

Conceptual Models & Interface Metaphors

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Winter 2022

February 16, 2022

Hall of Fame or Shame?



Add/Update Shipping Information

We found an error while verifying your shipping address.
We've marked the problem in red for you.

Update the address book of

Required information is marked in **GREEN CAPS**.
[HELP](#) for questions about shipping.

NICKNAME:

Please assign a "nickname" for the person you're shipping to.
You may change or delete this information at any time.

FIRST NAME: **MIDDLE INITIAL:**

LAST NAME:

ADDRESS:

 (international use only)

CITY:

STATE/PROVINCE:

Includes APO and FPO. Use "Other" if country is not USA or Canada.

ZIP/POSTAL CODE:

COUNTRY:

SHIPPING METHOD: **In the U.S.:** [HELP](#) Standard UPS (2 business days plus) **International:** [HELP](#) Canada Canada Post (4-10 business days)

- Design based on a top retailer's site

Hall of Shame!



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SHIPPING METHOD: **In the U.S.:** [HELP](#) Standard UPS (2 business days plus) **International:** [HELP](#) Canada Canada Post (4-10 business days)

- Design based on a top retailer's site
- Color deficiency
 - can't distinguish between red & green
- In study, user could not get by this screen!
- How to fix?
 - redundant cues

A Better Design

800-441-5713 • [Customer Service](#) • [Find a Store](#) •

L.L.Bean

What can we help you find?

CLOTHING FOOTWEAR OUTDOOR EQUIPMENT BAGS & TRAVEL HOME GOODS

Secure Checkout [Edit Shopping Bag](#)

1. Shipping Information

Please correct the following items:

- [Please enter your last name.](#)
- [Please select a country for your address.](#)
- [Please select a state for your address.](#)
- [Please enter a phone number.](#)

Shipping Address for Me [Ship to someone else](#)

First Name

Middle Name *(optional)*

Last Name

Please enter your last name.

Gender *(optional)*
 Male Female

Country

Please select a country for your address.

1. Instructions at the top for all errors
2. Redundant exclamation icons
3. Changed color on boxes around input fields with errors
4. Instructions on what to fix near each error

Hall of Fame or Shame?



<http://africanbusinessmagazine.com/wordpress/wp-content/uploads/2014/07/mobile-payment.png>

- M-Pesa mobile payments
- Common in Africa



<http://blog.unibulmerchantservices.com/m-pesa-by-the-numbers/>

Hall of Fame or Shame?



- M-Pesa mobile payments
- Common in Africa

<https://techweez.com/2017/04/27/is-our-over-dependence-on-mpesa-a-dangerous-move-can-something/>

<http://africanbusinessmagazine.com/wordpress/wp-content/uploads/2014/07/mobile-payment.png>

Hall of Fame!



<http://africanbusinessmagazine.com/wordpress/wp-content/uploads/2014/07/mobile-payment.png>



<http://blog.unibulmerchantservices.com/m-pesa-by-the-numbers/>

- M-Pesa mobile payments
- Common in Africa
- Simple UI but brings banking services to the unbanked!
- Good example of H12 – Fairness & inclusion

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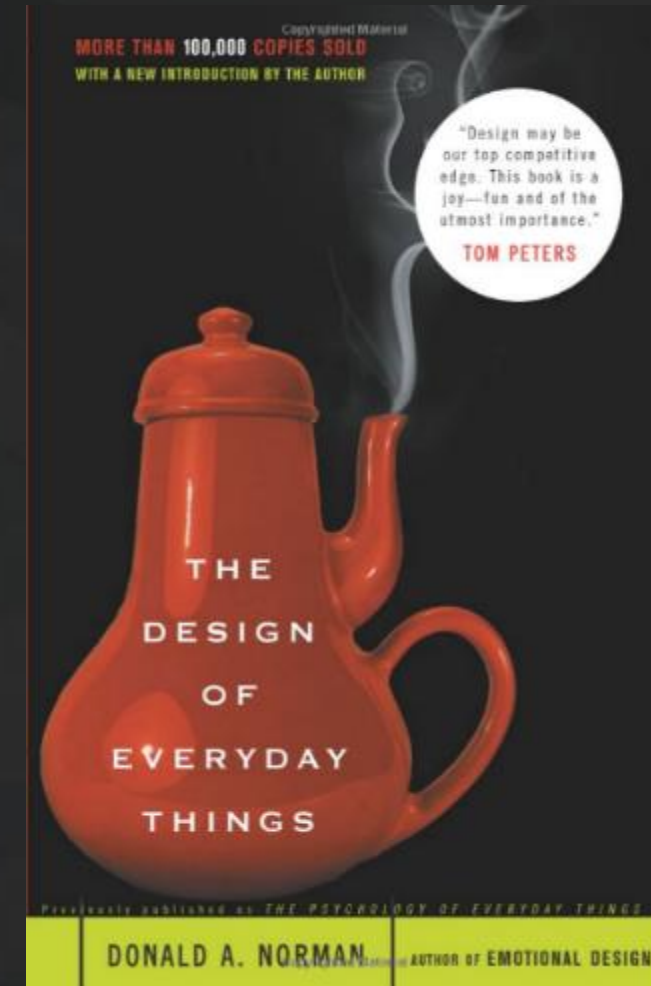
Winter 2022
February 16, 2022

Outline

- *Design of Everyday Things*
- Conceptual models
- Team break
- Design guides for conceptual models
- Interface metaphors
- UI consistency

Design of Everyday Things

- By Don Norman
 - UCSD, Apple, HP, NN Group, NU, UCSD
 - Design of everyday objects illustrates problems faced by designers of systems
 - Explains conceptual models
 - doors, washing machines, digital watches, phones
 - Resulting design guides
- Highly recommended



Conceptual Model?

