Perceptual and Artistic Principles for Effective Computer Depiction

Gestalt and Picture Organization

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Grouping by color
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Grouping, illusory contour & fig/gnd
Absolut

Context: Gestalt psychology
• [Palmer 99]
• Early 20th century
• Inspired by field theory in physics
• Holistic philosophy of vision
  – “Spontaneous” organization
  – Opposed to unconscious inference
• Has been integrated recently into modern framework

Context: Gestalt psychology
• Early 20th century
• Arnheim had a Gestalt psychology background
• Very popular in design
• Advertisement vs. art

Prägnanz
• Cornerstone of Gestalt
• “Goodness”
• “Simplest” possible figure or organization
• Things are organized spontaneously and assumed to be in the simplest configuration

• Has recently been related to information theory (simple in terms of amount of information required to encode it)
**Plan**
- Grouping
- Figure-ground
- Completion and illusory contours

**Grouping**
- “Similar” or “close” objects are perceived to belong to groups
- Spontaneous and powerful perceptual effect

**Grouping**
- By Proximity
- By Color
- By size

**Grouping by synchronicity**

**Grouping by synchronicity**
Grouping by synchronicity

Proximity is outweighed by region

Proximity is outweighed by connectedness

Task: Detect repetition of a shape in a sequence
- The repetition can be inside or across a group
- Slower when between groups (~0.7 vs. ~1.1s)

Repetition within group

Repetition across group

Repetition in neutral sequence

Redrawn after [Palmer 99]

Grouping effect

Grouping conflict
Grouping conflict

- Faster when within small oval

Redrawn after [Palmer 99]

Grouping in complex situations

- No quantitative rule yet!
- Very complex problem
- Too many parameters

Grouping and photo

Edward Weston

Grouping

- Grouping by proximity tells story

Grouping & Map Making

- Grouping provides efficient analysis

Grouping and ornament

- Repetition, rhythm
**Plan**

- Grouping
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- Completion and illusory contours

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**Figure-ground**

- What is in front (figure), and behind (ground)?
- There has to be one figure and one ground
- Related to occlusion and thus to depth
- Less attention is dedicated to the ground

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**Figure-ground**

- The shape with the best “Prägnanz” is the figure
- Can be bimodal: we switch from one interpretation to the other
  - Visible on brain imagery
- But only one at a time

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**Figure-ground & familiarity**

- Familiarity helps: We recognize a horse

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**Figure-ground pun**

- Rubin vase
**Figure-ground transition**

- +grouping

**Enhancing depth through contrast**

**Negative space**

- The ground defines the negative space
- Usually overlooked
- Fundamental for balance
  - Also for typography

**Closure & Negative space**

- George Seurat
- Negative space are enclosed in the picture frame

**Plan**

- Grouping
- Figure-ground
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**Continuation**

- Lines are continued after junctions
- And after gaps
Continuation and Map-Making

Continuation and design
- El Lissitzky, *Self Portrait: The Constructor* 1924

Closure
- Closed shapes have better “Prägnanz”
- + continuation
- + illusory lines

Illusory contour
- An illusory contour is implied by continuation of the lines
- Related to figure ground
**Illusory contours**

- Kanizsa

![Kanizsa Illusory Contour](image)

**Illusory contour**

- Can be more effective

![Matisse Illusory Contour](image)

**Illusory contour**

- Familiarity helps

![Figure-ground and Illusory Contour](image)

**Figure-ground and illusory contour**

- We complete the occluded part with the simplest shape (best “Prägnanz”)
- Related to continuation and closure

![Visual completion](image)
### Completion

- Magritte

- Marc Riboud
  - Completion is challenged

### Summary

- Prägnanz (goodness, simple in terms of information)
- Grouping
- Figure-ground
- Completion

- As usual pictures can
  - Simplify
  - Challenge

### History of science

- Initially, strong opposition between Gestalt and other theories
- Lack of experimental data
- Has been applied beyond its scope
- Has been taken too literally

- Now, has been integrated with other theories
- Experiments
- Computational models