

User-Centered Website Development: A Human-Computer Interaction Approach



2. Capabilities of Human Beings



In this chapter you will learn about:

- ◆ Human senses, perception, memory, and interruptions
- ◆ Mental models, metaphors, and perceived affordance
- ◆ Some design guidelines based on these topics



Definitions

- ◆ *Cognitive psychology*: the study of how people perceive, learn, and remember
- ◆ *Cognition*: the act or process of knowing
- ◆ The issue: confronted with a new experience (or website) how does a user draw on past experience to make sense of it?
- ◆ Example: underlined blue text is understood to be a link



Why do we care?

- ◆ Because when people try to understand something, they use a combination of
 - ⊕ What their senses are telling them
 - ⊕ The past experience they bring to the situation
 - ⊕ Their expectations



Senses

- ◆ Senses (sight, hearing, smell, taste, touch) provide data about what is happening around us
- ◆ We are visual beings (“See what I mean?”)
- ◆ Designing good Web materials requires knowledge about how people perceive



Constructivism

- ◆ Our brains do not create pixel-by-pixel images
- ◆ Our minds create, or *construct*, models that summarize what comes from our senses
- ◆ These models are what we perceive
- ◆ When we see something, we don't remember all the details, only those that have meaning for us



Example: familiar objects that we see, but don't store in detail

- ◆ How many links are there on top menu of amazon.com?
- ◆ What are the colors on your favorite cereal box?
- ◆ How many lines are there in the IBM logo?
- ◆ Who cares?
- ◆ Moral: People filter out irrelevant factors and save only the important ones



Context

- ◆ Context plays a major role in what people see in an image
- ◆ Mind set: factors that we know and bring to a situation
- ◆ Mind set can have a profound effect on the usability of a web site



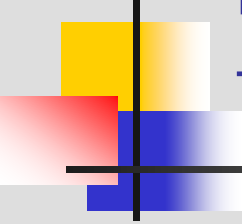
Example of context: What do you see?





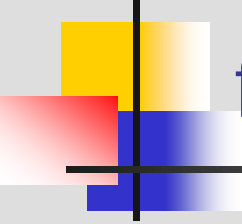
Hint: it's an animal, facing you . . .





Hint: this animal gives milk, and her face takes up the left half of the picture . . .





Why couldn't you see the cow's face at first?

- ◆ It's blurry and too contrasty, of course, but more:
- ◆ You had no idea what to expect, because there was no context
- ◆ Now that you do have a context, you will have little difficulty recognizing it the next time



Another example of context: are these
letters the same?





Well, yes, but now in context:

top ace

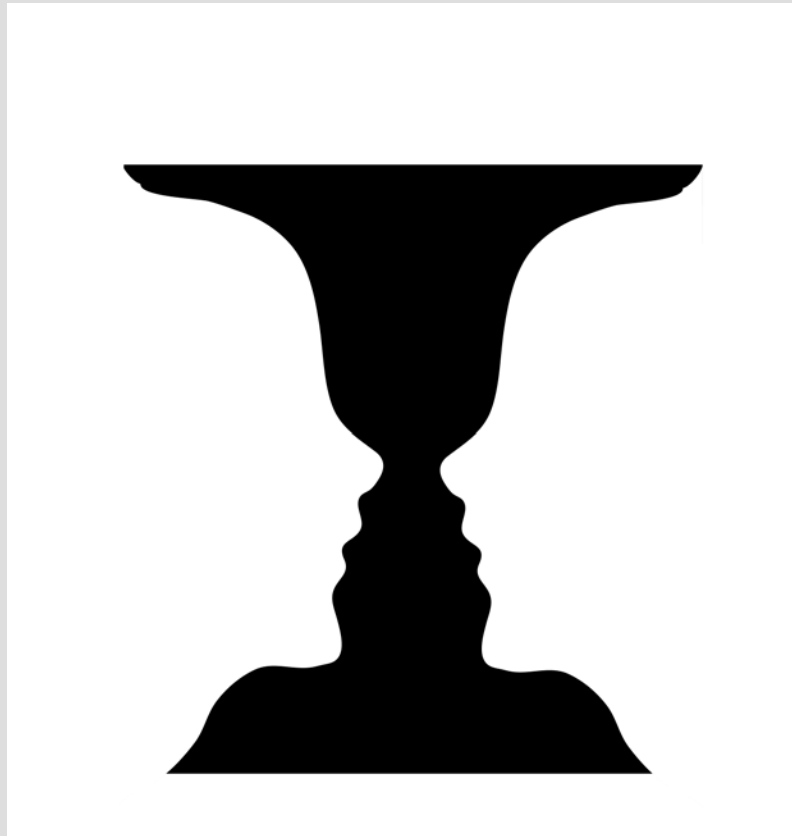


Figure and ground

- ◆ Images are partitioned into
 - ⊕ Figure (foreground) and
 - ⊕ Ground (background)
- ◆ Sometimes figure and ground are ambiguous



Figure and ground: What do you see?





Gestalt psychology

- ◆ “Gestalt” is German for “shape,” but as the term is used in psychology it implies the idea of *perception in context*
- ◆ We don’t see things in isolation, but as parts of a whole



