IPM 12/13 – T1.3
Design Concepts

Licenciatura em Ciência de Computadores

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U.PORTO FC

Summary

- Design concepts
  - Affordance
  - Mapping
  - Feedback
  - Visibility
- Other factors
  - Transfer effects
  - Cultural associations
  - Individual differences

Usable vs. Useful

Thomas Landauer, *The Trouble with Computers: Usefulness, Usability, and Productivity, 1995*

- Useful: the system can do what I need it to do
- **Usability: I can *get the system to do what I need it to do***
  - ease of learning, recall, productivity, minimal error rates, high user satisfaction

- Not disjoint concepts
  - e.g., system not useful because it is so difficult to interact with it

Design Concepts

design concept is highest level and open to interpretation;
It is a *starting point*

- Affordance
  - visible constraints
- Mapping
- Feedback
  - Causality (true and false kinds)
  - Understandable action
- Visibility
- Conceptual models

Other factors:

- Transfer effects
- Cultural associations
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"Psychology of everyday things",
Don Norman, 1988

Design Concepts: Affordance

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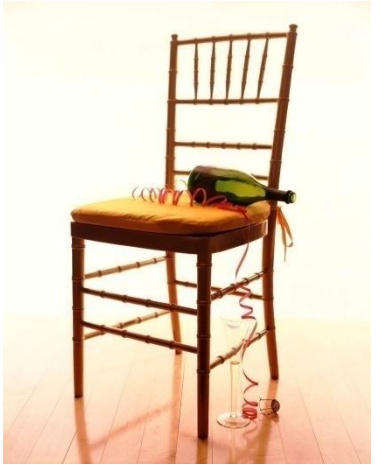
Affordance

The perceived and actual fundamental properties of the object that determine how it could possibly be used (Gibson 1977)

- Visual structure indicates how the object should be used
  - Chair for sitting
  - Table for placing things on
  - Knobs for turning
  - Slots for inserting things into
  - Buttons for pushing
  - Computers for ???
- Complex things may need explaining
- Simple things should not
  - when simple things need pictures, labels, instructions
    -> Design has failed!

