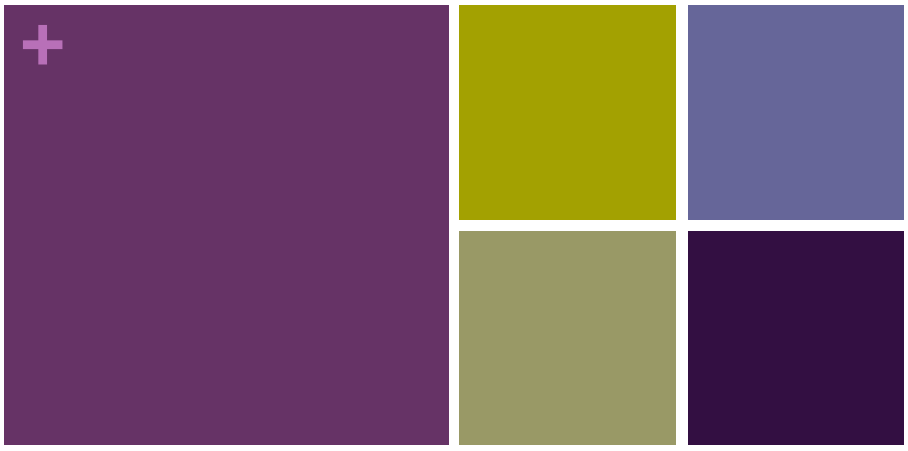

User Interface Aesthetics

COMPSCI 345 / SOFTENG 350

Prepared by Safurah Abdul Jalil & Beryl Plimmer 2011

Learning outcomes

- What is aesthetics?
- What are the principles of aesthetics?
- Why is aesthetics important to HCI?
- Do people agree on aesthetically pleasing?

3

4

Existential Graphs

MS 514 by Charles Sanders Peirce

with commentary by John F. Sowa

Peirce wrote MS 514 in 1909 as a tutorial on existential graphs, their rules of inference, and related topics in logic. The original manuscript of MS 514 is located at the Houghton Library, Harvard University, and this version was transcribed by Michel Balat. Peirce's words (either from MS 514 or in quotations from other sources) are printed in black, and the commentary is printed in red. The numbers highlighted in blue have hyperlinks to the bibliography. The text is essentially unchanged, some of the more obvious errors in spelling and transcription have been corrected, and some long stretches of text have been broken into paragraphs. The transcription begins at the bottom of page 9 of MS 514; page breaks in the manuscript are marked in brackets, such as [9.10].

For other views of Peirce's contributions to logic, see "Peirce the Logician" by Hilary Putnam or articles by Quine (1992), Dipert (1992), and Hintikka (1997). Peirce begins with a summary of his own work:

> One of my earliest works was an enlargement of Boole's idea so as to take into account ideas [9.11] of relation, — or at least of all ideas of existential relation. By an existential relation I mean any relation, R, such that anything that is R to x (where x is some particular kind of object) is nonexistent in case x is nonexistent. Thus lovers of women of bright green complexions are nonexistent in case there are no such women.

George Boole (1847, 1854) applied his algebra to propositions, sets, and monadic predicates. The expression $p \times q$, for example, could represent the conjunction of two propositions, the intersection of two sets, or the conjunction of two monadic predicates. With his algebra of dyadic relations, Peirce (1870) made the first major breakthrough in extending symbolic logic to predicates with two arguments (or *subjects*, as he called them). With that notation, he could represent expressions such as "lovers of women with bright green complexions". That version of the relational algebra was developed further by Ted Codd (1970, 1971), who earned his PhD under Arthur Burks, the editor of volumes 7 and 8 of Peirce's *Collected Papers*. At IBM, Codd promoted relational algebra as the foundation for database systems, a version of which was adopted for the query language SQL, which is used in all relational database systems today. Like Peirce's version, Codd's relational algebra and the SQL language leave the existential quantifier implicit and require a double negation to express universal quantification.

> I invented several different systems of signs to deal with relations. One of them is called the general algebra of relations, and another the algebra of dyadic relations. I was **finally led to prefer what I call a diagrammatic syntax**. It is a way of setting down on paper any assertion, however intricate, and if one so sets down any premises, and then (guided by 3 simple [9.12] rules) makes erasures and insertions, he will read before his eyes a necessary conclusion from premises.