Five principles of Gestalt psychology

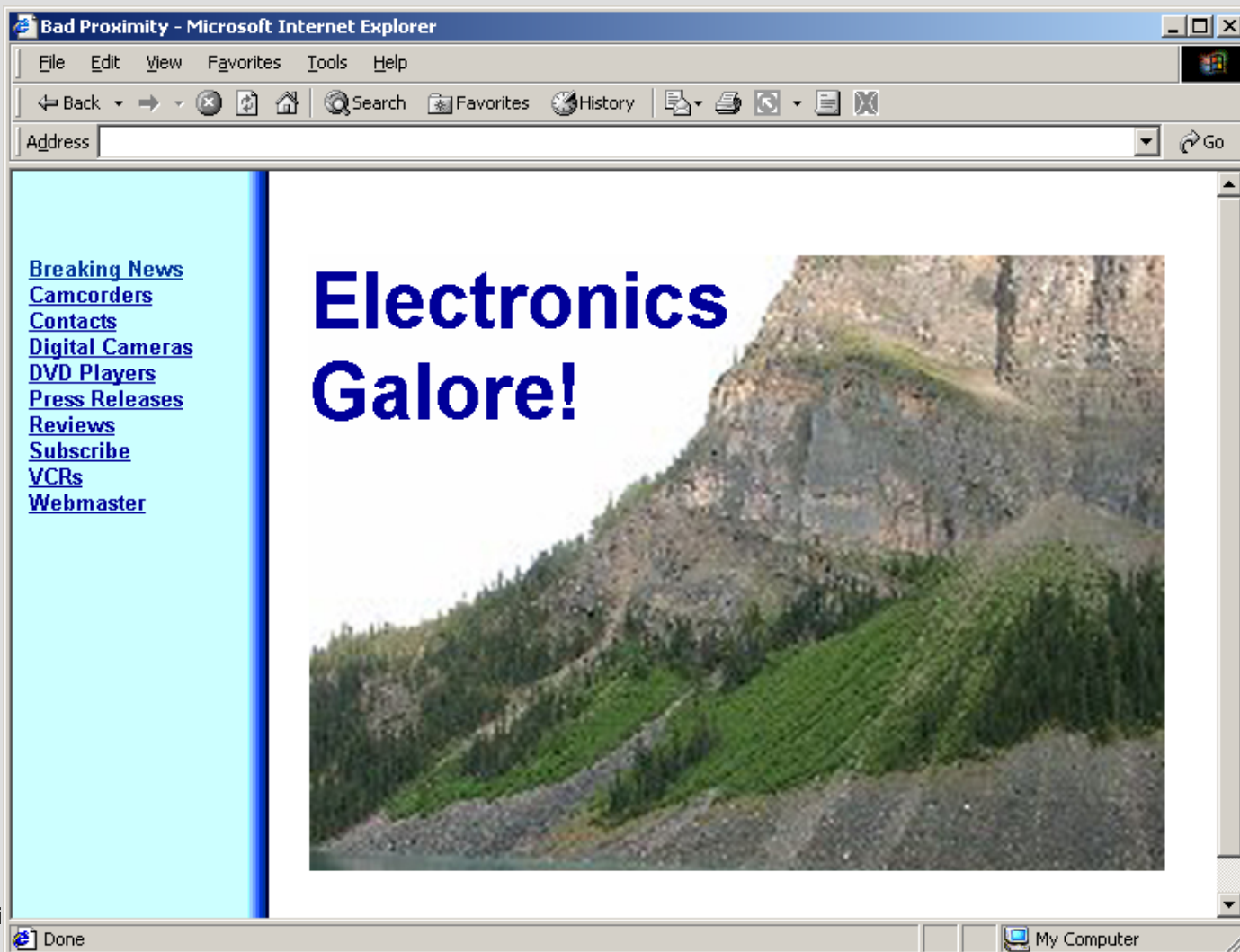
- ◆ We organize things into meaningful units using
 - ⊕ **Proximity**: we group by distance or location
 - ⊕ **Similarity**: we group by type
 - ⊕ **Symmetry**: we group by meaning
 - ⊕ **Continuity**: we group by flow of lines (alignment)
 - ⊕ **Closure**: we perceive shapes that are not (completely) there



