Designing visual interfaces

Unit 5

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Learning outcomes

• Principles of user interface design

• Introduction to information visualization
"To design is much more than simply to assemble, to order, or even to edit; it is to add value and meaning, to illuminate, to simplify, to clarify, to modify, to dignify, to dramatize, to persuade, and perhaps even to amuse."

– Paul Rand
Elegance & Simplicity

• Elegance = carefully select elements in a design with conscious decision
  – often involves taste

• Simplicity = solving a design problem in a clear and economical manner

• Best design is the result of a continuous simplification process
  – learnability
  – recognisability
  – immediacy
  – usability
Simplicity

“The easiest way to simplify a system is to remove functionality. […] The fundamental question is, where's the balance between simplicity and complexity?”

- John Maeda
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Simplicity principles

• Unity: The elements in the design must be unified to produce a coherent whole

• Refinement: The parts (& the whole) must be refined to focus the viewer’s attention on their essential aspects

• Fitness: The appropriateness of a specific design
Simplicity
Simplicity
Simplicity
Simplicity
Techniques

• **Reducing** a design to its essence

• **Regularising** the elements of the design

• Combining elements for **maximum leverage**
Reduction

Reduce the interface elements to the absolute minimum

• **Check**
  – Are all the elements needed?
  – Are all the control necessary?
  – Is it there any form of repetition? Redundancy?

• Reduction through successive refinement is the only path to simplicity
Reduction

• **Determine the essential qualities** (typically a short list of adjectives) that should be conveyed by the design, along with any fixed formal elements (label, an essential control, an image, a logo, a colour)

• Critically examine each element in your design and ask yourself **why is it needed**, how it relates to the essence of the design, and how the design would suffer without it. If you can’t answer any of these questions, remove the element.

• **Try to remove the element** from the design anyway. What happens? If the design collapses, either functionally or aesthetically, the elements must be replaced. Otherwise, consider omitting it from the final solution.
Reduction
Regularisation

• When further reduction is no more possible, the remaining elements can be regularised to further simplify the design

• Regularity can be achieved by aligning or reflecting elements along common axes, by standardising or repeating sizes and spacing of components, or by reducing components to basic geometric shapes
Regularisation

• Use regular geometric forms, simplified contours, and muted colours wherever possible

• If multiple similar forms are required, make them identical, if possible in size, shape, colour, texture, lineweight, orientation, alignment, or spacing

• Limit variation in typography to a few sizes to one or two families

• Make sure critical elements intended to stand out in the display are not regularised
Regularisation
Leverage

• The most challenging means of simplification is finding point of leverage at which design elements play multiple roles

• It requires insight into the user task

• Effective design utilizes every component to its fullest
Leverage

• Review the functional role played by each element in the design
• Look for situations where multiple elements are filling (or partially filling) the same role
• Question whether an element’s role could be filled as well by an adjacent component, possibly after minor modifications
• Combine redundant elements into a single, simpler unit or replace the lot with a common higher-level unit.
• Careful with modes!!!!
Leverage
Information visualization

- Information visualization (InfoVis) produces (interactive) visual representations of abstract data to reinforce human cognition

- visualisation is an activity in which humans are engaged, as an internal construct of the mind
WHY - Presentation

Graphics are a mean to display facts about the data in a way that others can see and understand the underlying structure and the hypothesis about the data (Rober, 2000).
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WHY - Explorative analysis

Graphics also are a mean for finding and identifying structures and properties in a given data set (Tufte, 1983).
WHY - Exploratory analysis

Graphics also are a mean for finding and identifying structures and properties in a given data set (Tufte, 1983).
WHY – Confirmative analysis

Graphics are also the visual mean to confirm or reject some hypothesis about the data.
WHY – Confirmative analysis

Graphics are also the visual mean to confirm or reject some hypothesis about the data.
Visual better then textual?

