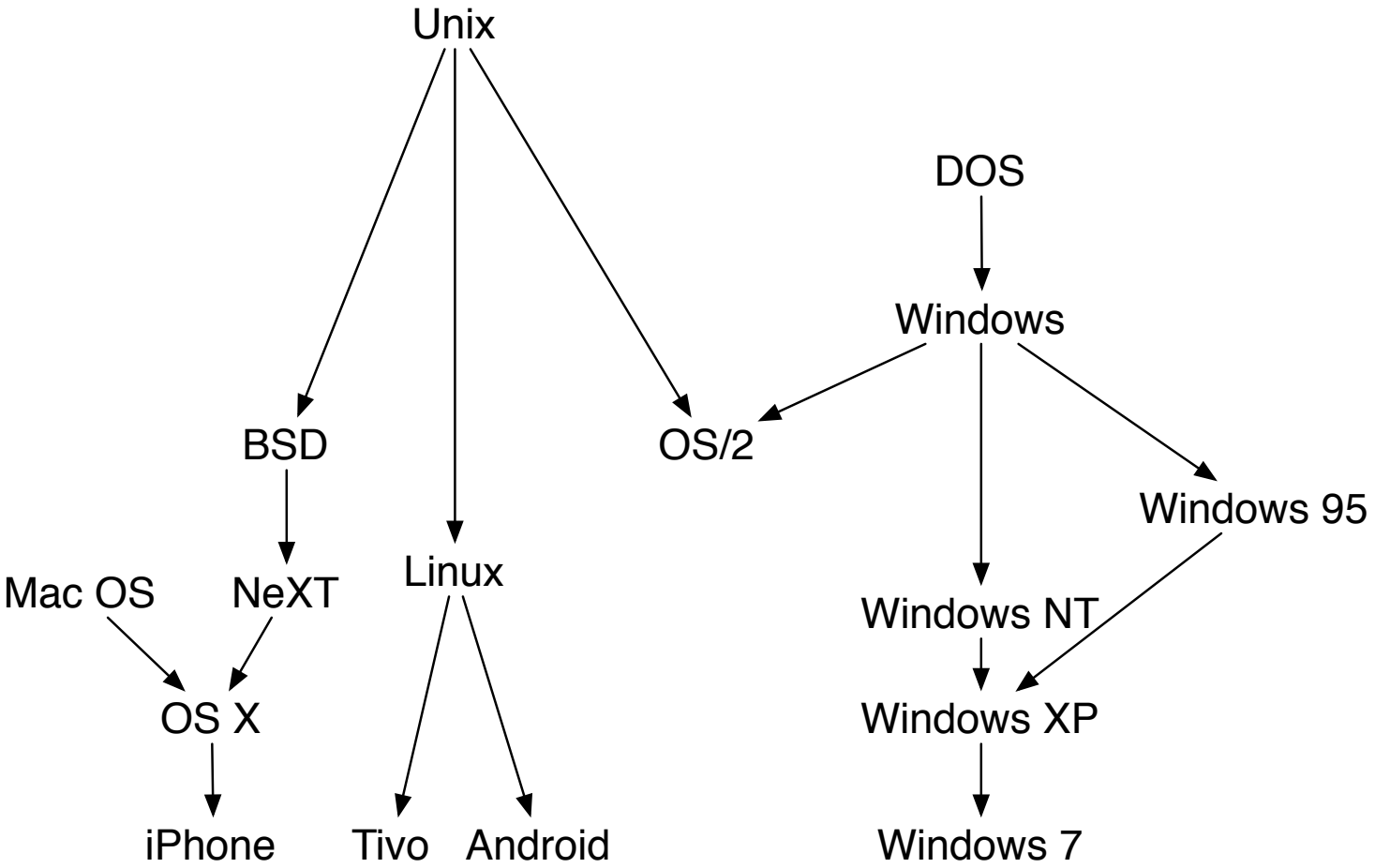
Goals

- 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 Paridigms
5. Information Architecture

A Brief History of Operating Systems



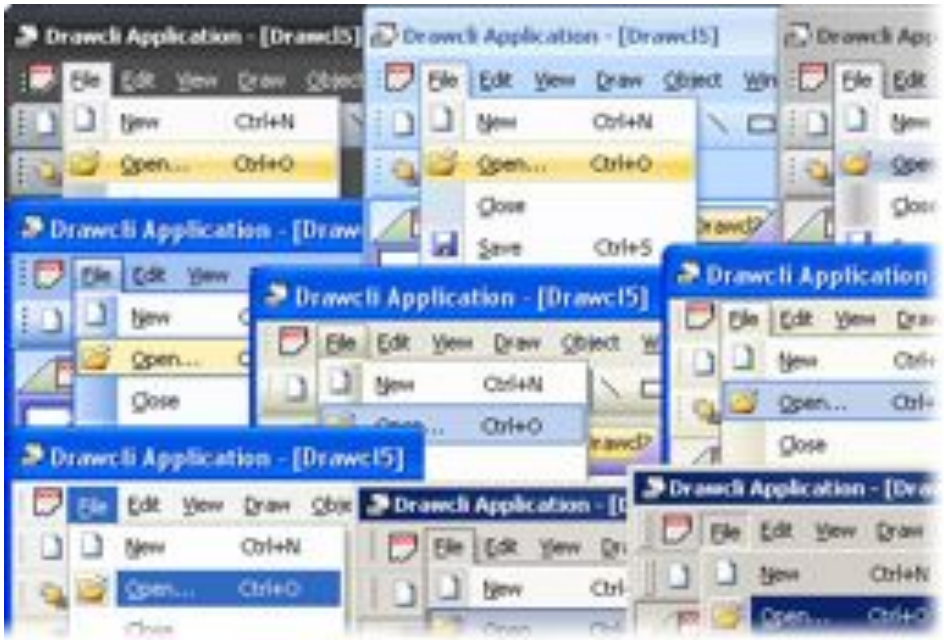
What does an OS do?

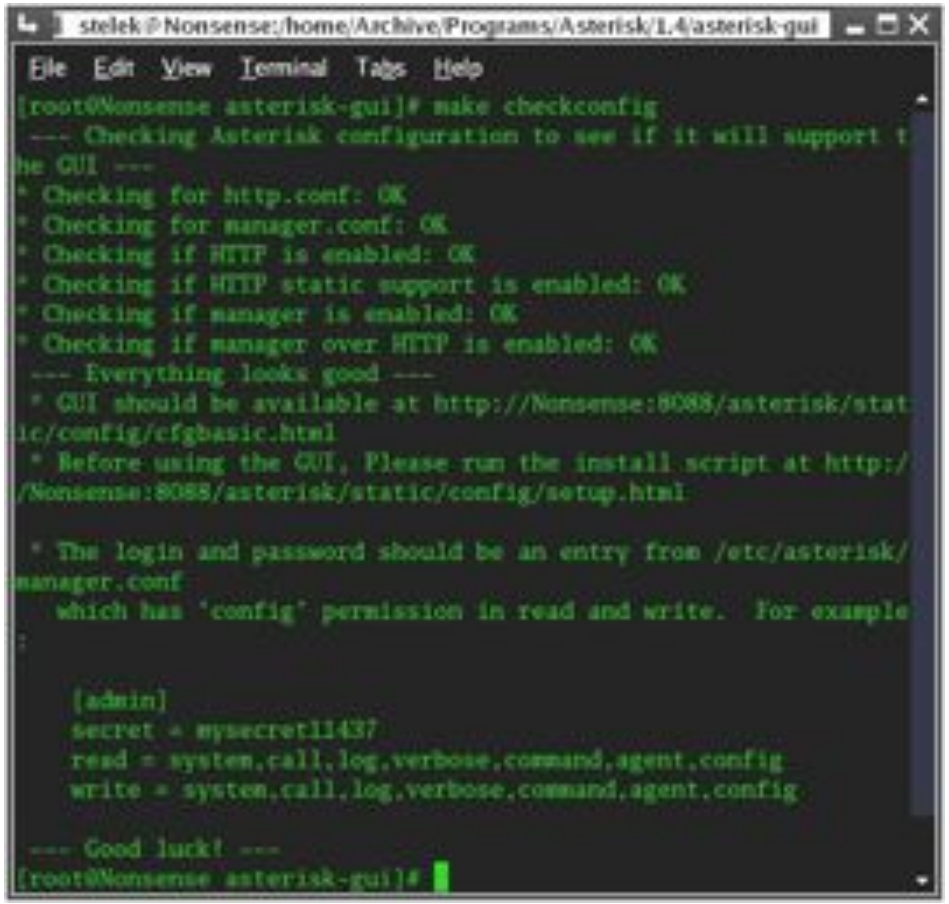
- More and more . . .
- Boot
- Provide an interface
- Manage programs & memory
- Drivers

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

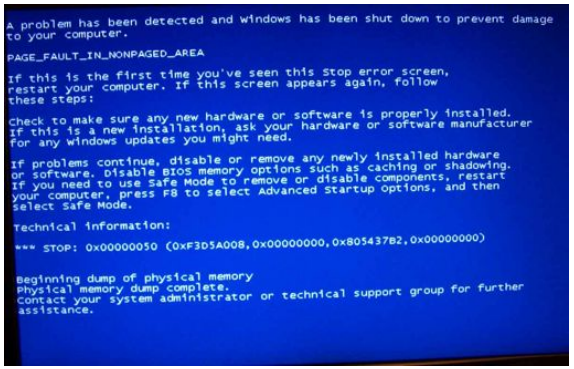
Interface





- 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

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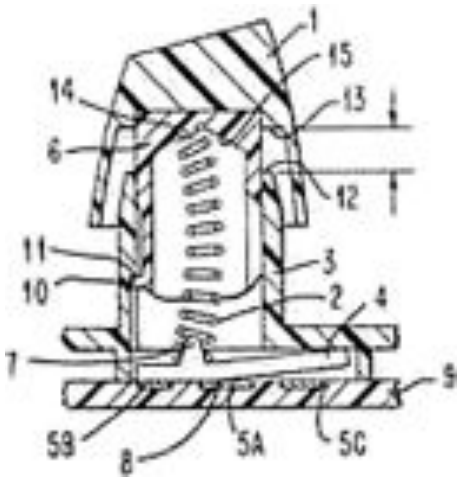
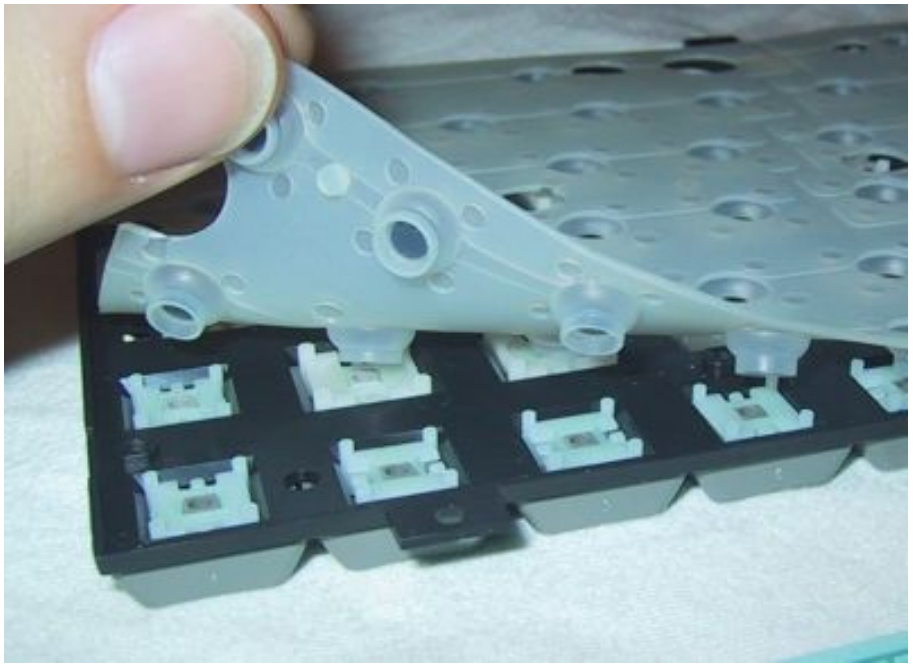
Input Devices