Def. *Mental representation of how an artifact works & how interface controls affect it*

- People may have preconceived models that are hard to change
 - $(4 + 5)$ vs. $(4\ 5 +)$
 - dragging to trash?
 - deletes file but ejects disk
- Interface must communicate model
 - visually, possibly physically or using sound



David Shillinglaw

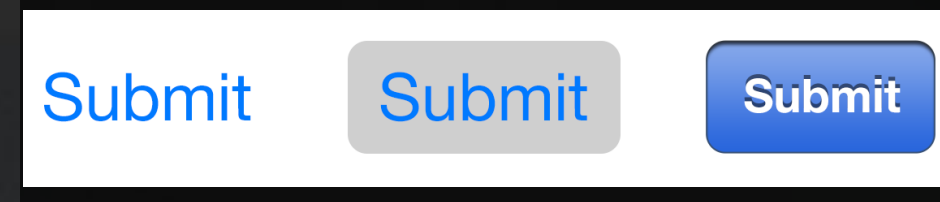
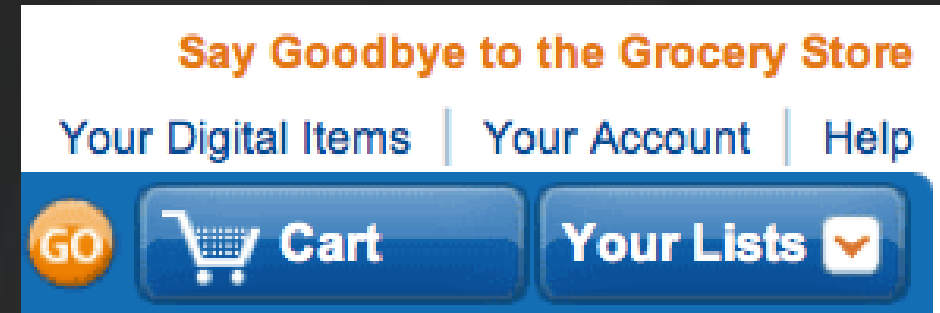
Affordances as Perceptual Clues

Well-designed objects have affordances

- clues to their operation
- often visual, but not always (e.g., speech)



Gibson: “actionable possibilities”



iOS7

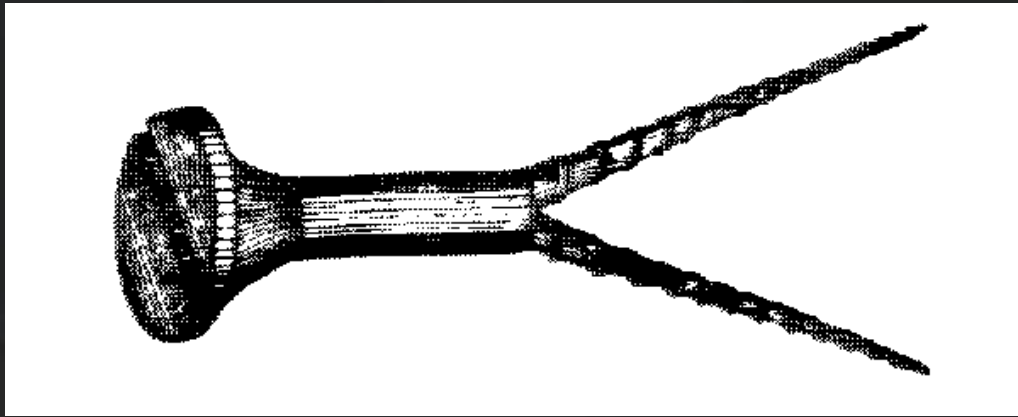
iOS7 w/ “button shapes”

iOS6

Affordances as Perceptual Clues

Poorly-designed objects

– no clues or misleading clues



Jacques Carelman, *Catalogue d'Objets Introuvables*
Crazy design for a screw punch!



Affordances as Perceptual Clues

Poorly-designed objects

- no clues or misleading clues

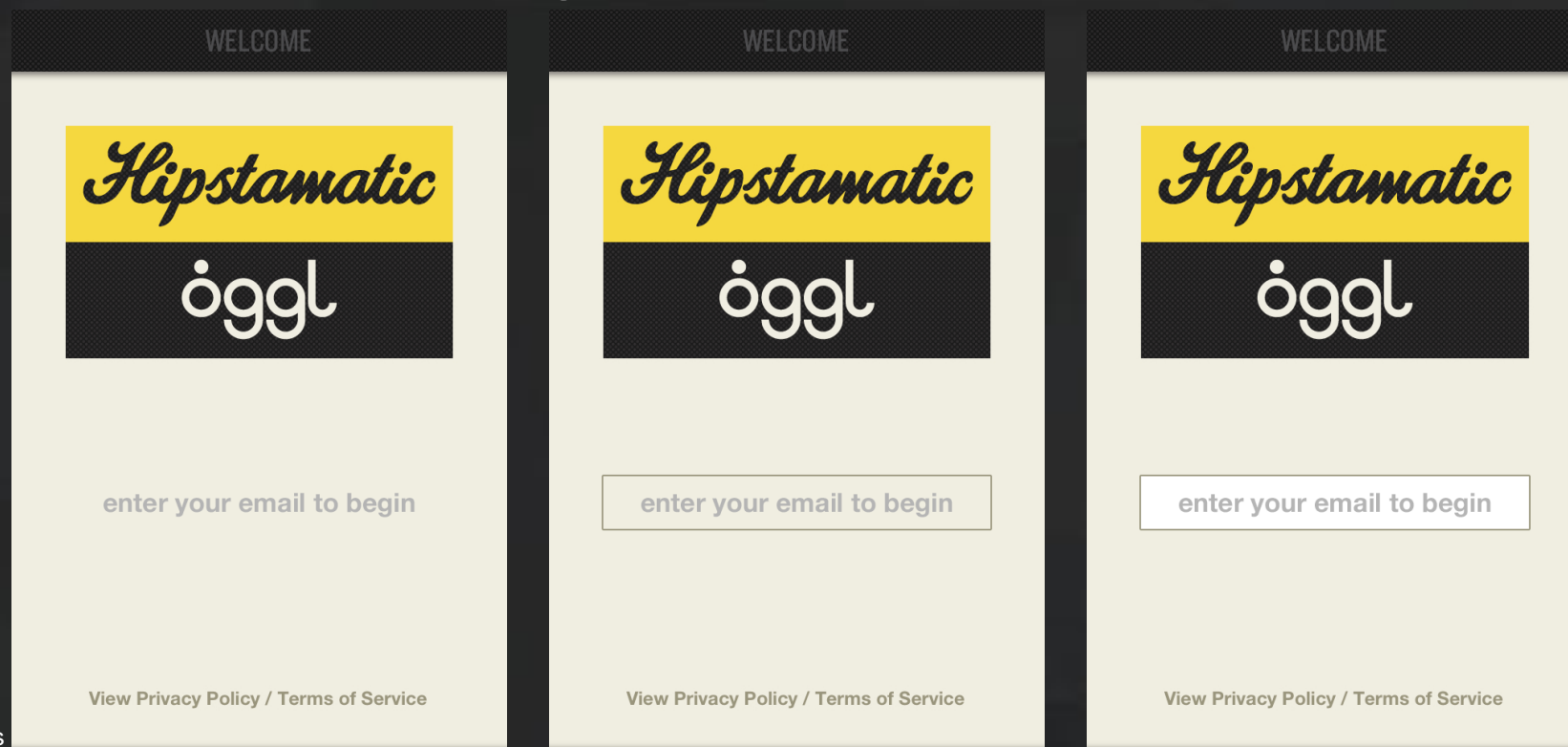


<https://99percentinvisible.org/article/norman-doors-dont-know-whether-push-pull-blame-design/> (5:31)