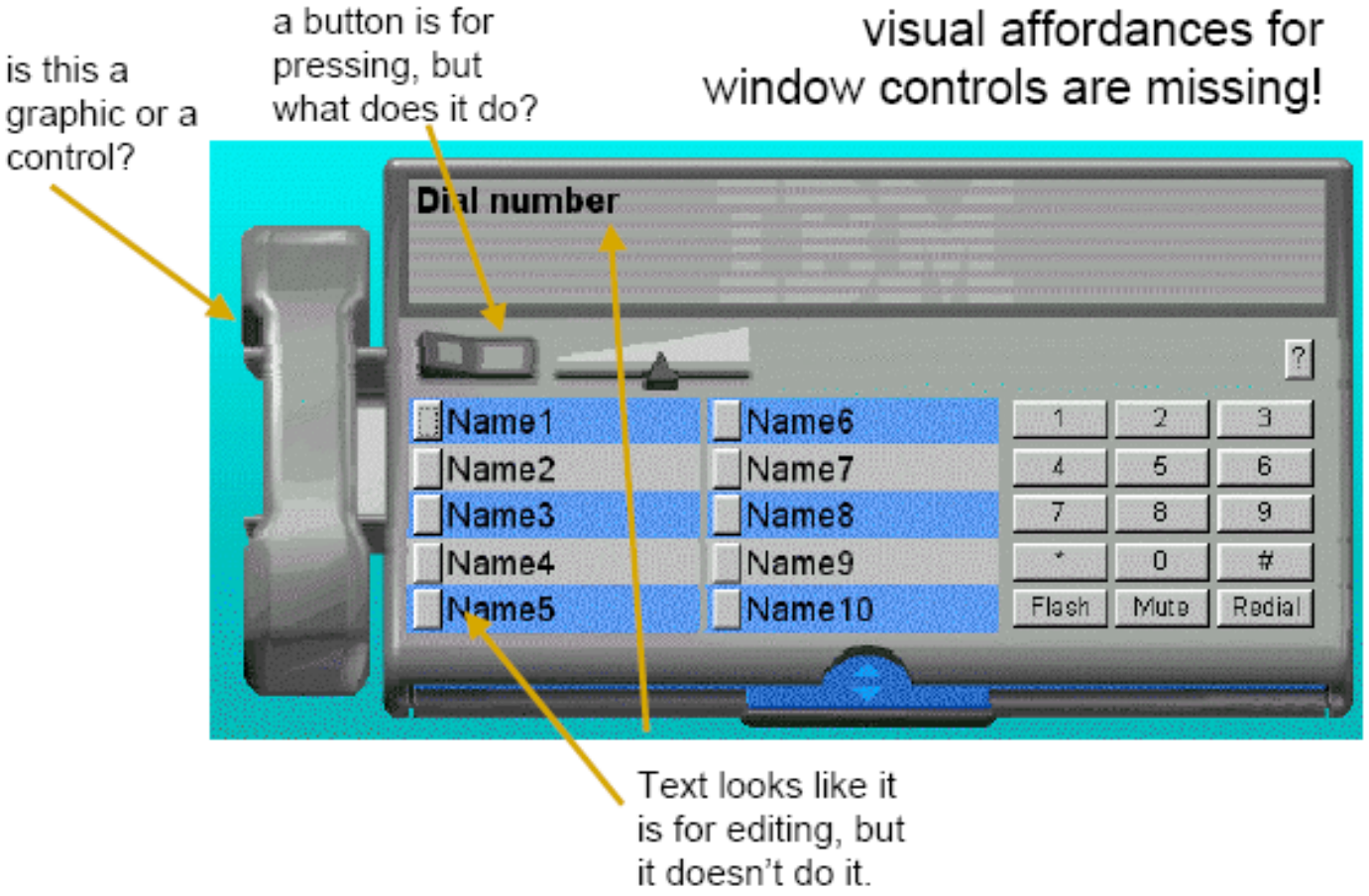


Physical affordance

photo from Don Norman's "good design" gallery:
http://www.jnd.org/GoodDesign.html

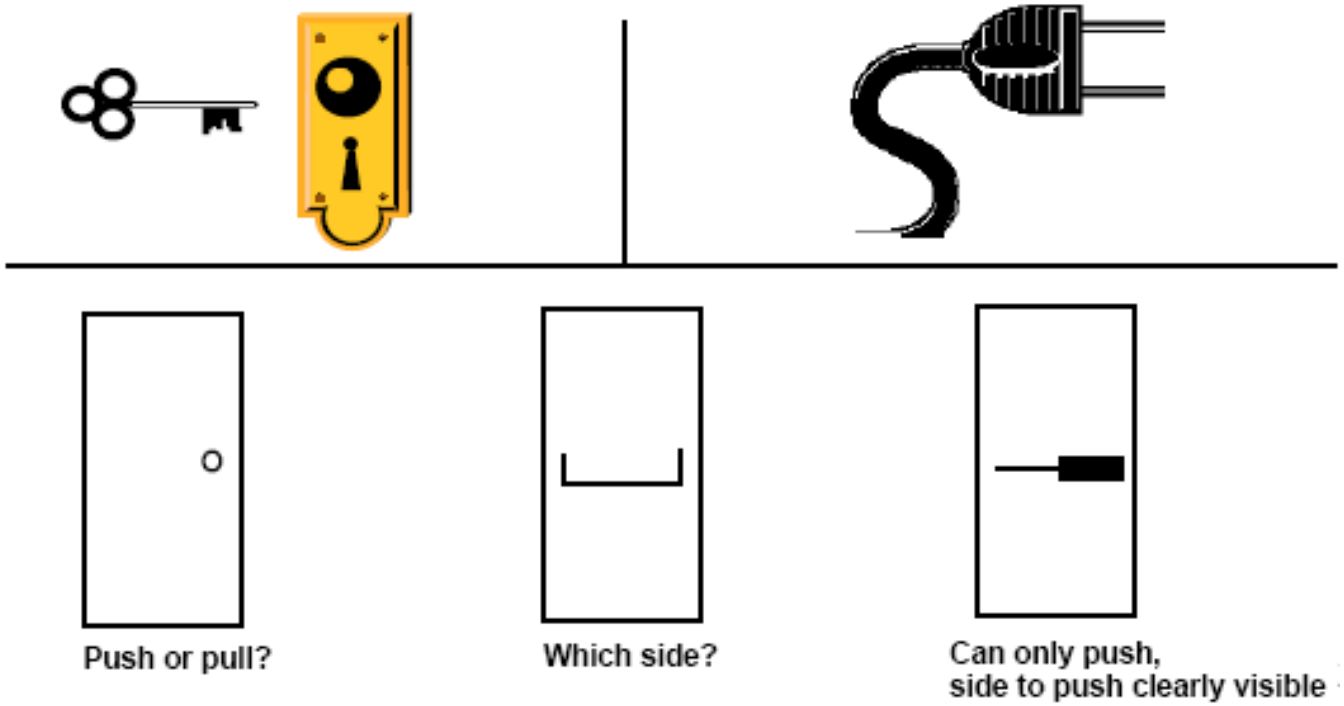
Low level affordances: needs familiar idiom and metaphor to work

Visual “affordance” can be misleading!