- Keyboard
- Mouse
- Camera

Keyboard

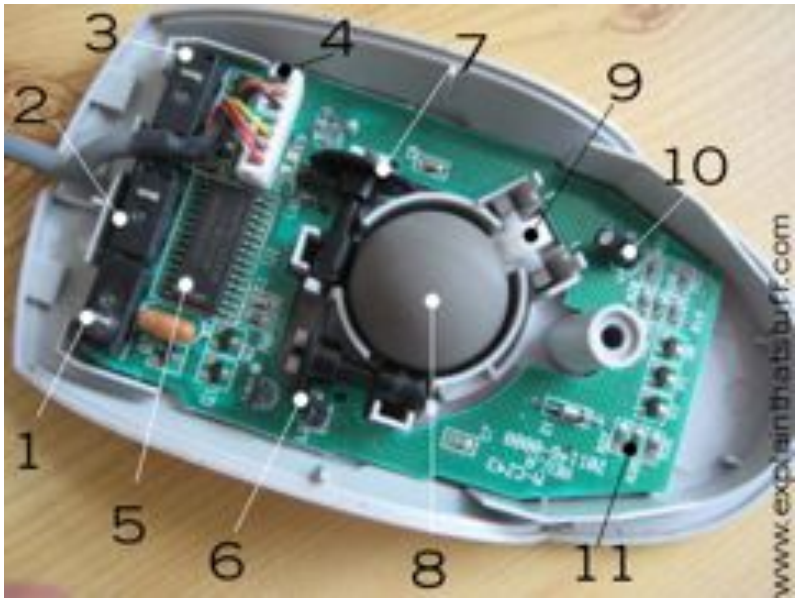


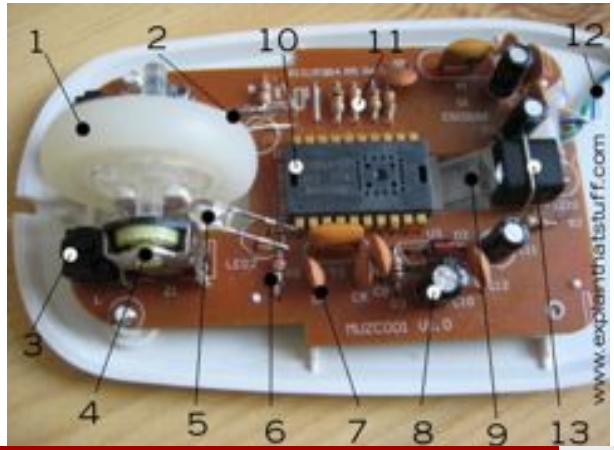


- When you press a key, it completes a circuit
- Each individual keypress is sent to computer as a special code
- Operating system interprets interrupts and responds
- A spring or piece of plastic restores key position
- First keyboards mimicked the depth you had to press a typewriter key (now much thinner)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

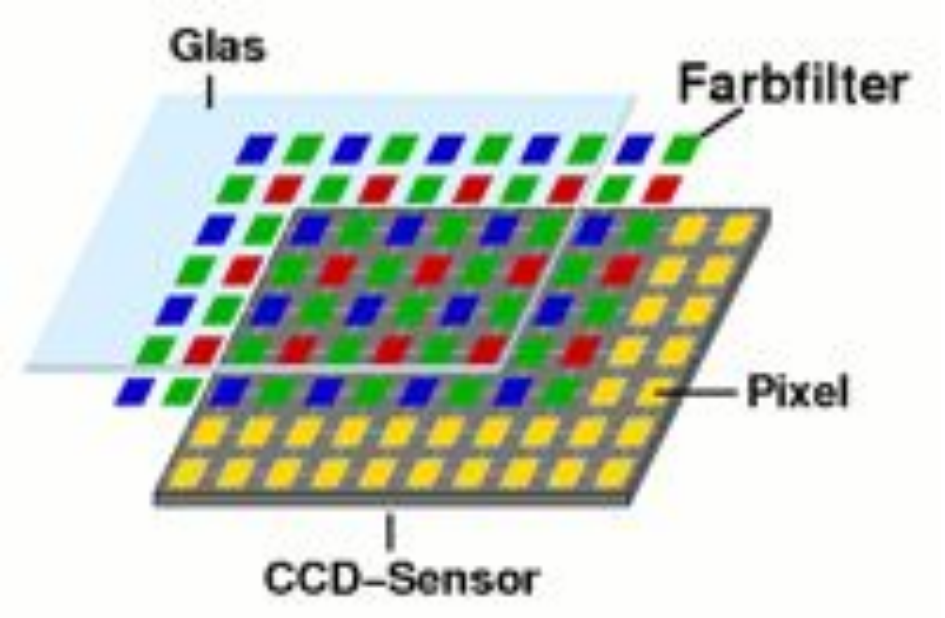
Mouse

- 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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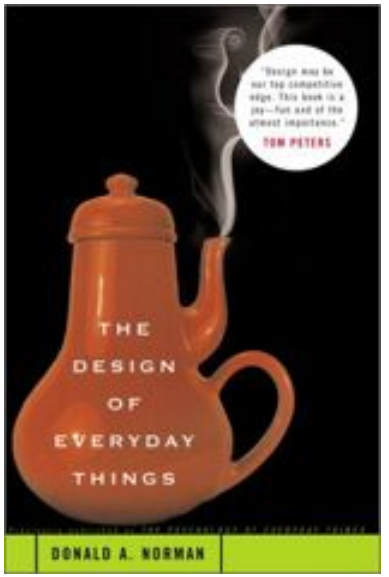
What is HCI?

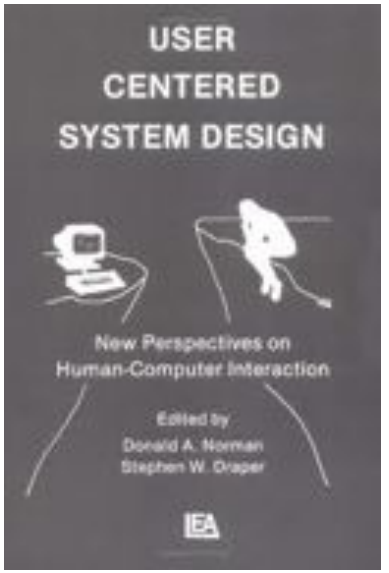
Human Computer Interaction

Field concerned with the . . .

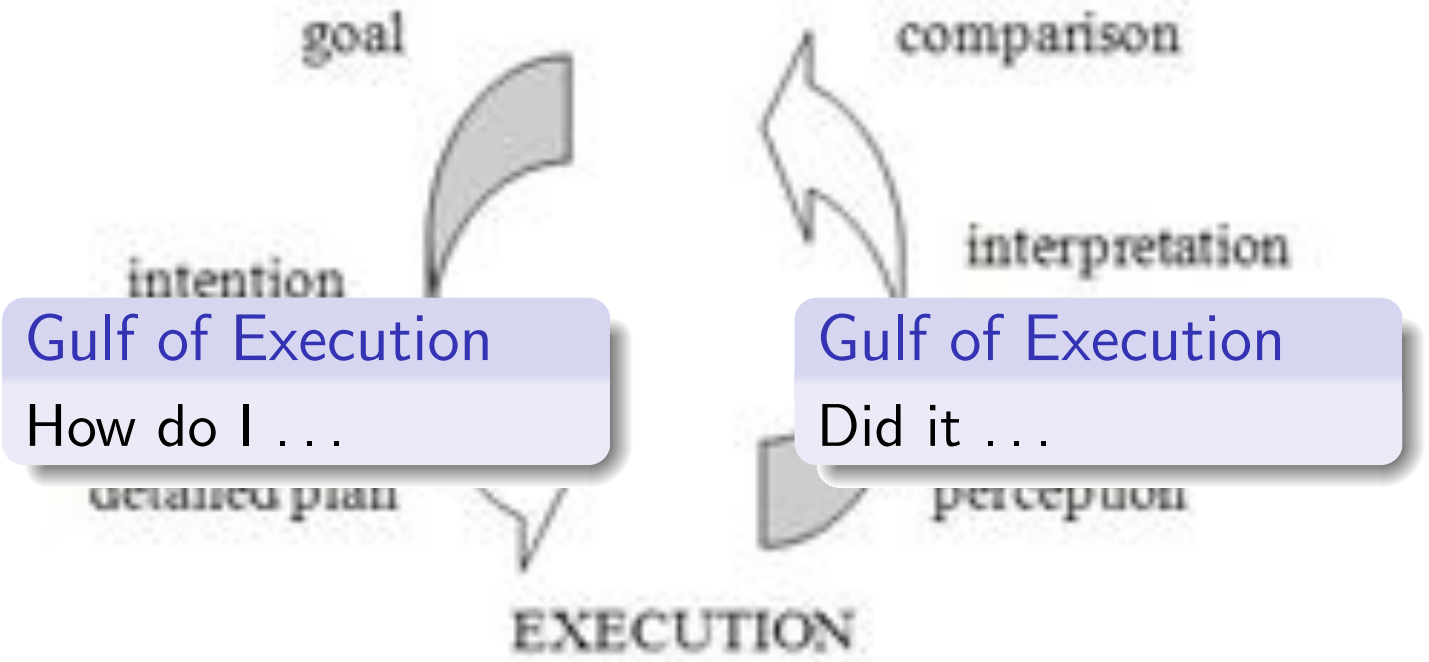
- Design
- Implementation
- Evaluation

of usable systems.