In other writings, Peirce discussed his concept of *diagrammatic reasoning*, which is best illustrated by the rules of inference and model theory that he developed for existential graphs:

> By diagrammatic reasoning, I mean reasoning which constructs a diagram according to a precept expressed in general terms, performs experiments upon this diagram, notes their results, assures itself that similar experiments performed upon any diagram constructed according to the same precept would have the same results, and expresses this in general terms. (NEM 4:47–48)

From 1880 to 1885, Peirce developed his *general algebra of relations*, which Giuseppe Peano (1889) adopted as the basis for the modern notation of predicate calculus. Gottlob Frege (1879) had developed an equivalent notation for first-order logic, which he called the *Begriffsschrift* (concept writing), but no one else ever used it.

Peirce experimented with *relational graphs* as early as 1882, but those graphs couldn't express all possible combinations of Boolean operators, quantifiers, and their scope. His *entitative graphs* of 1896, which were based on disjunction, negation, and universal quantifiers, were the first graphs that had the full expressive power of the algebraic notation for first-order logic with equality. In 1897, he switched to the dual form, *existential graphs*, which were based on conjunction, negation, and existential quantifiers. Peirce continued to develop versions of existential graphs for modal logic and higher-order logic until his death in 1914. In this commentary, "EG" will be used as an abbreviation for *existential* rather than *entitative* graphs.

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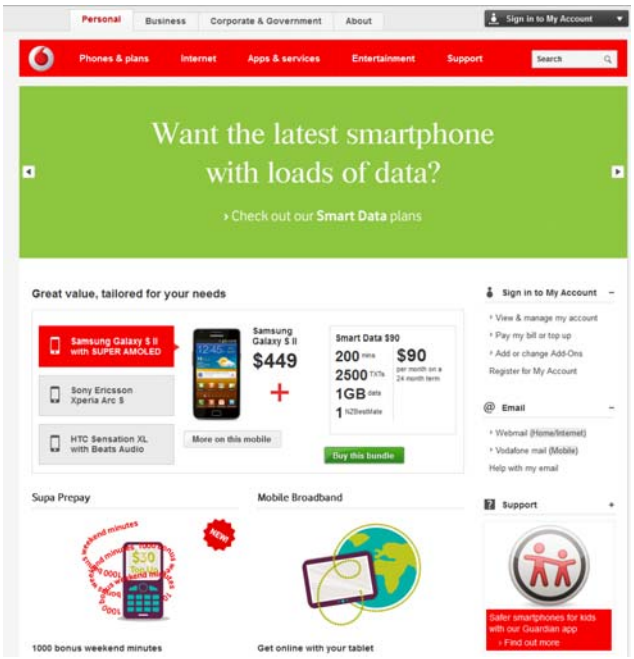
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Phones & plans
Internet
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Entertainment
Support
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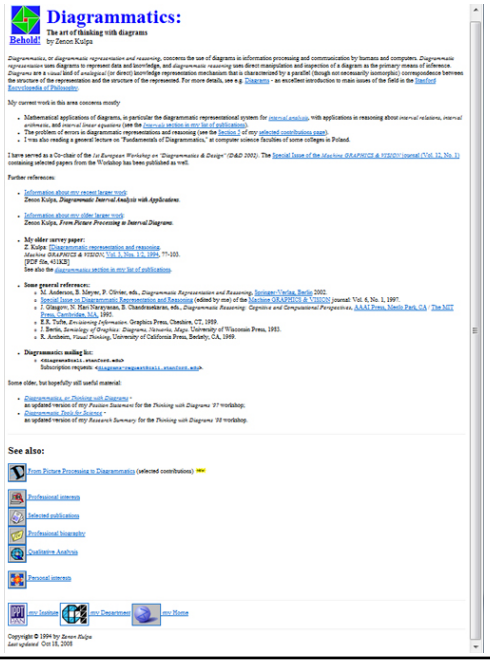
6


Diagrammatics:
The art of thinking with diagrams
Behold!
by Zenon Kulpa
See also:

7

8

Sketching Euler Diagrams

This EPSRC funded project [EP/H048480/1] focuses on developing sketch recognition techniques for Euler diagrams.

