HCI Design

Chapters 5, 9-11, 13-14

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Web & Media Group

Interaction Design Concepts

- Design principles
- Affordance, Constraints, and Mapping
- Feedback
- Visibility
- Conceptual models
- Other factors:
  - transfer effects
  - cultural associations
  - individual differences

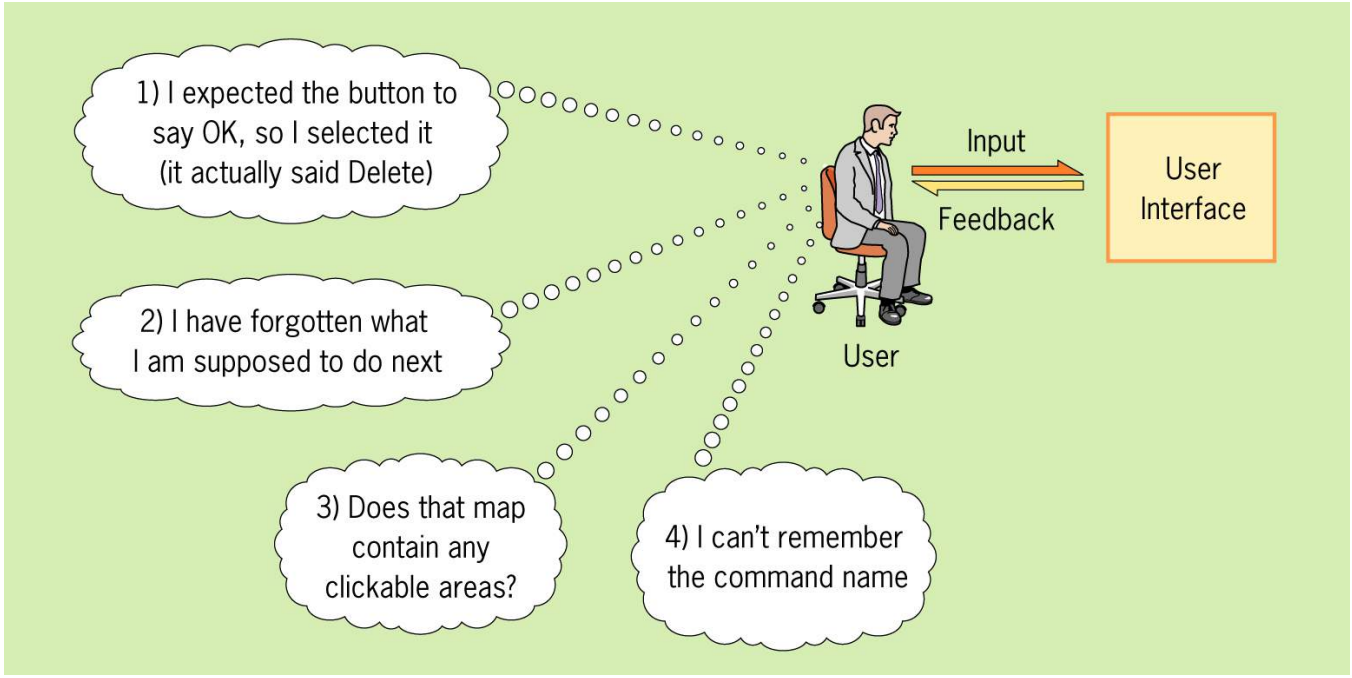

Start with people, not specs

Four psychological Principles

1. Users **See** What They Expect to See
2. Users Have Difficulty **Focusing** on More than One Activity at a Time
3. It Is Easier to Perceive a **Structured** Layout
4. It Is Easier to **Recognize** Something than to Recall It

Principle 1

User's confusions with the UI:



see what they want to see

people don't read

exploiting prior knowledge

consistency

Principle 2

Users Have Difficulty Focusing on More Than One Activity at a Time

- The Cocktail Party Effect
  - **Principle of Perceptual Organization**
    - **Group alike things together**
  - **Principle of Importance**
    - **Prominent display for important items**

Principle 3

It Is Easier to Perceive a Structured Layout

Destination	Flight	Carrier	Depart	Arrive	Rates Business	Rates Standard
Aberdeen	4171	BA	0845	0945	£155	£102
Dublin	664	FR	1035	1135	£149	£100
Toulouse	8064	AF	1110	1410	£307	£182
Frankfurt	4618	LH	1115	1355	£222	£152
Amsterdam	2045	UK	1130	1335	£222	£152
Copenhagen	8363	BA	1145	1445	£315	£187
Paris-CDG	1803	BA	1150	1400	£248	£165
Exeter	446	JY	1205	1305	£155	£102
Glasgow	1903	BA	1210	1310	£155	£102
Munich	4526	LH	1225	1525	£301	£179
Geneva	8413	BA	1235	1420	£222	£152
Aberdeen	4172	BA	1245	1345	£155	£102

(a)

Dest: Aberdeen (BA4171) Dep: 0845; Arr: 0945
(B/S: £155/102)
Dest: Dublin (FR664) Dep: 1035; Arr: 1135
(B/S: £149/100)
Dest: Toulouse (AF8064) Dep: 1110; Arr: 1410
(B/S: £307/182)
Dest: Frankfurt (LH4618) Dep: 1115; Arr: 1355
(B/S: £222/152)
Dest: Amsterdam (UK2045) Dep: 1130; Arr: 1335
(B/S: £222/152)
Dest: Copenhagen (BA8363) Dep: 1145; Arr: 1445
(B/S: £315/187)
Dest: Paris-CDG (BA1803) Dep: 1150; Arr: 1400
(B/S: £248/165)
Dest: Exeter (JY446) Dep: 1205; Arr: 1305
(B/S: £155/102)
Dest: Glasgow (BA1903) Dep: 1210; Arr: 1310
(B/S: £155/102)
Dest: Munich (LH4526) Dep: 1225; Arr: 1525
(B/S: £301/179)
Dest: Geneva (BA8413) Dep: 1235; Arr: 1420
(B/S: £222/152)
Dest: Aberdeen (BA4172) Dep: 1245; Arr: 1345
(B/S: £155/102)

(b)

- Law of proximity
- Law of similarity
- Law of closure
- Law of continuity
- Law of symmetry

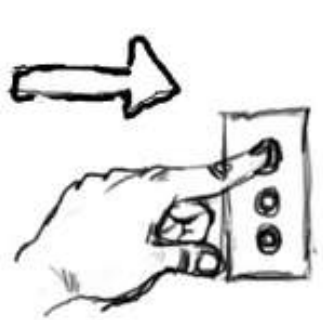
Principle 4

It Is Easier to Recognize Something Than to Recall It

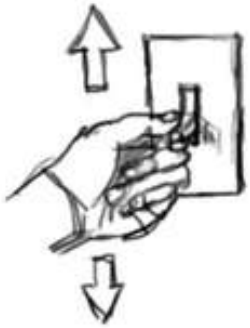
- Principle of recognition
- Knowledge in the **head** & Knowledge in the **world**

Principles from Experience: Affordance

It Should Be Obvious How a Control Is Used



Button - Push



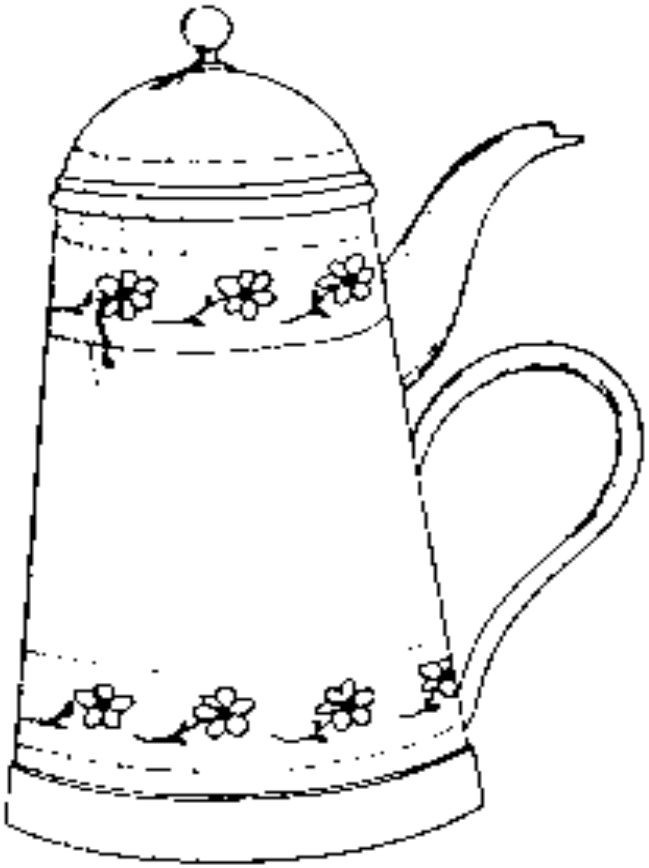
Switch - Flip

Knob - Rotate

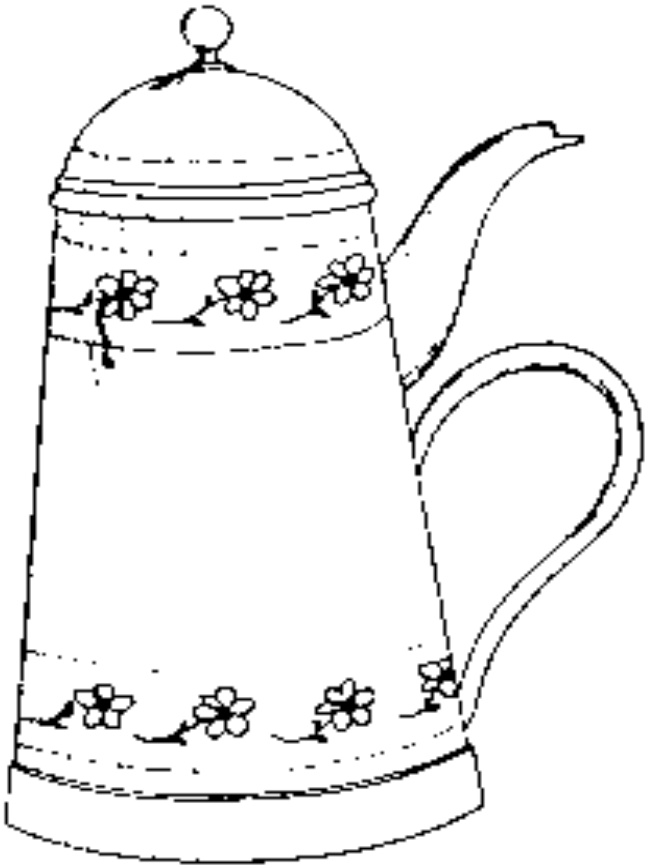
Affordances

- *The perceived and actual fundamental properties of the object that determine how it could possibly be used (Gibson 1977)*
- Some affordances are obvious, some learned
- Have suggestions or clues about to how to use these properties
- Can be dependent on the
  - Experience
  - Knowledge
  - Culture of the actor
- Can make an action easy or difficult

Affordances of a Teapot?



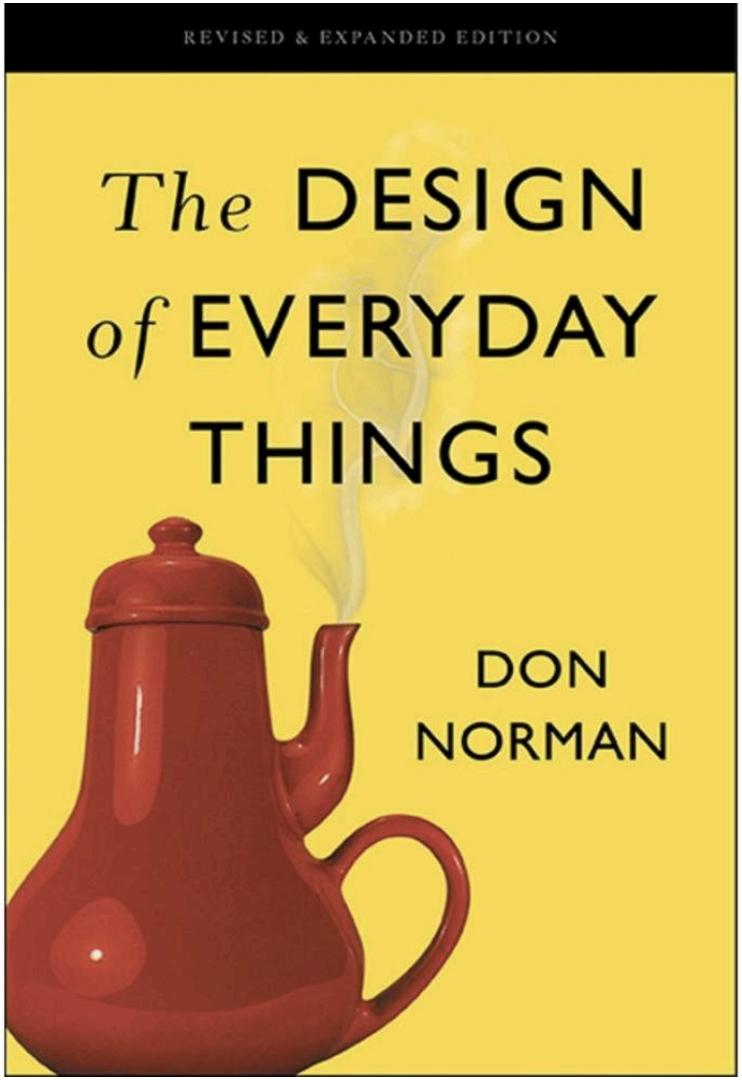
Affordances of a Teapot?



1.1 Carelman's Coffeepot for Masochists. The French artist Jacques Carelman in his series of books *Catalogue d'objets introuvables (Catalog of unfindable objects)* provides delightful examples of everyday things that are deliberately unworkable, outrageous, or otherwise ill-formed. Jacques Carelman: "Coffeepot for Masochists." Copyright © 1969–76–80 by Jacques Carelman and A. D. A. G. P. Paris. From Jacques Carelman, *Catalog of Unfindable Objects*, Balland, éditeur, Paris-France. Used by permission of the artist.

Affordances of a Teapot?

Affordances of a Teapot?