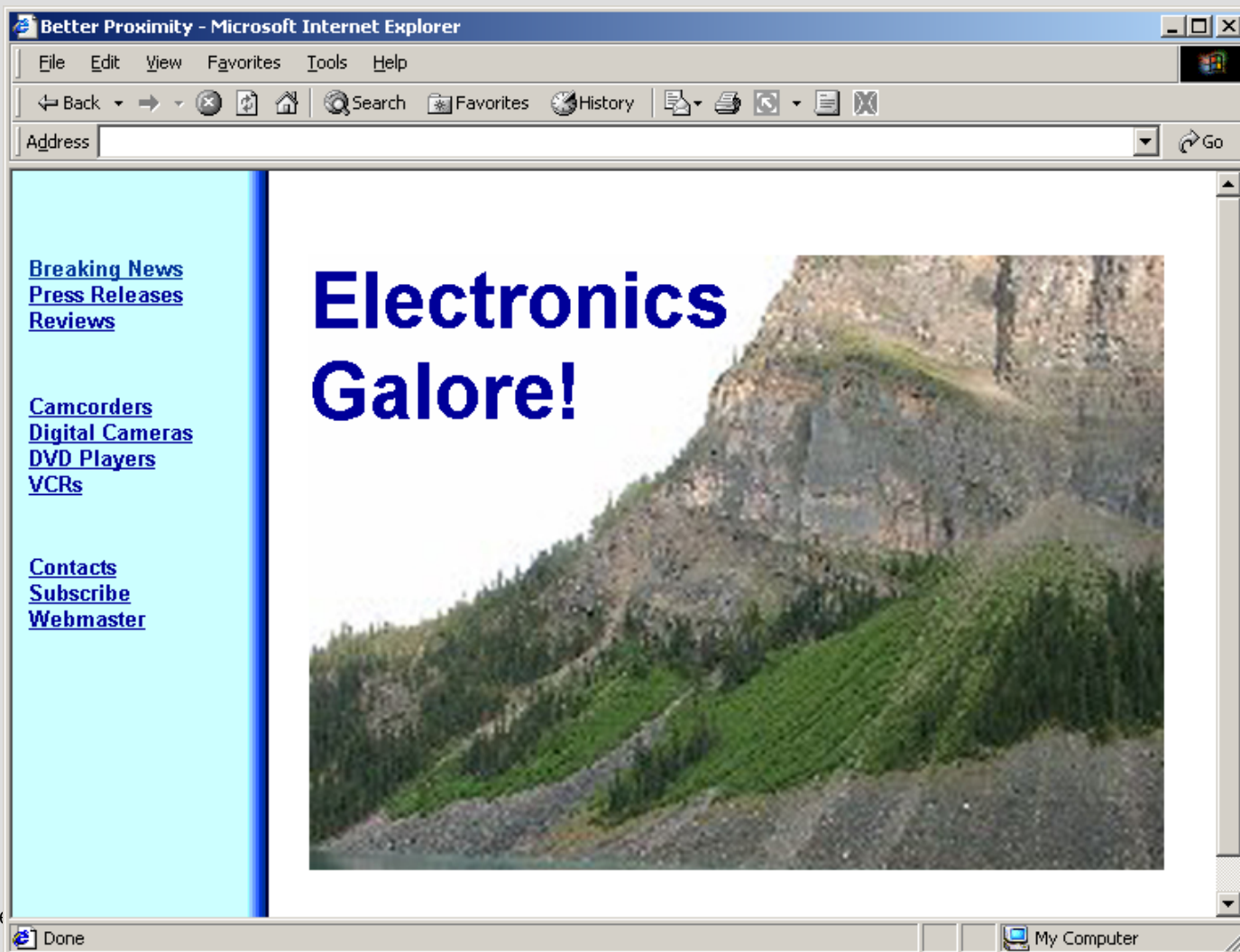
Proximity



Example: a page that can be improved . .

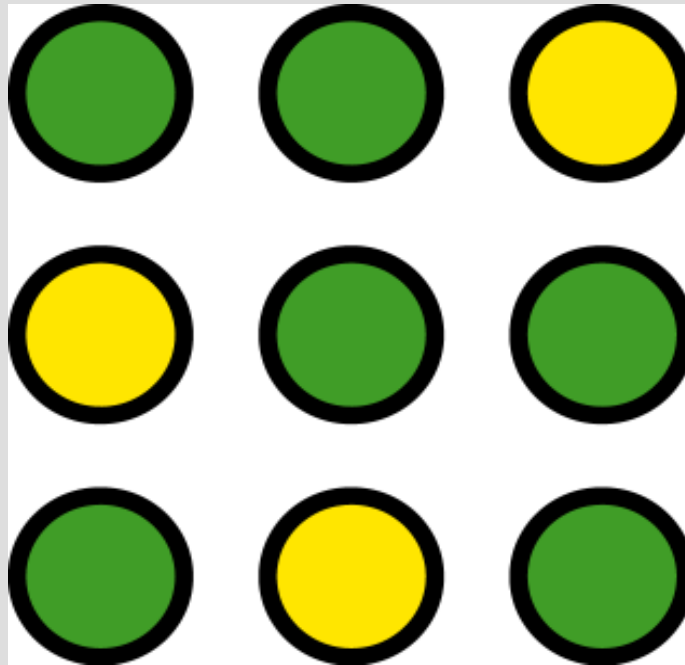


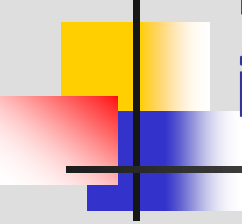
By using proximity to group related things