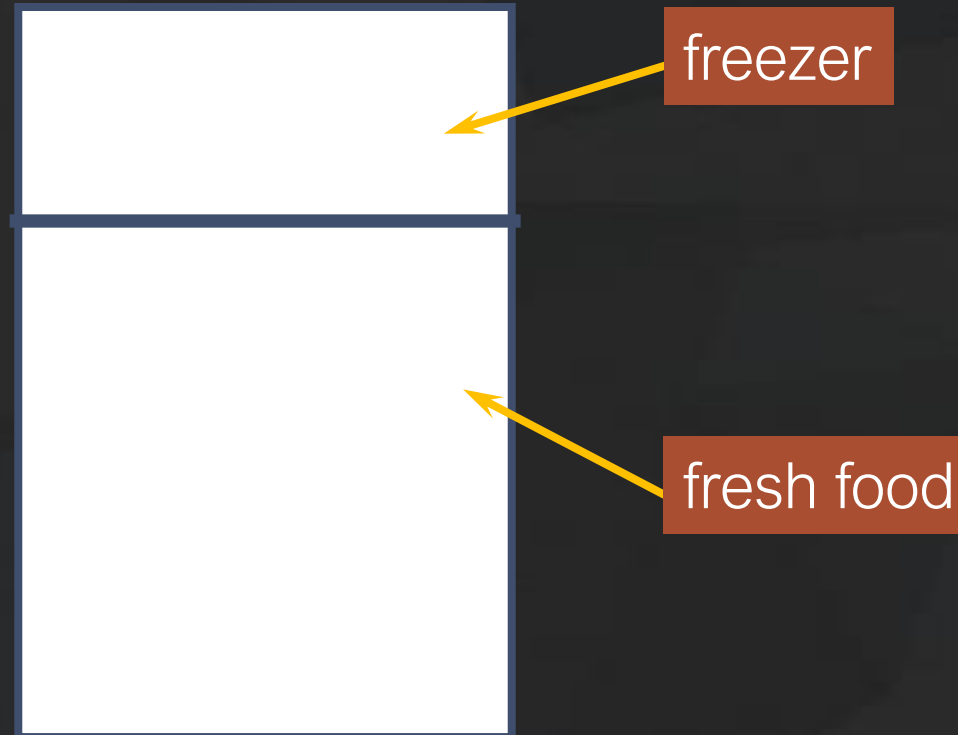
Affordances as Perceptual Clues

Poorly-designed objects

- no clues or misleading clues




Refrigerator



Problem: freezer too cold, but fresh food just right

Refrigerator Controls

Normal Settings	C and 5
Colder Fresh Food	C and 6-7
Coldest Fresh Food	B and 8-9
Colder Freezer	D and 7-8
Warmer Fresh Food	C and 4-1
OFF (<i>both</i>)	0



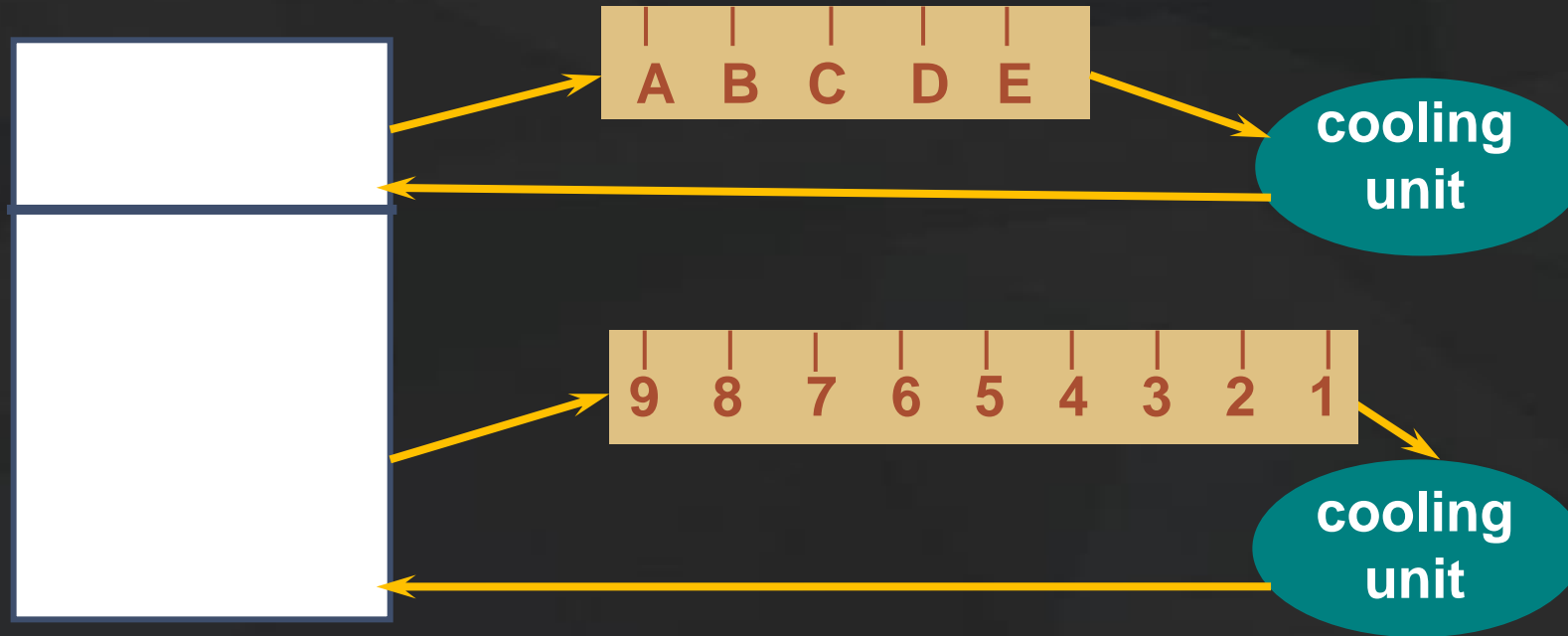
What is your conceptual model?