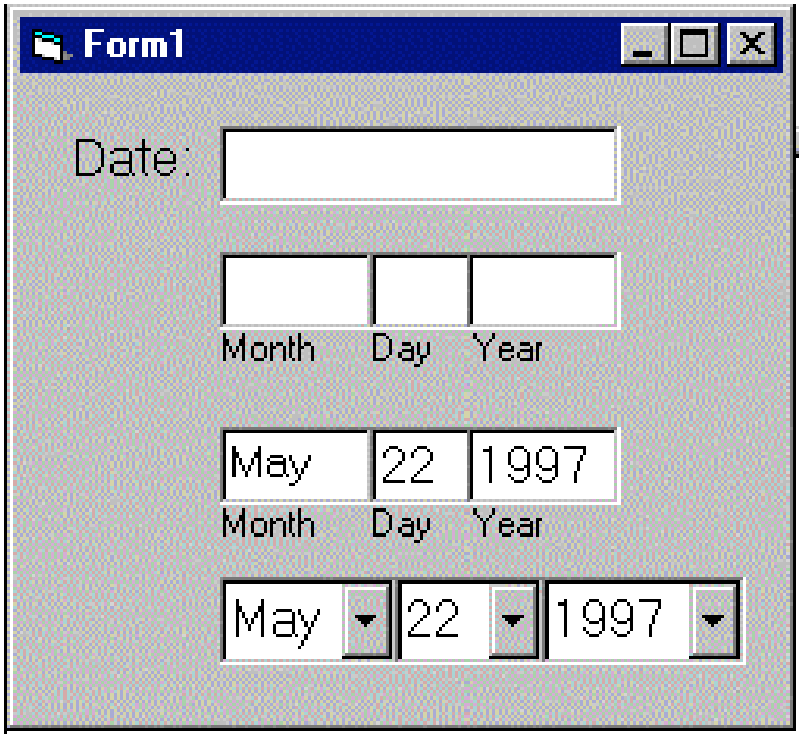


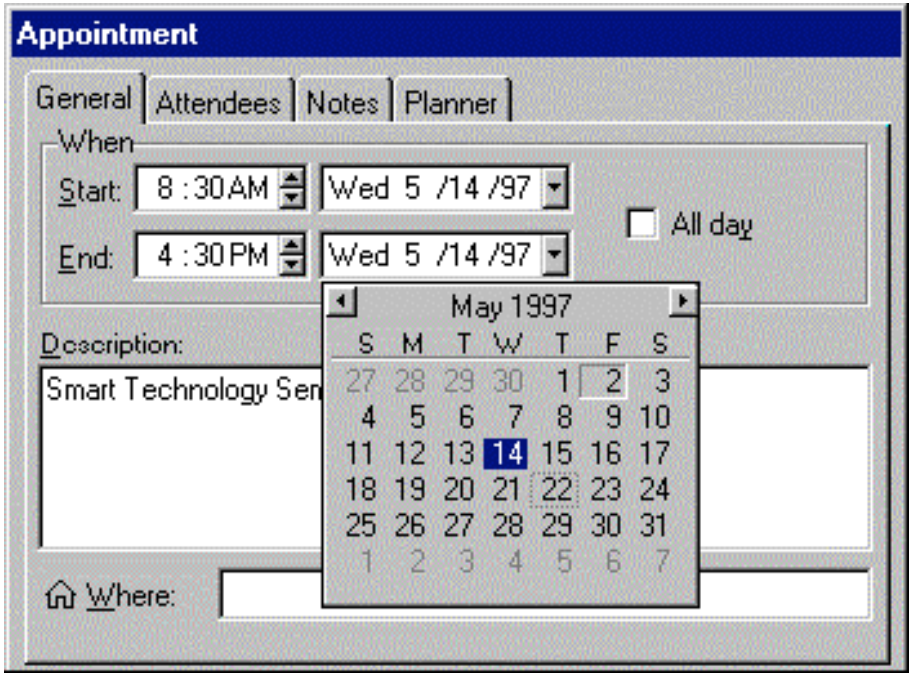
Affordance: visible constraints

Object's appearance indicates *limitations of* possible actions



A progression of visible constraints to enter a date





Design Concepts: Mapping

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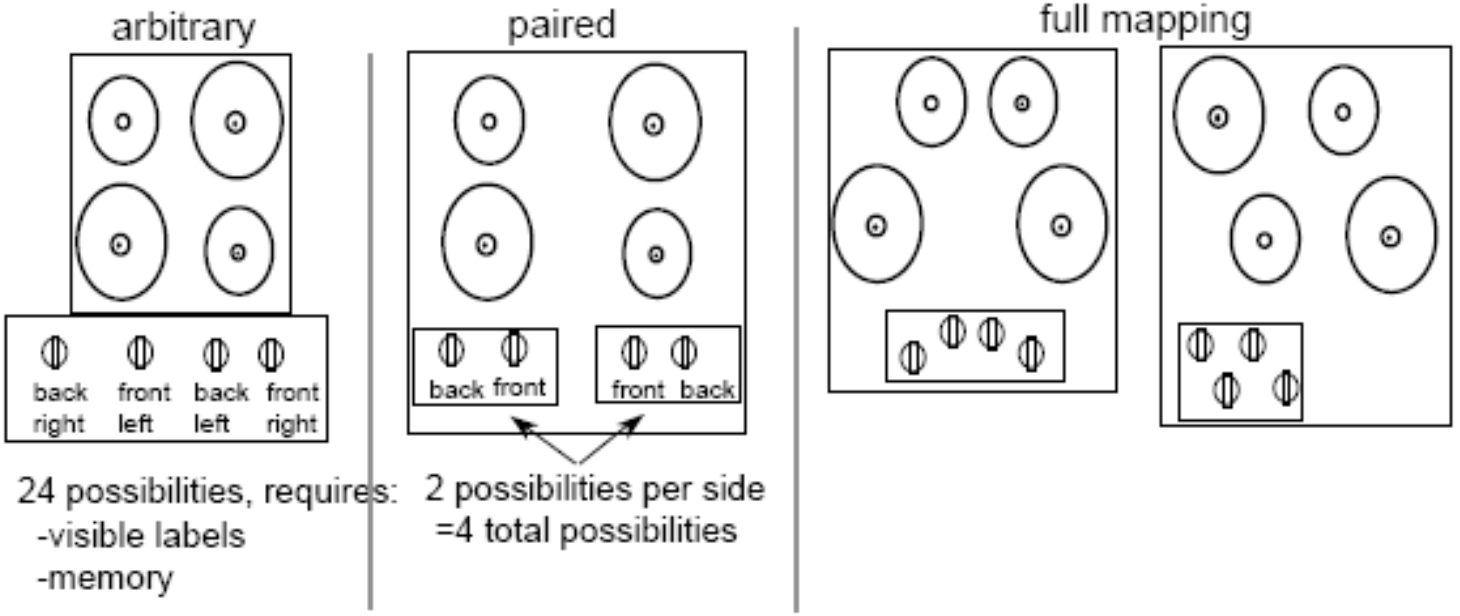
OFF
OFF
OFF
OFF
OFF
OFF
OFF
HI
LO
HI
LO
HI
LO
HI
LO
HI
LO
250
100
200
150
ON
200 230 260
400 450 500
OVEN
HOTPLATES
GRILL
Centenary

What is mapping?

The set of possible / natural relations between objects

- e.g. control-display compatibility:
  - Visible mapping and mimic diagrams: stove and controls
  - Cause and effect: steering wheel-turn right, car turns right



Example of mappings

Design Concepts: Feedback

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Feedback & understandable action

Effects visible only after ‘Exec’ button is pressed:

- OK does nothing! Exec THEN OK (action is not understandable)
- When hit OK, action is irreversible.

- So… just remove the Exec button, right?

Feedback and causality

Causality: *A caused B to happen*

True causality != perceived causality

- We usually assume that the thing that happens right after an action was caused by that action.
- Interpretation of “feedback”.

False causality

- Incorrect effect:
  - Starting up an unfamiliar application just as computer crashes causes “superstitious” behaviors.
- Invisible effect:
  - Command with no apparent result often re-entered repeatedly.
  - e.g., hitting esc, or alt-ctrl-del, on unresponsive system.

