# SENG 310: Human Computer Interaction

Lecture 3.

The design of everyday things

Readings:

Donald Norman, The Design of Everyday Things, Chapter 1.

# Highlights from the last course

- Progress in HCI is a result of:
  - cheaper computers/workstations meant people more important than machines
  - excellent interface ideas focus on human needs instead of system needs (user centered design)
  - ideas evolve into products through several iterations
    - *pioneer* systems developed innovative designs, but often commercially unviable
    - *settler* systems (many years later) well-researched designs + killer applications

# Today

- The psychopathology of everyday things

  - Why are some everyday things difficult to understand and use?

  - What are Don Norman's principles and how do they apply to the design of everyday things?

  - How can we apply Norman's principles to the design of computer interfaces?

# Main concepts

- Affordances
- Mappings
- Constraints
- Feedback
- Conceptual models

# Psychopathology of Everyday Things

- We are surrounded by many everyday things that have poor *usability*

Some of my daily nightmares:

Fax machines
Face down or face up?

Photocopiers
no clues in how to do a recto-verso copy

# Programming a VCR

http://www.epinions.com/content_155485769348

Excerpt:

## Too Hard To Use; Took It Back To The Store

One of the important things I look for in a VCR is ease of use. It took me several days to figure out that after setting a timer program, you have to change the JVC unit's settings to say "AUTO TIMER = ON". If you don't, when you shut off the unit it WILL NOT activate the timer. I missed a six-hour recording of the then-recent (at the time of this writing) U.S. Open coverage. Every VCR should automatically engage the timer when you turn it off; what's the point in not having this important feature?

I mean, could you imagine being half-asleep, trying to set the VCR for the big game or that concert you've been waiting six months for, thinking you set it correctly, and getting nothing? Don't take that chance with this VCR.

# Lessons learned

"Imagining that we can create a good user experience for our products after their internals have been constructed is like saying that a good coat of paint will turn a cave into a mansion."

(About Face 2.0-Cooper)

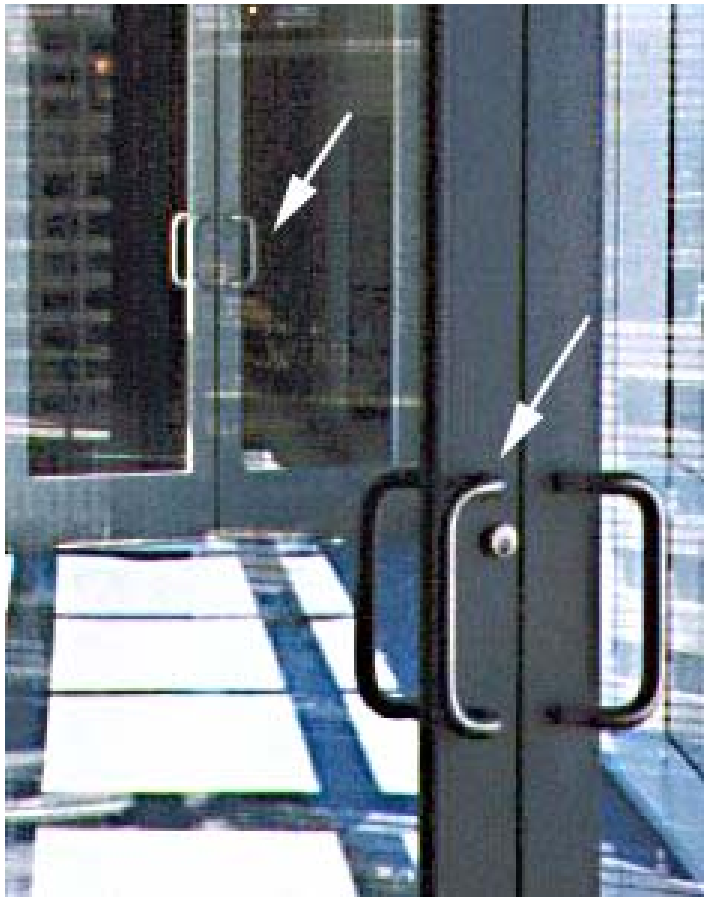
# Example of bad design: affordance

Trapped between doors

1st problem: affordance: handles afford for pulling rather than pushing

- 2nd problem: inconsistency

The two sets of doors work in opposite ways.