Affordances in Screen-based UI

In graphical, screen-based UI:

- designer has control over perceived affordances
  - display screen
  - pointing device
  - selection buttons
  - keyboard
- afford touching
- pointing
- looking
- clicking on every pixel of the display

- Buttons & links

- Drop-down arrows

- Texture

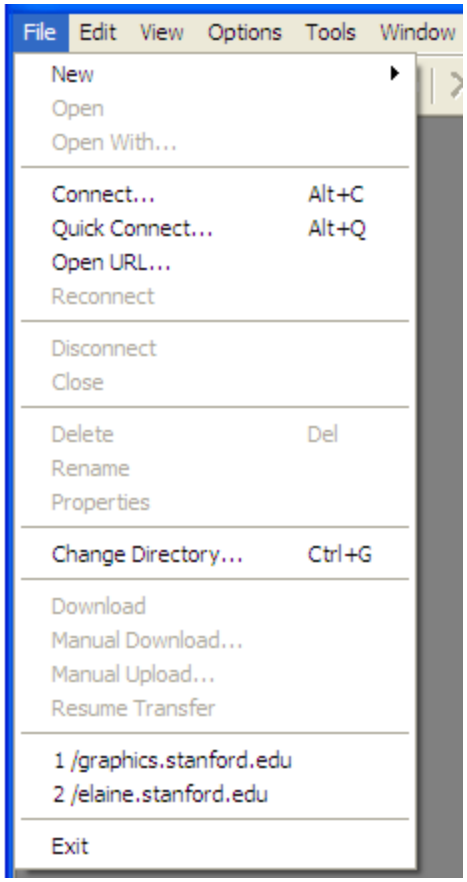
- Mouse cursor

- Highlight on mouseover

Based on slide by Saul Greenberg

Constraints

- Restricting interaction to reduce errors

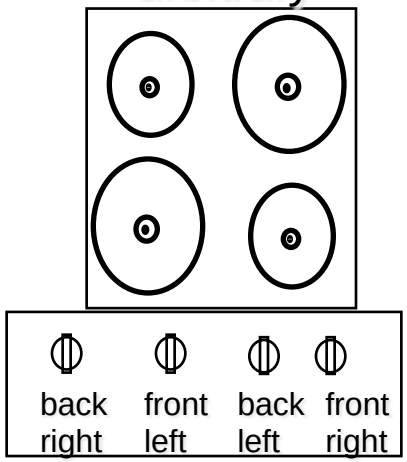


Mappings

- Relationships between controls and their results
- For devices, appliances
  - natural mappings use constraints and correspondences in the physical world
    - Controls on a stove
    - Controls on a car
      - Radio volume
        - » Knob goes left to right to control volume
        - » Should also go in and out for front to rear speakers
- For computer UI design
  - mapping between controls and their actions on the computer
    - Controls on a digital watch
    - Controls on a word processor program

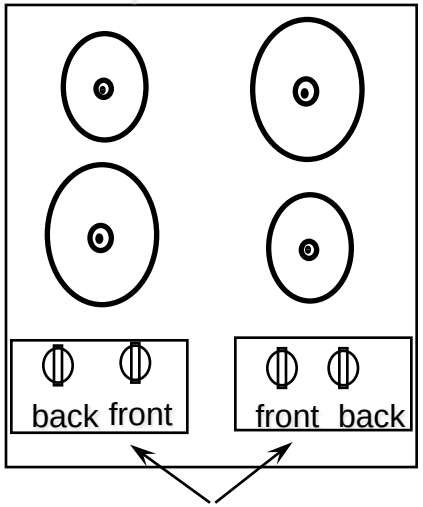
Mapping Controls to Physical Outcomes

arbitrary



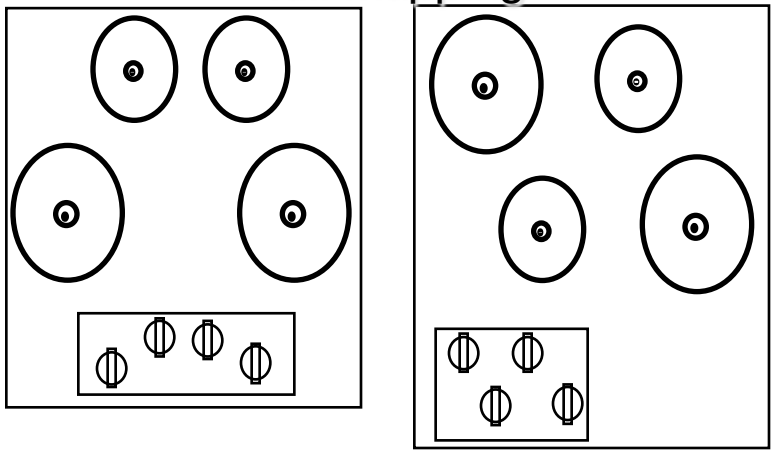
24 possibilities, requires:
-visible labels
-memory

paired



2 possibilities per side
=4 total possibilities

full mapping

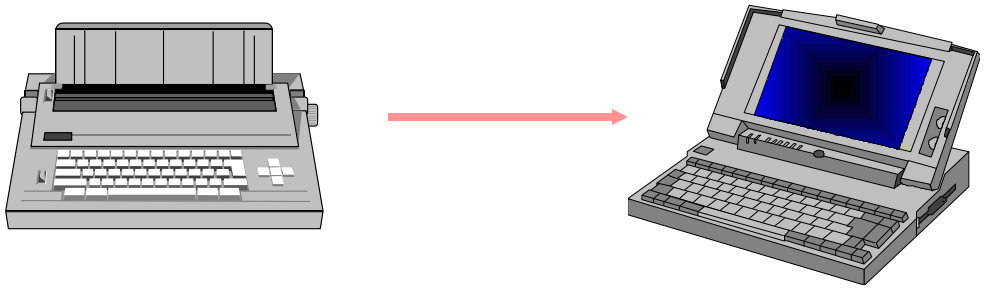


Slide adapted from Saul Greenberg

Transfer Effects

People transfer their expectations from familiar objects to similar new ones

- positive transfer: previous experience applies to new situation
- negative transfer: previous experience conflicts with new situation



Based on slide by Saul Greenberg

Visibility

- Making it obvious which actions are available

Consistency

- Similar functions are performed in the same way
- Identical terminology for identical operations

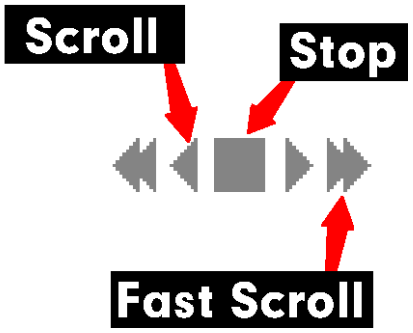
Feedback

- Send information about what is happening back to the user

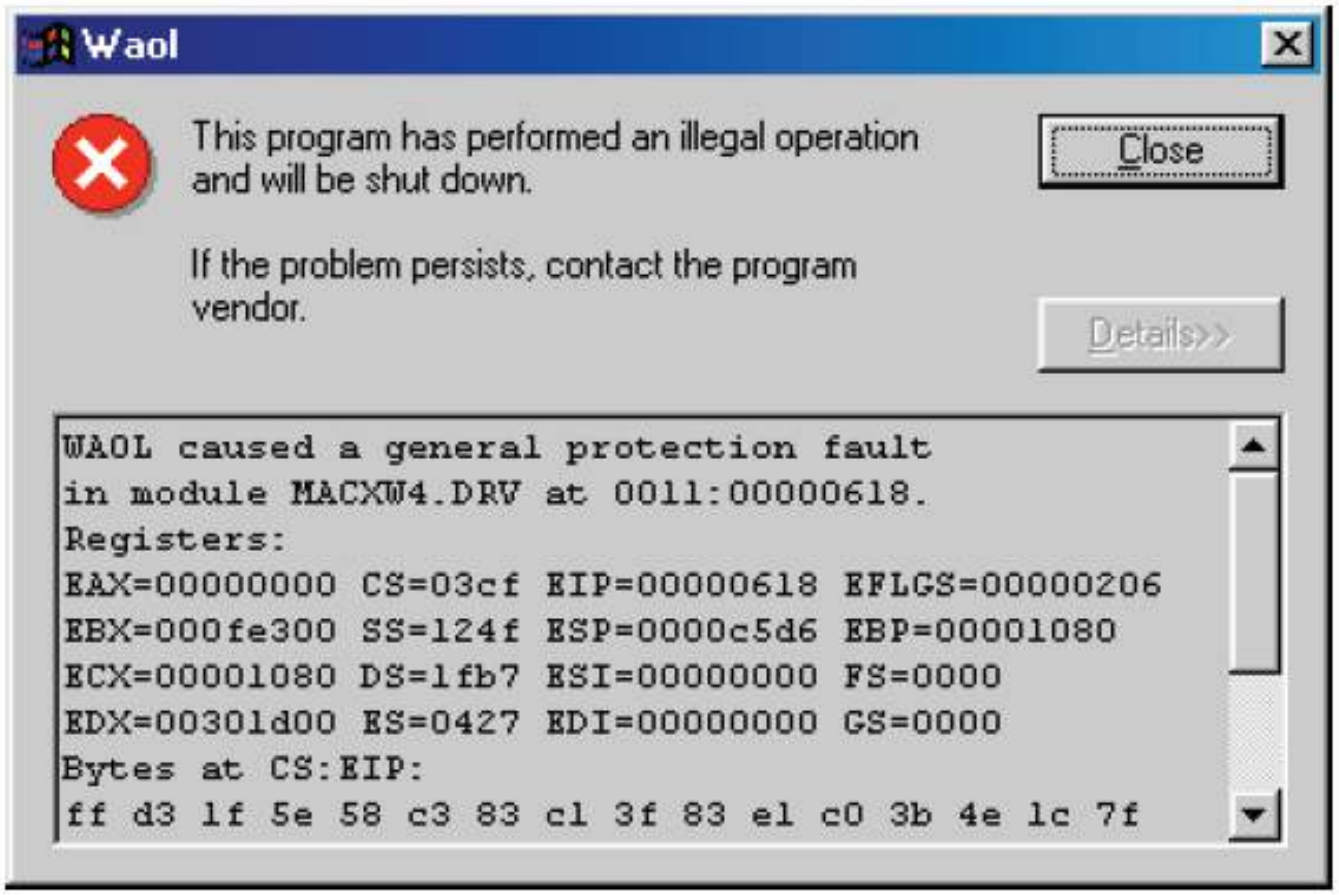
Feedback

The Principle of Feedback:

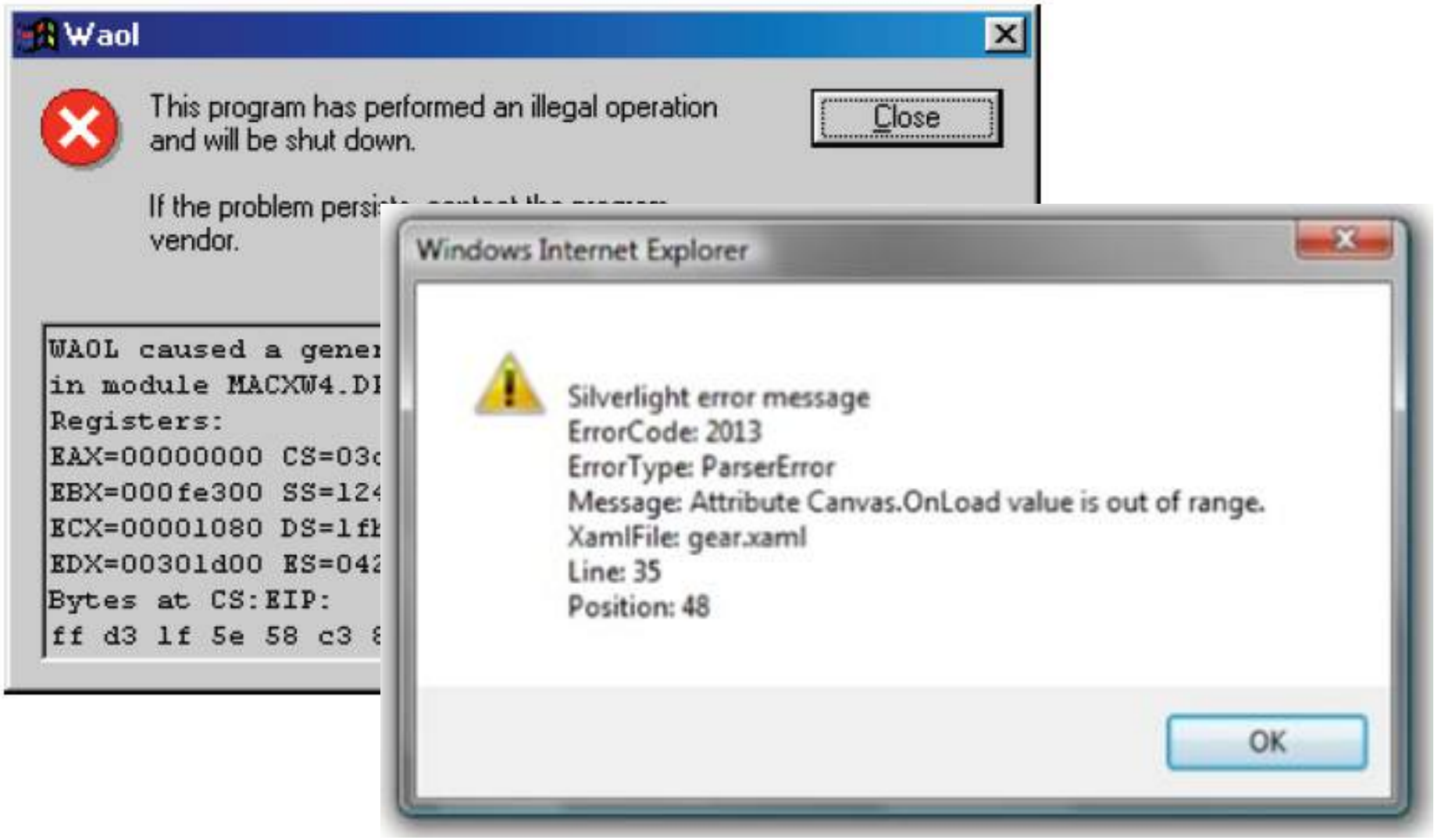
- It Should Be Obvious When a Control Has Been Used