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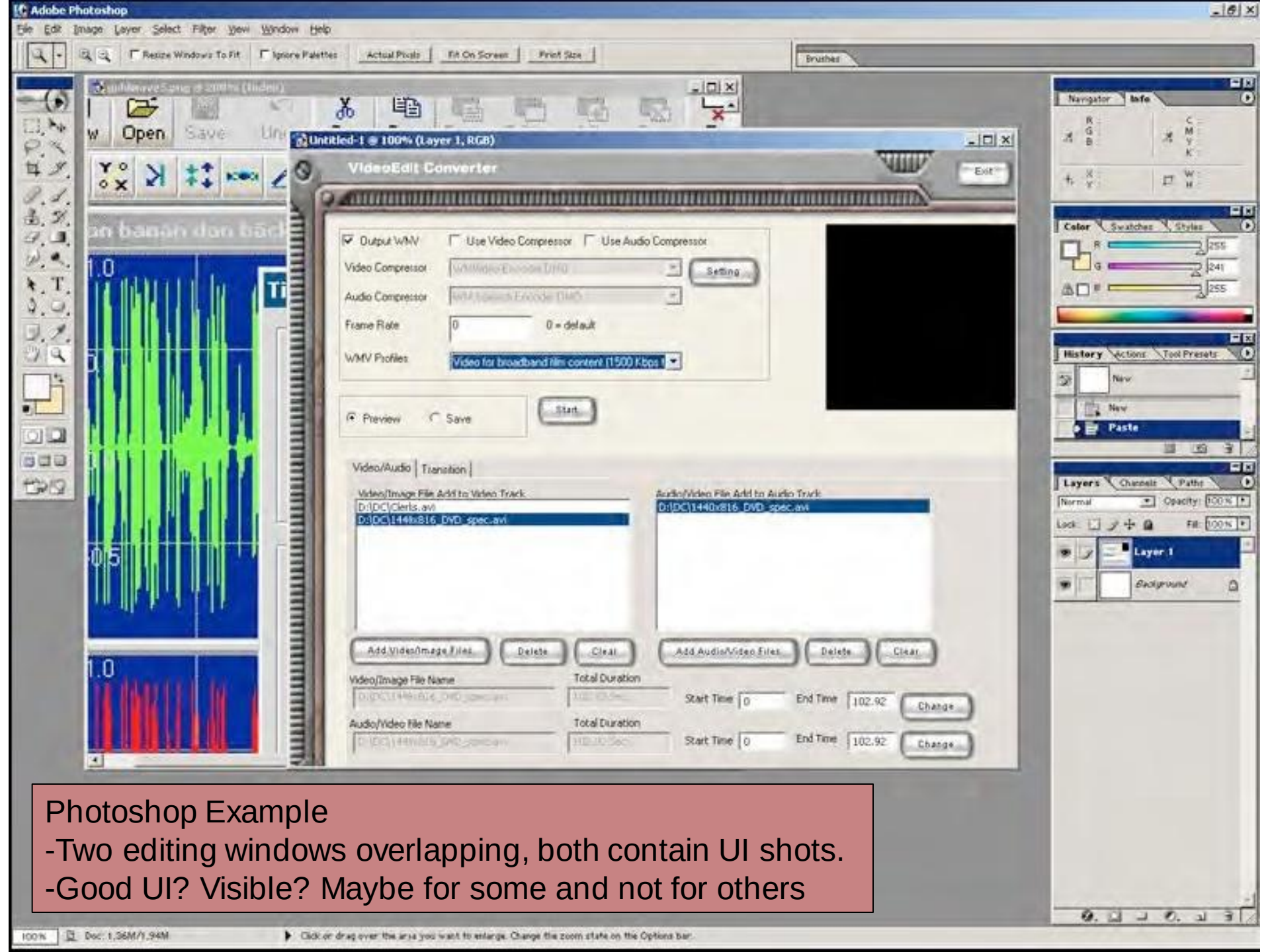
Visibility: what can it do?

Too many buttons (most unused)
Poor mappings
Obscure labels
Overlapping functions

www.useit.org



Photoshop Example

-Two editing windows overlapping, both contain UI shots.