# Example of bad design (cont'd)

- Redesign suggestions:
- 1. Quick fix: add PUSH and PULL labels to the doors. Will this work?
- 2. install appropriate flat push-bar handles on the sides of the doors to be pulled
- 3. install swinging doors that can be opened by both pushing and pulling

# Affordances

- The word "affordance" was originally invented by the perceptual psychologist J. J. Gibson (1977, 1979) to refer to the actionable properties between the world and an actor (a person or animal).
- affordances are a relationship.
- They are a part of nature: they do not have to be visible, known, or desirable.

# Affordances

- The affordances of an object determine, naturally, how it can be used
  - Button affords pushing
  - Handle affords grasping
  - Chair affords sitting
  - Knob affords turning
  - Computer afford ?
- Just by looking at a simple object, a user should know how to use it: visual affordance
- When simple things need pictures, labels, instructions, then their design is flawed.

# Smart design for affordance

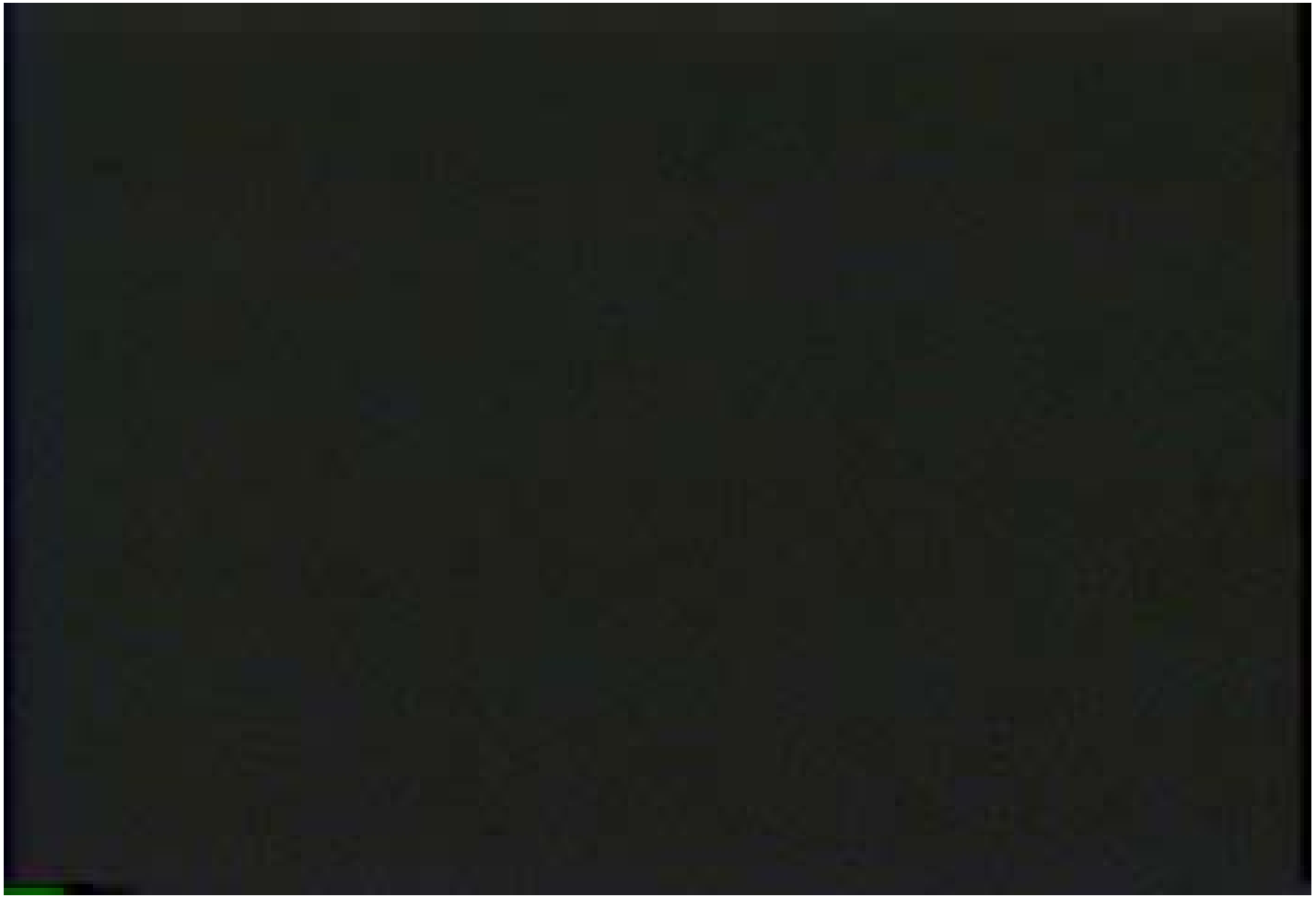
The Oxo measuring cup is angled so you can now see how much liquid is inside without having to bend over and view from the side.

