ICS 105: Project in HCI

Visual Design and Visualization

affordances

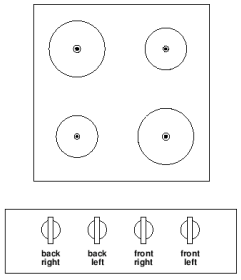
- "knowledge in the head" versus "knowledge in the world"
  - the world imposes constraints
  - constraints can make things easier for us
    - physically
    - cognitively
  - examples:
    - door handles
    - the VGA plug for my laptop

affordances

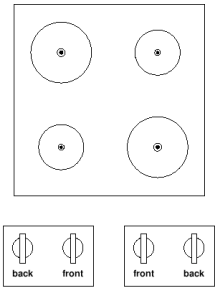
- an affordance is "a *property of the world* that *affords action* to *appropriately equipped* individuals"
  - three-way relationship
  - a coupling of *perception* with *action*
    - how you move around affects how you see
- examples
  - chairs afford sitting (if…)
  - knobs afford turning (if…)
  - buttons afford pressing
  - doors: vertical plates and horizontal bars

affordances

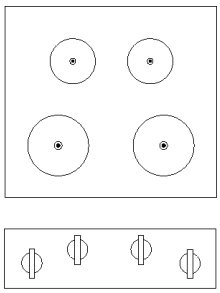
affordances



affordances



affordances



visual design

- what is visual design for?

visual design

- what is visual design for?
  - not just about aesthetics…
  - communicating function
- we live in a visually rich world
  - we're used to processing visual information
  - it's a very high bandwidth channel
  - visual design can convey a great deal
    - how system is structured
    - how system should be used

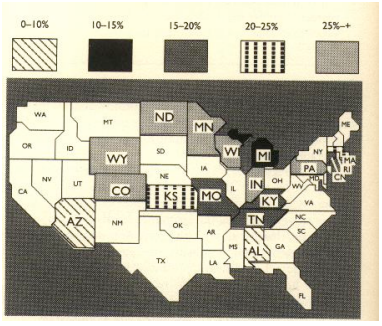
recognition versus recall

- two paradigms for interaction
  - the recognition paradigm (e.g. GUI)
    - opportunities for action are visibly present
  - the recall paradigm (e.g. UNIX commands)
    - you need to remember how to take action
- this is not an all-or-nothing thing
  - you need to be able to design for recognition
    - depends on the kinds of tasks
    - visual and perceptual features help make actions clear

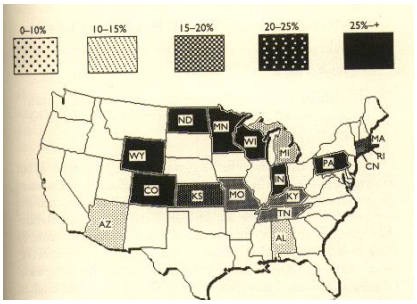
visual representation

- human beings are very good at…
  - understanding information
  - interpreting the world
  - seeing patterns
- or are they?
  - you can only see a pattern if it's been made visible for you

visual representation



visual representation



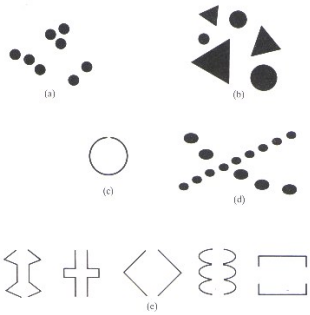
visual representation

- think of representations as *cognitive artifacts*
  - ways we structure the world to make it easier to process
- example: roman and arabic numerals
  - both represent numbers
  - arabic numerals make computation easier
    - positional structure
    - zero
- need to design representations accordingly
  - understand how they'll be processed