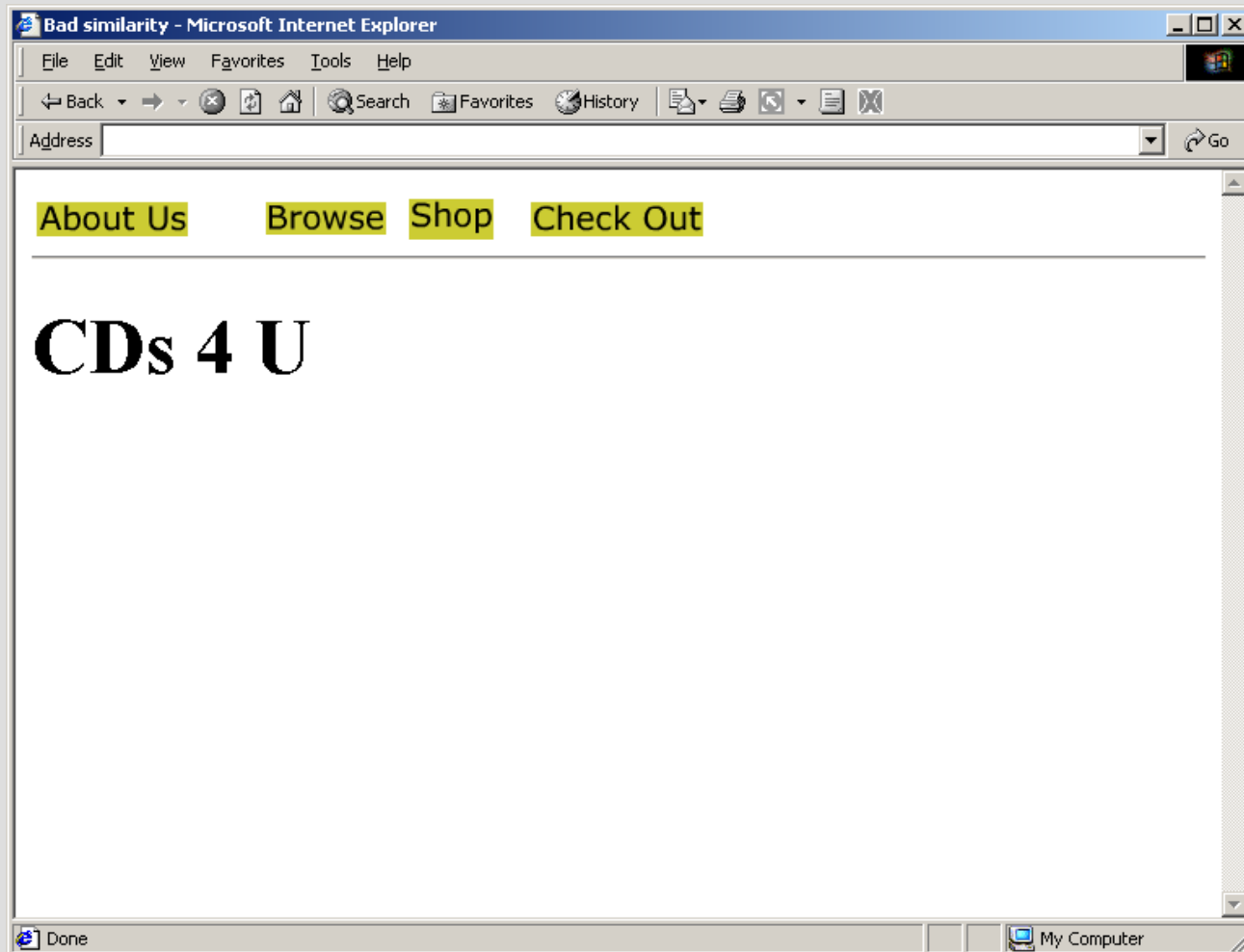


Similarity



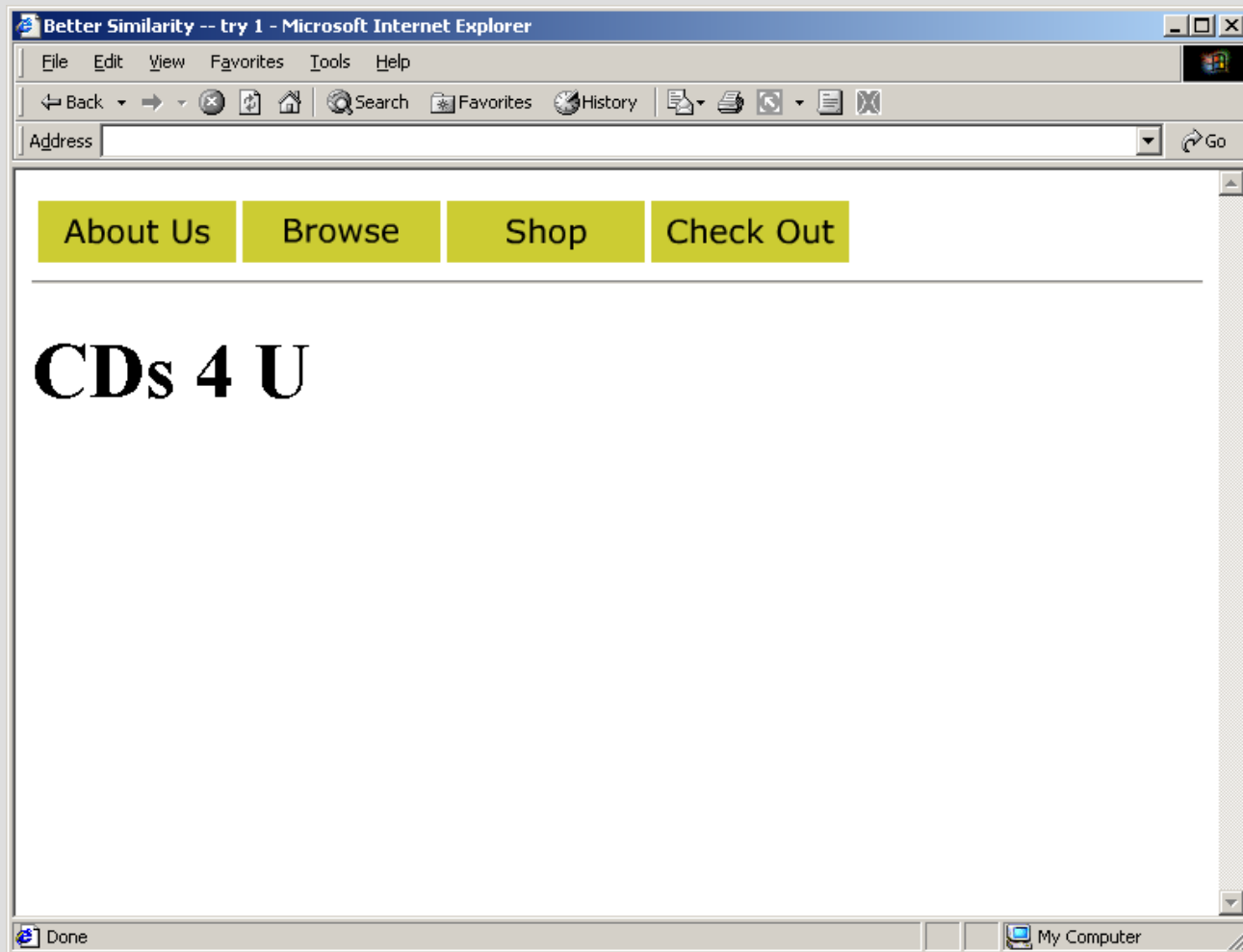


Example: can you use similarity to improve this page?