The measurement levels sit at an angle so you can easily read them as you look downwards.

# Perceived versus real affordance

- In product design, one deals with real, physical objects.
- This involves both real and perceived affordances, and the two are usually not the same.
- as designers, we care more about what the user perceives (perceived affordance).
- whether the user perceives that some action is possible (or in the case of perceived non-affordances, not possible).

# Design for perceived affordances for physical objects



# Affordances in graphical interfaces

- the designer has control only over perceived affordances.
- The peripherals of the computer system (keyboard, display screen, mouse) afford:

- pointing,
- touching,
- looking
- clicking on every pixel of the display screen.
  - Most of this affordance is of no value for HCI.

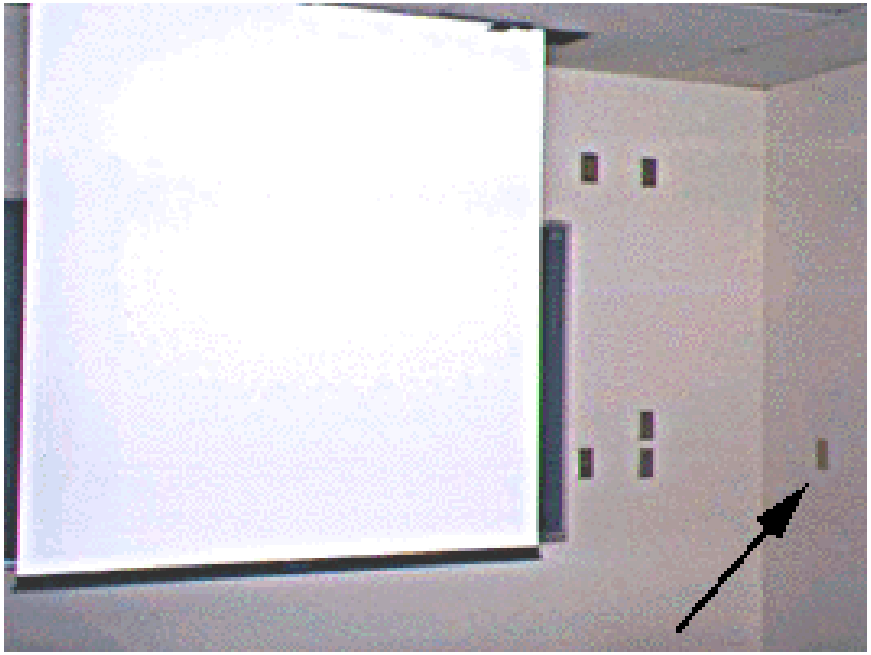
Example: in a typical (not touch sensitive) display, the screen still affords touching, but it has no result on the computer system.