Spend 60 sec. drawing a diagram showing your model

- where the cooling units are & how they are controlled

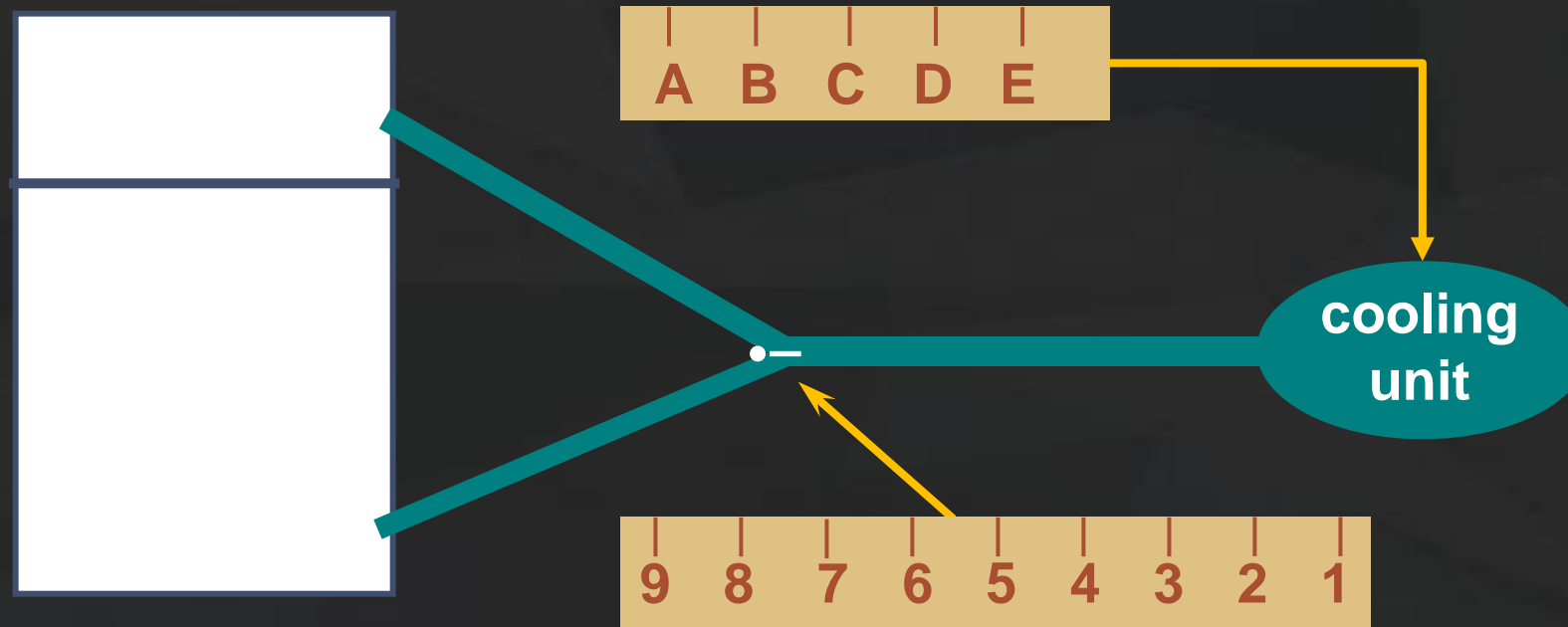
Share with your neighbor a picture in the slack channel

A Common Conceptual Model



independent cooling units

Actual Conceptual Model

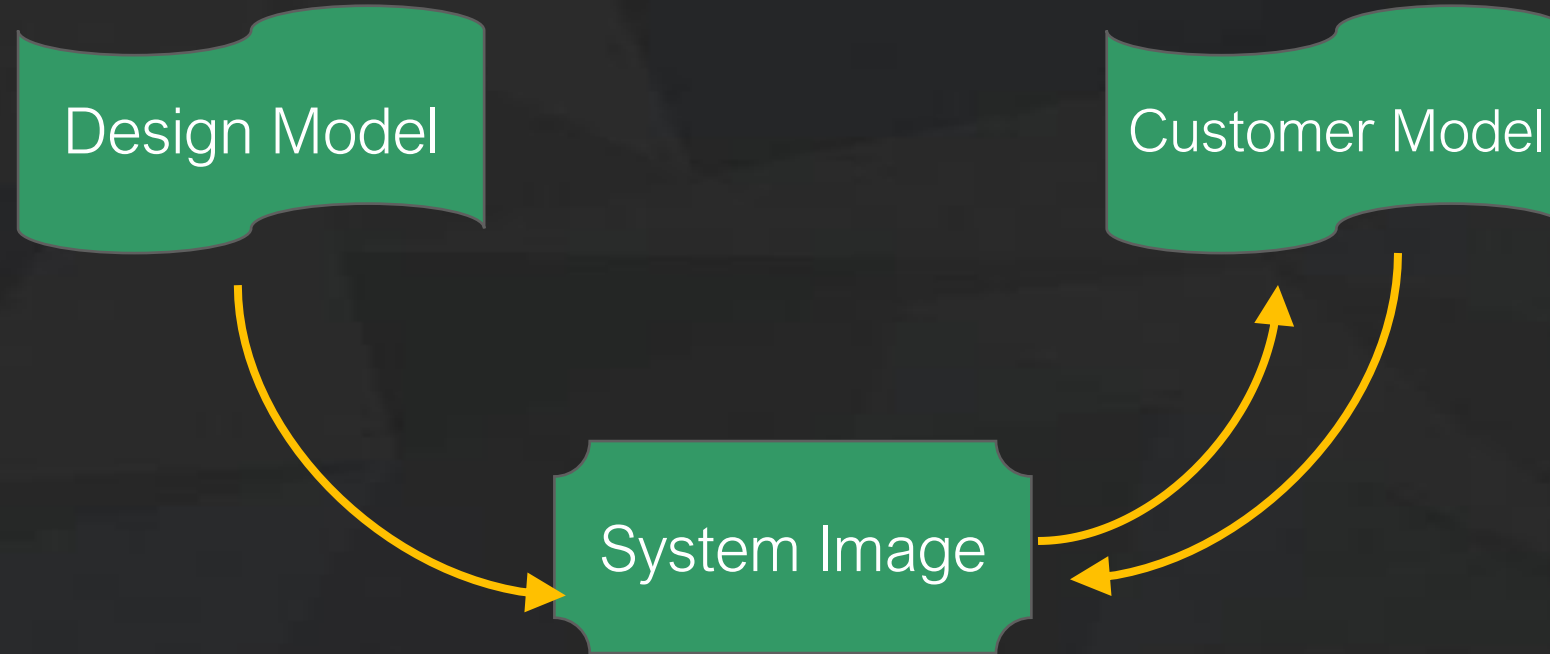


Can you fix the problem?