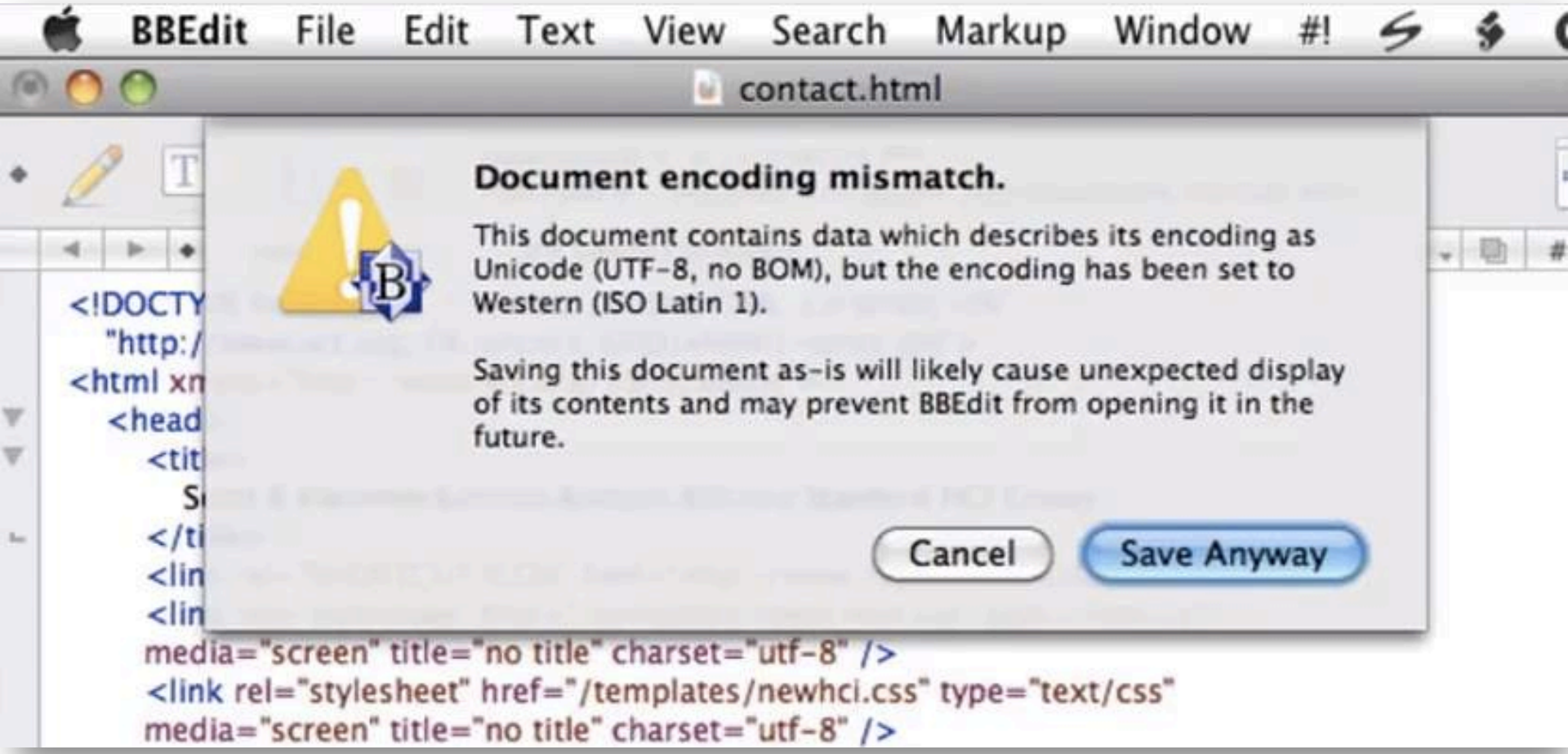
Feedback and Explanations



Feedback and Explanations



Feedback and Explanations



Feedback and Explanations

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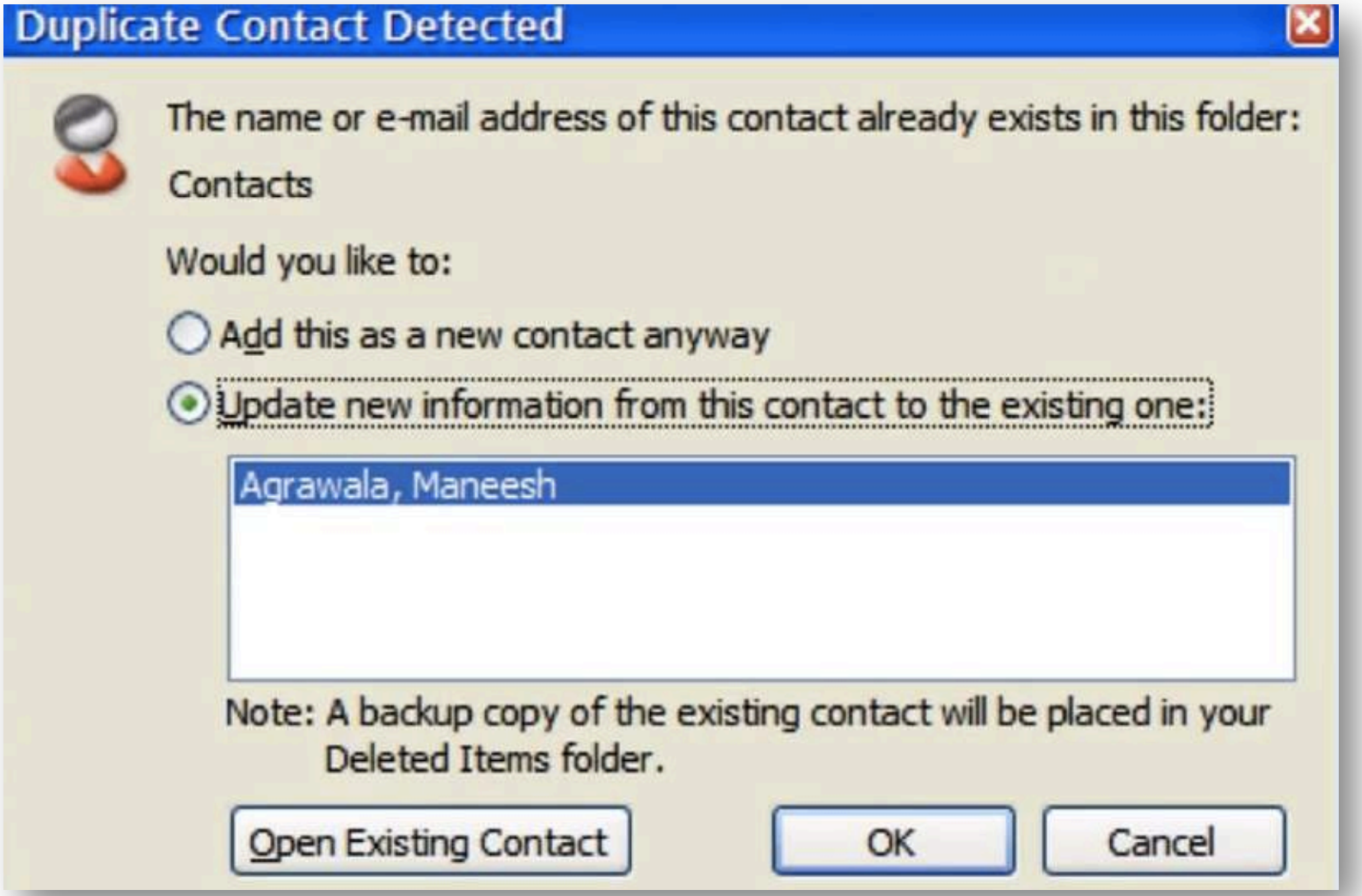

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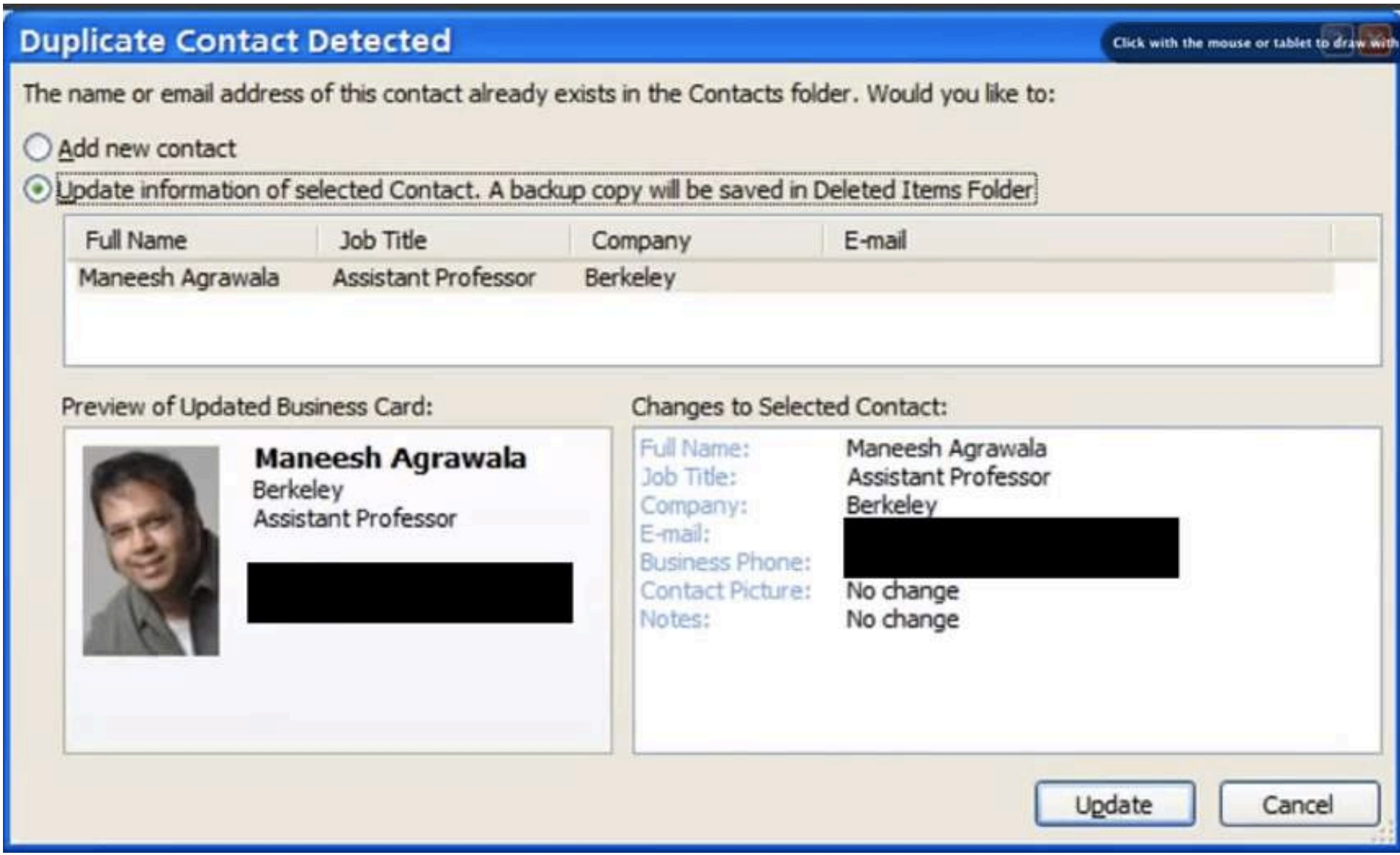