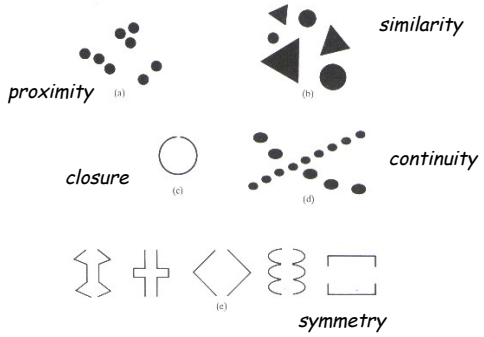
gestalt perception

- gestalt – "the whole"
  - perception of objects
  - the *holistic* perception of scenes
  - underlying principles
    - regular patterns on which perception is based
    - determine how the visual scene is parsed

gestalt perception

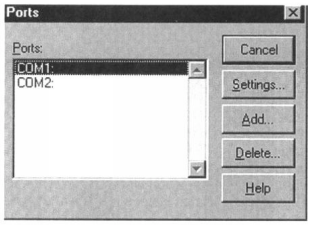


gestalt perception



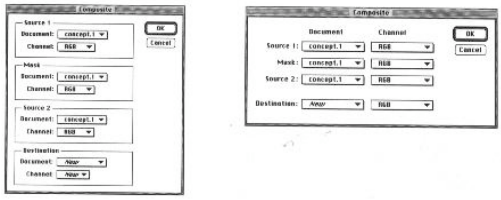
gestalt in GUI design

- grouping
  - items that appear grouped appear to be related



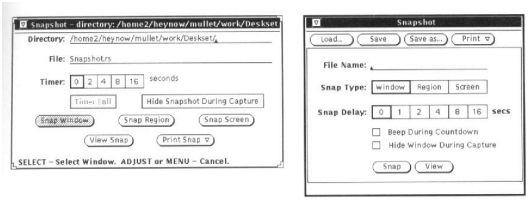
gestalt in GUI design

- grouping
  - use proximity to indicate relatedness



gestalt in GUI design

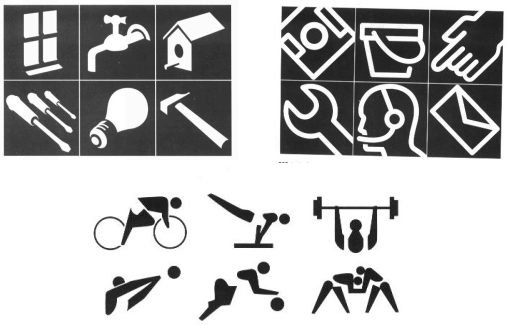
- alignment is an important cue



gestalt in GUI design

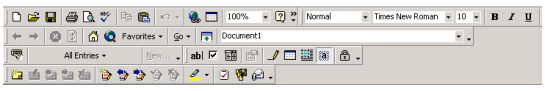
- exploiting consistency and structure
  - design interfaces as "visual languages"
    - a set of visual conventions that can be combined and extended across a range of specific uses
    - using visual characteristics to express features of the objects
  - consistency across representations
    - visual structure
    - information density
    - abstraction

visual languages



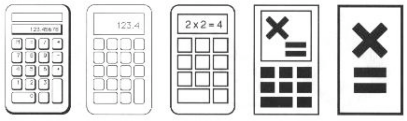
visual languages

- sometimes these features are more notable by their absence…
  - how do these items relate?



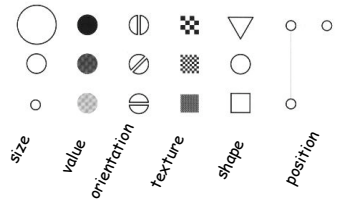
visual languages

- levels of abstraction
  - abstracting simplifies the design…
  - … but only so far before it becomes meaningless