# The Strauss mouse

# Mapping

- A technical (mathematical) term meaning a relationship between two things
- User input (controls), their movements and their results in the real world.
- Natural mapping takes advantage of physical analogies (ex. spatial analogy)
- Poor mapping makes random correspondences, or hard to memorize, or …

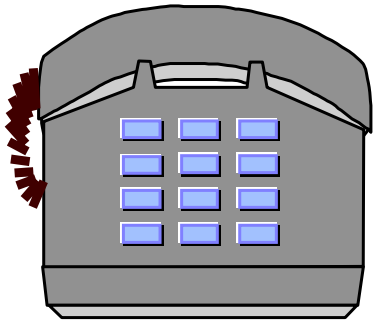
# Poor mapping



Which switch controls the projection screen?

http://www.baddesigns.com/projscrn.html

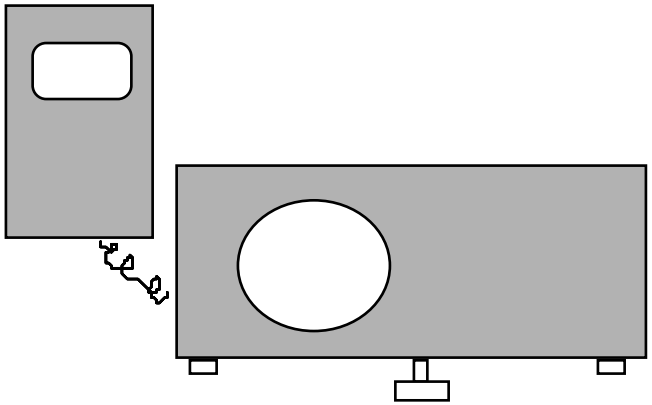
# Poor mapping (random)



- Modern telephone systems
  - standard number pad
  - two additional buttons * and #
- Problem
  - many hidden functions
  - operations and outcome completely invisible
  - Long sequence of operations for a simple thing

# Poor mapping (cont'd)

- Remote control from Leitz slide projector. How do you forward/reverse?



- Instruction manual:
  - *short press*: slide change forward
  - *long press:* slide change backward

- Adapted from Saul Greenberg

# Constraints

- Perceived affordance is about letting the user know that some action is possible
- The design should make easy for the user to determine which actions are possible at a given moment.
- Make use of constraints
- Constraints help to improve the learnability, memorability, and efficiency of the UI. They also minimize user errors.

# Constraints in GUI

Physical constraints are closely related to real (not perceived) affordances:

Ex: it is not possible to move the cursor outside the screen

Logical constraints use reasoning to determine alternatives

Ex: prompting the user to click on 5 locations when only are immediately visible; the person will browse to find the one location left.

Adapted from http://jnd.org/dn.mss/affordances_and.html

# Constraints in GUI (cont'd)

- Cultural constraints = learned conventions shared by a cultural group
- Examples:
- the "scroll bar" on the right hand side of a display
- Actions: one should move the cursor to it, hold down a mouse button, and "drag" it downward in order to see objects located below the current visible set
- Arbitrary choice of actions, not related to the perceived affordances of the input and output devices.

- Adapted from http://jnd.org/dn.mss/affordances_and.html
  - Scroll bar movie

# Are constraints only for users?

- Developers also have to face constraints in the design process:
- Example: the real-estate problem in GUI:

  - solutions: scroll-bars

  - overlapping windows 

  - critical decisions with respect to font size, window size etc. which impact on the visibility of the interface.

# Example: ignoring physical constraints

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News coverage

*Published:* May 02, 2006

- NEW YORK (AdAge.com) “Starting today air travelers passing through Chicago's O'Hare Airport terminal 3 will be able to impersonate Tom Cruise's character from "Minority Report" and use their hands to manipulate content -- weather, news [] -- on a giant 10-by-7-foot screen. Accenture's new billboards operate like gigantic interactive computer screens.”

# Example: ignoring physical constraints

- The designer's vision:

  "Video is wallpaper and you can interact with it as screens are getting better and cheaper."

