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

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

visual design

• what is visual design for?
  – 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

recognition versus recall

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
• 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 – “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

• grouping
  – items that appear grouped appear to be related
gestalt in GUI design

- grouping
  - use proximity to indicate relatedness

- alignment is an important cue

- 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

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

- 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”
  – size
  – value
  – orientation
  – texture
  – shape
  – position

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

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

• consistency and structure

• spatial logic

• grid-based design
grid-based design

- a single grid can provide multiple uses

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

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