-Good UI? Visible? Maybe for some and not for others

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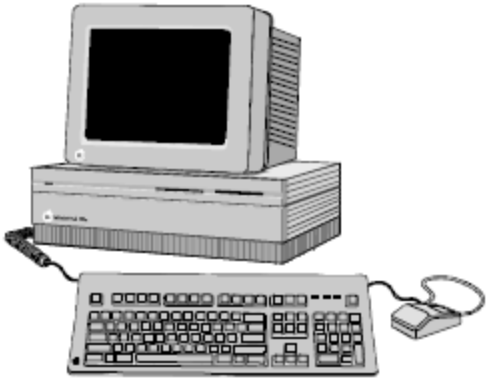
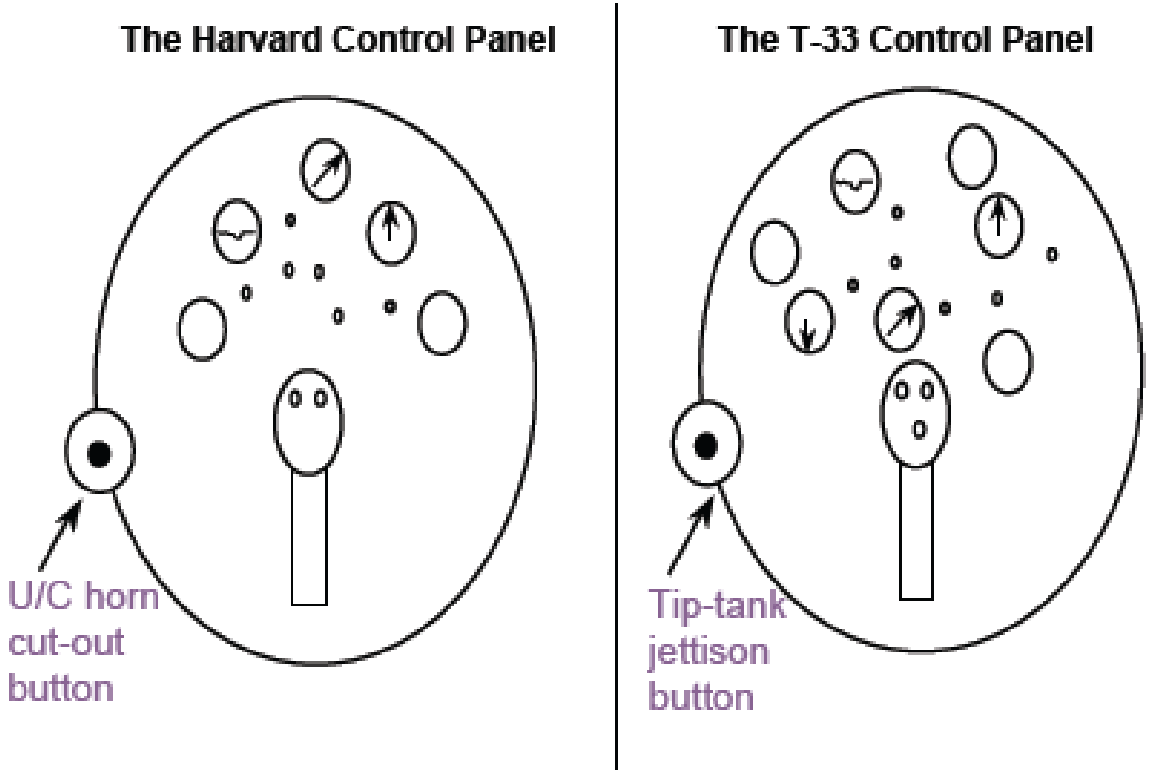
Transfer effects

- People transfer their learning/expectations of similar objects to the current objects
  - Positive transfer: previous learning applies to new situation
  - Negative transfer: previous learning conflicts with new situation



Negative transfer



Problem #2: Negative transfer

T-33's: tip-tank jettison button in same location

Intentional inconsistency

Cultural idioms

Idiom: A standard with a meaning that cannot be derived from the conjoined meanings of its elements.

Populations learn idioms that work in a certain way

- red means danger, green means safe

But idioms vary in different cultures!

- Light switches: up is (N America) **on** **(Britain) off**
- Faucets: clockwise is (N America) **off** **(Britain) on**

Ignoring/changing stereotypes?

- Home handyman: light switches installed upside down
- Calculators vs. phone number pads:
  - which should computer keypads follow?

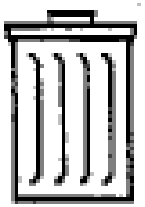
Difficulty of changing stereotypes

- Qwerty keyboard: designed to prevent jamming of keyboard
- Dvorak keyboard (’30s): probably faster to use

Cultural Idioms

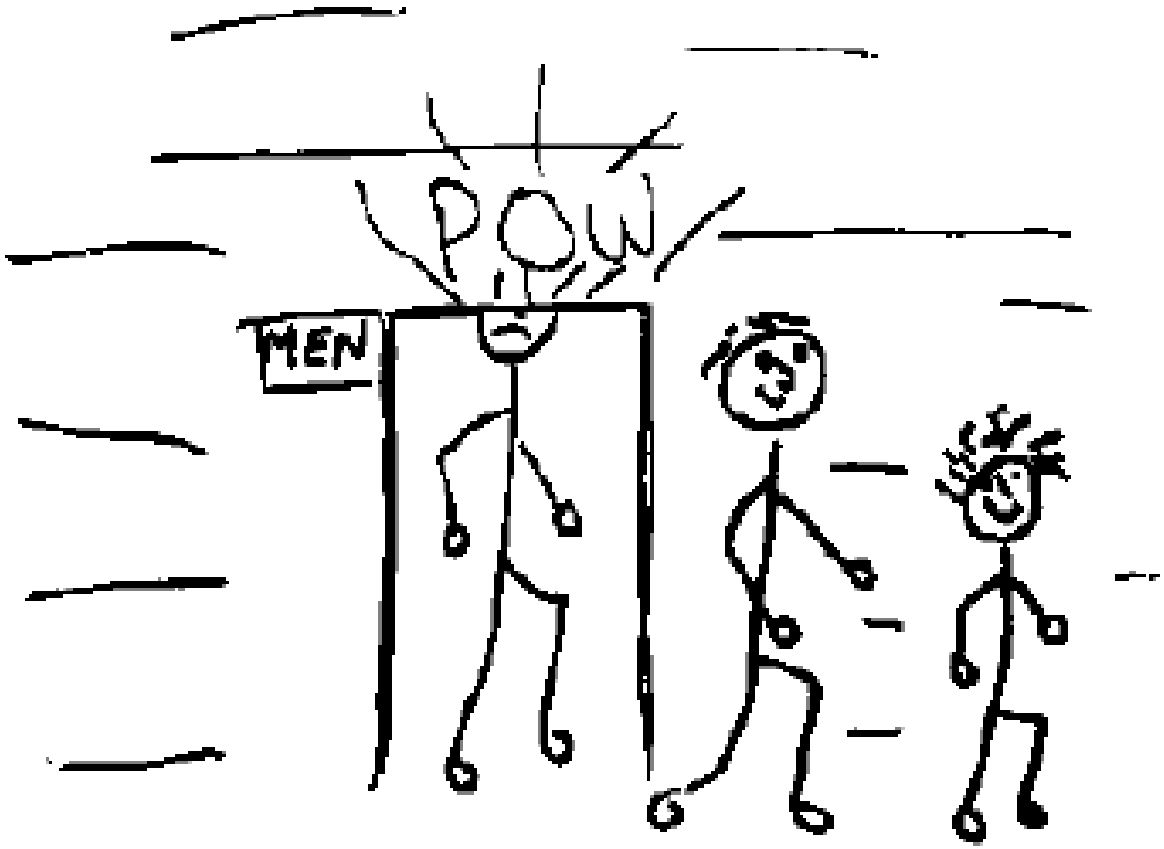
Because a trashcan in Malaysia may look like this:

a Malaysian user might be confused by this image popular in Apple interfaces:



Sun found their email icon problematic for some American urban dwellers who are unfamiliar with rural mail boxes.

Individual differences

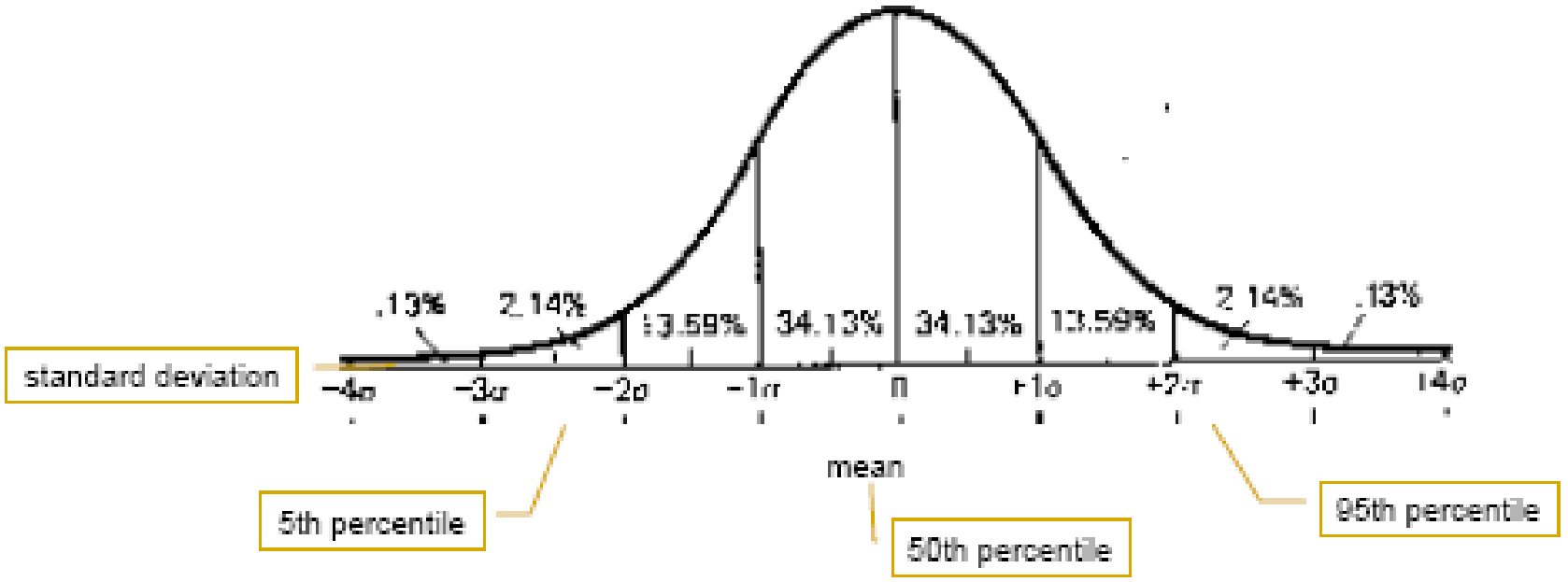


Individual differences: physical

People are different

- It is rarely possible to accommodate all people perfectly
  - Design often a compromise:
    - ceiling height: 8' … but tallest man: 8' 11"!
- Rule of thumb:
  - Design should cater to 95% of audience (5th or 95th percentile)
    - 5% of population may be (seriously!) compromised
- Designing for the average a mistake
  - may exclude half the audience!
- Examples:
  - Cars and height: headroom, seat size
  - Computers and visibility:
    - font size, line thickness, color for color-blind people?