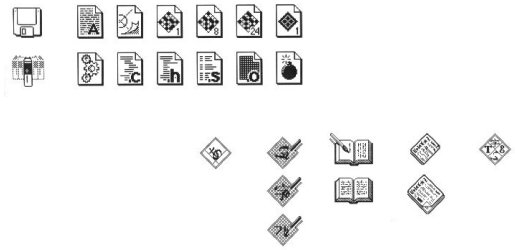
visual languages

- looking for common patterns and scales
  - the key is to build a *system* of representations
  - based on systematic variability
- bertin's "retinal variables"



visual languages

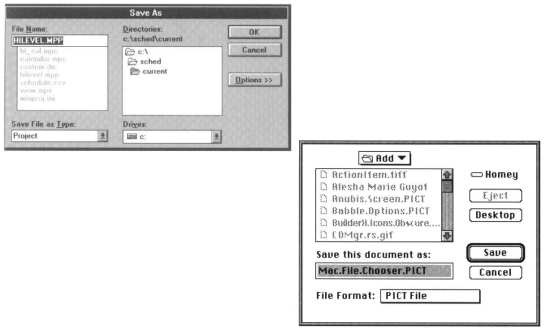
- consistency and structure



spatial logic

- aligning structure
  - the structure of the visual display
  - the structure of the task
- left-to-right, top-to-bottom
  - we're used to "reading" texts and images
  - look for the "flow" of the task
  - make sure it's reflected in the interface

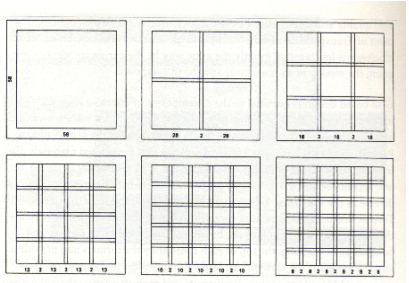
spatial logic



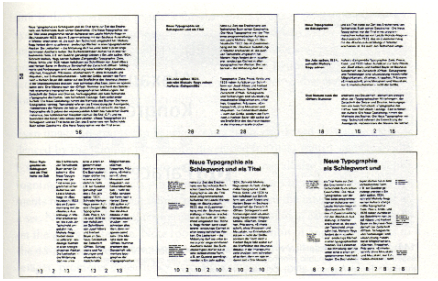
grid-based design

- grid-based design creates a framework
  - exploiting techniques from graphic design
  - an underlying logic to the problems of layout
  - you can use the grid many ways
    - to tie objects together visually
    - to separate them

grid-based design

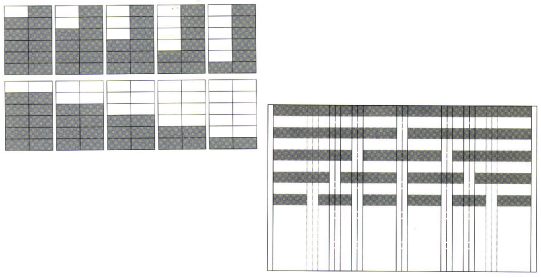


grid-based design

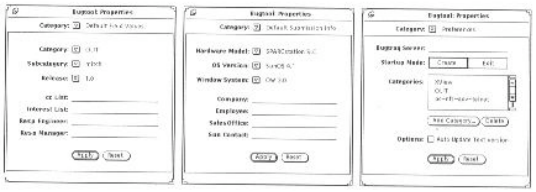


grid-based design

- a single grid can provide multiple uses

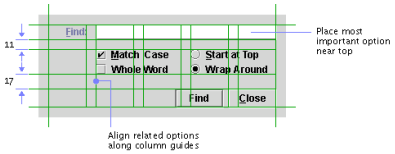


grid-based design



grid-based design

- a consistent layout structure
  - operates across different interfaces and dialogs
  - makes it easier to parse the visual scene
  - exploits proximity, grouping, symmetry, alignment



summary: design principles

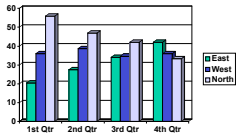
- reduce design to its essence
- combine elements for maximum leverage
- use alignment to establish relationships
- use symmetry to ensure balance
- reinforce structure through repetition
- use grid-based layouts
- coordinate to ensure visual consistency
- pay attention to performance

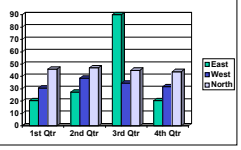
visualization

- the key issue in visual design
  - visual design conveys
    - information
    - intent
    - meaning
- can we exploit this information?
  - designing systems in which the visual aspects of an interface are key features of the information that is provided?
  - shift the information burden from the *cognitive* to the *perceptual* system?