Human Action Cycle



Only small fraction of cycle is physical

Design Concepts

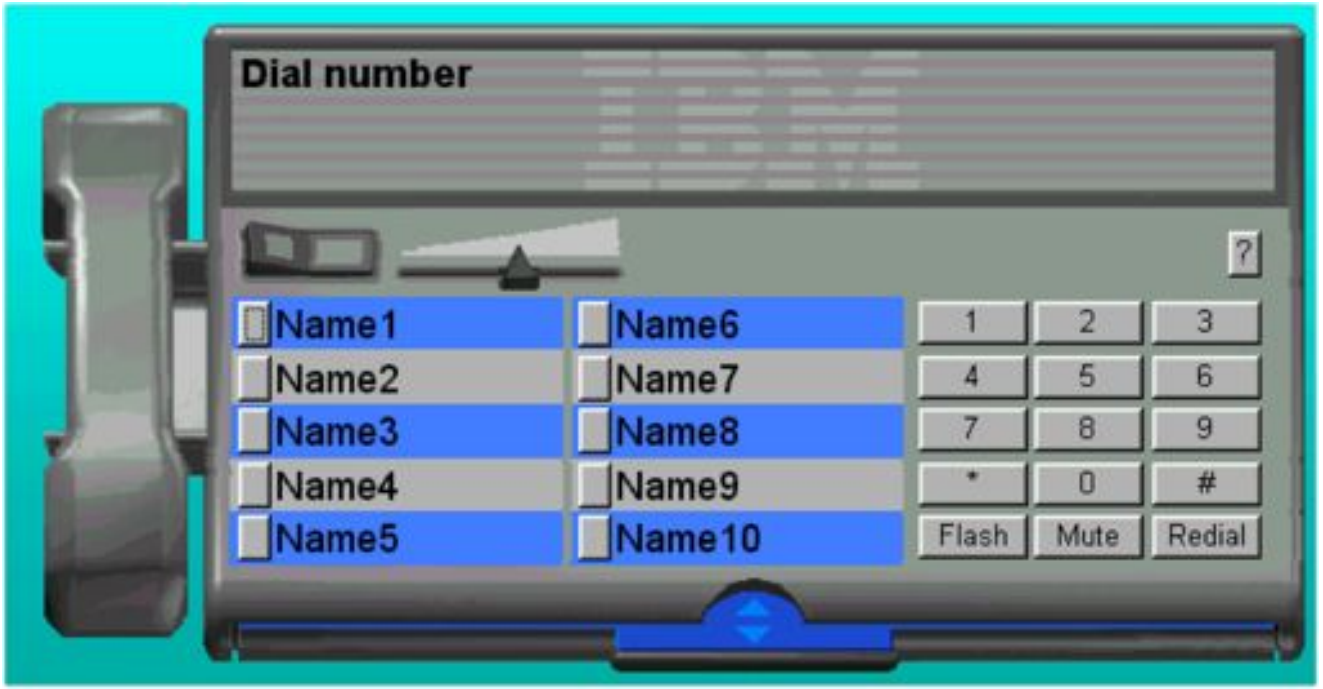
- Visual affordance
- Visible Constraints
- Mapping
- Causality
- Transfer effects
- Idioms
- Metaphors
- Cultural associations
- Individual differences

Affordance

- 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 ???

AUDIOSTATION 32
Turtle Beach
AUDIO MIXER
Volume Control
3D
EQUALIZER
0
Hz 31 63 125 250 500 1k 2k 4k 8k 16k
CD PLAYER
2 of 6
Untitled
Track 2
02:41
00:00

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?

Los Angeles Times

Tuesday, Aug
1:53 a.m. PDT

LOCAL NATION WORLD BUSINESS SPORTS ENTERTAINMENT LIVING TI

IN THE NEWS | OBAMA JOKER ARTIST | STATE PARKS | TOM DELAY | HEALTHCARE | IMMIGRA

Allen J. Schaben / Los Angeles Times

Date growers scurry to fill Ramadan orders

By Raja Abdulrahim

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.

Supreme Court orders hearing for condemned man

By Richard Fausset

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

Constraints

Knob

Push or pull?

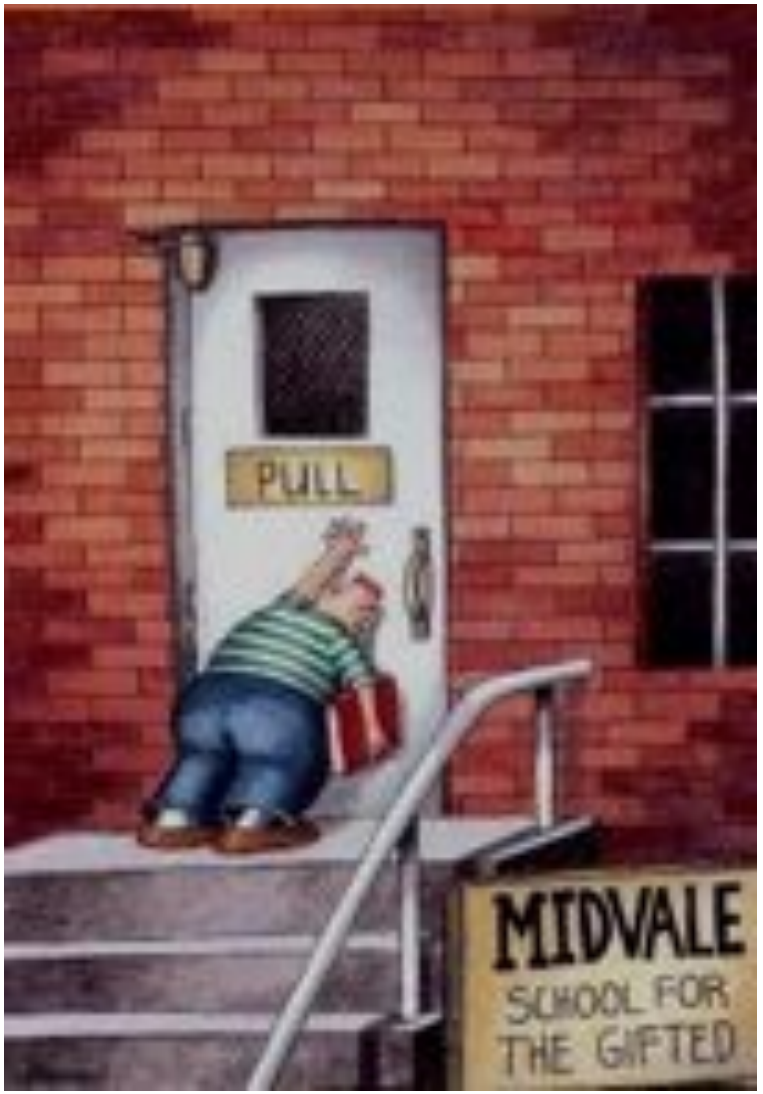
Bar

Push, but which side?

Asymmetric Bar

Push right hand side.

Constraints



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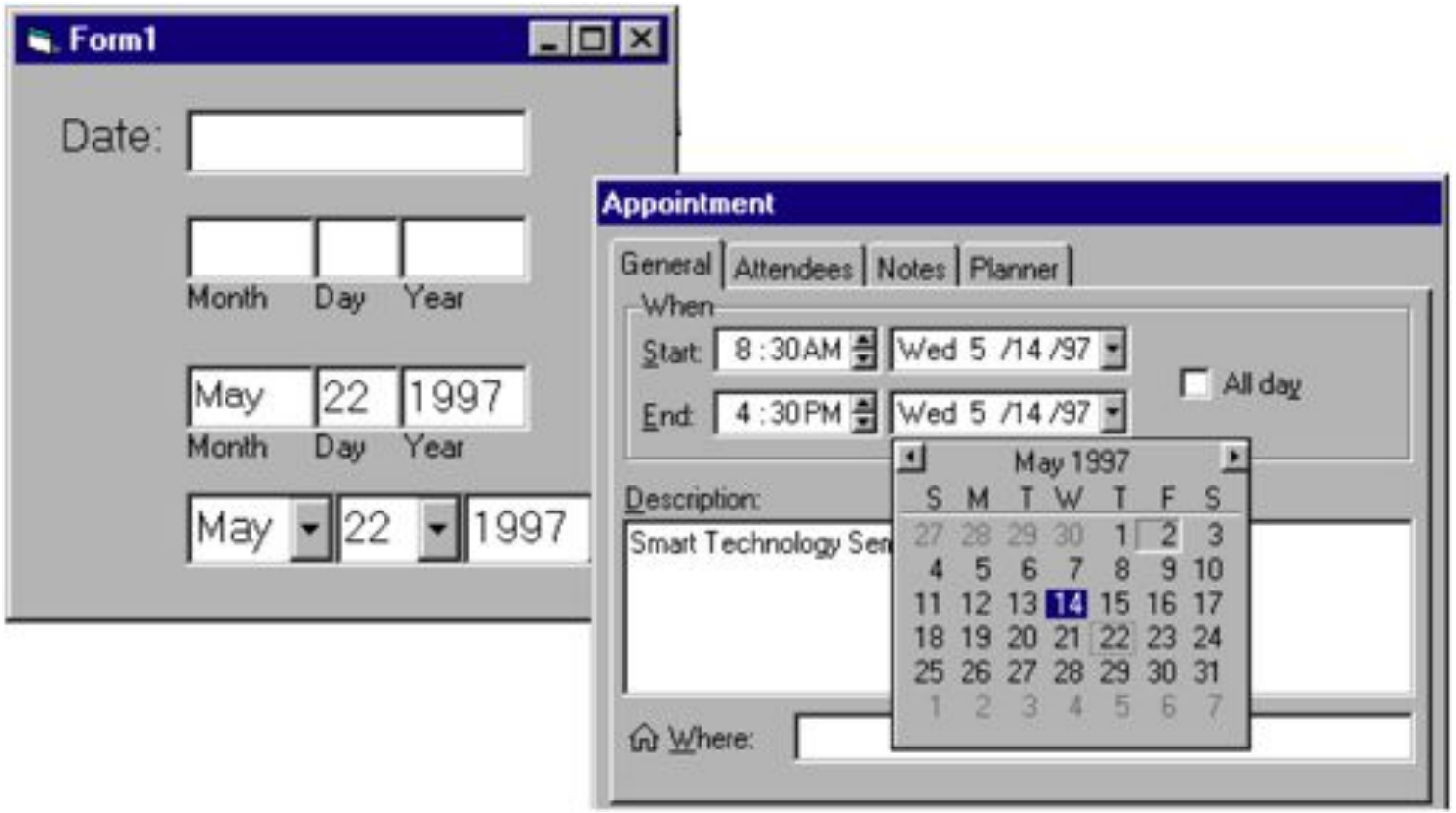
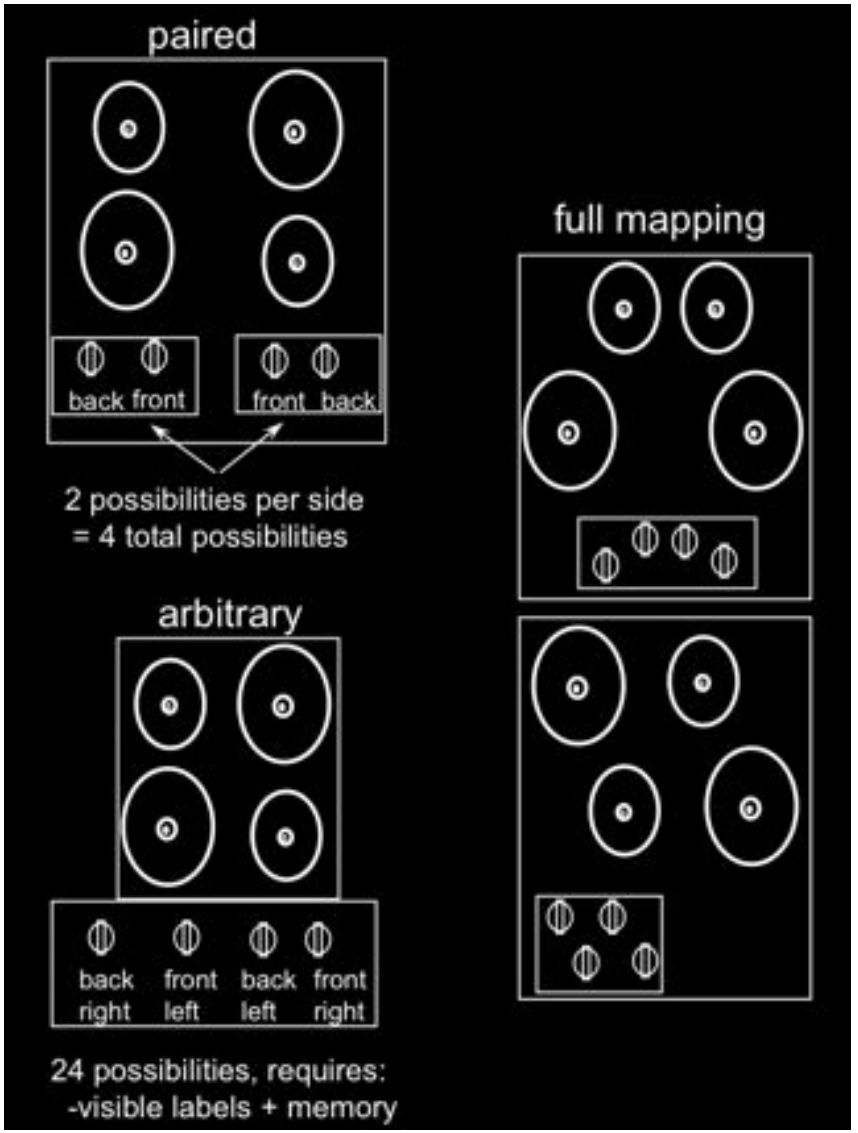