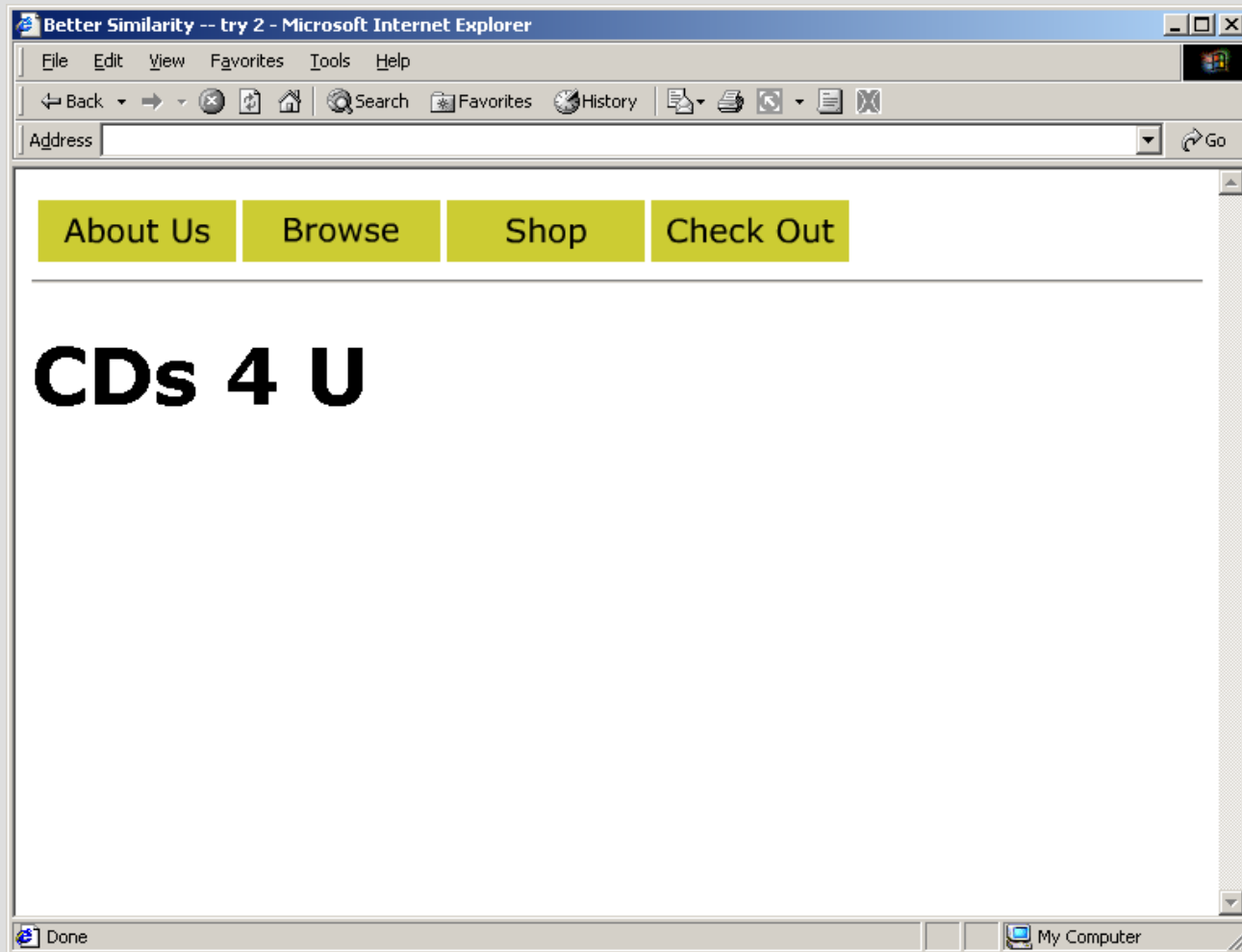


Sure: make the buttons the same size:



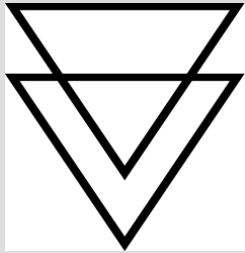


Sure: use the same font everywhere:





Symmetry: we use our experience and expectations to make groups of things



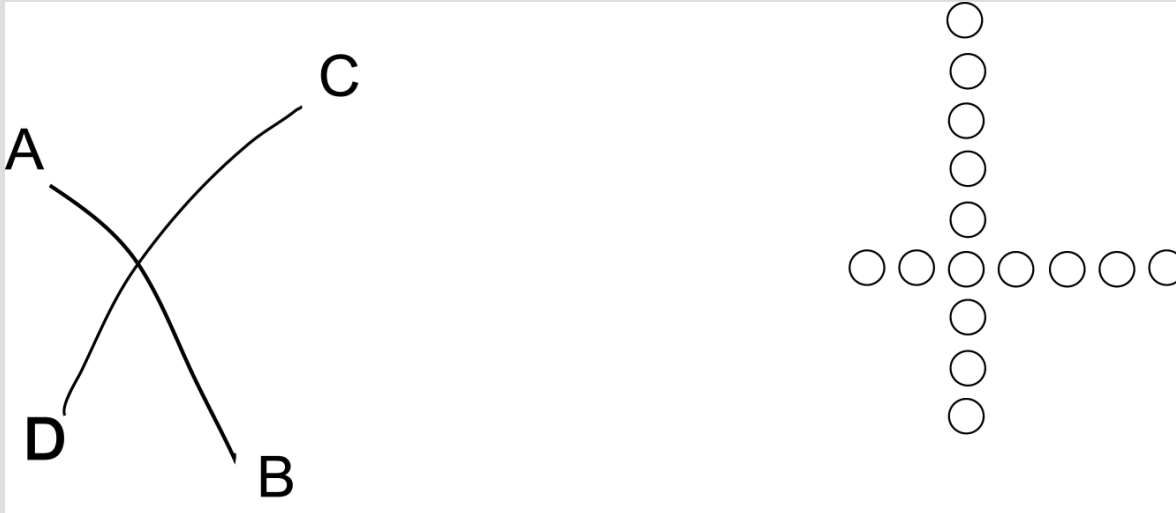
We see two triangles.



We see three groups of paired square brackets.