Possible solutions

- make controls map to customer's model
- make controls map to actual system

Design Model & Customer Model



- Customers get model from prior experience & usage of new
 - through system image
- What if the two models don't match?

Conceptual Model Mismatch

- Mismatch between designer's & customer's conceptual models leads to...
 - slow performance
 - errors
 - frustration
 - ...



Model Mismatch: Car Automatic Shifter



Administrivia

- Hi-Fi Prototype Assignment posted later today
 - mid-way milestone due on Thur/Fri Mar. 3/4 (at start of studio) including report draft
 - video demo due Wed. March 9th at 11:59 PM
 - final prototype due Thur./Fri. Mar. 10-11 (at start of studio)
 - final presentations at project fair, Fri. Mar. 11, 5-8:30 PM (** moving earlier) (show starts at 5:30 PM)
 - final write-up due Sun. Mar. 13, 11:59 PM
- Midterm Wednesday, Feb 23rd (***review session tomorrow night 6:30-7:30 pm***)
 - if you sent us OAE letter, you should get email from us about exam accommodations
- If you aren't in CS47 & want to learn React Native
 - see CS147 home page for links to CS47 assignments 1-4 & Lectures 1A-6B
- New: CS194H this Spring on Tue/Fri 1:30-3:30 pm
 - continue your project or join another one & get it to app store quality
 - practice design principles individually w/ crit
 - meets senior project requirement
 - slower pace than 147
 - small size w/ feedback from me & very experienced TA

TEAM BREAK

Talk about how to build your hi-fi prototype

EXIT TICKET

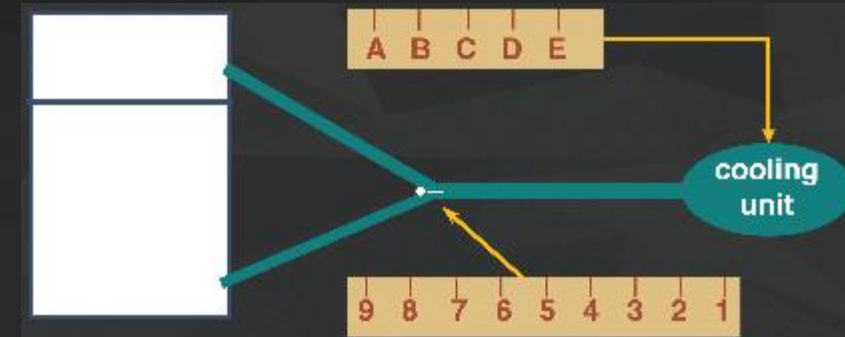
[https://bit.ly/cs147-
2022wi-exit7-021](https://bit.ly/cs147-2022wi-exit7-021)

Design Guides

- Provide good conceptual model
 - customer wants to understand how controls affect object
- Make things visible
 - if object has function, interface should show it
- Map interface controls to customer's model
 - infix vs. postfix calculator – whose model is that?
- Provide feedback
 - what you see is what you get! (WYSIWYG)

Make Things Visible

- Refrigerator?
 - make the 1..9 dial something about percentage of cooling between the two compartments?
- Functions available on watch w/ 4 buttons? Is there an issue?
 - too many & they are not visible!



Make Things Visible



<http://www.brucesallan.com/wp-content/uploads/2013/03/Becker-Car-Stereo.jpg>

- Compare to controls on old & new car radios
 - #controls = #functions
 - controls are labeled (?) and grouped together

Make Things Visible



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Make Things Visible



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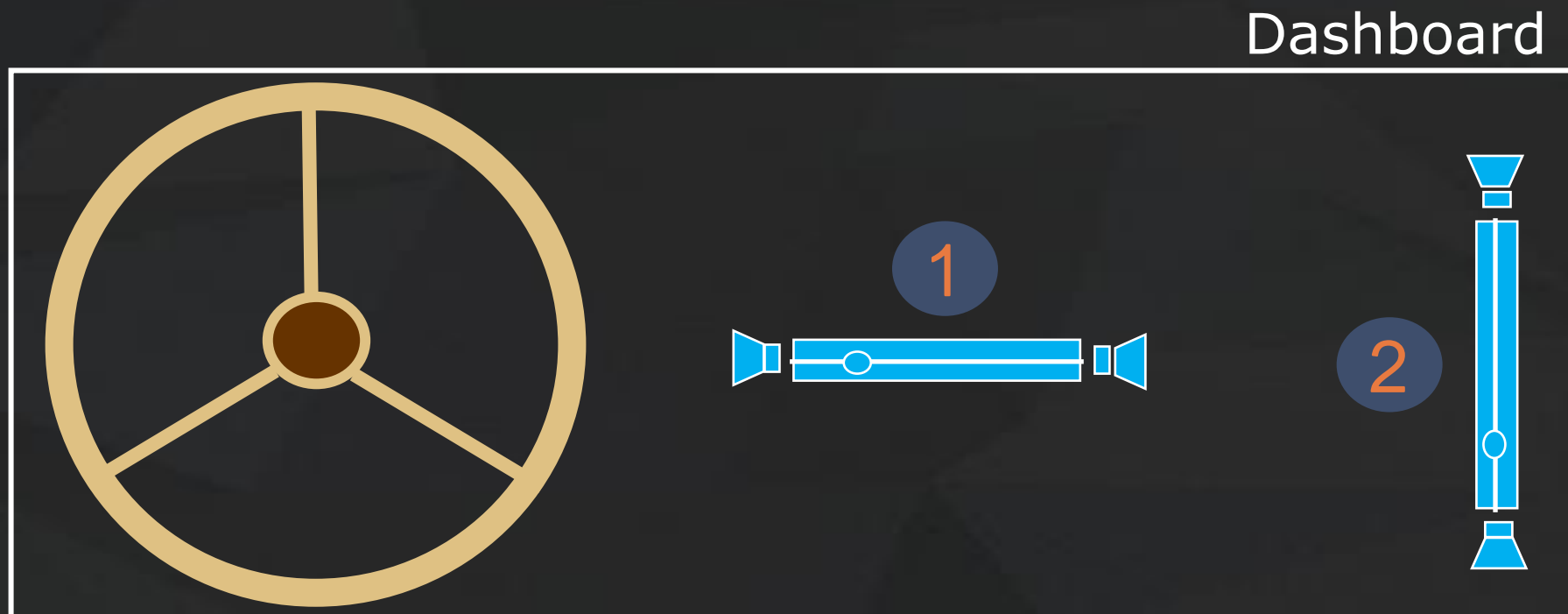
Make Things Visible



- Compare to controls on old & new car radios
 - #controls = #functions
 - controls are labeled (?) and grouped together
 - tradeoffs of the “glass UI” (e.g., Tesla)?