- **Locality** - is enabled by grouping together information that is used together (e.g., demographical growth)

- **Minimising labelling** - is enabled by using location to group information about a single element, avoiding the need to match symbolic labels (e.g., maps)

- **Perceptual enhancement** - is enabled by supporting a large number of perceptual inferences which are easy for humans to perform (e.g., London cholera)
# Visual variables

## Bertin’s Original Visual Variables

<table>
<thead>
<tr>
<th><strong>Position</strong></th>
<th>changes in the x, y location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>change in length, area or repetition</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
<td>infinite number of shapes</td>
</tr>
<tr>
<td><strong>Value</strong></td>
<td>changes from light to dark</td>
</tr>
<tr>
<td><strong>Colour</strong></td>
<td>changes in hue at a given value</td>
</tr>
<tr>
<td><strong>Orientation</strong></td>
<td>changes in alignment</td>
</tr>
<tr>
<td><strong>Texture</strong></td>
<td>variation in ‘grain’</td>
</tr>
</tbody>
</table>

- Jacques Bertin
Colours

https://webdesign.tutsplus.com/articles/an-introduction-to-color-theory-for-web-designers--webdesign-1437
Shneiderman’s InfoViz Tasks

• **Zoom**: see a smaller subset of the data
• **Filter**: see a subset based on values, etc.
• **Detailed on demand**: see values of objects when interactively selected
• **Relate**: see relationships, compare values
• **History**: keep track of actions and insights
• **Extract**: mark and capture data
Example - Navigation

- **Zooming**: is the increasing magnification of a decreasing (or increasing) fraction of a two dimensional image
- **Panning**: is the smooth movement of a viewing frame over a two-dimensional image of greater size
- **Scrolling**: is the movement of data past a window able to contain only a part of it
- **Focus + context**: to illustrate at the same time the overall picture (the context) and to see details of immediate interests (the focus)
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Usability

Usability is a **quality attribute** that assesses how easy user interfaces are, based on:

- **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?
- **Efficiency**: Once users have learned the design, how quickly can they perform tasks?
- **Memorability**: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
- **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
- **Satisfaction**: How pleasant is it to use the design?
PACT Analysis

User-centric framework for thinking about a design problem:

- Who the users are - People
- What activities are being carried out - Activities
- Where the interaction is taking place - Context
- What technologies are used - Technologies
Nielsen’s heuristics (1)

Rules of thumb for user interface design:

1. **Visibility of system status**: Inform the users about what is going on (appropriate feedback within reasonable time)

2. **Match between system and the real world**: Use the users' language, with familiar concepts (follow real-world conventions)

3. **User control and freedom**: Users often choose system functions by mistake and will need a clearly marked "emergency exit"

4. **Consistency and standards**: Users should not have to wonder whether different words or actions mean the same thing

5. **Error prevention**: Even better than good error messages is a careful design which prevents a problem from occurring
Nielsen’s heuristics (2)

Rules of thumb for user interface design:

6. Recognition rather than recall: Minimize the user's memory load by making objects, actions, and options visible

7. Flexibility and efficiency of use: Allow users to tailor frequent actions (novice and expert users)

8. Aesthetic and minimalist design: No information which is irrelevant or rarely needed

9. Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes)

10. Help and documentation: It may be necessary to provide help and documentation.
Exercise

- Design a visual interface – cameras online store

  1. PACT analysis
  2. Usability issues of existing websites
  3. Design proposal
Key point

- Elegance and simplicity:
  - Reduction
  - Regularisation
  - Leverage

- Information visualization = visual representations of abstract data to reinforce human cognition
Recommended readings

- Elegance & Simplicity
  https://www.evl.uic.edu/aej/422/week06.html

- Introduction to InfoViz
Other readings


http://www.nngroup.com/articles/recommended-books-visual-design/

http://webdesign.tutsplus.com/articles/design-theory/
an-introduction-to-color-theory-for-web-designers/

http://bokardo.com/principles-of-user-interface-design/

http://dzineblog.com/2009/03/interface-design-inspiration-36-beautiful-login-
pageform-designs.html

http://www.webdesignfromscratch.com/web-design/
web-2-0-design-style-guide/