Constraints

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


paired
back front
front back
2 possibilities per side
= 4 total possibilities
full mapping
arbitrary
back right
front left
back left
front right
24 possibilities, requires:
-visible labels + memory

Mapping

Mapping

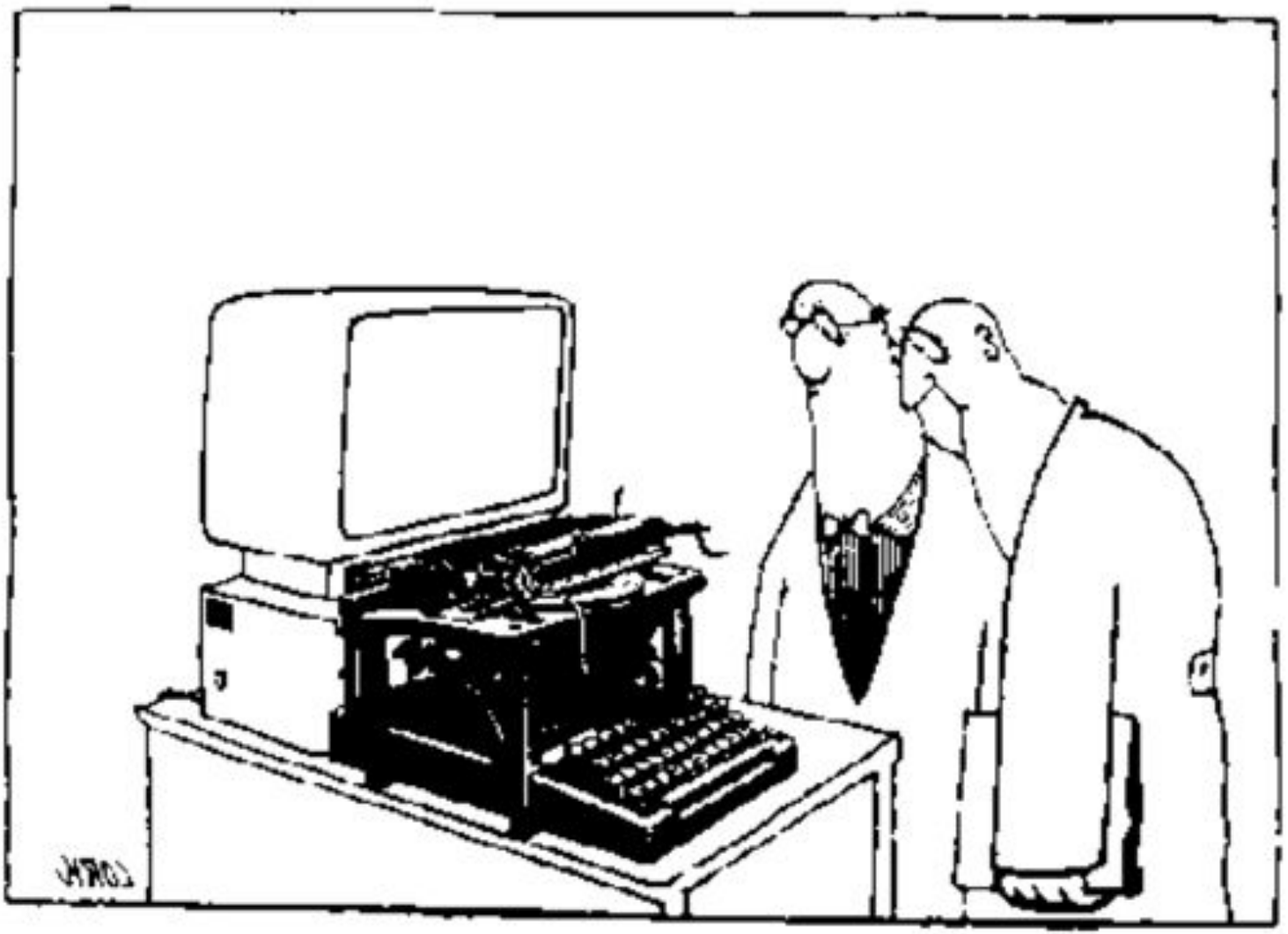
Mapping

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



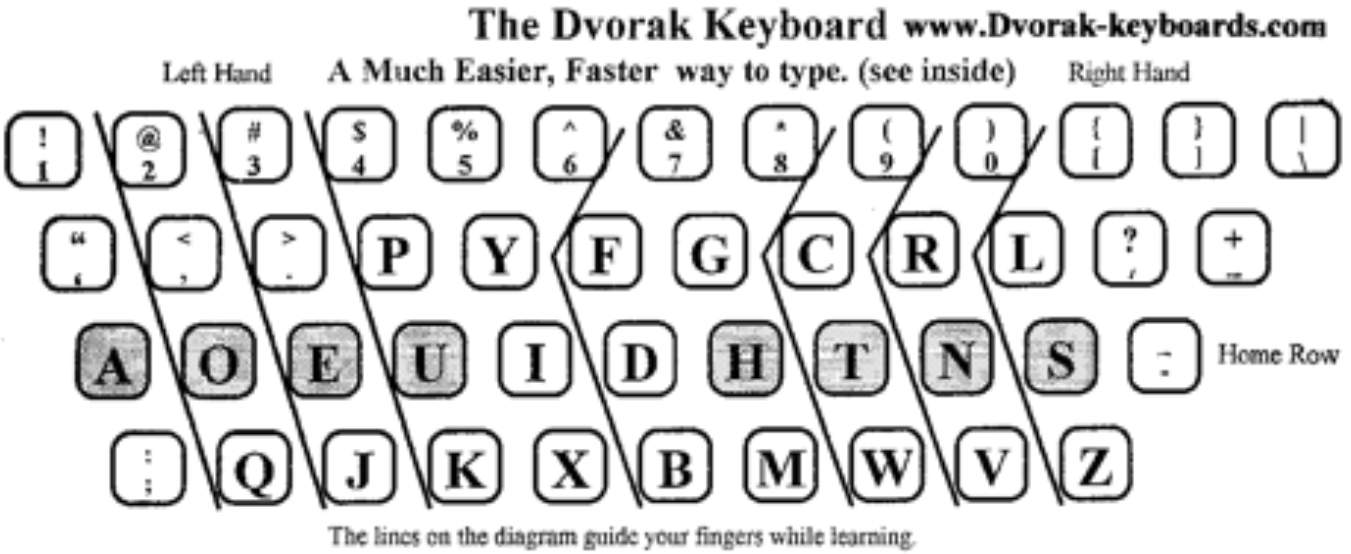
Transfer Effects

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



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

Individual Differences: Unexpected Outcomes

- Your assumptions may not match users
- Use case might be different from what you intended
- Moral: Keep things as simple and general as possible

Examples

Examples

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WIMP

- **W**indows, **I**con, **M**enu, **P**ointing Device

WIMP

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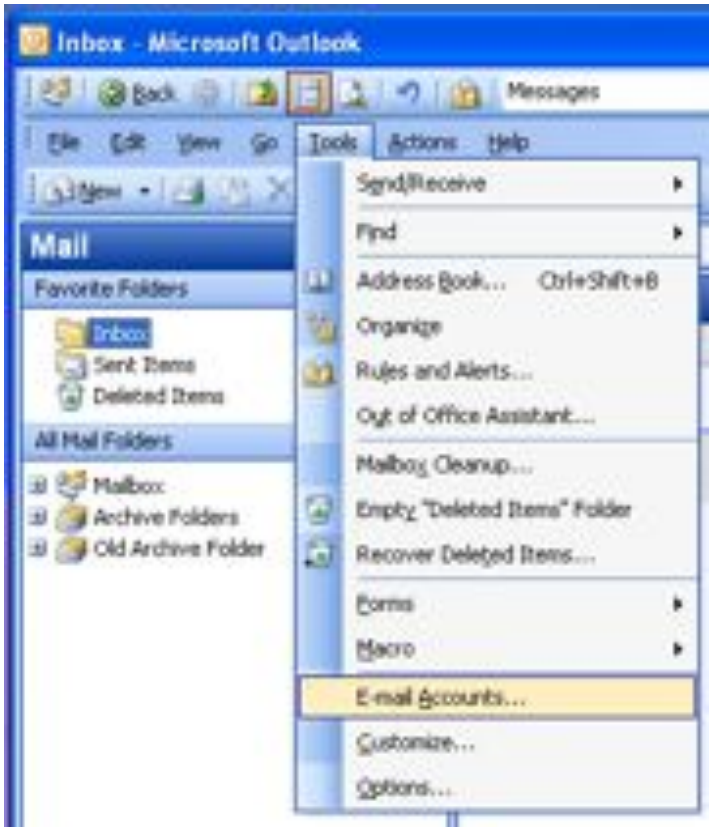


WIMP

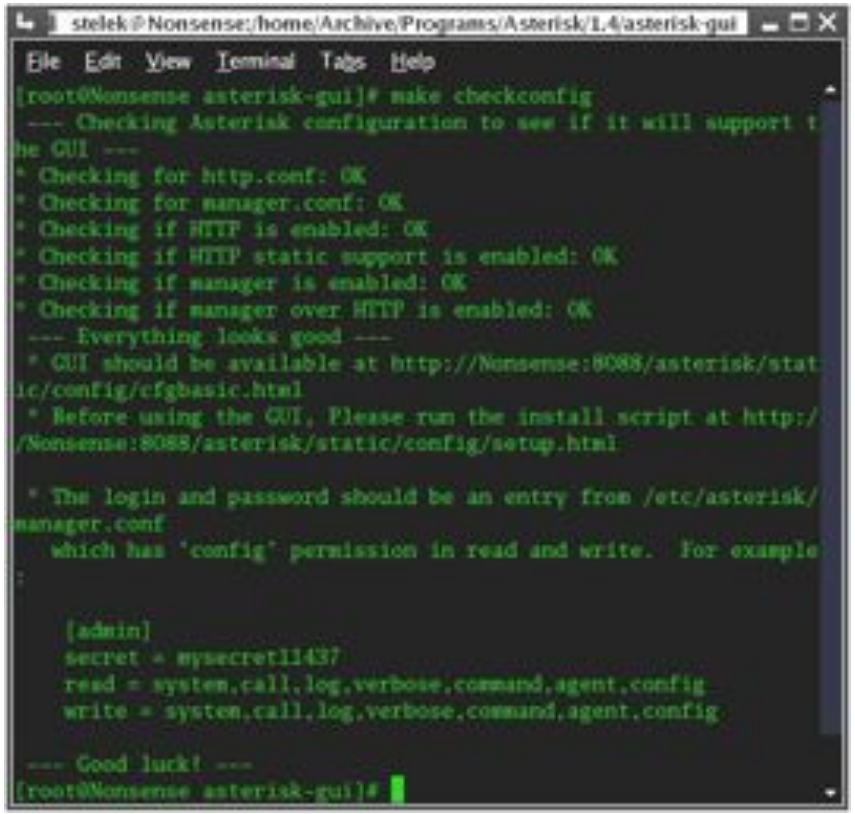
- **W**indows, **I**con, **M**enu, **P**ointing Device