  Dale Herigstad, executive creative director and co-founder of Schematic

# Example: ignoring physical constraints

- What users say:

  "It sure is a great demo. But it's a bad product."

  "Here's what happens. You walk up to it, you move your hands, touch the screen, things move around, data is exposed, etc. It's cool. For 10 seconds. And then you realize that because the screen is so damn big, and because your arms are so much shorter relative to the screen size, that you are way too close to actually read anything you just selected. It's like trying to watch a 50" TV from 1 foot away. It doesn't work."

http://37signals.com/svn/archives2/a_great_demo_a_bad_product.php?42#comments

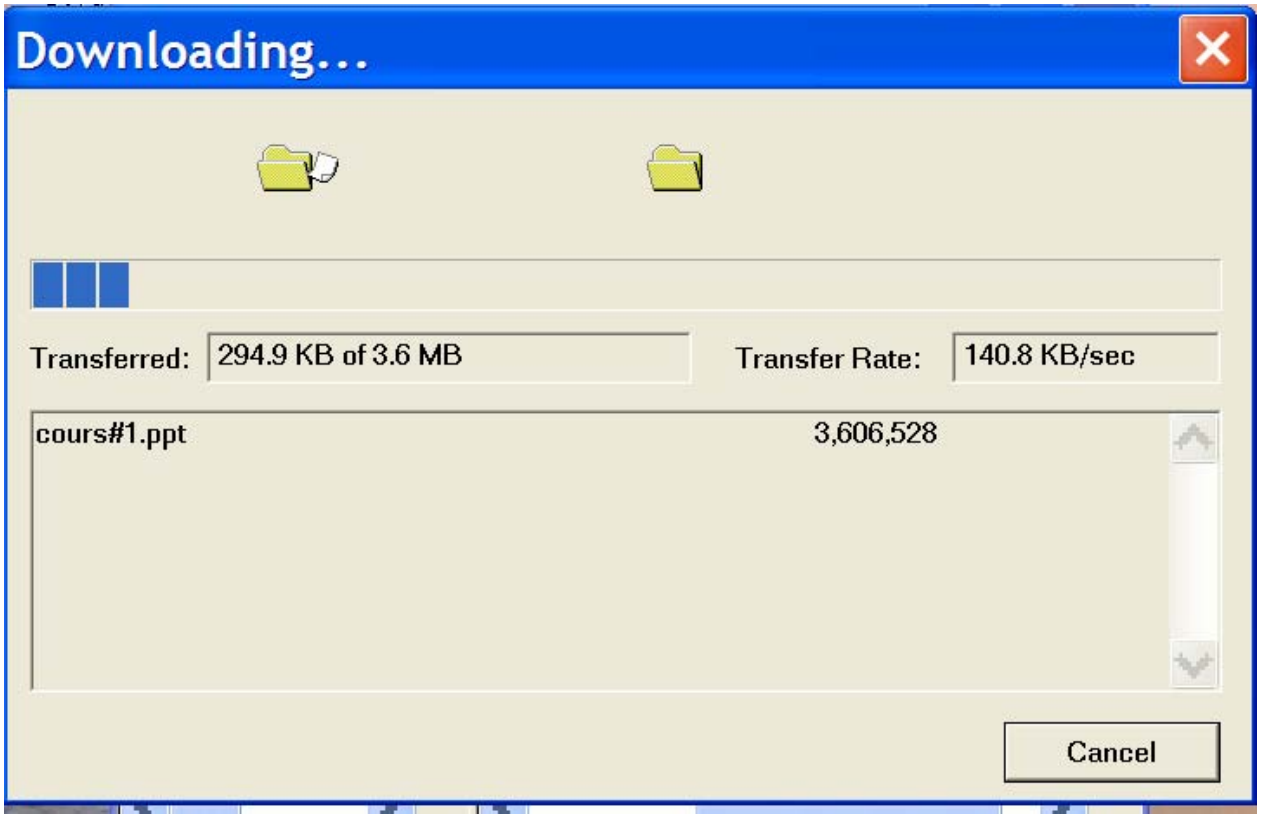
# Feedback

- Feedback is sending back to the user information about what action has been performed, or is in process.
- Visibility of the effects of the operation tell you if your action worked correctly
- Systems should be designed to provide adequate feedback to the users to ensure they know what to do next in their tasks