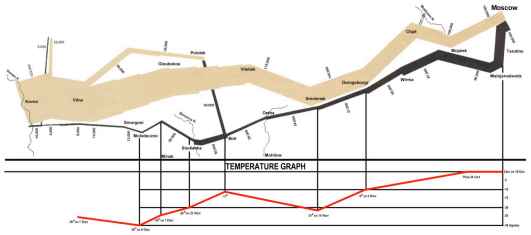
visualization

- conveying information visually
  - exploiting features of the human visual system
    - the retinal variables
  - information in emergent structure
    - visual properties as outcomes of individual events
    - exploit the fact that people can perceive patterns
      - so, how do we help them?

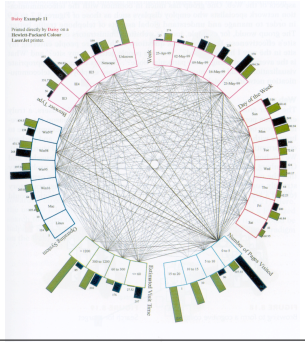




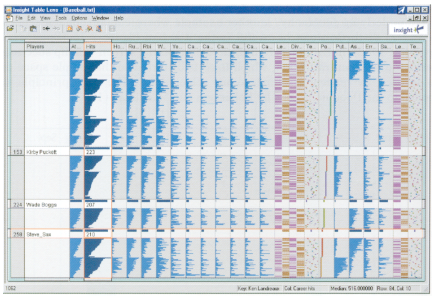
minard



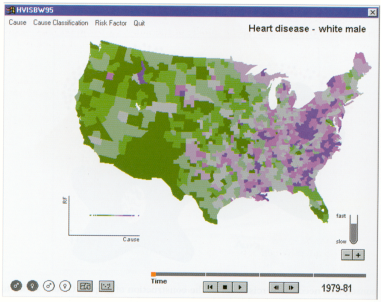
visualizing web data



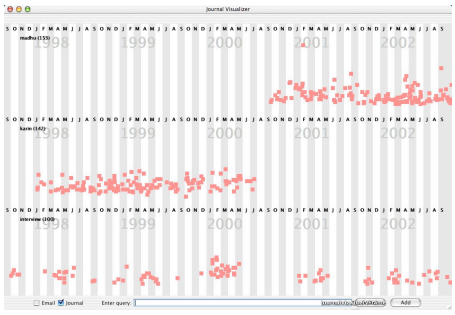
visualizing tabular information



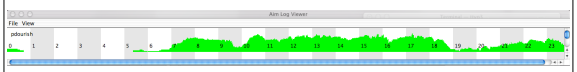
visualizing statistical trends



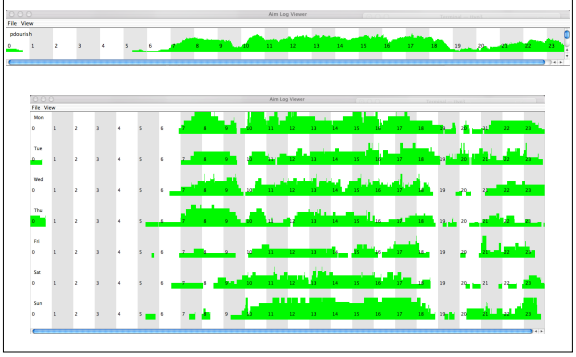
visualizing temporal patterns



visualizing temporal patterns



visualizing temporal patterns



visualization

- graphical design is about visual communication
  - the lessons of Bertin's retinal variables
- *interactive* visualization goes beyond that
  - the emphasis is on
    - dynamics -- how information changes over time
      - the "pattern" might not be in a single element, but in structure
      - example: air traffic
    - exploration -- correlating patterns
      - multiple simultaneous views
      - response to interaction

want to know more?

- we've only scratched the surface
  - this isn't something with hard-and-fast rules
  - need to develop an "eye" for good design
- these books can tell you more:
  - "Designing Visual Interfaces", Mullet & Sano
  - "Things that Make Us Smart", Norman