A natural creation method for Euler diagrams is using a pen but, prior to this project, no intelligent tool support existed for the pen-based creation of diagrams of this type. Euler diagrams are a popular and frequently used visualization technique; in part, this popularity serves to motivate our selection of them for the proposed research, since the results are likely to have significant impact. Moreover, Euler diagrams form the basis of more expressive notations, built by augmenting them with graphs or arrows (or both), for instance. Example notations include spider diagrams, Euler/Venn diagrams, Venn-II diagrams, constraint diagram, and concept diagrams. The research results of the project provide a basis for developing sketch recognition tools for these more expressive notations.

The figure below shows a sketched Euler diagram (on the left) alongside a formal Euler diagram (on the right). The sketch was drawn on a touchscreen and automatically converted to the formal version. The conversion process relies on being able to distinguish text from curves. In addition, sketched curves which are approximately circles or ellipses are rendered as these shapes in the formal diagram.

Previous work on sketch recognition has focused on types of diagrams, such as graphs, where properties like connectedness are semantically important. Euler diagrams, by contrast, use containment and overlap in semantically significant ways. Thus, the process of converting a recognised sketch to an Euler diagram must ensure that these properties are preserved.

The project runs from 2010 - 2011 and the proposal can be found here, which contains full details of the aims and objectives.

Rank these, most to least attractive

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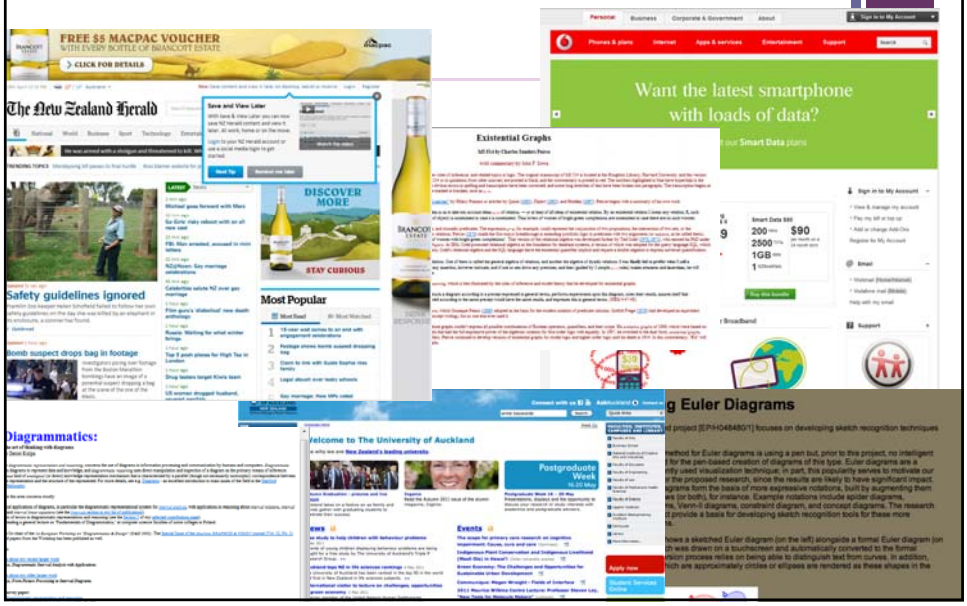

"What is beautiful is usable"

10

Tractinsky, et al. (2000)

- The term "aesthetics" has been studied from different viewpoints.
  - It was not until the eighteenth century that the word "aesthetics" (from the Greek **aisthanesthai**—to perceive) was introduced into philosophical terminology
  - By the end of that century "aesthetics" was no longer merely a technical term in philosophy; it became an integral part of the general language.
  - Broadly speaking, aesthetics has been studied by two different investigative methods:
    - philosophical approach - on what criteria is a thing consider beautiful – function? Form?
    - empirical approach – experimental measuring of what is pleasing – people prefer A to B

"What is beautiful is usable"

Tractinsky, et al. (2000)

- In the field of user interface design, research has shown that **visual aesthetics** of an interface **affects user's perception** on the system's.
- An aesthetically pleasing site is **perceived** as
  - More usable
  - More trustworthy
  - More error tolerant
- In a world of online banking, retail, etc, etc. this is hugely important.
- Its also important if your product is software. Beautiful software products have an immediate advantage over their rivals.