WIMP

- **W**indows, **I**con, **M**enu, **P**ointing 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)

CLI

- 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)

CLI

- Bigger programs are invoked in the same way
- emacs, vi, sqlite3 (subject of HW3)

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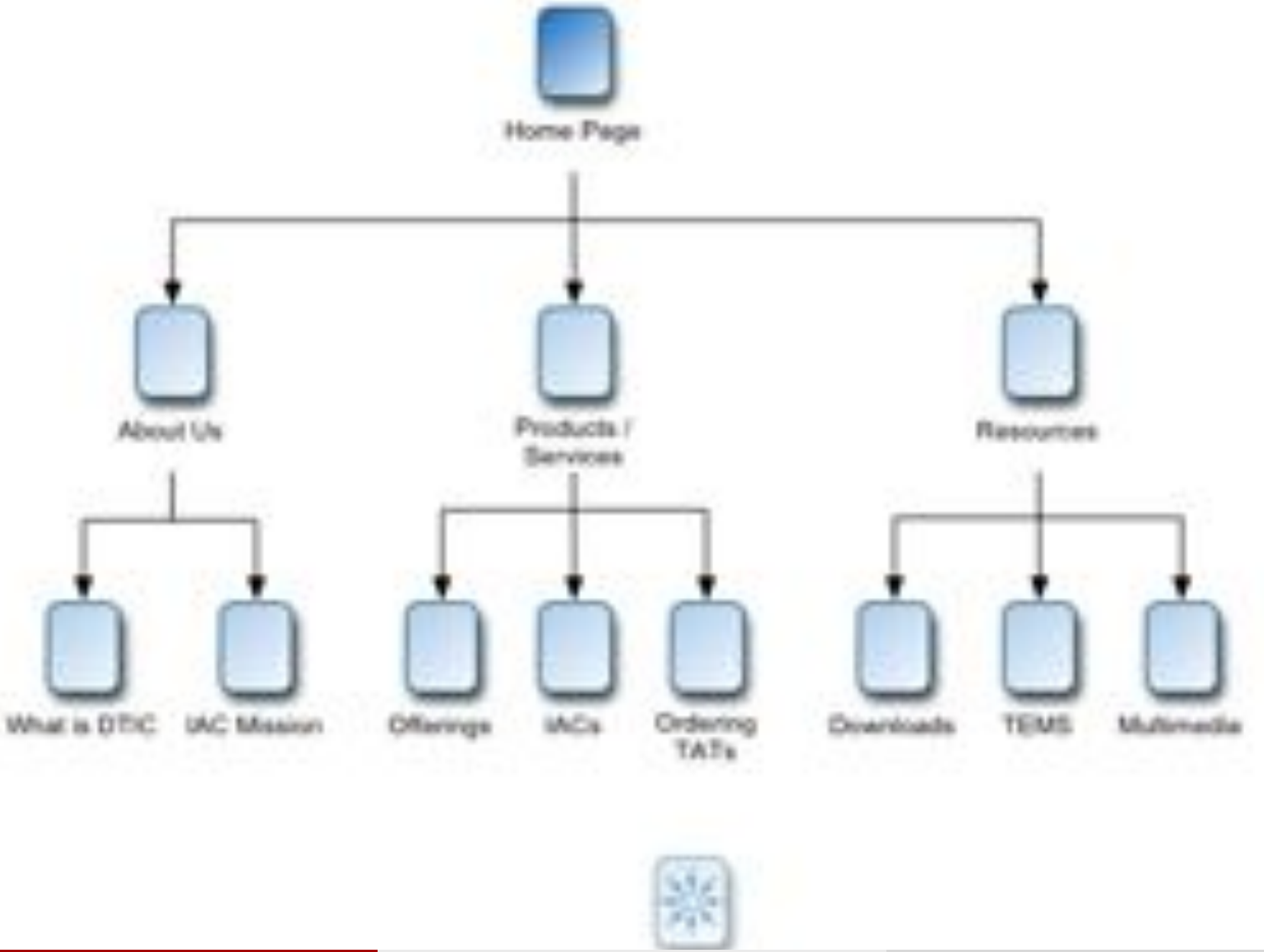
Information Architecture

- The design of an "information space" to facilitate access to content
- Consists of two components:
  - Static design
  - Interaction design

Static 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



Designing CRAPpy Pages

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

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Designing CRAPpy Pages

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Designing CRAPpy Pages

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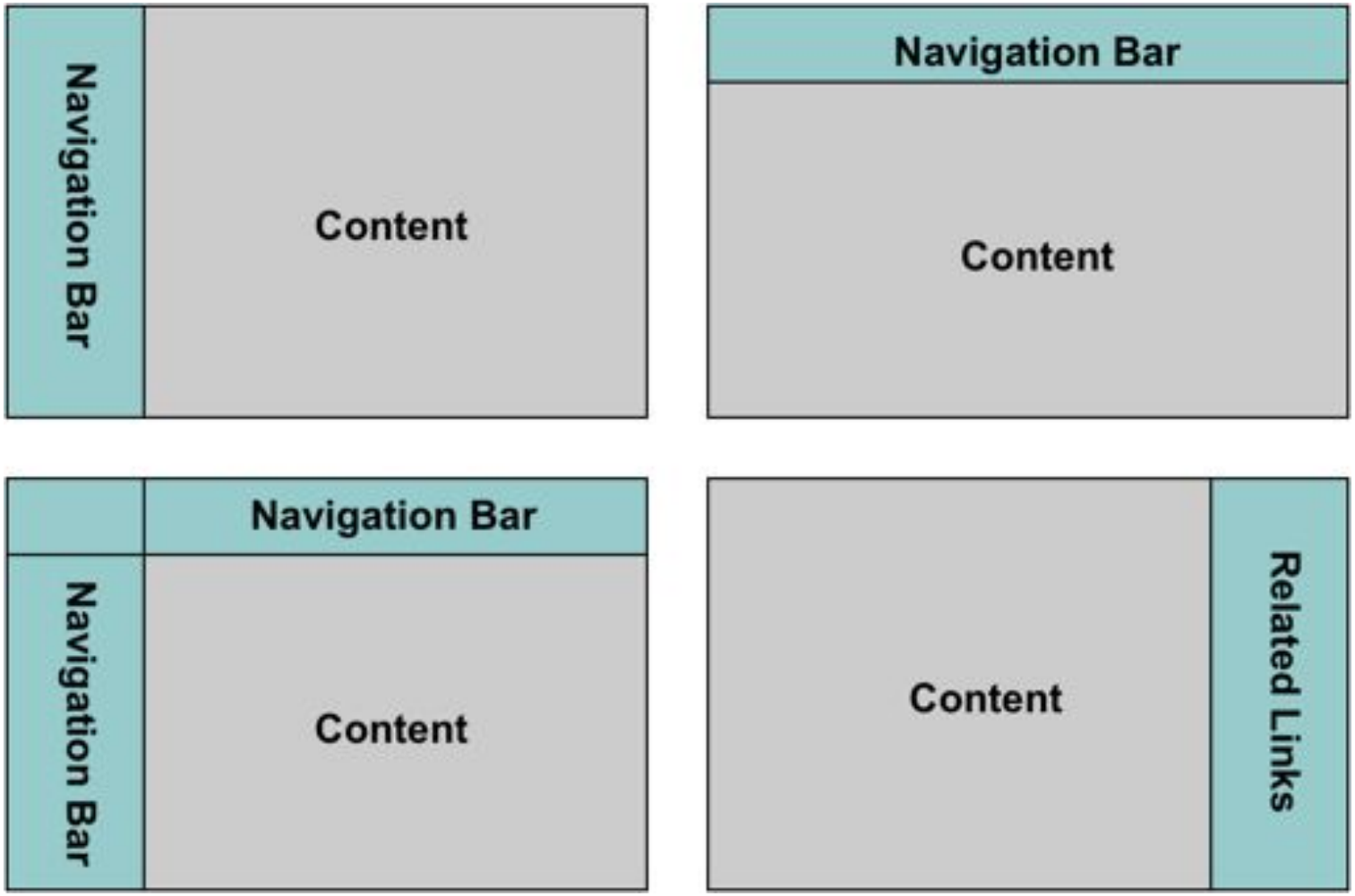
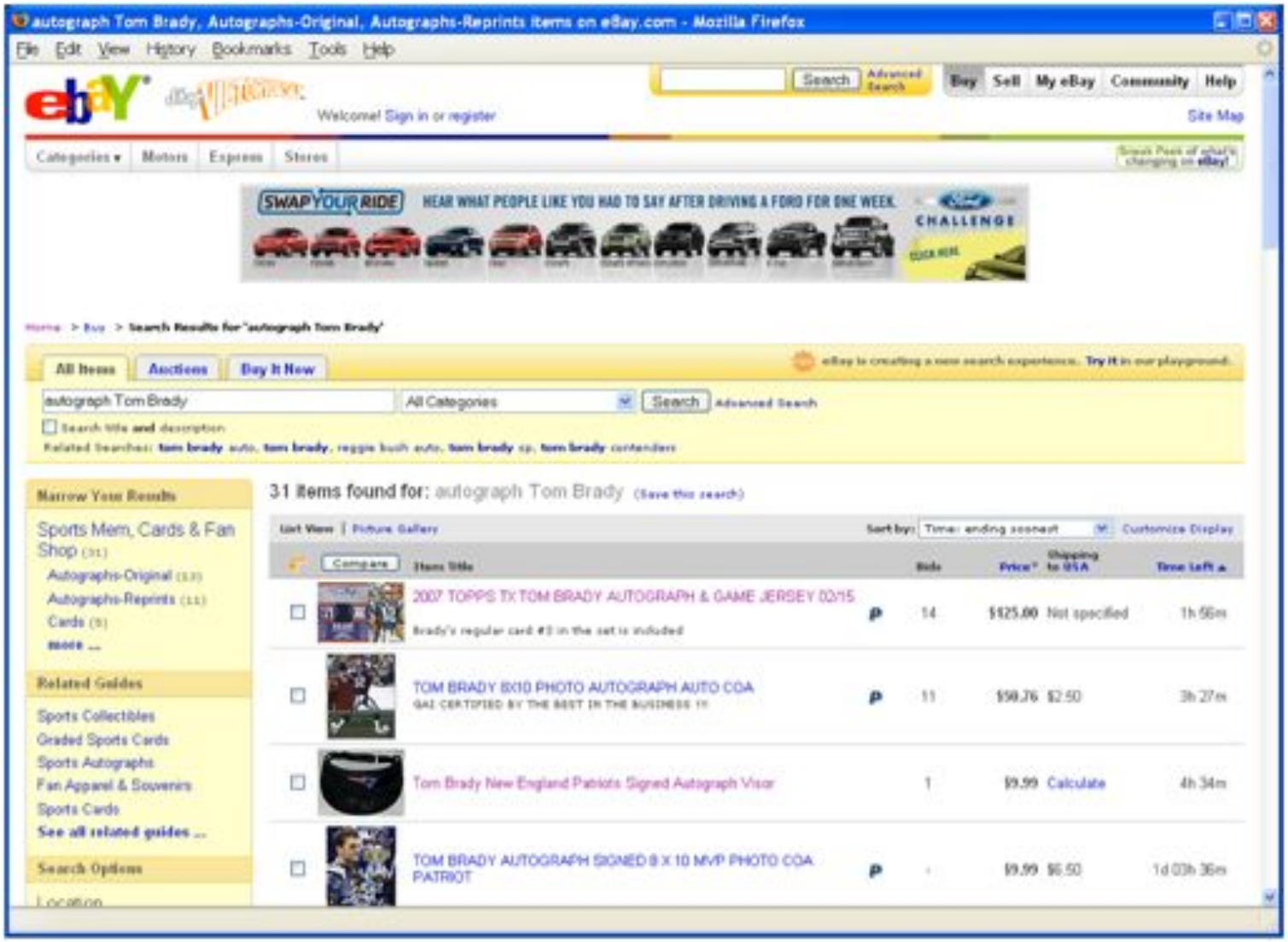
- **Alignment**: visually connect elements
  - to create flow
- **Proximity**: make effective use of spacing
  - to group related elements
  - to separate unrelated elements