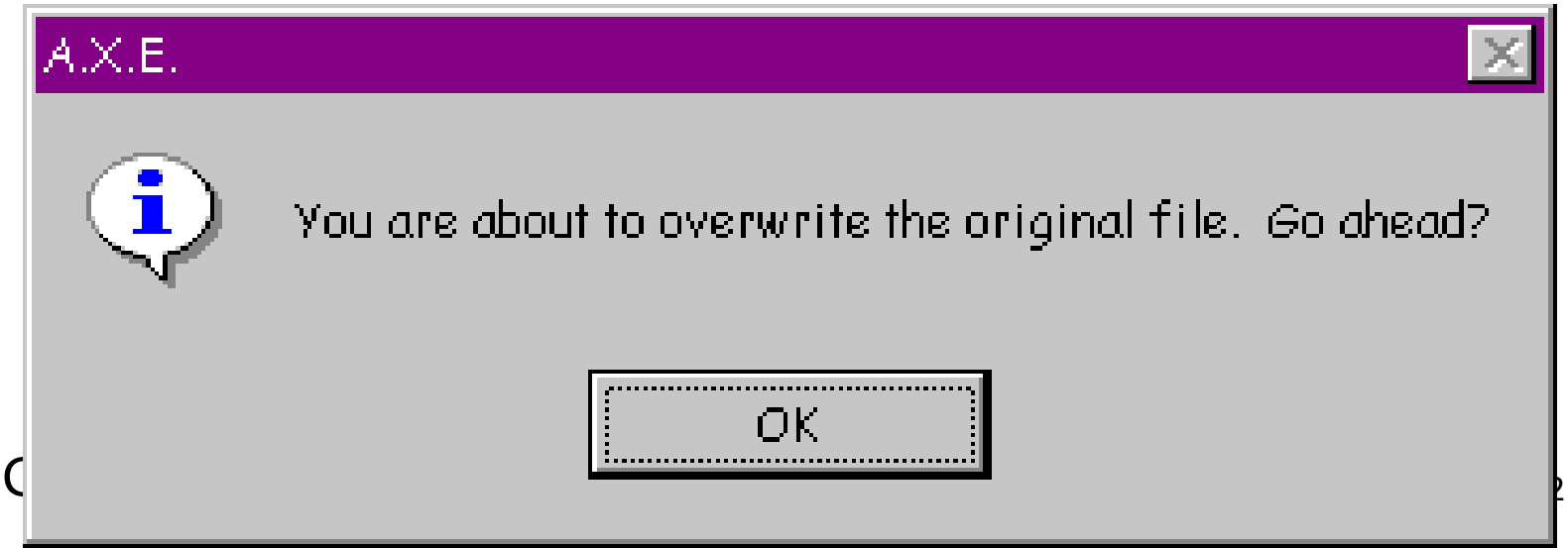
# Visual feedback: WYSIWIG

- The term describes a user interface (most often a text editor) that allows the user to view on screen how a document will look when it is printed to paper or displayed in a Web browser.
- The most interesting feature: “on-line” visual feedback which creates the feeling of ease-of-use
- MS Word versus LaTeX