Half time entertainment

- Don Norman is on of the founders of Usability. He has always had a reputation for function over form…
- https://www.youtube.com/watch?v=RlQEoJaLQRA

13

What guides a design?

Principles

- Principles of design are concepts used to organize or arrange the components in a design
- We are going to review 3 principles:
  - Balance
  - Emphasis
  - Unity

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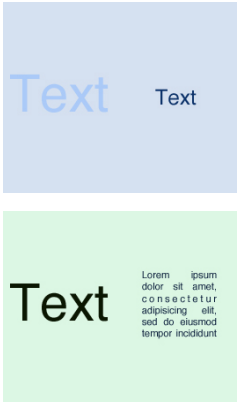
Principles

Balance

- The distribution of the optical weight in an interface

  Perception that some objects appear heavier than others, e.g.:
  - Larger objects.
  - Cluster of small objects
  - Objects with strong, intense colors.
- The balance in screen design is achieved by providing an equal 'weight' of screen elements, left and right, top and bottom.

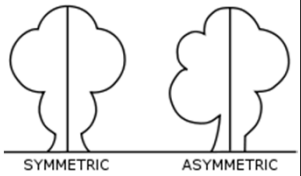


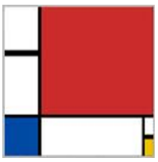
Principles

Balance

There are two common systems for achieving balance:

- **Symmetry** - a mirror image
  - Symmetry can occur in any orientation as long as the elements are the same on either side of the central axis.
  - Also called **formal balance because a form (formula) is used**
- **Asymmetry** - without symmetry
  - Also known as **informal balance.**
  - The term, however, is usually used to describe a kind of balance that does not rely on symmetry.
  - There are no rules or limits with asymmetrical balance. It can be achieved by careful placement of objects and the use of other organizational devices (like figure/ground in **Gestalt principles**).



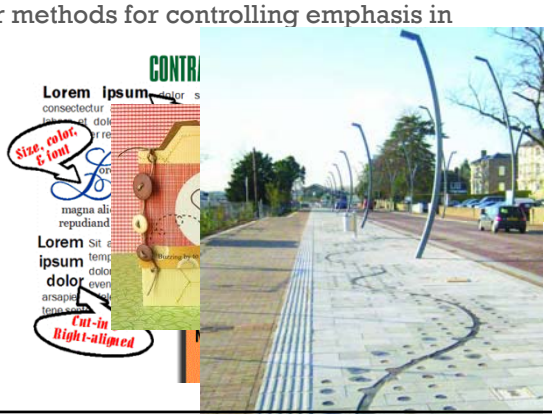


Mondrian achieves a subtle asymmetrical balance in his compositions.

Principles

Emphasis

- Dominance is to control the attention of someone viewing the visual (make objects easy or difficult to notice).
- There are three major methods for controlling emphasis in a visual image:
  - **Contrast**
  - **Placement**
    - **Central vision**
  - **Isolation**
    - **Search for detail**



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Principles

Unity

- The relationship between the individual parts and the whole of a layout.
  - Aspects that are to tie the composition together, to give it a sense of **wholeness**, or to break it apart and give it a sense of **variety**.
- Stems from some of the Gestalt theories of visual perception (psychology),
  - specifically those dealing with how the human brain organizes visual information into categories, or groups.
- Careful placements of components
  - connect by one grouping tendency (similarity of color, for example)
  - disconnect by others (distance, for example, or differences of shape, size or direction)
- Understanding gestalt concepts can help to create unity and variety.

18

What is it that is guided?

Components

- Foreground
  - Text
  - Colours & images
  - Lines & borders
  - Forms & Controls
- Background

Summary

- Principles
  - Balance
  - Emphasis
  - Unity
- Components
  - Foreground
    - Text
    - Colours & images
    - Layout, lines & borders
    - Forms & Controls
  - Background

References

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- **Art, Design and Gestalt Theory by Roy R. Behrens** http://www.leonardo.info/isast/articles/behrens.html
- **The Principles of Design magazine article** http://www.digital-web.com/articles/principles_of_design/

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