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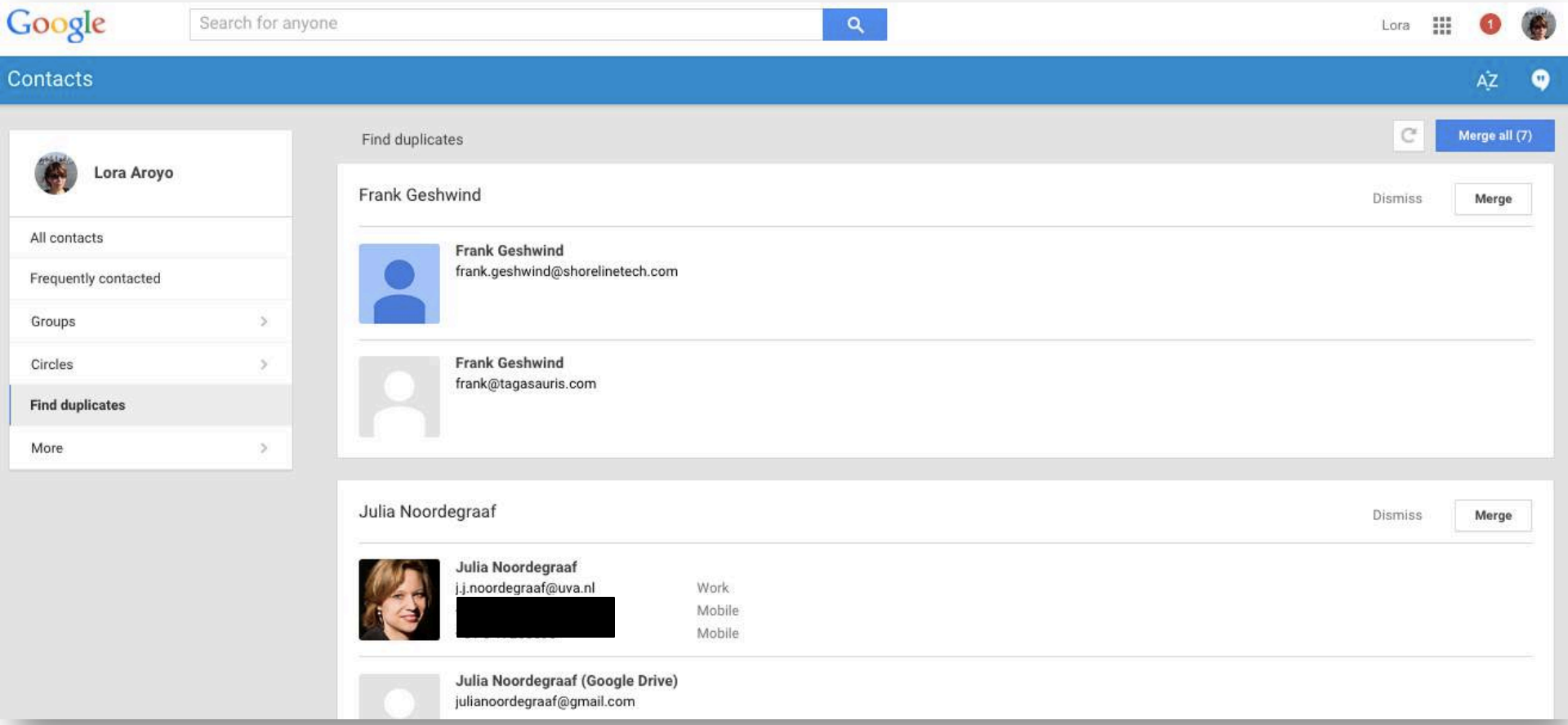
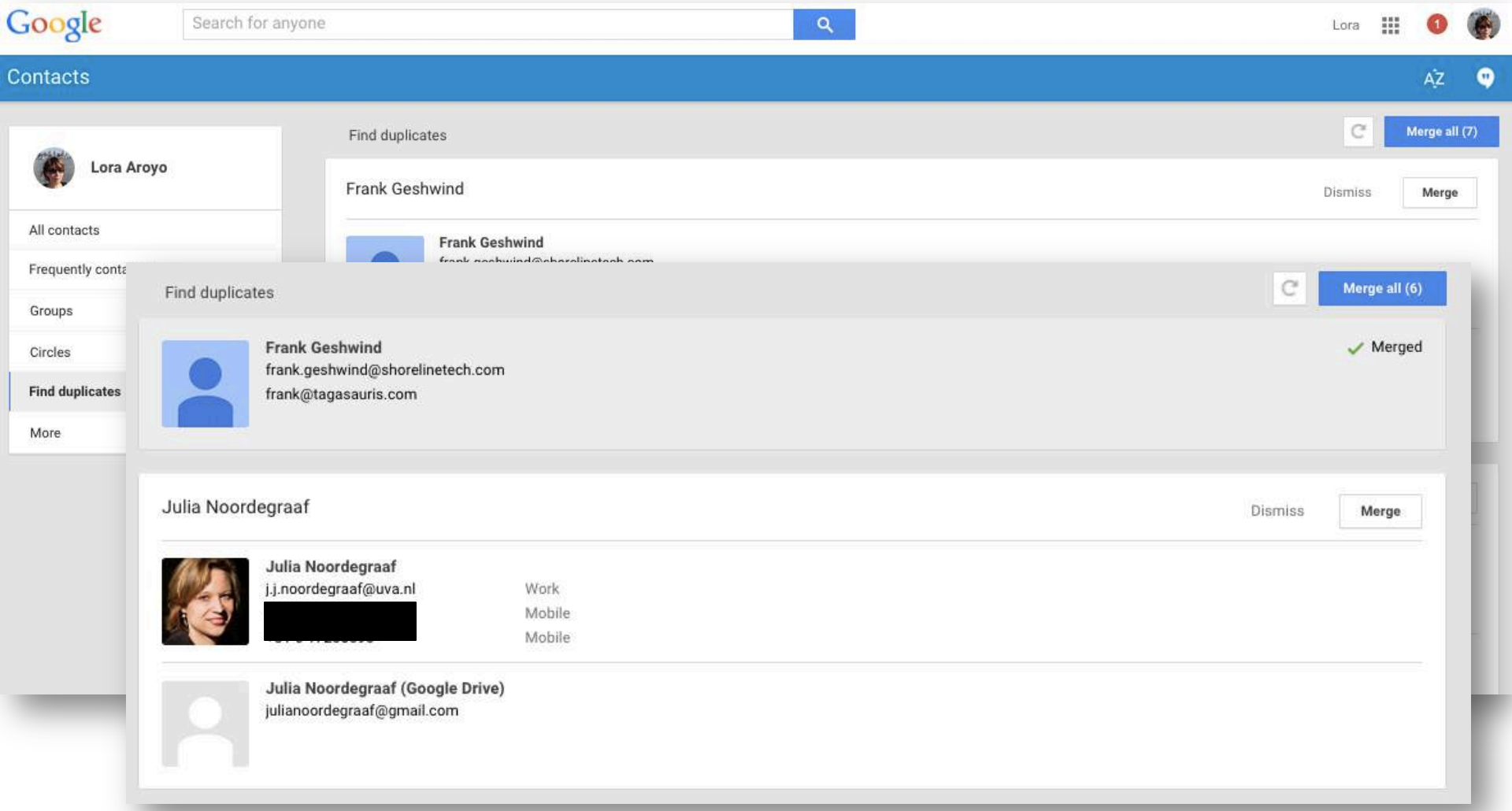
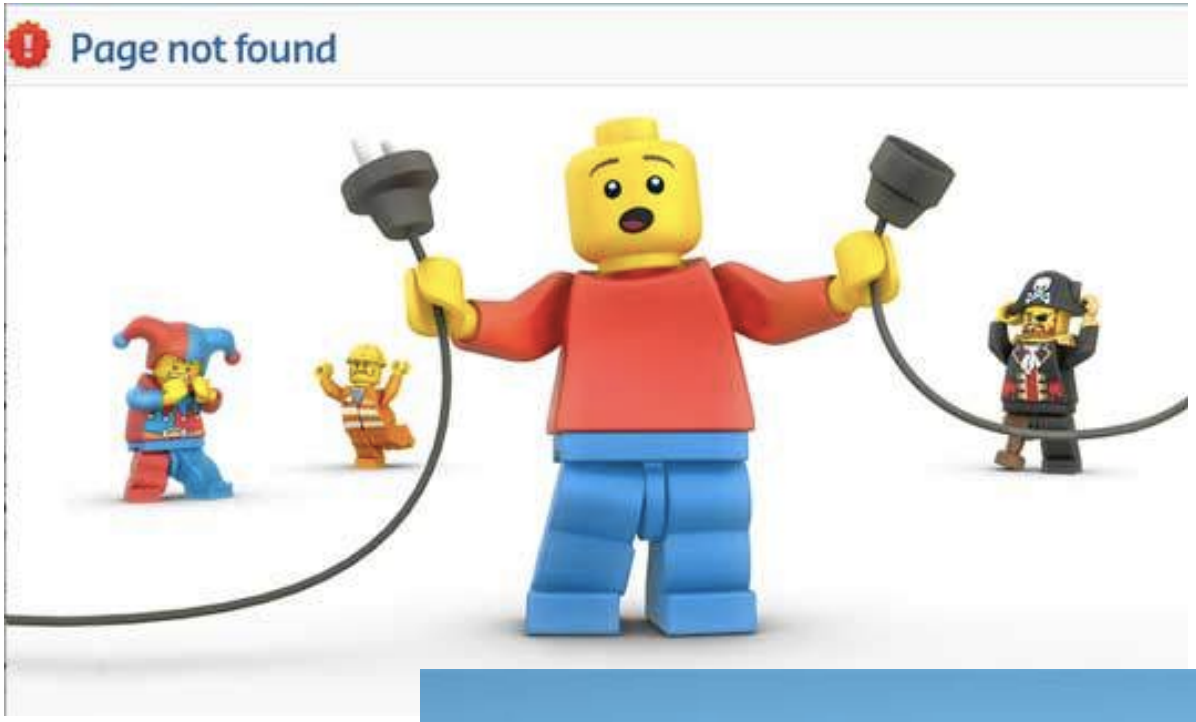


Feedback and Explanations

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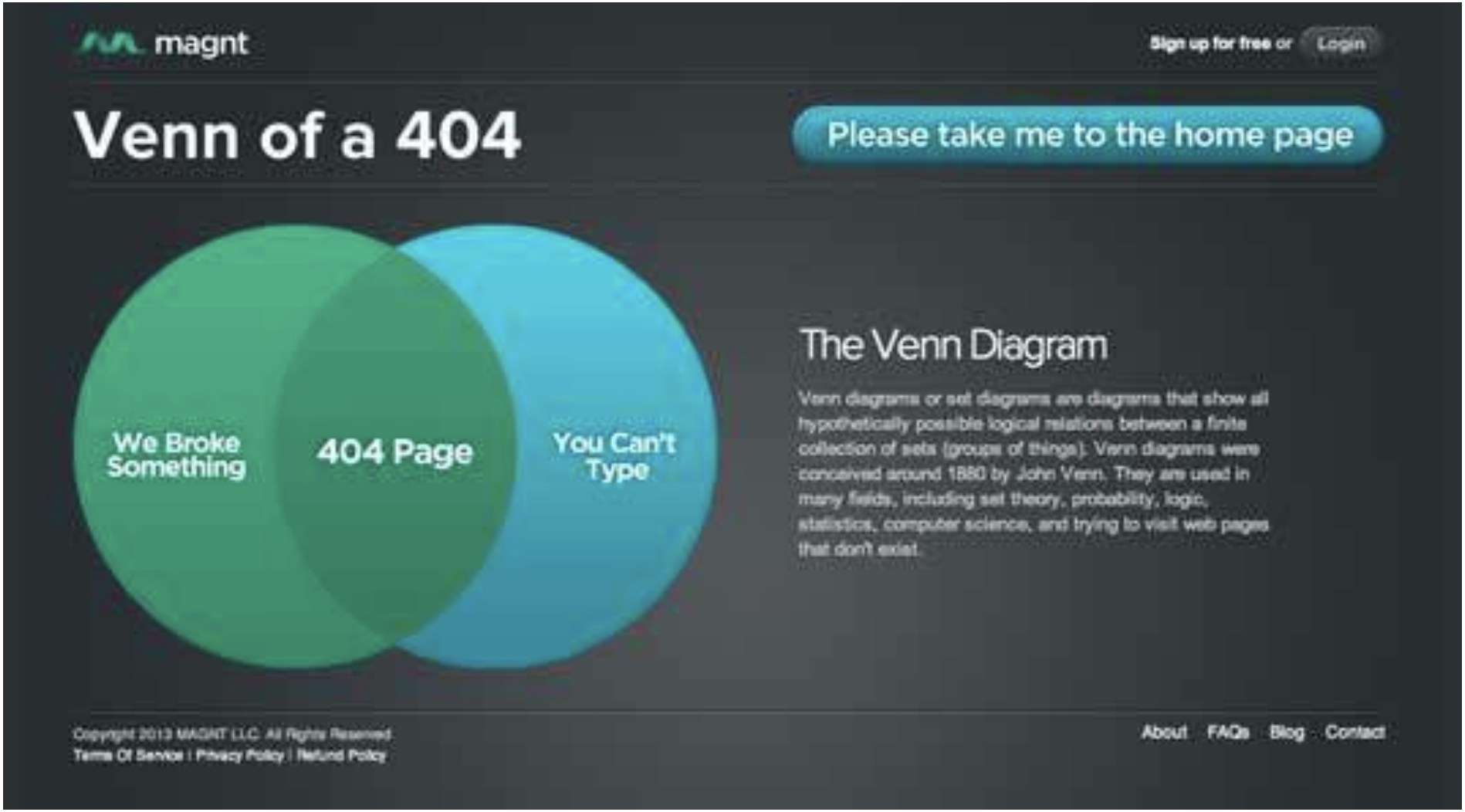
This is not the web page you are looking for.


magnt
Sign up for free or Login
Venn of a 404
Please take me to the home page
We Broke Something
404 Page
You Can't Type
The Venn Diagram
Venn diagrams or set diagrams are diagrams that show all hypothetically possible logical relations between a finite collection of sets (groups of things). Venn diagrams were conceived around 1880 by John Venn. They are used in many fields, including set theory, probability, logic, statistics, computer science, and trying to visit web pages that don't exist.
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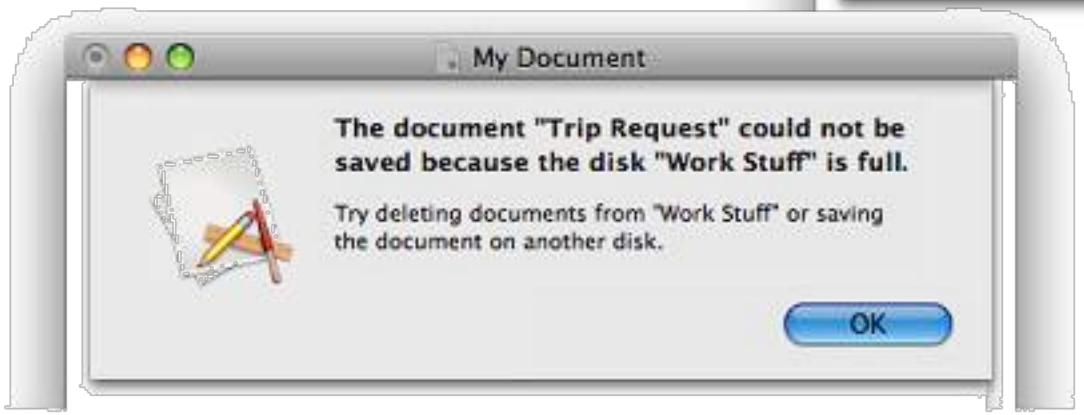
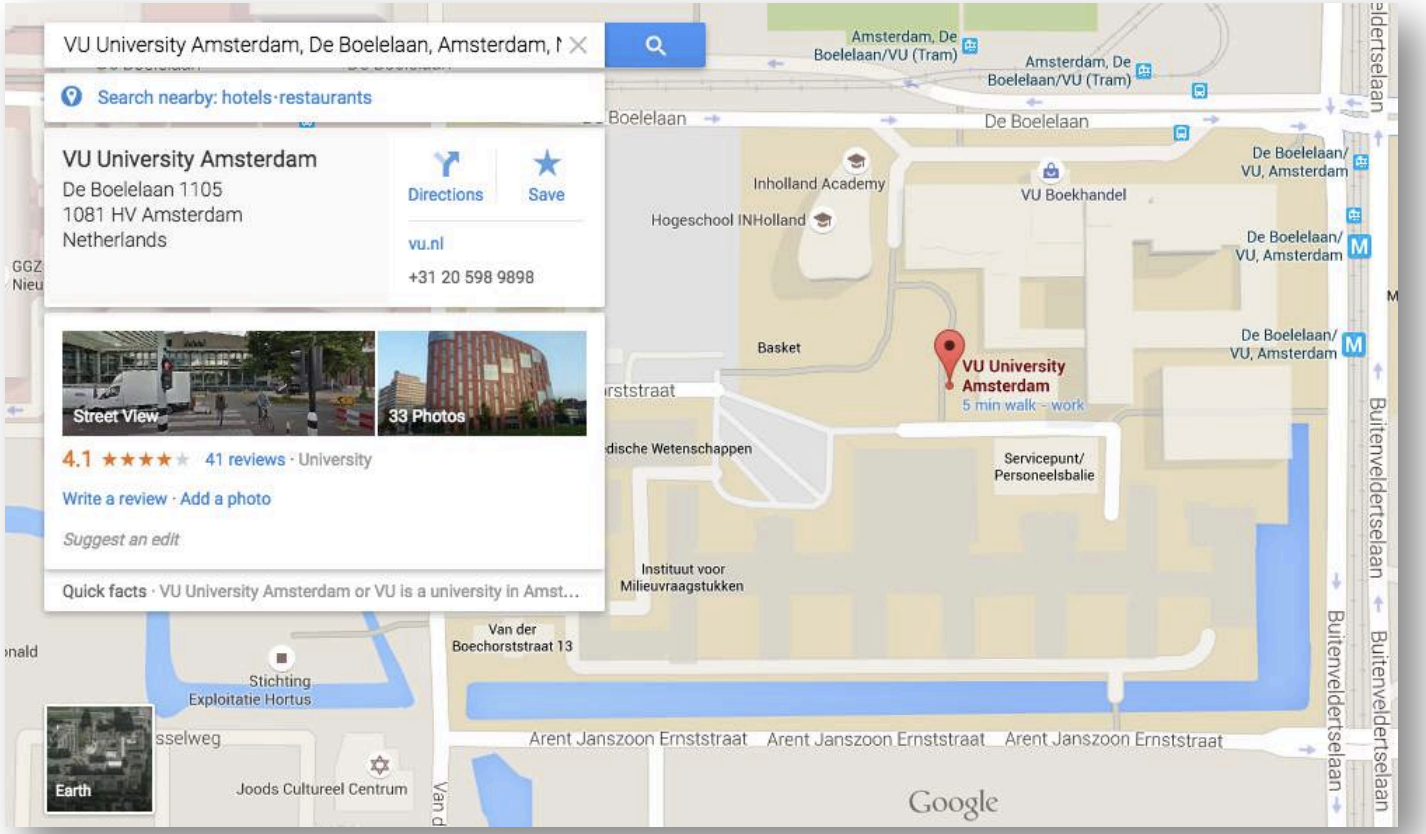
From Bad to Better