# Feedback: the progress indicator bar



# Feedback: inane dialog boxes

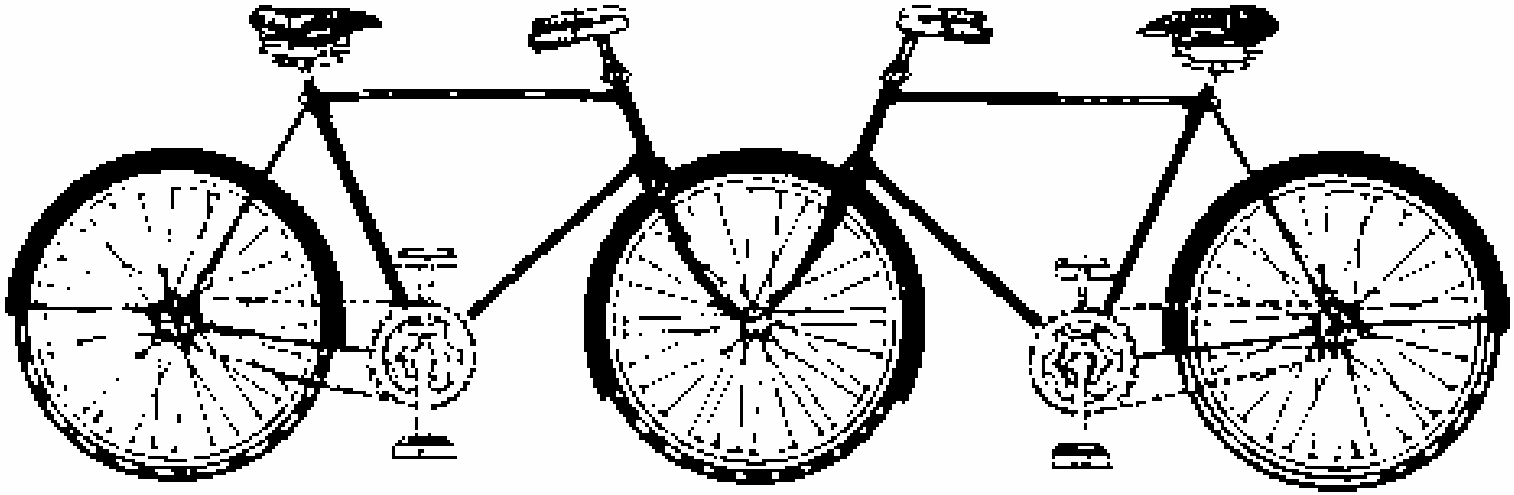



# Non-error messages and emotional design


"Always turn an error into an opportunity to help!"

Donald Norman

# Conceptual models



Just by looking at this object, you know it won't work.

How do you know that?

# Conceptual models are built from:

- Affordances (perceived)
- Constraints (physical, logical, cultural)
- Interactions (trial-and-error)
- Positive transfer
- Instructions

- Conceptual (mental) models can be wrong

# Transfer effects

- People transfer their conceptual models from familiar objects to new ones
  - positive transfer: previous experience applies to new situation
  - negative transfer: previous experience conflicts with new situation

# Transfer effects (example): Lost in the remote control world

- Alexandra –

  I checked with Technical Services regarding the availability of a remote control for your slide presentation and was informed that the video data projectors are apparently expressly set-up to be operated by the instructor from the keyboard of a computer; therefore, remotes are not provided by Tech. Services.

  However, there are 2 remotes in our storage room which are used with the VCR. I don't know if such things are universal in operating other equipment, but you may want to borrow one and try it out.

# How to build good conceptual models for GUI design?

- Formulating an appropriate conceptual model and assuring that everything else is consistent with it.
  - Lots of work on perceived affordances (especially in graphical and industrial design)
  - Little work on constraints
  - Use metaphors (carefully)
    - Not all users may understand the point
    - They may take the metaphor too literally and try to do actions that were not intended