Screen Design: Use Grids



Screen Design: Ebay



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Screen Design: New York Times

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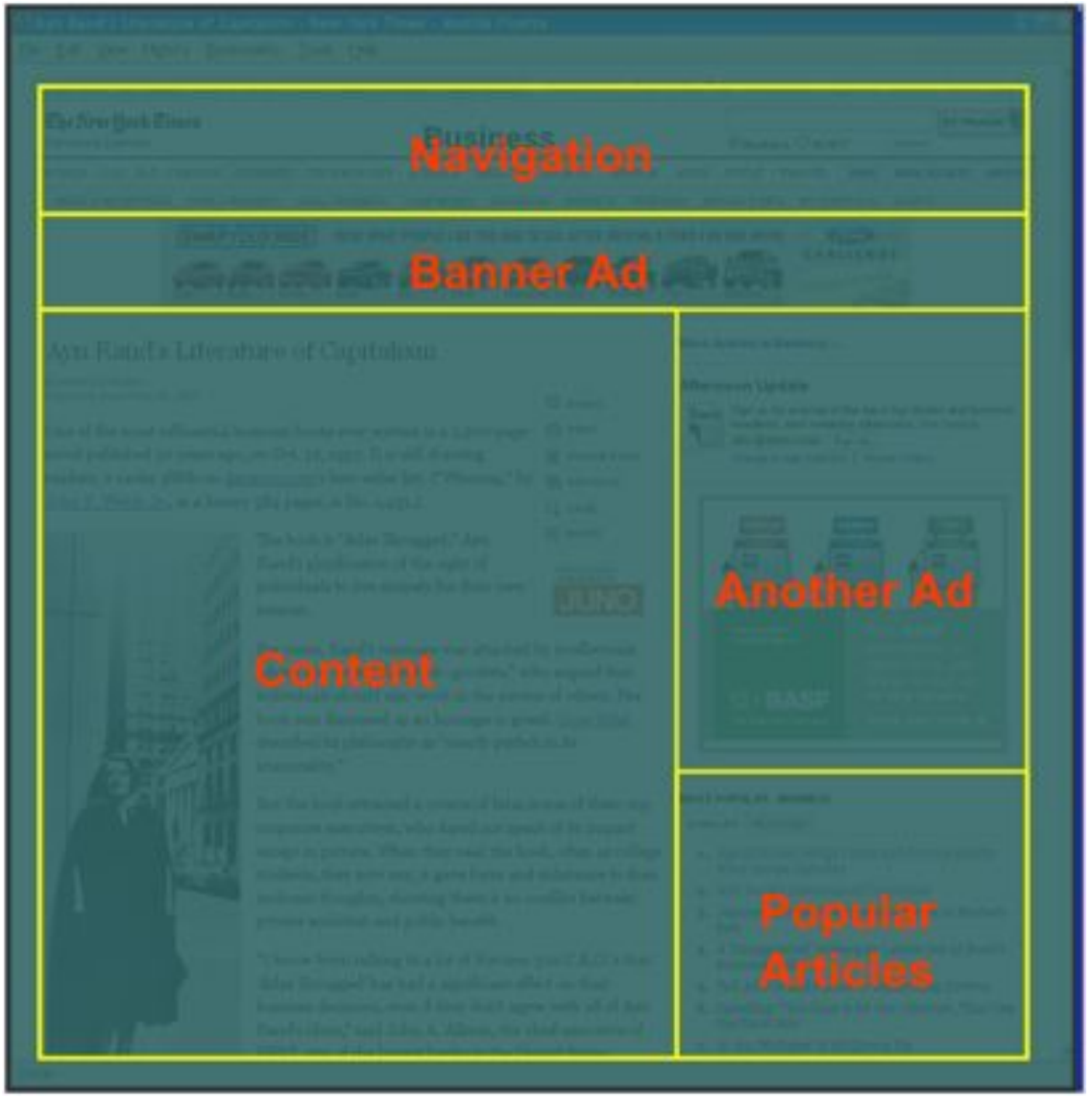


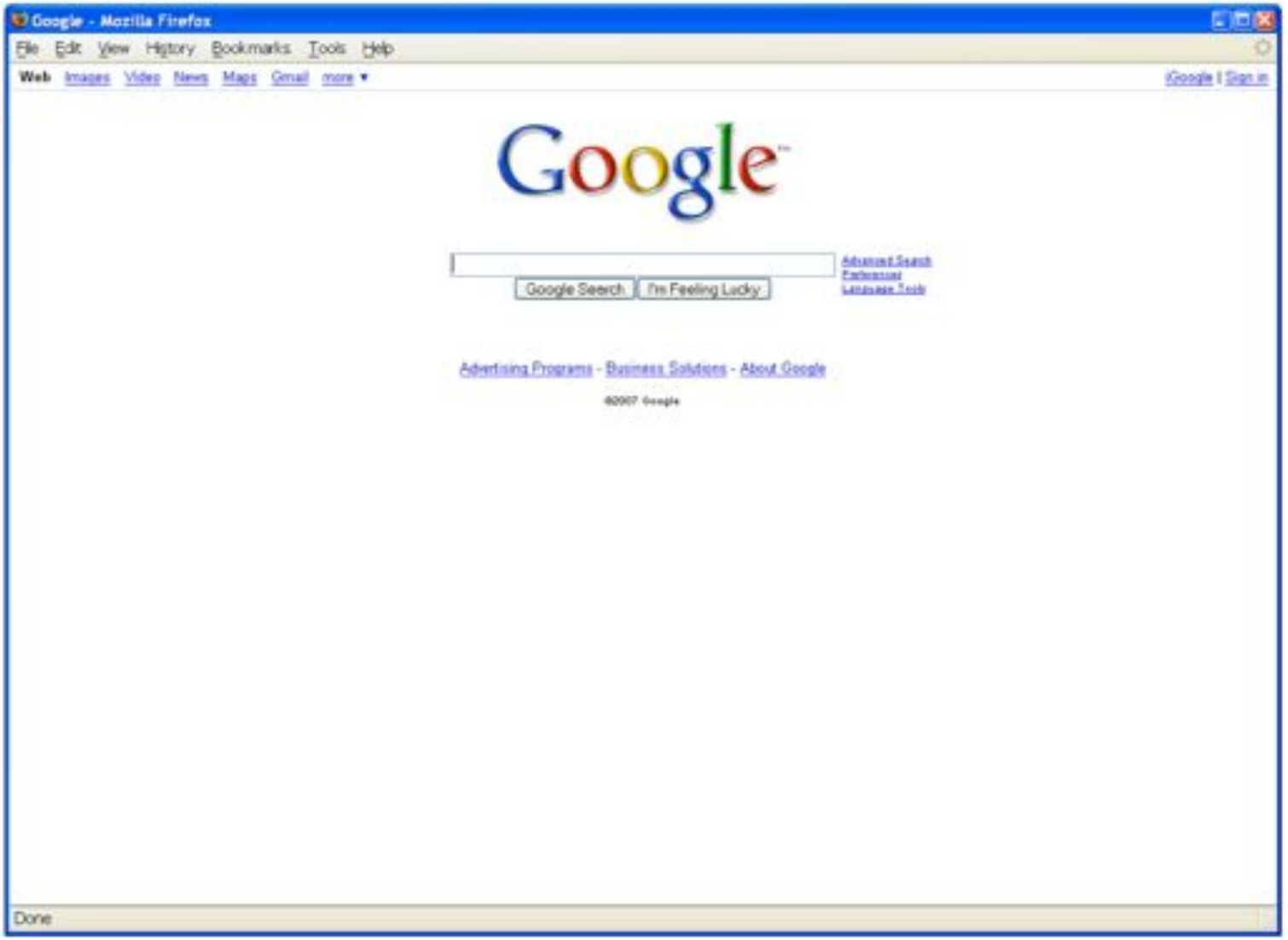
Screen Design: Amazon

Screen Design: Amazon

Interaction Design

- 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



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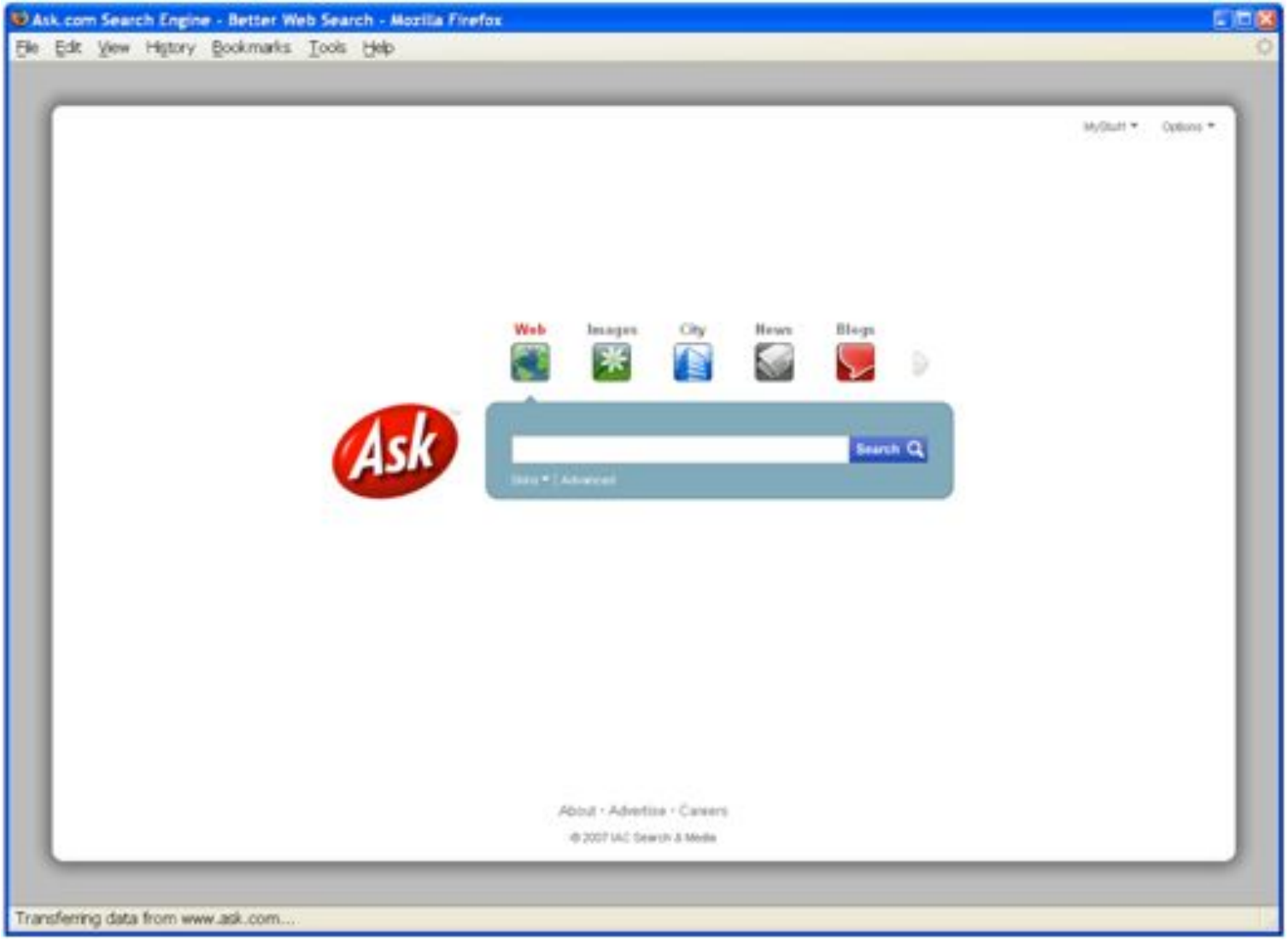