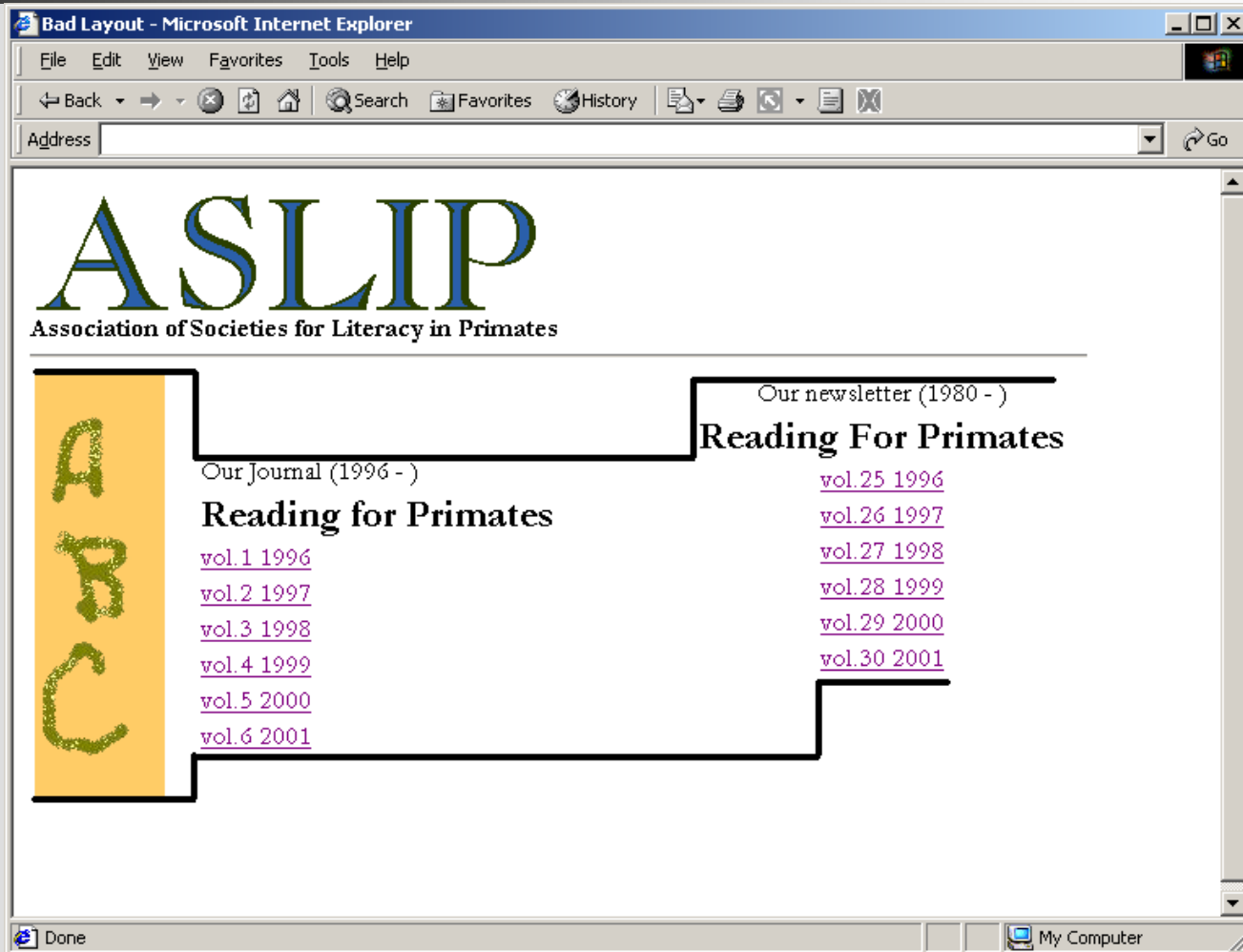
Continuity: flow, or alignment



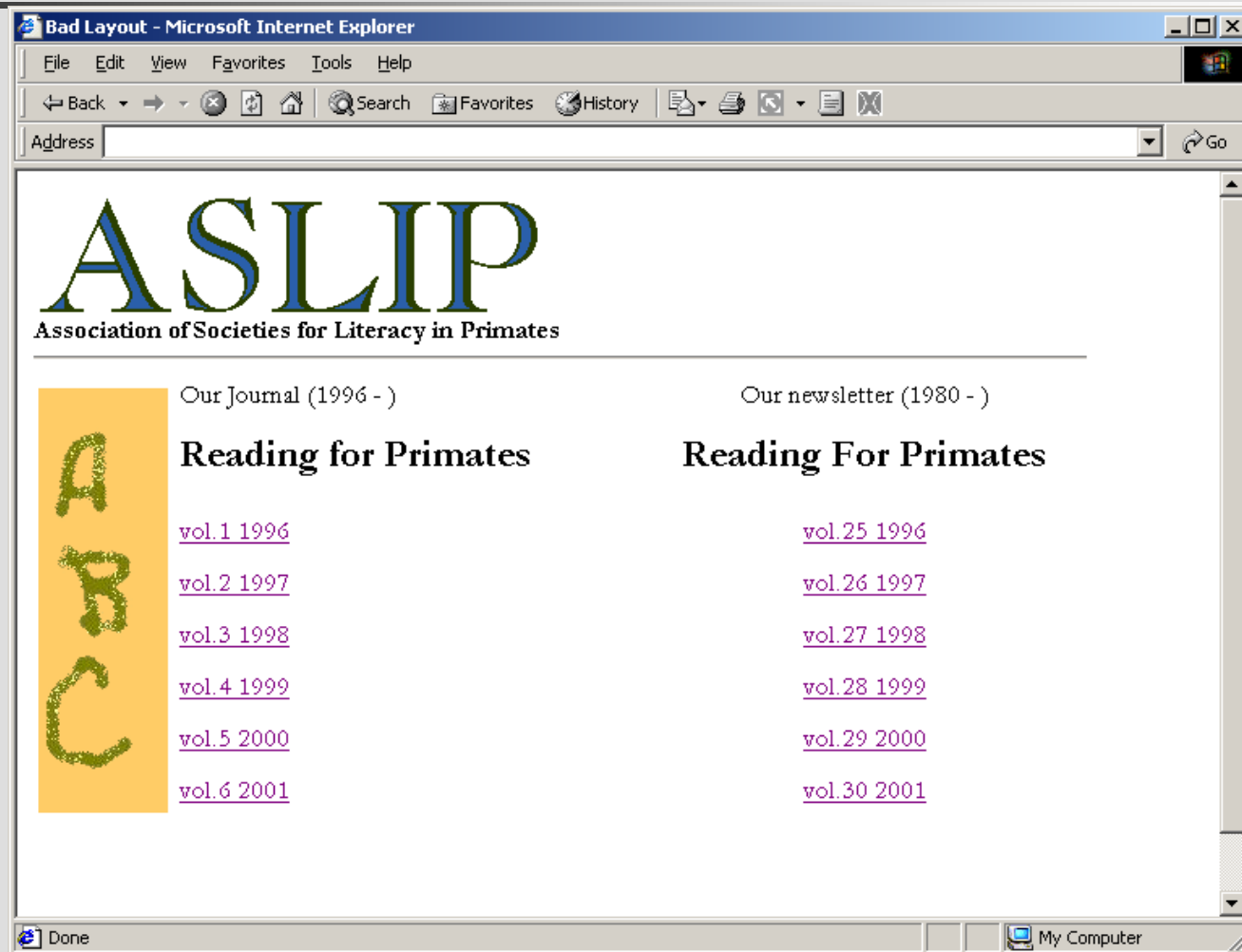
We see curves AB and CD, not AC and DB, and not AD and BC