Feedback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Quick facts · VU University Amsterdam or VU is a university in Amst...
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De Boelelaan
Inholland Academy
VU Boekhandel
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Basket
VU University Amsterdam
5 min walk - work
Servicepunt/ Personeelsbalie
Instituut voor Milieuvraagstukken
Van der Boechorststraat 13
Stichting Exploitatie Hortus
Joods Cultureel Centrum
Arent Janszoon Ernststraat
Buitenveldertselaan
Google


Create visual priority

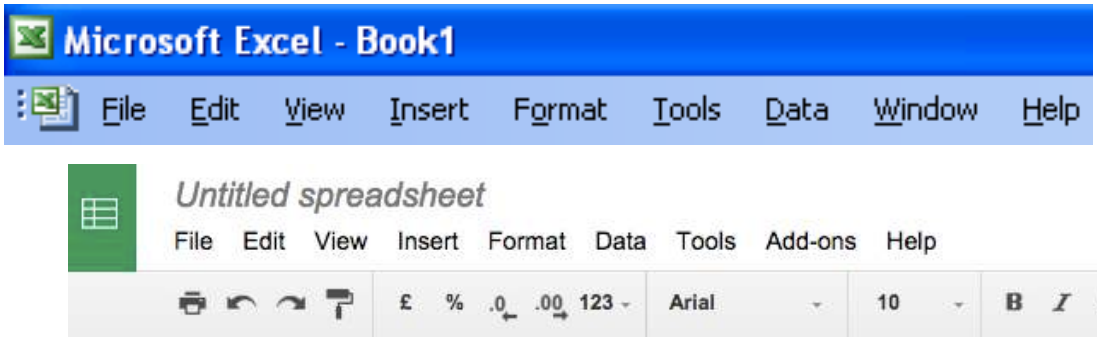
Visibility (perceived affordance)

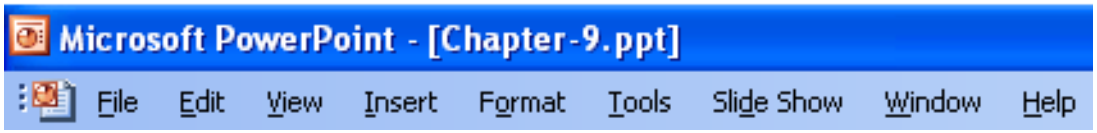
The Principle of Visibility:

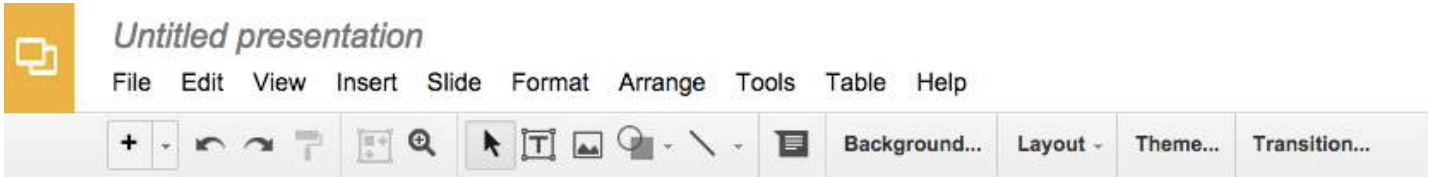
It Should Be Obvious What a Control Is Used For

Consistency

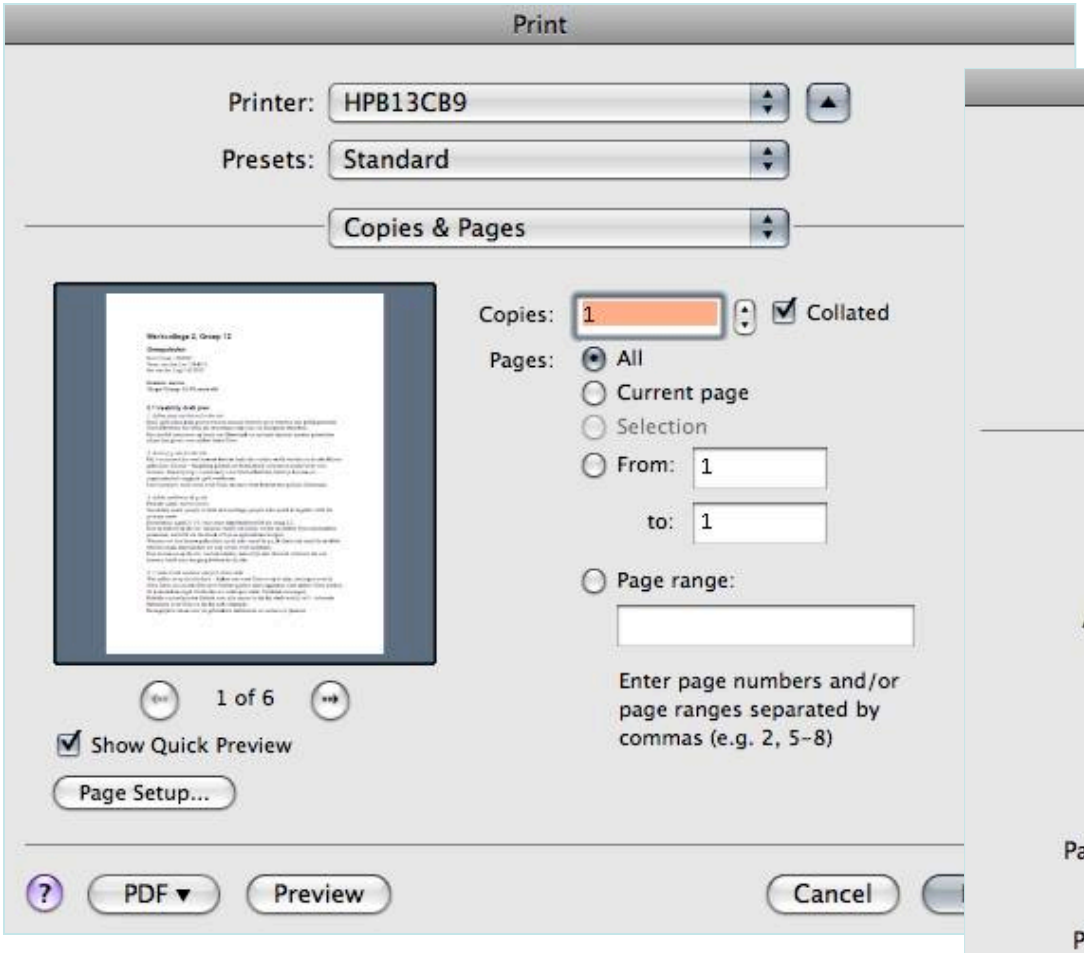
Uniformity in appearance, placement, and behavior