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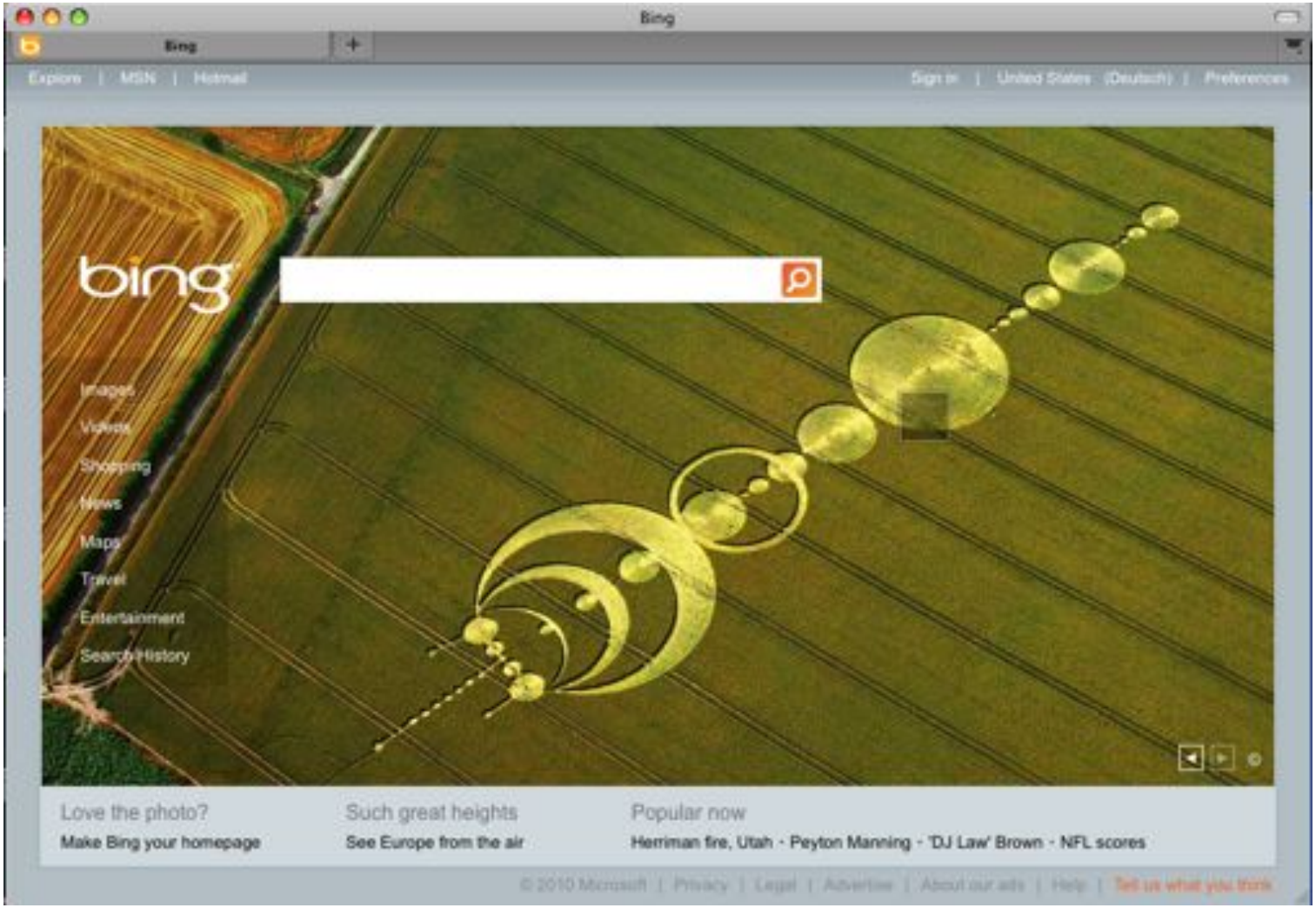
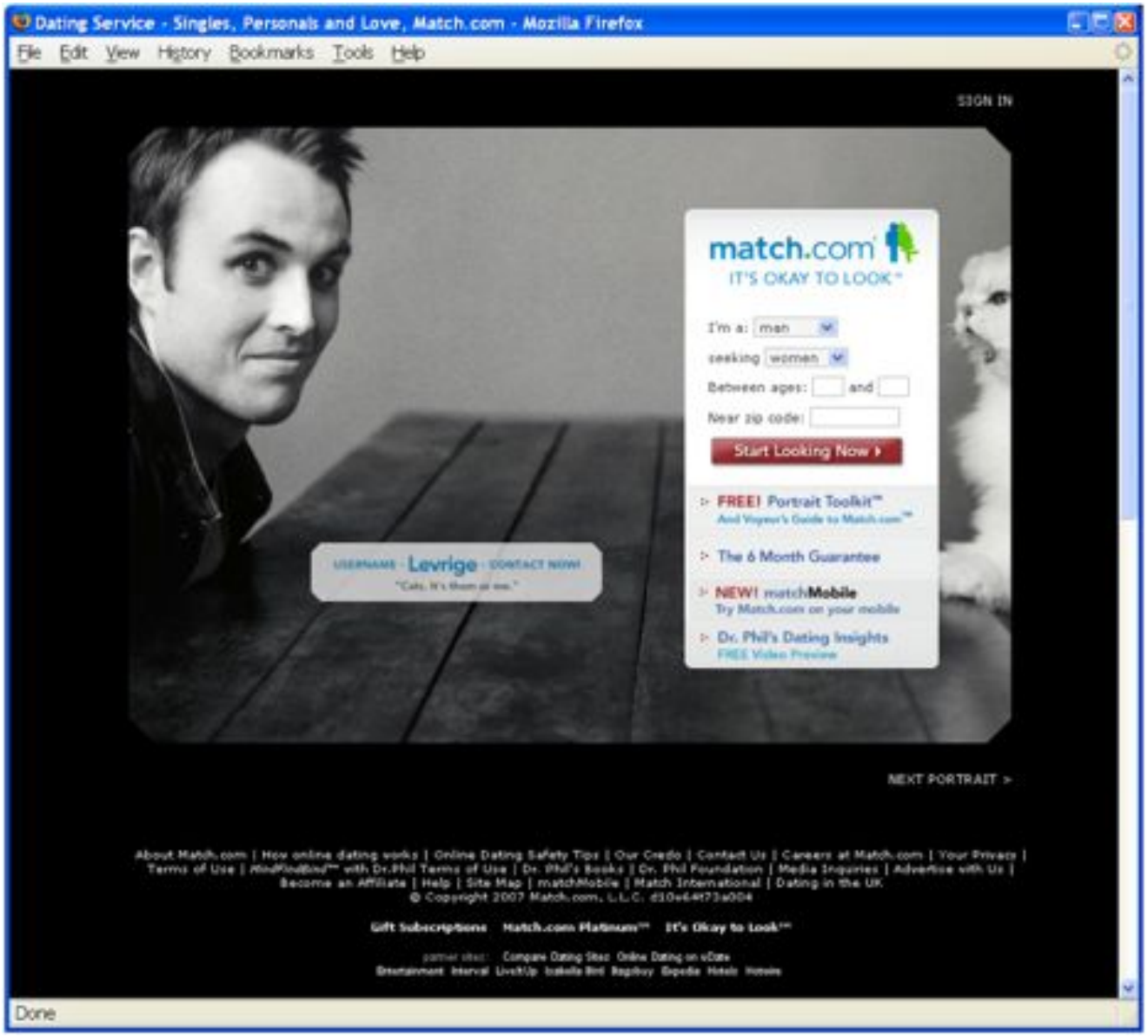
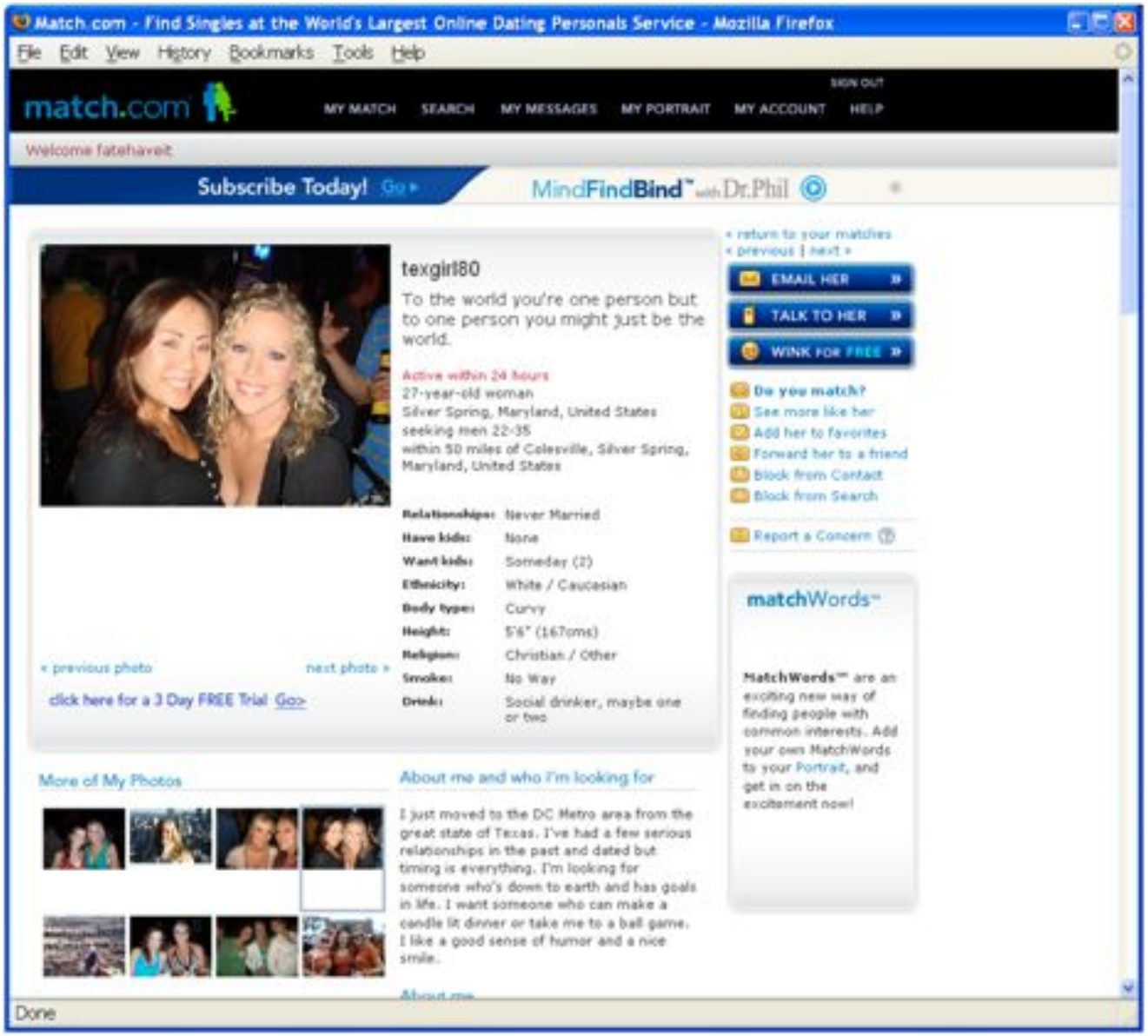