We see two rows of circles, not two L-shaped groups

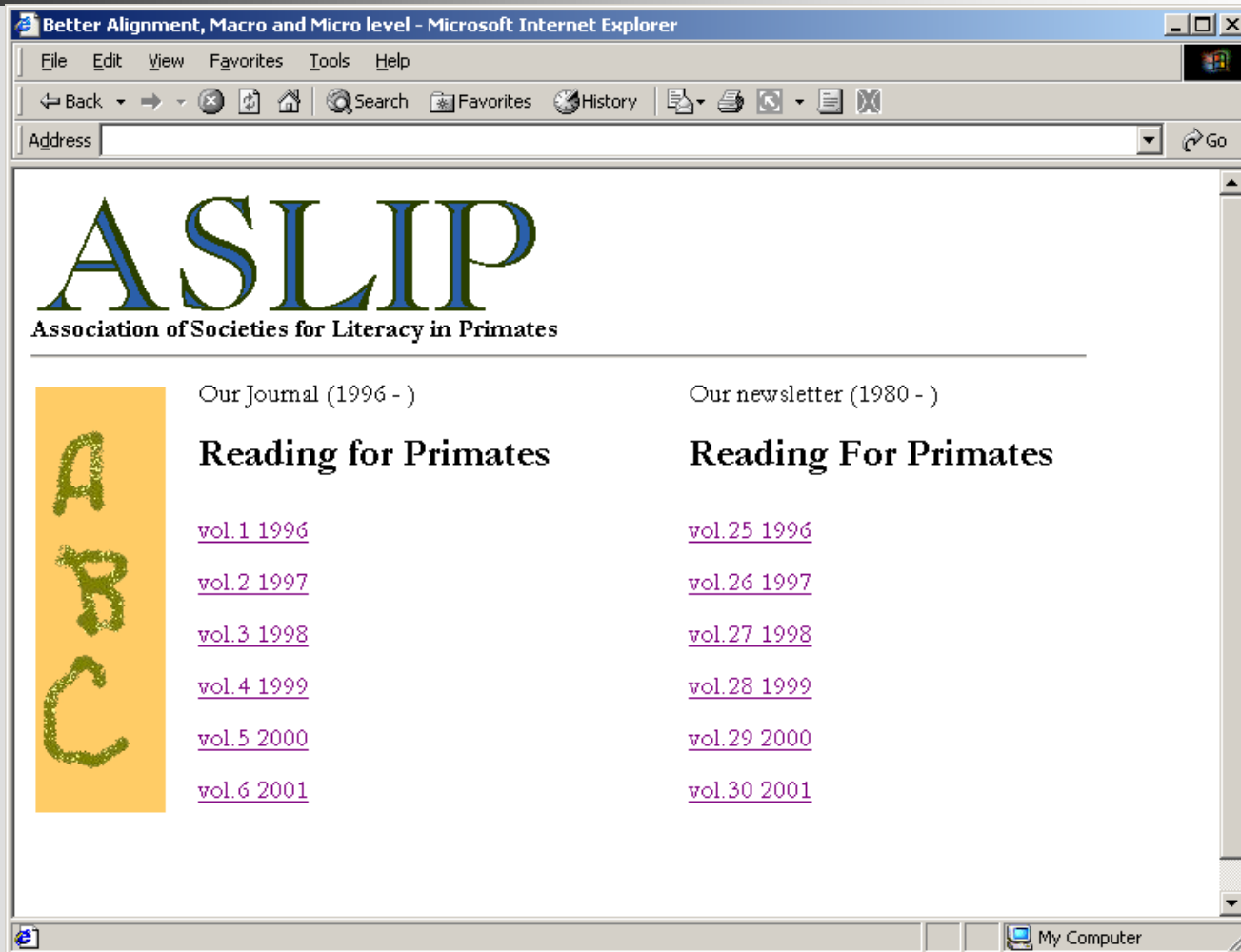
Can you use alignment (one form of continuity) to improve this page?



Sure: the lines on the previous slide show how to use horizontal alignment

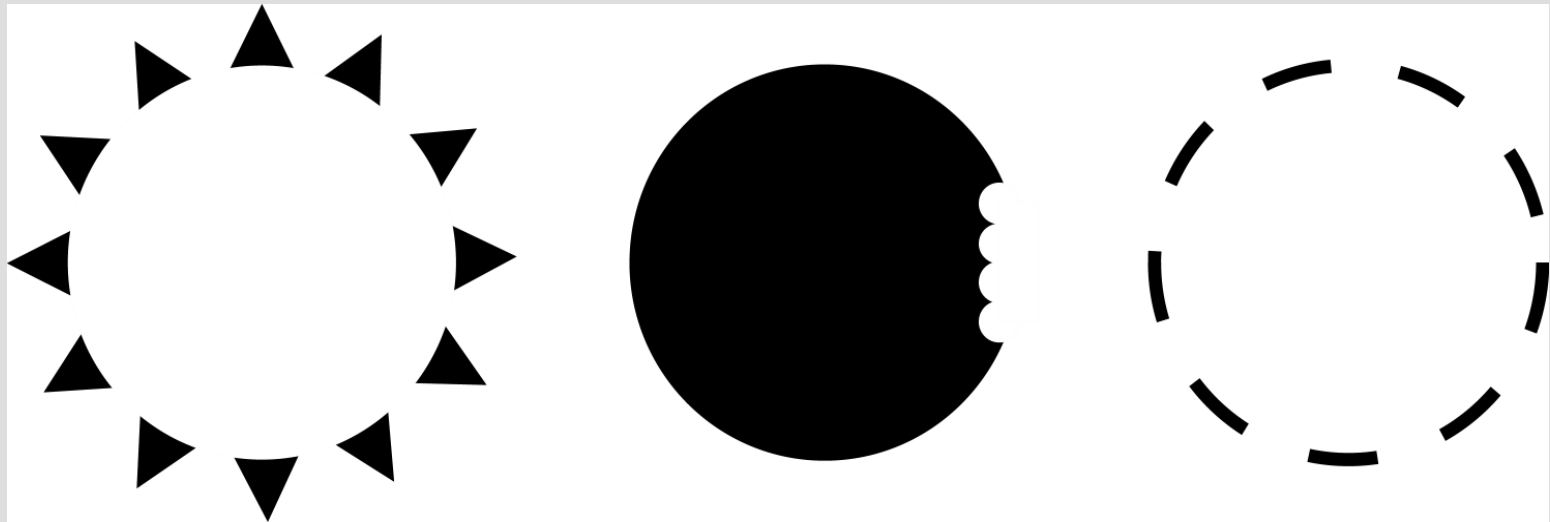


But why stop? Left-align both columns to get vertical alignment also





Closure: we mentally “fill in the blanks”