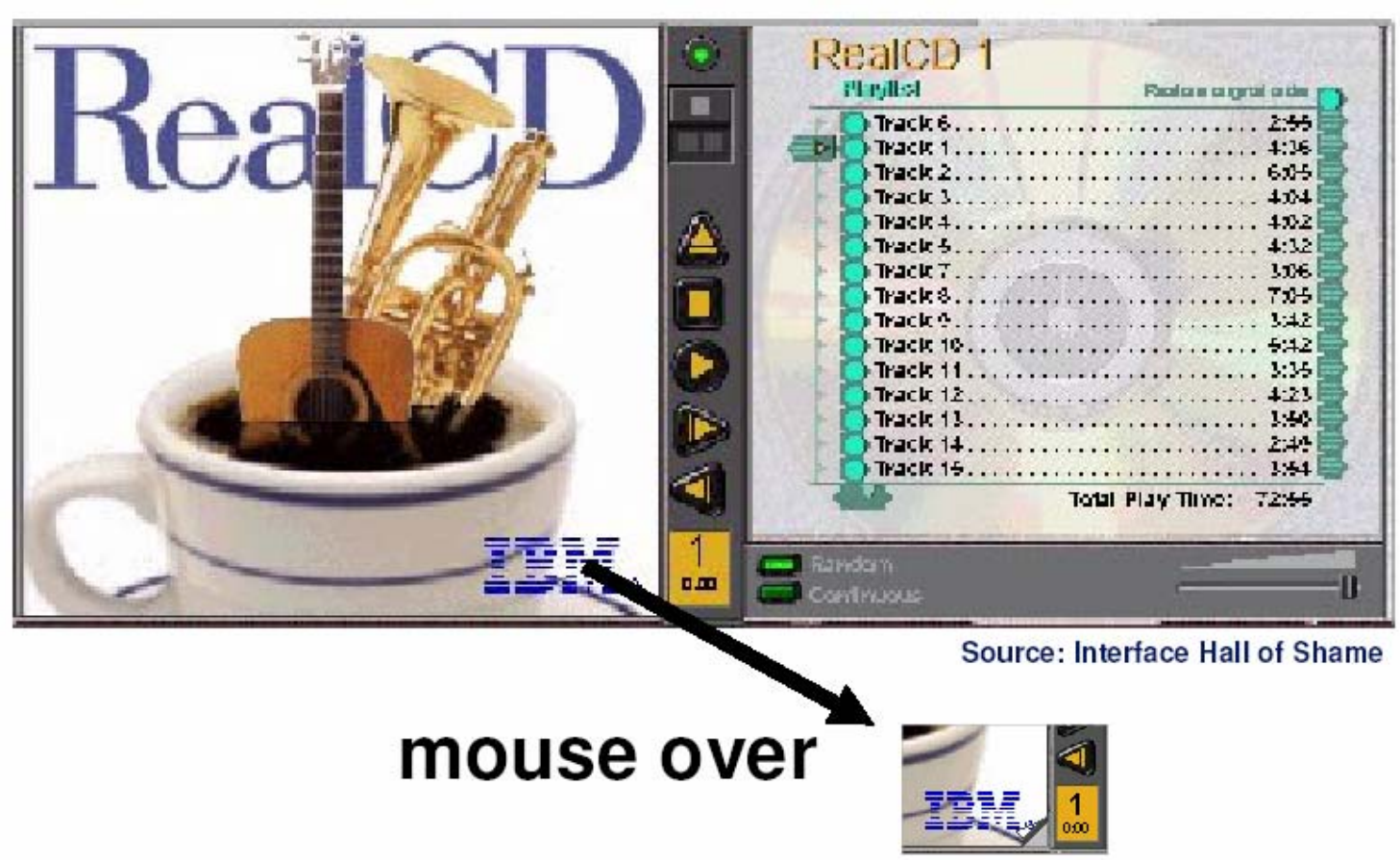
# Metaphor: an example


Source: Interface Hall of Shame

# Metaphor: an example (cont'd)


Source: Interface Hall of Shame

# Metaphor: an example (cont'd)



# Lessons learned

- interface metaphors can be misused;
- the presence of a metaphor does not at all guarantee an “intuitive”, or easy-to-
- learn, user interface.
- that beautiful graphic design doesn’t equal usability, and that graphic designers can be just as blind to usability problems as programmers can.
- metaphor is not the only way to build good conceptual models and achieve learnability.

# Thursday, May 8

- Invited lecture: Dr. Naznin-Virji Babul
- User requirements for the course project