Map Interface Controls to Customer's Model

- Which is better for car dashboard speaker front / back control?
- Control should *mirror real-world*



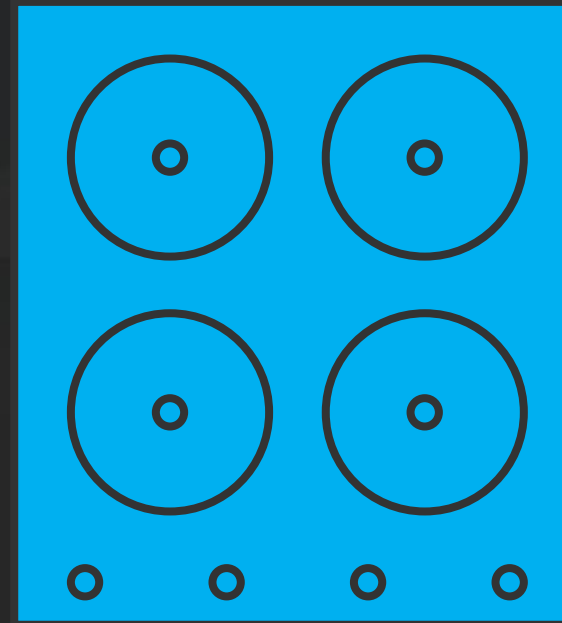
Map Interface Controls to Customer's Model

- Which is better for car dashboard speaker front / back control?
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Mercedes Benz Seat Control maps to real world

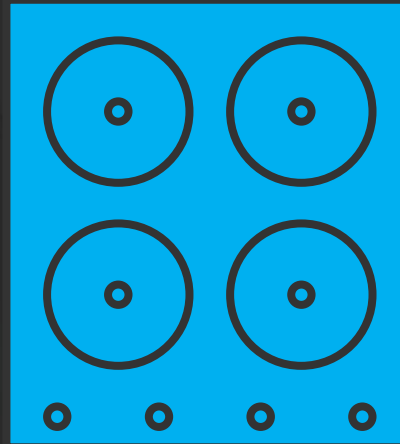
Map Interface Controls to Customer's Model



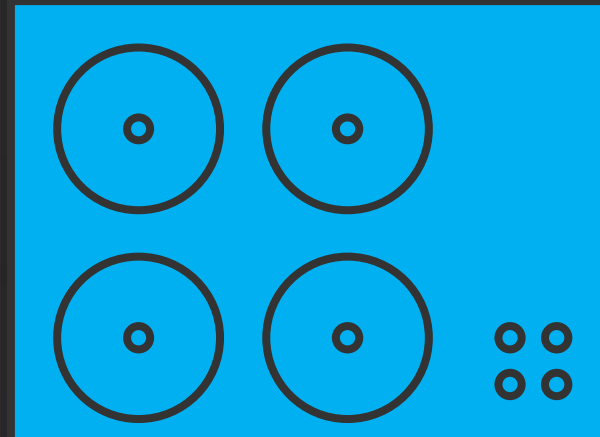
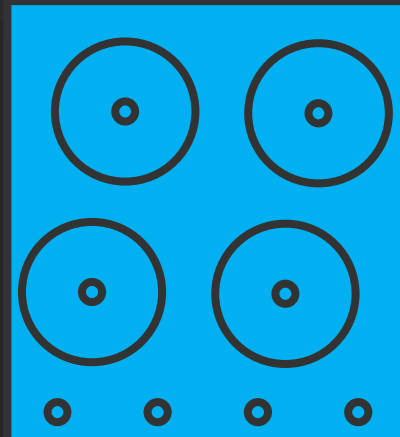
Problem?

Which knob controls which burner?

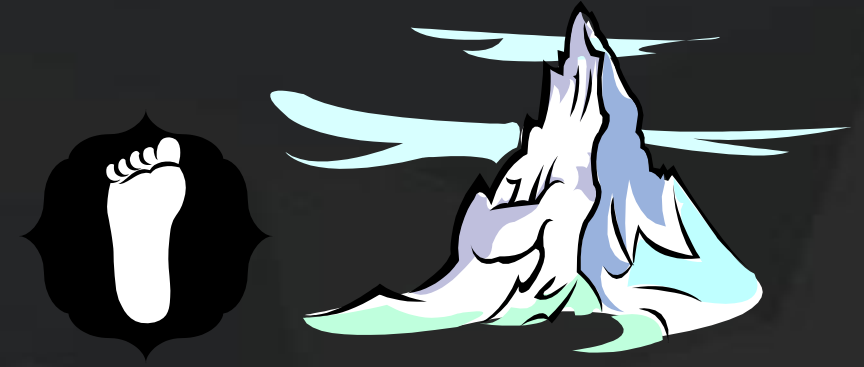
Map Interface Controls to Customer's Model



Possible fixes?

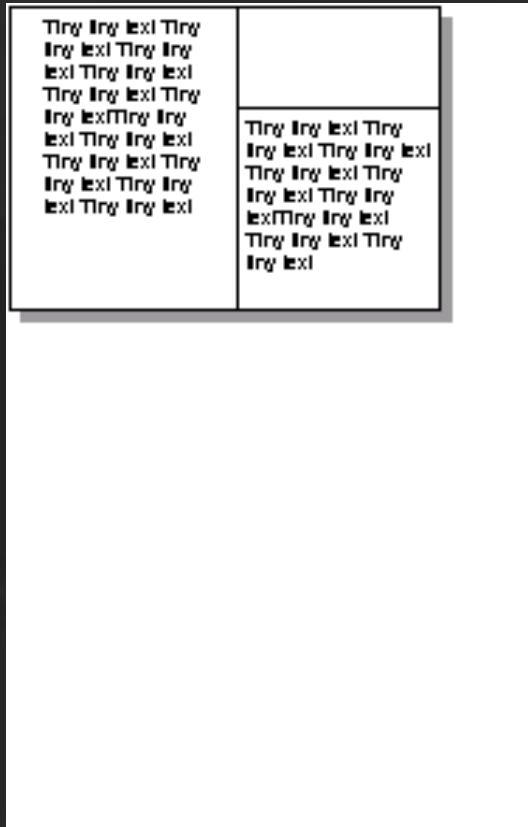


Metaphor



- Definition ?
“The transference of the relation between one set of objects to another set for the purpose of brief explanation.”
- Lakoff & Johnson, *Metaphors We Live By*
 - “...the way we think, what we experience, and what we do everyday is very much a matter of metaphor.”
 - in our language & thinking – “argument is war”
 - ... he attacked every weak point
 - ... criticisms right on target
 - ... if you use that strategy
- We use metaphor in UI design to *leverage existing conceptual models*