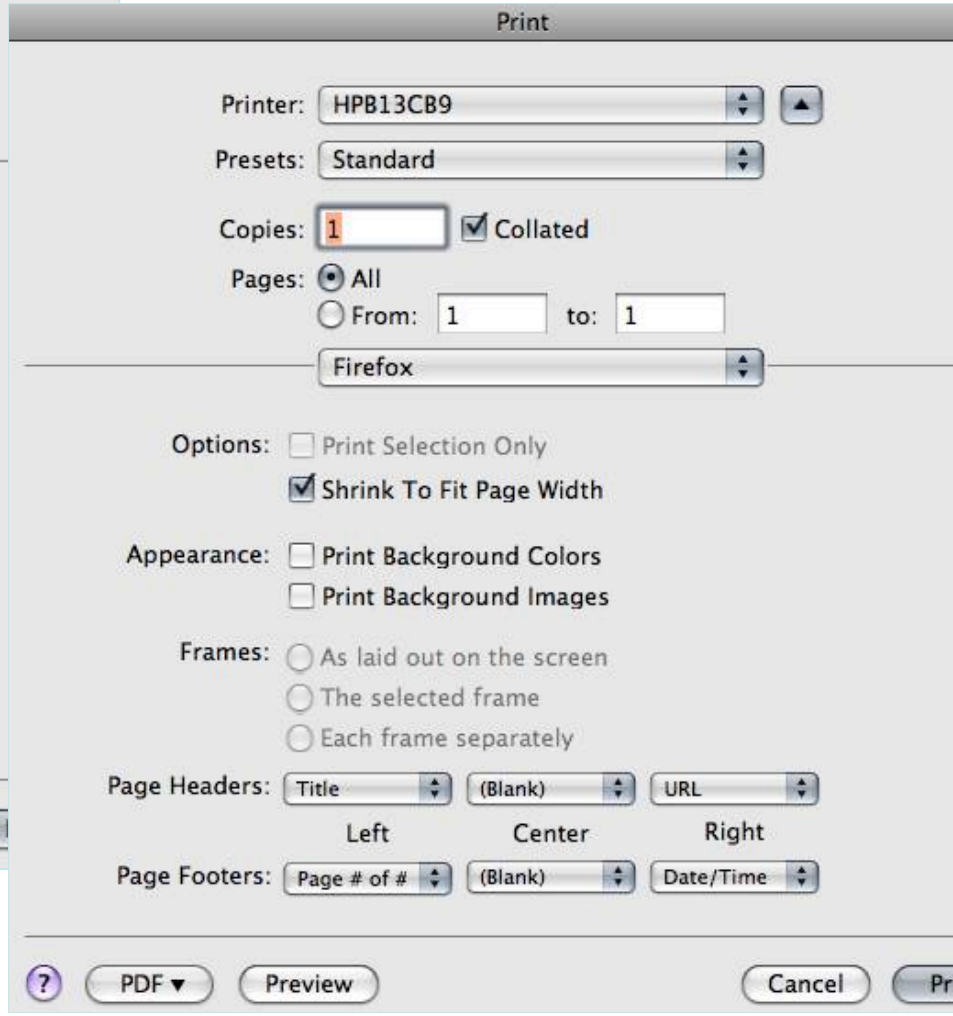


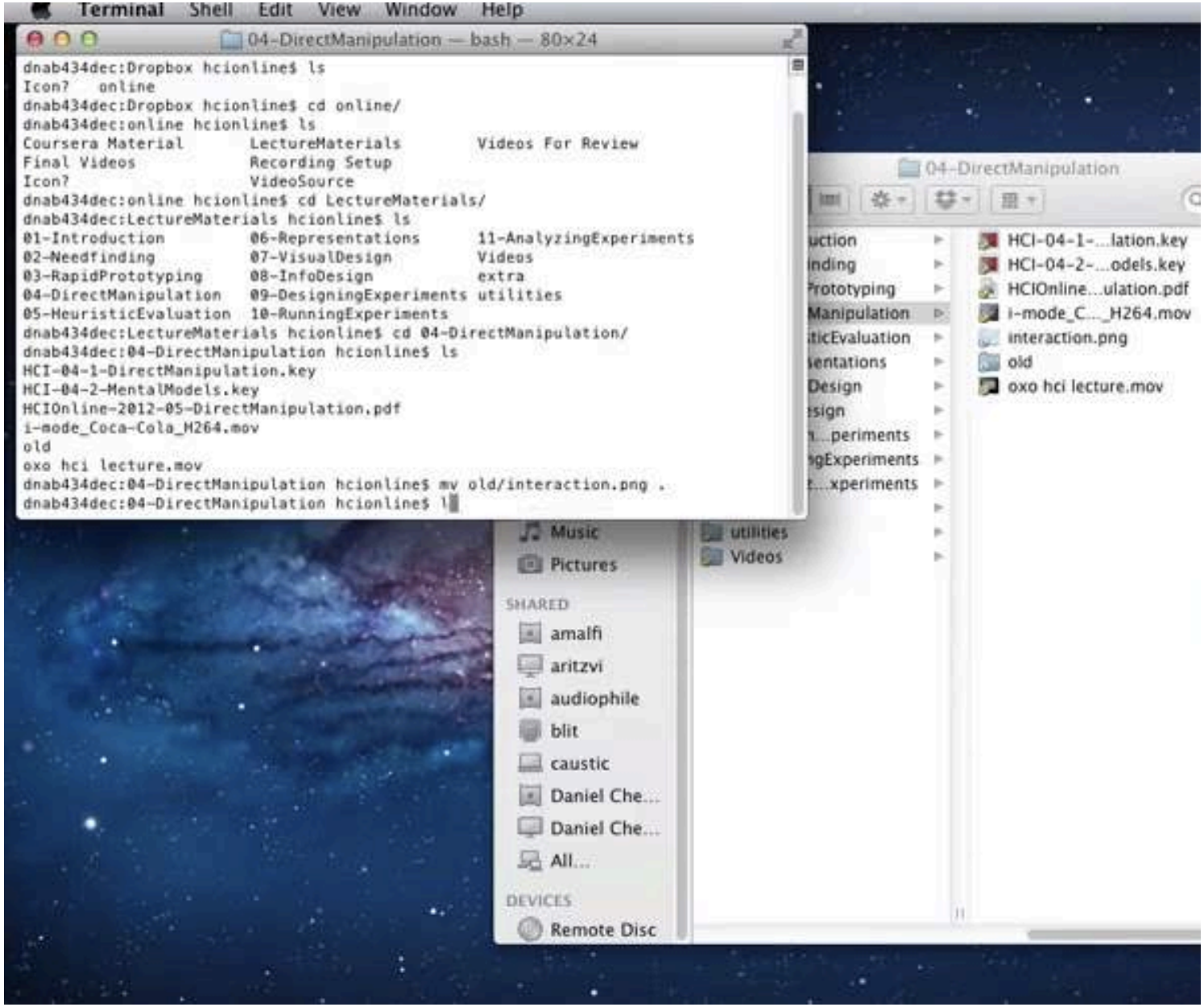




Structure & Consistency



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Icon? online
dnab434dec:Dropbox hcionline$ cd online/
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Coursera Material LectureMaterials Videos For Review
Final Videos Recording Setup
Icon? VideoSource
dnab434dec:online hcionline$ cd LectureMaterials/
dnab434dec:LectureMaterials hcionline$ ls
01-Introduction 06-Representations 11-AnalyzingExperiments
02-Needfinding 07-VisualDesign Videos
03-RapidPrototyping 08-InfoDesign extra
04-DirectManipulation 09-DesigningExperiments utilities
05-HeuristicEvaluation 10-RunningExperiments
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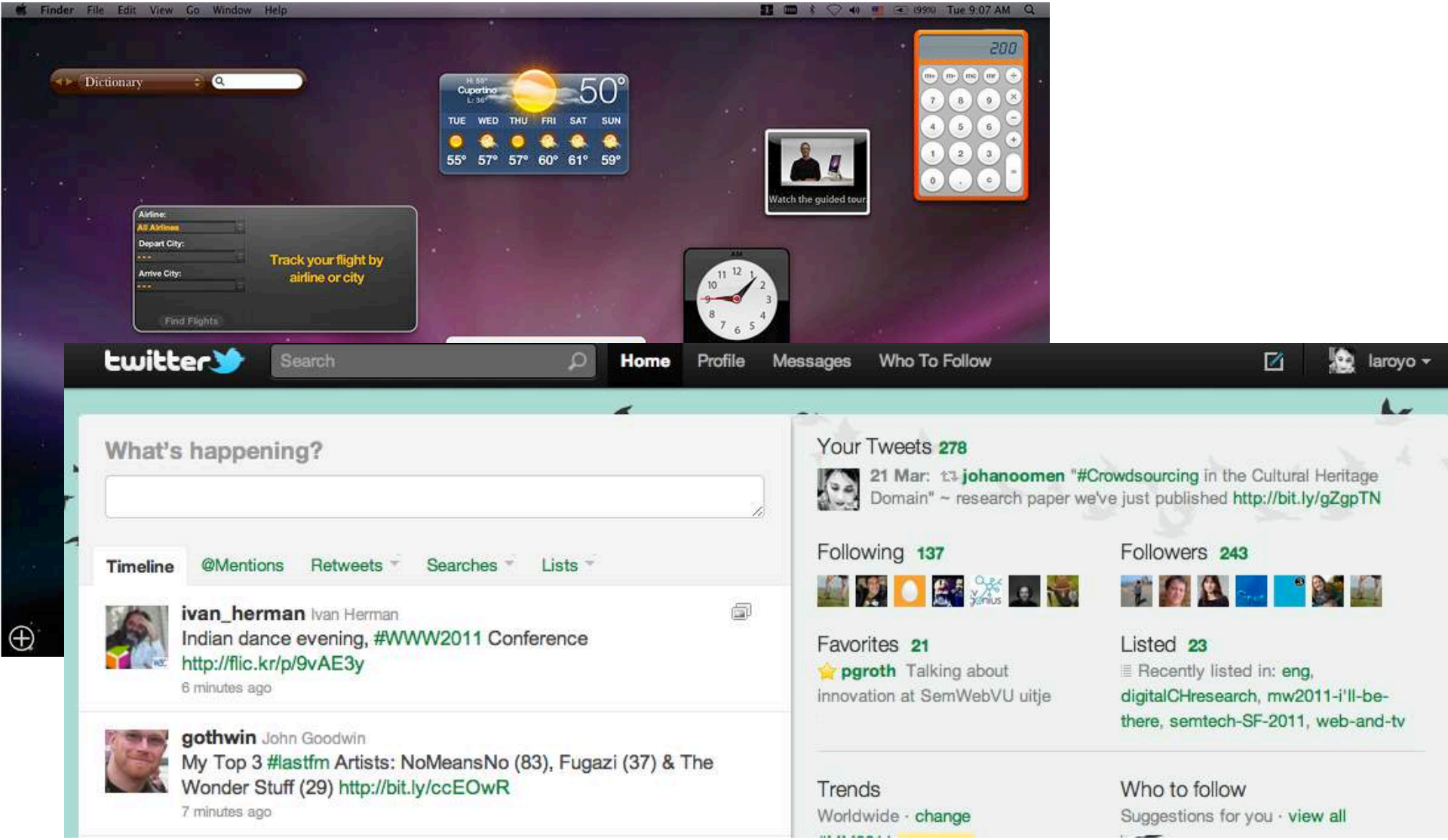
caustic
Daniel Che...
Daniel Che...
All...
DEVICES
Remote Disc

Cultural Associations

- Groups of people learn idioms
  - red = danger, green = go
- But these differ in different places
  - Light switches
    - America: down is off
    - Britain: down is on
  - Faucets
    - America: counter-clockwise is on
    - Britain: counter-clockwise is off

Metaphors


Finder File Edit View Go Window Help
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Dictionary
Cupertino
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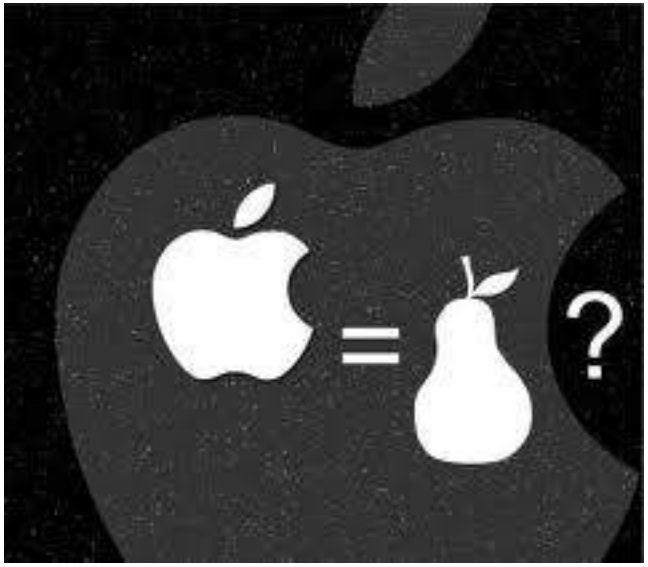
TUE WED THU FRI SAT SUN
55° 57° 57° 60° 61° 59°
Watch the guided tour
Airline:
All Airlines
Depart City:
Arrive City:
Find Flights
Track your flight by airline or city
twitter
Search
Home
Profile
Messages
Who To Follow
laroyo
What's happening?
Timeline
@Mentions
Retweets
Searches
Lists
ivan_herman Ivan Herman
Indian dance evening, #WWW2011 Conference http://flic.kr/p/9vAE3y
6 minutes ago
gothwin John Goodwin
My Top 3 #lastfm Artists: NoMeansNo (83), Fugazi (37) & The Wonder Stuff (29) http://bit.ly/ccEOwR
7 minutes ago
Your Tweets 278
21 Mar: johanoomen "#Crowdsourcing in the Cultural Heritage Domain" ~ research paper we've just published http://bit.ly/gZgpTN
Following 137
Followers 243
Favorites 21
pgroth Talking about innovation at SemWebVU uitje
Listed 23
Recently listed in: eng, digitalCHresearch, mw2011-i'll-be-there, semtech-SF-2011, web-and-tv
Trends
Worldwide · change
Who to follow
Suggestions for you · view all

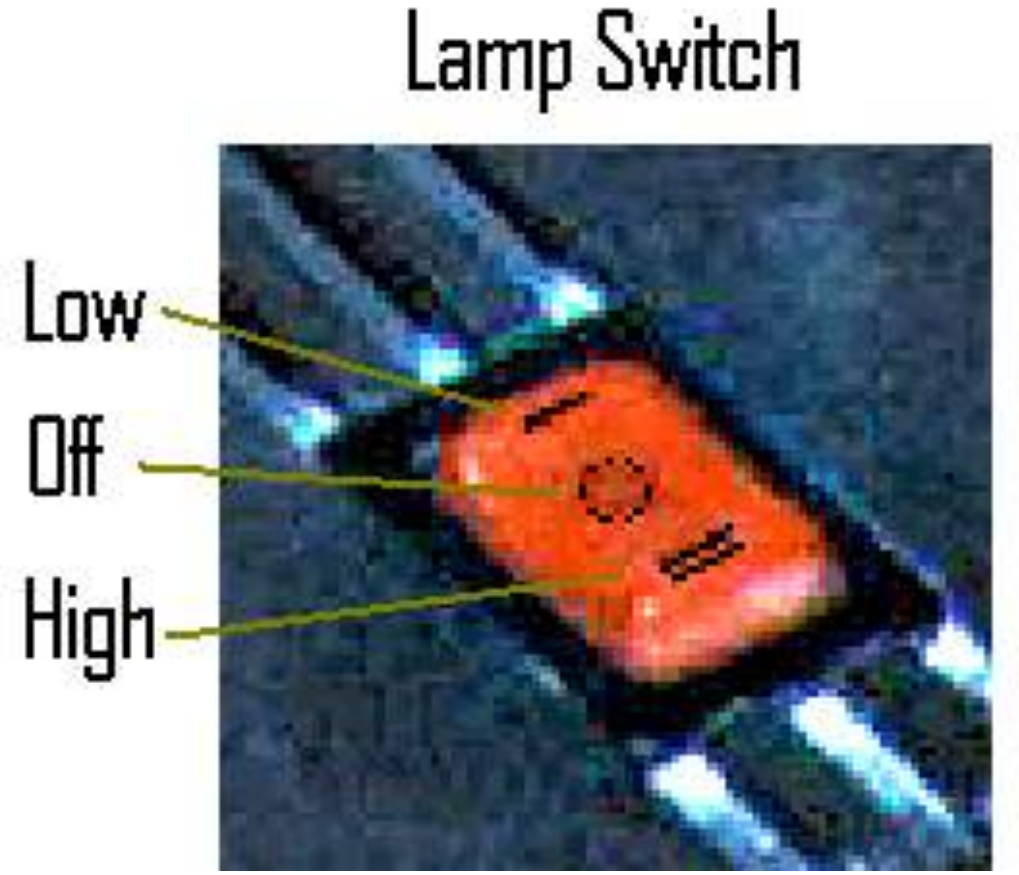
Metaphors

Facebook Timeline

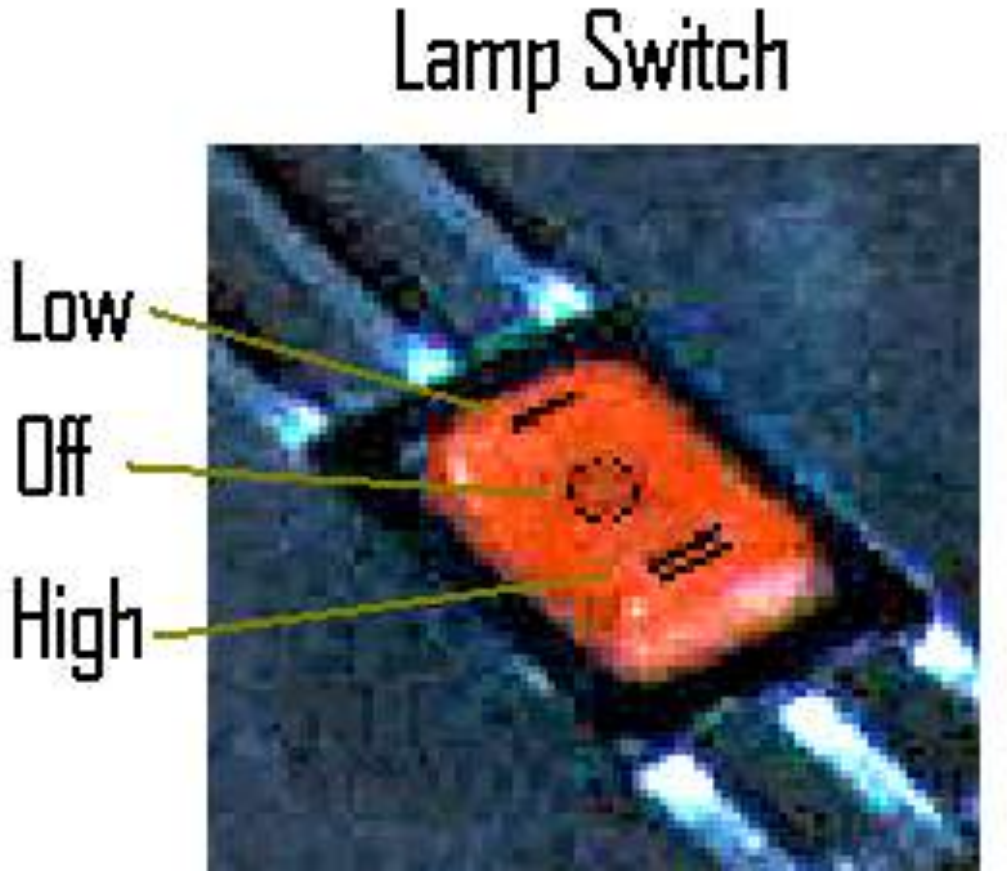
Bookmark



What's Wrong?



What's Wrong?



Mapping – we'd expect to go off, low, high

Feedback – when lamp is on, hard to tell from switch position whether it's in low or high mode

What's Wrong?

To set timer, turn to desired time.

For times less than 15 minutes, turn past 15 minutes, then turn back to desired time.

What's Wrong?