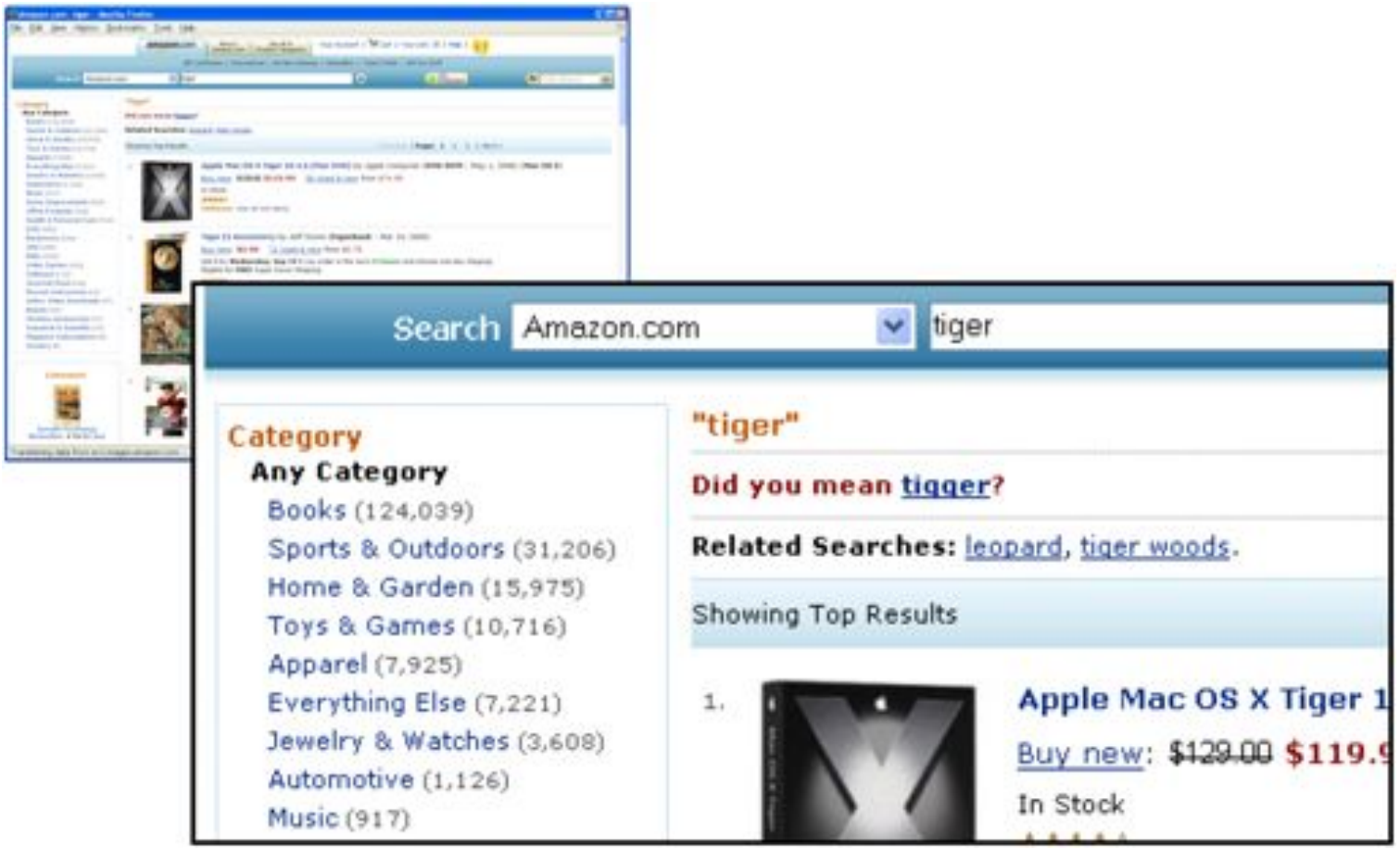
Opening Moves



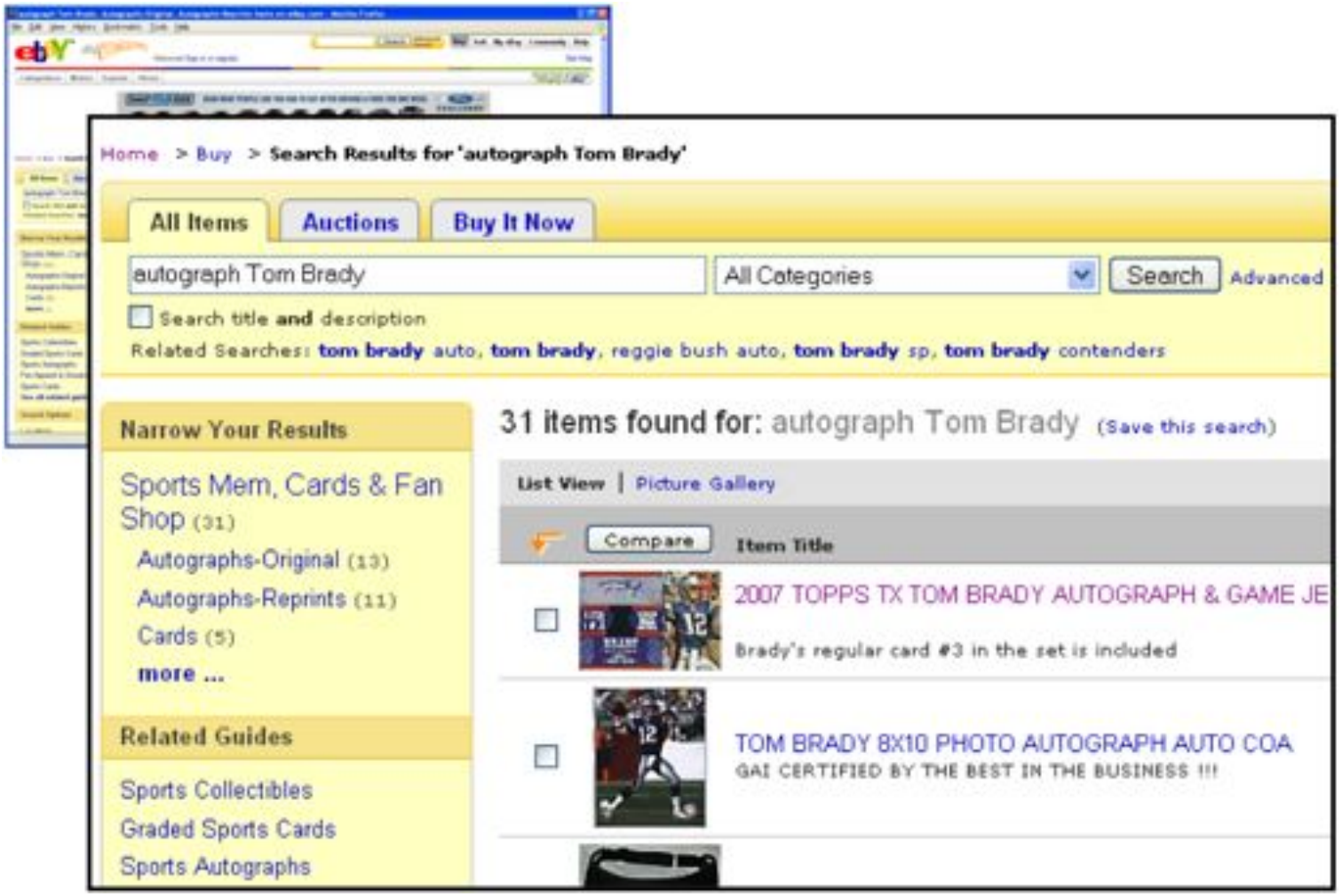
Endgame


Match.com - Find Singles at the World's Largest Online Dating Personals Service - Mozilla Firefox
File Edit View History Bookmarks Tools Help
match.com
SIGN OUT
MY MATCH SEARCH MY MESSAGES MY PORTRAIT MY ACCOUNT HELP
Welcome fatehaveit
Subscribe Today! Go
MindFindBind with Dr.Phil
texgirl80
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 type: Curvy
Height: 5'6" (167cms)
Religion: Christian / Other
Smoke: No Way
Drink: Social drinker, maybe one or two
« previous photo
next photo »
click here for a 3 Day FREE Trial! Go>
« return to your matches
« previous | next »
EMAIL HER
TALK TO HER
WINK FOR FREE
Do you match?
See more like her
Add her to favorites
Forward her to a friend
Block from Contact
Block from Search
Report a Concern
matchWords™
MatchWords™ are an exciting new way of finding people with common interests. Add your own MatchWords to your Portrait, and get in on the excitement now!
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 candle lit dinner or take me to a ball game. I like a good sense of humor and a nice smile.
About me
Done

Middle Game


Search
Amazon.com
tiger
Category
Any Category
Books (124,039)
Sports & Outdoors (31,206)
Home & Garden (15,975)
Toys & Games (10,716)
Apparel (7,925)
Everything Else (7,221)
Jewelry & Watches (3,608)
Automotive (1,126)
Music (917)
"tiger"
Did you mean tigger?
Related Searches: leopard, tiger woods.
Showing Top Results
1.
Apple Mac OS X Tiger 1
Buy new: $129.00 $119.9
In Stock

Middle Game


Home > Buy > Search Results for 'autograph Tom Brady'
All Items
Auctions
Buy It Now
autograph Tom Brady
All Categories
Search
Advanced
Search title and description
Related Searches: tom brady auto, tom brady, reggie bush auto, tom brady sp, tom brady contenders
Narrow Your Results
Sports Mem, Cards & Fan Shop (31)
Autographs-Original (13)
Autographs-Reprints (11)
Cards (5)
more ...
Related Guides
Sports Collectibles
Graded Sports Cards
Sports Autographs
31 items found for: autograph Tom Brady
(Save this search)
List View | Picture Gallery
Compare
Item Title
2007 TOPPS TX TOM BRADY AUTOGRAPH & GAME JE
Brady's regular card #3 in the set is included
TOM BRADY 8X10 PHOTO AUTOGRAPH AUTO COA
GAI CERTIFIED BY THE BEST IN THE BUSINESS !!!

Middle Game

ssNss00
5 more photos
ctive within 5 days
eetRachel1979
21 more photos
ctive within 5 days
Refine Your Search
I am
seeking
Man
Women
between
and
25
35
Online Now
Photos only
located within
50
miles of
20902
city/zip/postal
Basics
Appearance
Lifestyle
Background/Values
Search

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

Discussion

Accessible Pages

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?