Desktop Metaphor



Engelbart's windows

```
;; Code:
;;;autoload
(defun gline-shell ()
  "Open up a shell buffer. If there isn't one, make one."
  ;; walk buffer list
  ;; pop to the 1st shell buffer
  ;; also make one
  (interactive)
  (unless (gline-shell--pop-to-nearest-shell-buffer)
    (shell)))

(defun gline-shell--pop-to-nearest-shell-buffer ()
  "Pop to the nearest shell buffer in buffer list."
  ;; goto nearest shell buffer
  ;; If one visible, focus that
  ;; else pop up shell buffer
  (interactive)
  (do-list (buf (buffer-list))
    (when (and (gline-shell--shell-node-p buf)
              (not (eq buf (current-buffer))))
      (pop-to-buffer buf))))

(defun gline-shell--shell-node-p (buf)
  "Returns whether the given buffer is in shell-mode."
  (eq (gline-shell--buffer-mode buf)
      'shell-mode))

(defun gline-shell--buffer-mode (buffer-or-string)
  "Returns the major mode associated with a buffer."
  (let ((current-buffer buffer-or-string)
        major-mode))
    major-mode))

;;; gline-shell.el ends here

BU-----F1 gline-shell.el Bot L37 Git-master (Emacs-Lisp SP company)
[close-input-port]
(printed-markov v)
(printed-markov v)
(i printed-markov : Any -> markov)
(define (printed-markov printed)
  (define-predicate number? Natural)
  (define-predicate number? Natural)
  (match printed
    ( (TOP n) <list prefix blob> ...)
      (define a empty-markov)
      (if (not (number? n))
          (error "load expected number, got '%s'" n)
          (markov
            n
            (let loop ((chain (markov-chain n)) [ps prefix] [blobs blob])
              (cond ((null? ps) chain)
                    (t (loop (parse-prefix (first ps))
                              (define pi (parse-blob (first blob)))
                              (loop (hash-set chain pi bi)
                                    (rest ps)
                                    (rest blobs))))))))))
  (define parse-prefix : Any -> (List Symbol Symbol))
  (define parse-blob : ()
    (define-predicate prefix? (List Symbol Symbol))
    (if (prefix? p)
        p
        0))
  (let ((chain (markov-chain n)) [ps prefix] [blobs blob])
    (loop (hash-set chain pi bi)
          (rest ps)
          (rest blobs))))))

BU-----F1 halve-other-window-height.el Bot L68 Git-master (Scheme Racket/R SP company)-----F1 index.html All L11 (HTML company)
(Expand current window to use half of the other window's lines."
  (interactive)
  (enlarge-window (/ (window-height (next-window) 2)))

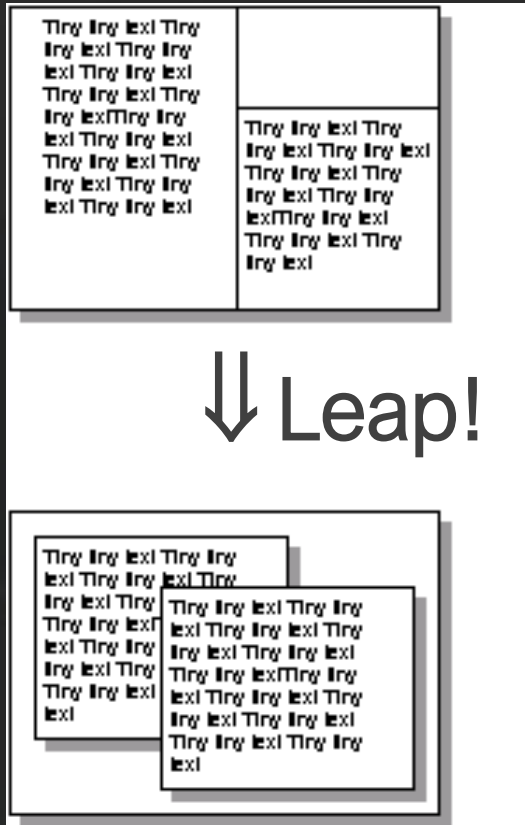
(global-set-key (kbd "C-c C-c") 'halve-other-window-height)

(provide 'halve-other-window-height)

BU-----F1 halve-other-window-height.el All L6 Hq-288 (Emacs-Lisp SP company)
Mark set
```

In today's Emacs

Desktop Metaphor



Suggests a conceptual model

- not really an attempt to simulate a real desktop
- a way to explain why some windows overlapped
- leverages knowledge about files, folders & trash

Xerox PARC's overlapping windows

Example Metaphors

- Global metaphors
 - personal assistant, wallet, clothing, cards
- Data & function
 - to-do list, calendar, documents, find, assist
- Collections
 - drawers, files, books, newspapers, photo albums



How to Use Metaphor

- Develop interface metaphor tied to conceptual model
- Communicate that metaphor to the user
- Provide high-level task-oriented operations, not low-level implementation commands

Avoid Metaphor for Metaphor's Sake

- Skeuomorphism
 - “making items resemble their real-world counterparts”
or
“a physical ornament or design on an object made to resemble another material or technique”

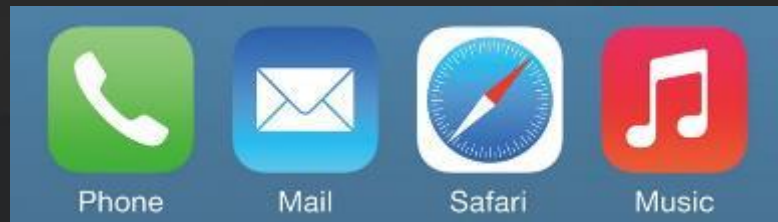
- Argument against: takes up space & leads to inconsistent look
- Argument for: helps people learn



Apple iBooks2

Avoid Metaphor for Metaphor's Sake

- Metaphors can become dated



iPhone metaphors dated?



iPad Podcast app – ever seen a reel-to-reel tape deck?

Ways of Being Consistent

- Interfaces should be consistent in a *meaningful way*
 - e.g., ubiquitous use of same keys for cut/copy/paste
- Types of consistency
 - consistent internally
 - e.g., same terminology & layout throughout app
 - consistent with other apps
 - e.g., works like MS Word, uses same keyboard conventions
 - design patterns (across many apps)
 - consistent with physical world

Is Consistent Always Better?

NO

- Palm PDA example: should “new appointment” & “delete appointment” be in the same place?
- New (add) is common, but delete is not



Is Consistent Always Better?