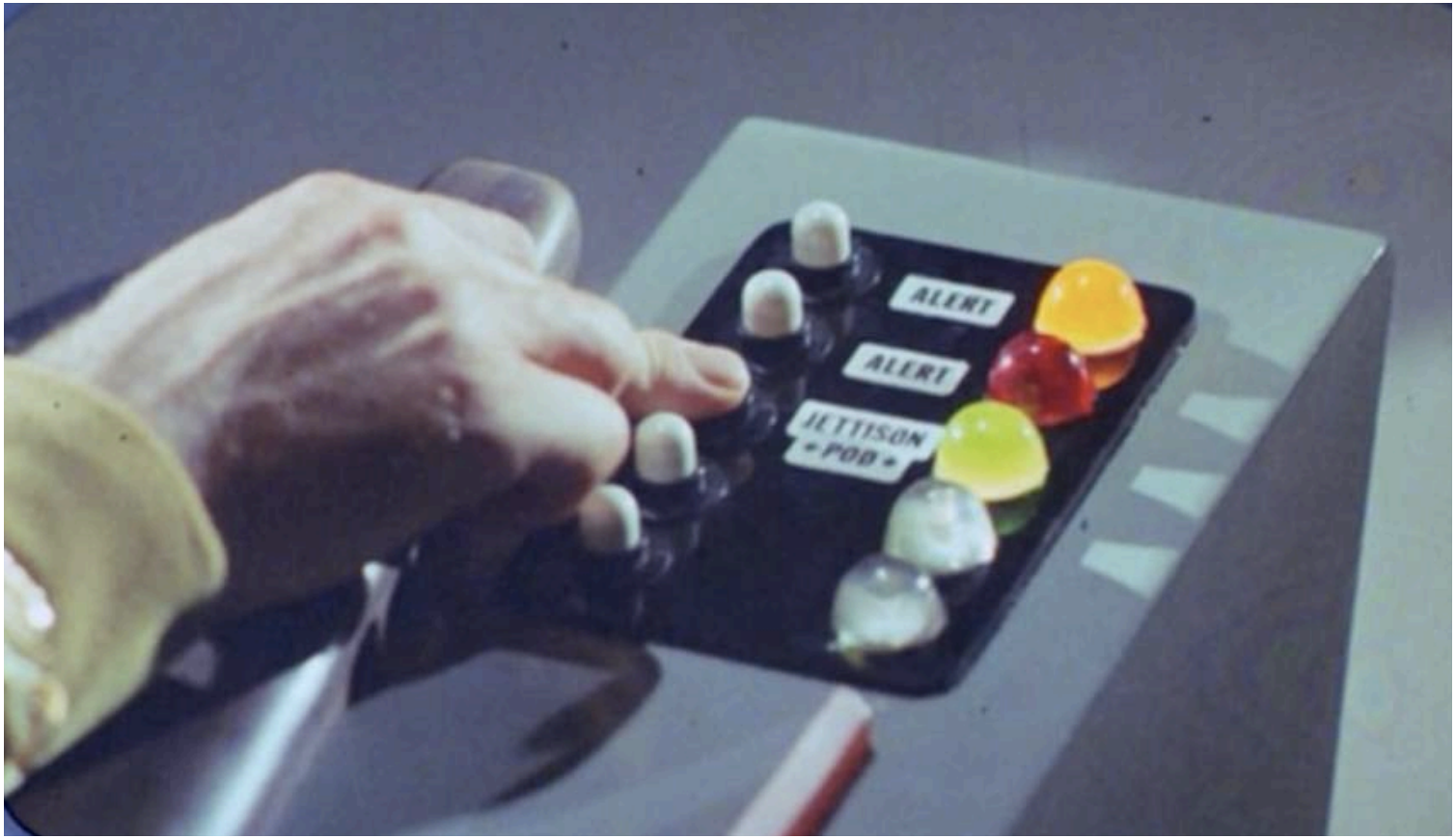
To set timer, turn to desired time.

For times less than 15 minutes, turn past 15 minutes, then turn back to desired time.

CONSISTENCY: Different procedure for setting different intervals of time.

FEEDBACK: When timer is at a time under 15 minutes, hard to tell if it's actually on or not (silent failure).

Star Trek TOS: Command Controls What's Wrong?



What's Wrong?

Design Knowledge

- Design Principles
  - First Principles of Interactive Design
  - http://www.asktog.com/basics/firstPrinciples.html
- Design Rules
  - 8 Golden Rules
  - http://www.usask.ca/education/coursework/skaalid/theory/interface.htm

DESIGN GUIDELINES & RATIONALE

Standards

- **ISO 9241:** *Ergonomic requirements for office work with visual display terminals (VDTs)*
  - defines usability as effectiveness, efficiency and satisfaction with which users accomplish tasks
- **ISO 14915:** *Software ergonomics for multimedia user interfaces*
  - guidelines for design of multimedia interfaces
- **ISO 13407:** *Human-centered design processes for interactive systems*
  - management guidance through the development life-cycle
- **ISO/CD 20282:** Ease of operation of everyday products
  - four-part standard to ensure products can be used as consumers expect them to

Guidelines (1/2)

- For optimizing the user experience
  - ***abstract guidelines (principles)*** applicable during early life cycle activities
  - ***detailed guidelines (style guides)*** applicable during later life cycle activities

- http://www.usability.gov/pdfs/guidelines.html

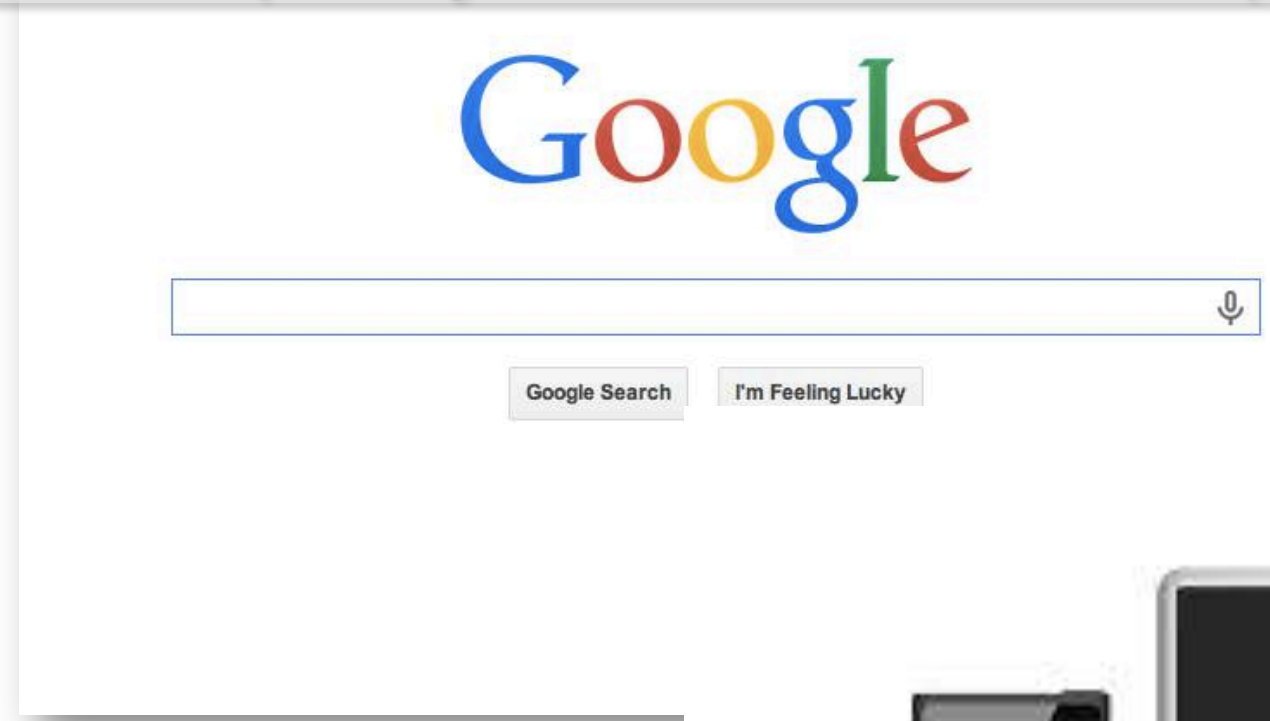
Guidelines (2/2)

- Accessibility
- Page Layout
  - Navigation, Scrolling and Paging, Headings, Titles, and Labels
- Content Organization
  - Text Appearance
  - Lists
  - Links
  - Screen–Based Controls (Widgets)
  - Graphics, Images, and Multimedia
- Search

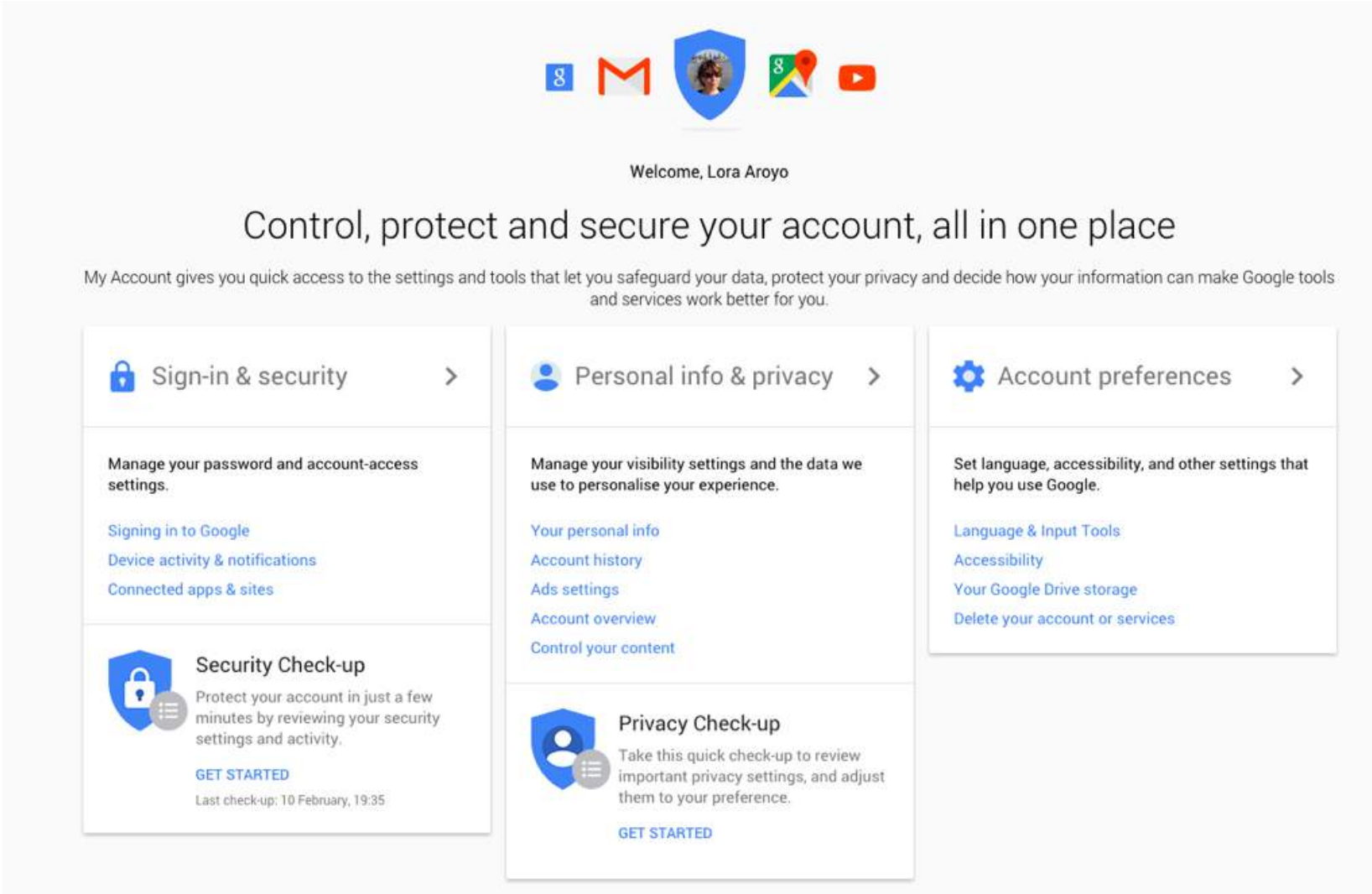
DESIGN PRINCIPLES

Keep it Simple

"Simplicity is the ultimate sophistication"



"Simplicity is the ultimate sophistication"



All-in-One Doesn't Work


“
Everything should be made as simple as possible, but not simpler.
ALBERT EINSTEIN

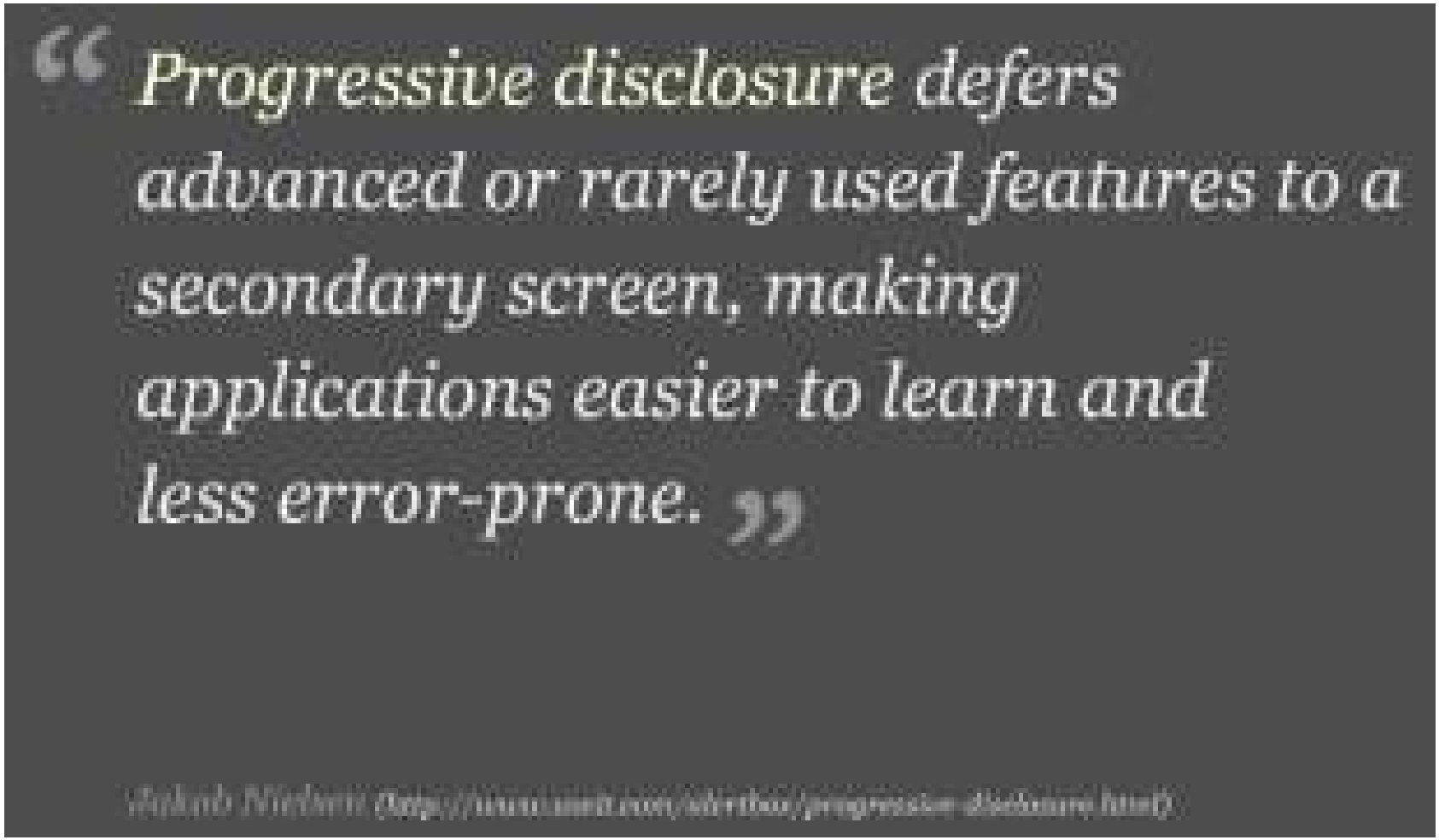
- In his TED Talk “Towards a science of simplicity”, Harvard professor George Whitesides breaks ‘simple’ down into three characteristics:

- They are predictable
- They are accessible
- They serve as building blocks

http://www.ted.com/talks/george_whitesides_toward_a_science_of_simplicity

Buy a drink with your cell phone

A Way to Achieve It



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Jump to Regional and general **HCI**: Graphics Interface: Annual Canadian computer graphics and **HCI** conference. The oldest regularly scheduled conference ...
Goals - Differences with related fields - Design principles - Design methodologies
en.wikipedia.org/wiki/Human–computer_interaction - Cached - Similar

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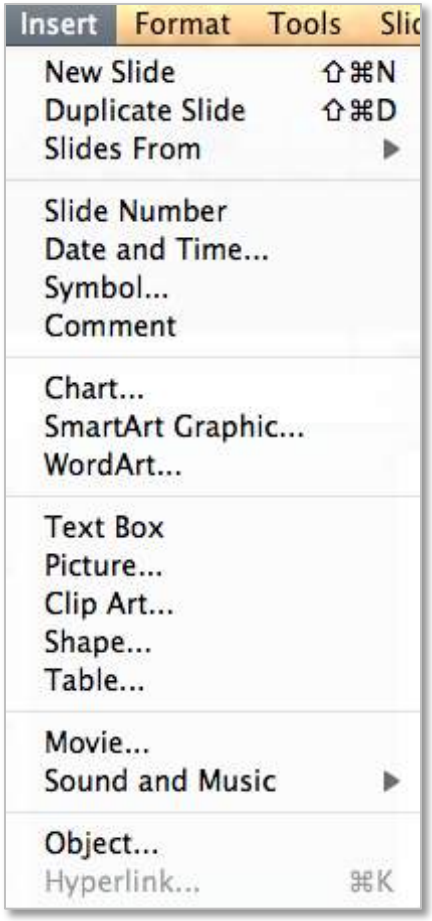
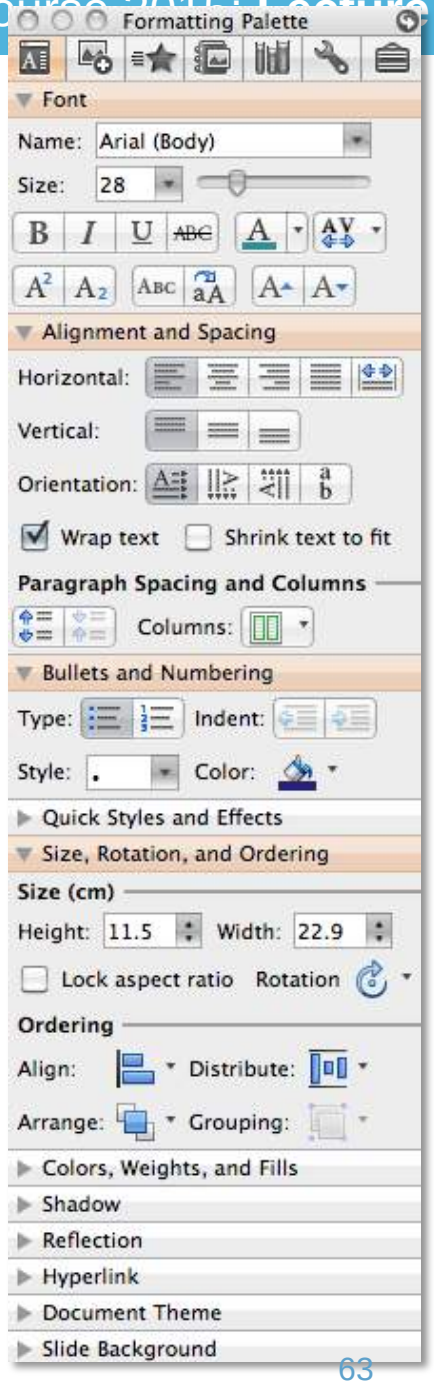
HCI Bibliography : **Human-Computer Interaction** Resources
9 Apr 2011 ... The **HCI** Bibliography (HCIBIB) is a free-access bibliography on **Human-Computer Interaction**, with over 50000 records in a searchable database.

Organization of the UI in a meaningful way





Tolerance

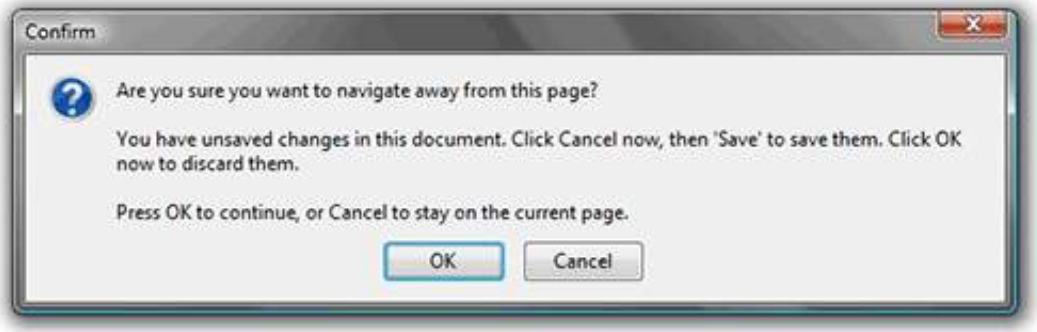
Prevent user from making mistakes

- Prevention
- Recoverability
  - Forward error *recovery - system accepts the error and helps the user to accomplish their goal*
  - Backward error recovery *– undo the effects of the previous interaction*


Gmail
by Google
Search Mail
Search the Web
The conversation has been moved to the Trash. Learn more Undo


human coputer interaction
Search
About 254,000 results (0.22 seconds)
Advanced search
Did you mean: human computer interaction


Google maps
Paris, France, eiffel tower
Find businesses, addresses and places of interest.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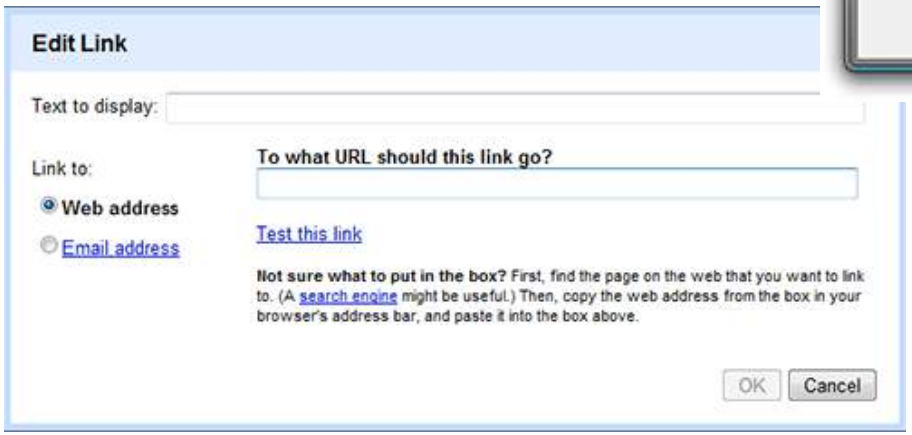
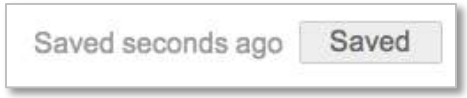
You have unsaved changes in this document. Click Cancel now, then 'Save' to save them. Click OK now to discard them.
Press OK to continue, or Cancel to stay on the current page.
OK
Cancel


Edit Link
Text to display:
Link to:
Web address
Email address
To what URL should this link go?
Test this link
Not sure what to put in the box? First, find the page on the web that you want to link to. (A search engine might be useful.) Then, copy the web address from the box in your browser's address bar, and paste it into the box above.
OK
Cancel


Gmail Calendar Documents Reader Web more ▾
Saving...
Google docs
Sample document
saved on 11/16/09 3:35 PM by Janko Jovanovic


Saved seconds ago
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Location on the screen

Mind the typical Ads location
Use typical locations

W3C Accessibility Guidelines

W3C Web Content Accessibility Guidelines
http://www.w3.org/TR/WAI-WEBCONTENT/

1. Provide alternatives to auditory and visual content
2. Don't rely on color alone
3. Use markup and style sheets properly
4. Clarify natural language usage
   - abbreviation and foreign text
5. Create tables that transform gracefully
6. New technology pages transform gracefully
   - accessible when newer technologies are not supported

W3C Accessibility Guidelines

7. Ensure user *control of time-sensitive* content
   - pausing/stoping of animation, scrolling, etc.
8. Ensure direct *accessibility of embedded UI*
9. Design for *device independence*
   - various input devices
10. Use interim solutions (for older browsers to function)
11. Use *W3C technologies and guidelines*
12. Provide *context and orientation* information
13. Provide *clear navigation* mechanisms
14. Ensure that documents are *clear and simple*

Style Guides

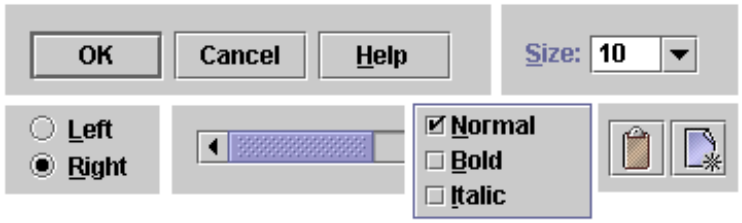
- A typical guide includes:
  - description of required interaction styles & user interface controls
  - guidance on when and how to use the various styles or controls
  - illustrations of styles and controls
  - screen templates


BRAND
Design with brand in mind

Example Style Guides

- Apple Interface Guidelines
  - http://developer.apple.com/DOCUMENTATION/UserExperience/Conceptual/AppleHIGuidelines/
- Microsoft Windows XP UI Guidelines
  - http://www.microsoft.com/whdc/Resources/windowsxp/default.mspx
- IBM's Common User Access
  - http://en.wikipedia.org/wiki/Common_User_Access
- Motif Style Guide
  - http://www.opengroup.org/motif/motif.data.sheet.htm
- Sun Microsystems' Java Look and Feel
  - http://java.sun.com/products/jlf/ed2/book/HIGTitle.html

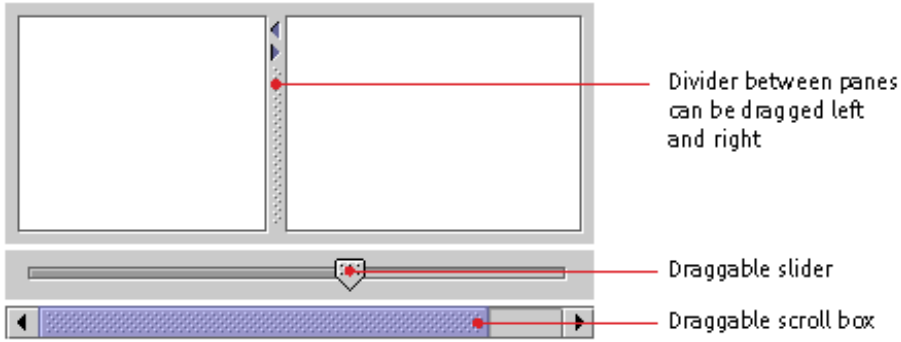
Figure 1 Consistent Use of the Flush 3D Style



The clean, modern appearance reduces the visual noise associated with beveled edges. Flush 3D components fit in with a variety of applications and operating systems. For details on the flush 3D style, see Producing the Flush 3D Effect.

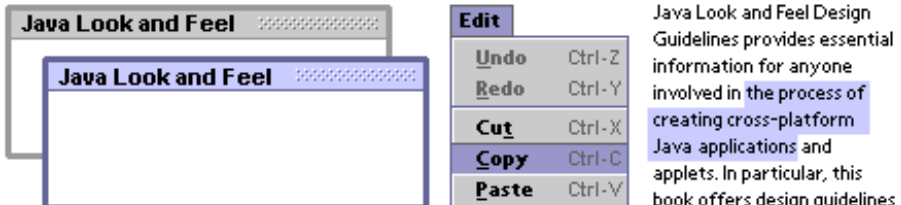
A textured pattern, used throughout the Java look and feel, indicates items that users can drag. Such an indication cues cross-platform users in a reliable way. The following figure demonstrates several uses of the drag texture.

Figure 2 Consistent Use of the Drag Texture



A simple and flexible color model ensures compatibility with platforms and devices capable of displaying quite different color depths. The default colors provide an aesthetically pleasing and comfortable scheme for interface elements, as shown in the following figure. For more on the Java look and feel default color theme, see Themes.

Figure 3 Consistent Use of Color Across Design Elements



Design Rationale

- Design rationale is information that *explains why a system is the way it is*
- Benefits of design rationale
  - communication throughout life cycle
  - reuse of design knowledge across products
  - enforces design discipline
  - presents arguments for design trade-offs
  - organizes potentially large design space
  - capturing contextual information
- *Process-oriented*
  - preserves order of deliberation and decision making
- *Structure-oriented*
  - emphasizes post hoc structuring of considered design alternatives


DESIGN
Design with words as well

Read more …

- User Interface Engineering, *Designing for the Scent of Information*
- Peter Pirolli, *Information Foraging Theory*
- Jakob Nielsen, *Alertbox*, www.useit.com/alertbox