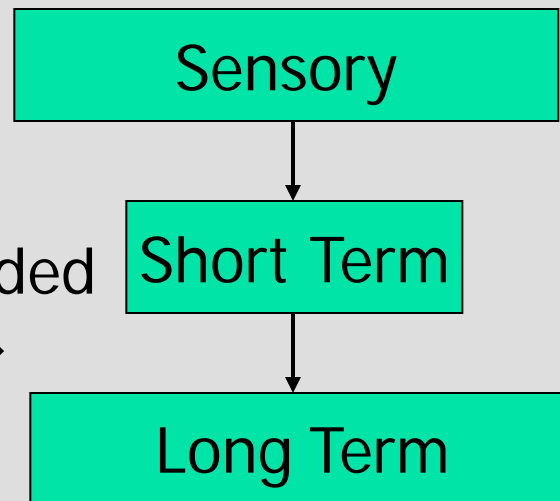


All are seen as circles

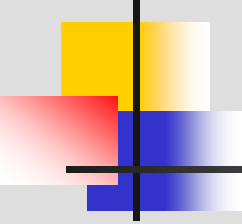


2.4 Memory

- ◆ Hierarchical Model



Practice and effort needed
to make this transfer ➔



"The Magic Number 7, Plus or Minus 2"

George Miller, 1956

- ◆ Value of " chunking"
 - ⊕ 2125685382 vs. 212DanHome
 - ⊕ 10 chunks vs. 3 (assuming 212 is familiar)
- ◆ Can you remember:
 - ⊕ Vsdfnjejn7dknsdnd33s



How many chunks in . . .

- ◆ www.bestbookbuys.com
- ◆ 20? Not really:
 - ⊕ www.
 - ⊕ best
 - ⊕ book
 - ⊕ buys
 - ⊕ .com



Recognition vs. recall

- ◆ Why is a multiple choice test easier than an essay test?
 - ⊕ Multiple choice: you can recognize the answer
 - ⊕ Essay: you must recall the answer
- ◆ A computer with a GUI allows us to recognize commands on a menu, instead of remembering them as in DOS and UNIX



Memory aids

- ◆ Post-It[®] notes
- ◆ In Windows
 - ⊕ ctrl- N (new)
 - ⊕ ctrl- C (copy)
 - ⊕ ctrl- S (save)
- ◆ Favorites List and bookmarks to store URLs
- ◆ Hyperlinks—if their wording indicates the content of the target page. (“Click here” is not a memory aid.)



2.5 Interruptions

- ◆ Focusing attention and handling interruptions are related to memory
- ◆ In website design you need to give cues or memory aids for resuming tasks:
 - ⊕ Back button
 - ⊕ Followed links change color
 - ⊕ When filling in forms, blank boxes show where to pick up the job



Interruptions, continued

- ◆ How fast must a system respond before the user's attention is diverted? (Robert Miller, 1968)
- ◆ Response time User reaction
 - < 0.1 second Seems instantaneous
 - < 1 sec Notices delay, but
does not lose thought
 - > 10 sec Switches to another task



2.6 Mental Models

- ◆ How do people use knowledge to understand or make predictions about new situations?
- ◆ People build mental models
- ◆ For example, a car: put gas in, turn key, and it runs. (Not exactly a car mechanic's model!)
- ◆ Can't ignore user's mental model
- ◆ And how do we know what the users' mental models are? **Through user testing.**



2.7 Metaphors

- ◆ Way to relate a difficult or more abstract concept to a familiar one

- ◆ Open file



- ◆ Save file





Metaphors have problems



- ◆ Disadvantage: metaphor may not be widely known or correctly understood
- ◆ The mailbox icon meant nothing outside rural United States until explained. And it's backwards: we put the flag up *to tell the mailman* that we have put mail in the box *to be picked up*.



2.8 Affordance

- ◆ Affordance: “The functions or services that an interface provides”
 - ⊕ A door affords entry to a room
 - ⊕ A radio button affords a 1-of-many choice
 - ⊕ On a door, a handle affords pulling; a crash bar affords pushing

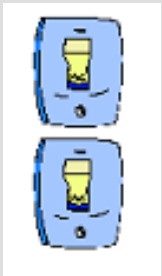


Perceived affordance

- ◆ We want affordance to be visible and obvious to the user
 - ⊕ The Up and Down lights on an elevator door should have arrows, or they should be placed vertically so that the top one means Up
 - ⊕ On a car, turning the steering wheel to the left makes the car go left



Example of perceived affordance



Top switch controls top lights

By convention, with a light switch "up" is "on"



2.9 Design Guidelines for the Web

- ◆ Lessen burden on user's memory:
 - ⊕ Use recognition instead of recall
 - ⊕ Help users chunk information
 - ⊕ Require as little short-term memory as possible
- ◆ Consider user's mental models
- ◆ Provide visual clues and memory aids
- ◆ Provide feedback: let users know their input was received



Summary

In this chapter you learned that

- ⊕ Sight is the most important sense—on the Web and in general
- ⊕ We construct mental models; we don't store bitmaps
- ⊕ Context and expectations influence what we see
- ⊕ Five principles of Gestalt psychology: proximity, similarity, symmetry, continuity, closure
- ⊕ Metaphors are tricky
- ⊕ Chunking helps memory
- ⊕ Perceived affordance depends on users' backgrounds, mental models, and expectations