Gaussian distribution



Individual differences: expertise

computer users:

novices	*walk up & use systems* *interface affords restricted set of tasks* *introductory tutorials to more complex uses*
casual	*standard idioms* *recognition (visual affordances) over recall* *reference guides* *interface affords basic task structure*
intermediate	*advanced idioms* *complex controls* *reminders and tips* *interface affords advanced tasks*
expert	*shortcuts for power use* *interface affords full task + task customization*

most kiosk + internet systems

most shrink-wrapped systems

custom software

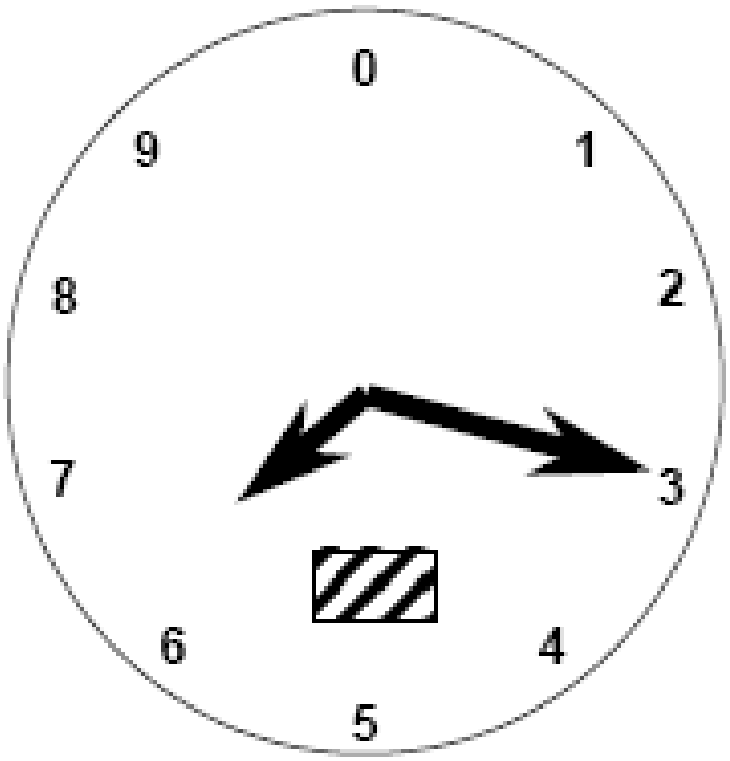
Proverbs on individual differences

you probably aren't much like the "average" user of a system you've designed

don't expect others to think and behave as you do, or as you might *like them to.*

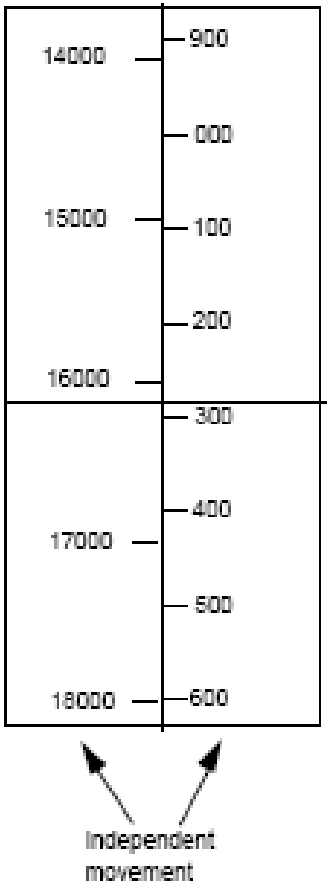
people are as different in the ways they think and behave, as they are physically

Example: What's the altitude?



- early days (< 1000'):
  - Only one needle needed
- As ceilings increased over 1000':
  - small needle added
- As they increased > 10,000':
  - box indicated 10,000' increment through color change

A kind of tape altimeter



- Human factors test showed that this altimeter:
  - Eliminated reading errors
  - Was faster to read
- But it was not put into standard use!
  - Why?

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Resources

1. Kellogg S. Booth, Introduction to HCI Methods, University of British Columbia, Canada http://www.ugrad.cs.ubc.ca/~cs344/current-term/