NO

Event Details ⓘ

Time: 12:00 pm - 1:00 pm

Date: Thu 6/24/99

Alarm:

Repeat:

None | Day | **Week** | Month | Year

Every: ... 1 week(s)

End on: ▼ No End Date

Repeat on: S M T W T F S

Private:

OK Cancel Delete... Note

Early Palm design
(like desktop version)

Event Details ⓘ

Time: 12:00 pm - 1:00 pm

Date: Thu 6/24/99

Alarm:

Repeat: None

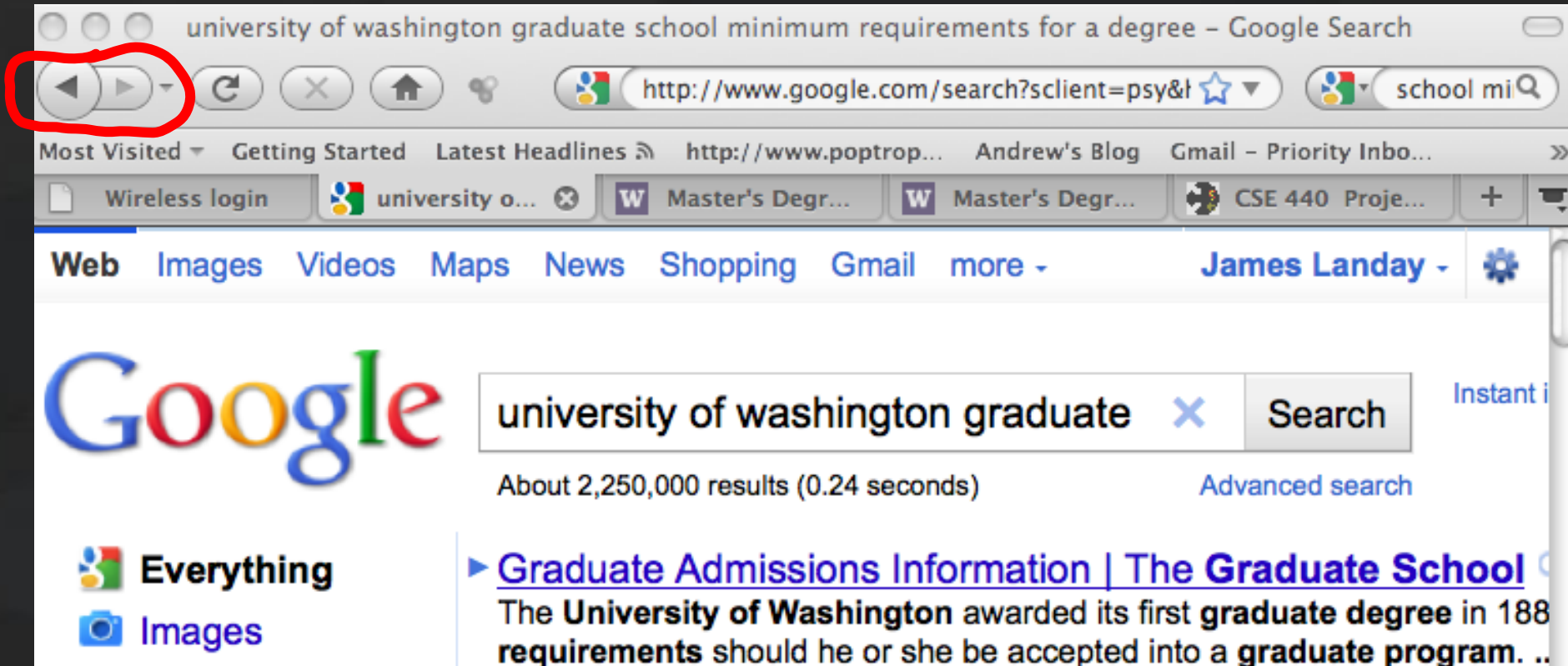
Private:

OK Cancel Delete... Note

Streamlined design

Is Consistent Always Better?

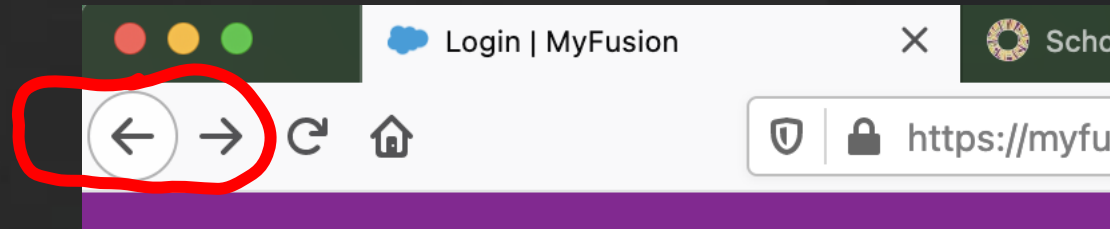
NO



Firefox 3 Back/Forward Buttons

Is Consistent Always Better?

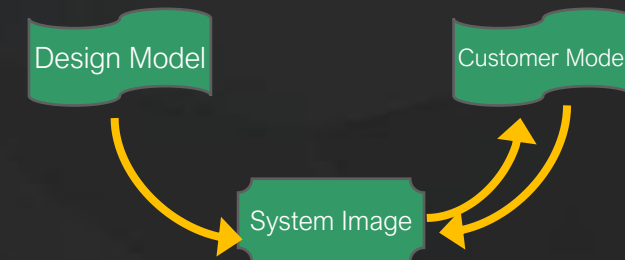
NO



Most Recent Firefox Back/Forward Buttons

Summary

- Conceptual model?
 - mental representation of how the object works & how interface controls effect it
- Design model should equal customer's model?
 - mismatches lead to errors
 - use customer's likely conceptual model to design
- Design guides?
 - provide good conceptual model
 - make things visible
 - map interface controls to customer's model
 - provide feedback



Further Reading

- *Design of Everyday Things*, Donald Norman
- Design as Practiced, Donald Norman
 - Talks about failure to make changes to Macintosh
 - http://www.jnd.org/dn.mss/Design_as_Practiced.html
- Computing the Case Against User Interface Consistency, Jonathan Grudin
 - Talks about why interfaces should not always be consistent
 - <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.90.6480&rep=rep1&type=pdf>

Next Time

- Lecture
 - Thursday evening: Midterm Review
 - Monday: Holiday
 - Wednesday: Midterm
- Studio
 - This week: HE group assignment, Midterm Q&A
 - Two weeks: Hi-Fi Prototype Midway Milestone