The Art and Science of Depiction

Picture Organization and Gestalt

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Summary

- Contrast processing
- Different pathways
- Computational theory of vision
- Invariants
Overview

- After image-based, we only know where edges are
- Need to organize the image
  - Segment by region, find structure
Context: Gestalt psychology

• Early 20\textsuperscript{th} century
• Inspired by field theory in physics
• Holistic philosophy of vision
  – “spontaneous” organization
  – Opposed to unconscious inference
• Has been integrated recently into modern framework
• Very popular in design
Prägnanz

- “Goodness”
- “Simplest” possible figure or organization
- Has recently been related to information theory (simple in terms of amount of information required to encode it)
Some Gestalt principle

- Continuation
Continuation and Map-Making
Continuation and Map-Making
Continuation and design

- El Lissitzky, *Self Portrait: The Constructor* 1924
Some Gestalt principle

- Continuation
- Closure
Plan

- Grouping
- Figure-ground
- Completion and illusory contours
No Grouping
Grouping by proximity
Grouping by color
Grouping by size
Grouping by shape
Grouping by orientation
Grouping by synchronicity
Grouping by synchronicity
Grouping by synchronicity
Grouping by synchronicity II
Grouping by synchronicity II
Grouping by region
Grouping by connectedness
Grouping by symmetry
Grouping by parallelism
Grouping conflict

- Proximity is overweighed by region
Grouping conflict

- Proximity is overweighed by connectedness
Grouping conflict

- Detect repetition
- Slower when between groups (0.7 vs. 1.1s)

A  

B  

C  

D  

E  

Within-group

Between-group

Neutral

Within-group

Between-group
Grouping conflict

- Detect repetition
- Faster when within small oval

A. Pair within Small Ovals

B. Pair within Large Ovals
Grouping after lightness constancy

- If the shadow is visible as a shadow
- Grouped by lightness
Grouping after size constancy

- Grouped by 3D –proximity, not by retinal image proximity
Grouping in complex situations

• No quantitative rule yet!
Grouping in photos

Arthus-Bertrand
Grouping in photos

Arthus-Bertrand
Grouping and photo

Edward Weston
Grouping and photo

Jean-Pierre Sudre
Grouping and photo

- Grouping reinforces contrast
Grouping by color

Georgia O’Keeffe
Grouping

- Grouping by proximity tells story
Grouping

- Abbas
  *South African Police in Training, 1978*

- Grouping by proximity and similarity tells story
Grouping

• Grouping by similarity
Grouping & Map Making

• Grouping provides efficient analysis
Grouping & Architecture

• Grouping by similarity
Grouping & Architecture

• Grouping and symmetry
• Cesar Pelli
  Petronas Towers
  Kuala Lumpur, Malaysia
  1991-97
Grouping

- Lucien Clergue
  *Camargue*, 1940
Grouping and repetition

- Andy Warhol
  *30 Are Better than One*
  1963
Grouping and ornament

- Repetition, rhythm
Closure & grouping
Plan

• Grouping
• Figure-ground
• Completion and illusory contours
Figure-ground

- There has to be one figure and one ground
- Related to occlusion and thus to depth
Figure-ground

- A: ambiguous
- B: relative size
- C: symmetry & main axis
- D: contrast
Figure-ground

- A: symmetry
- B: convexity
- C: parallelism
Figure-ground & familiarity
Figure-ground & familiarity
Closure & figure-ground

Picture Organization & Gestalt
Figure-ground & signal-noise ratio

- Information theory (Shannon)
- Figure-ground separation is simpler when high signal-noise ratio
Figure-ground painting
Figure-ground pun

• Rubin vase
Figure-ground transition

- +grouping
Figure-ground logos

[Diagram of figure-ground logos]
Figure-ground logos
Figure Ground in design

• Sharon Gresh, Michael Mc Ginn
Figure ground: empty ground

Hopper
Figure ground simplification
Figure-ground simplification

- Egon Schiele
- Contrast enhancement
Figure-ground simplification
Figure-ground and map-making
Figure ground – not so easy

- Monet
Figure ground – not so easy

• Picasso
Figure ground – stage of vision

• Note that Impressionism and cubism were not classified surface-based
• In contrast, in this Raphael, figure-ground separation is easy
Figure ground – stage of vision

- Note that Impressionism and cubism were not classified surface-based.
- But in this Picasso, figure-ground separation is easy.
Negative space

• The ground defines the negative space
• Usually overlooked
• Fundamental for balance
  – Typography

From Drawing with the Right Side of the Brain, Edwards
Negative space

- George Seurat
Negative space

- George Seurat
Closure & Negative space

- Negative space are enclosed in the picture frame
Negative space in Architecture

- Michael Graves, 1969
Plan

• Grouping
• Figure-ground
• Completion and illusory contours
Illusory contours

- Kanisza
Illusory contours

A

B

C

D
Image-based (primary sketch)

- Contrast, edge detection
- Not so easy

Raw edge detection
Illusory contour

• Can be more effective
Illusory contour
Illusory contour

- Cocteau
Illusory contour

- Matisse
Figure-ground and illusory contour
Figure-ground puzzle
Illusory contour

• From [Ramachandran 1995]
Illusory contours

Vasarely, *Helios*
Illusory contour

• William Anders
  *Earthshine*
  1969

• Prägnanz:
  a circle is
  “simpler”
Illusory contour

- Familiarity helps
Illusory contour

- Familiarity helps
**Visual completion**

- We complete the occluded part
Visual completion

- We complete the occluded part with the simplest shape
Visual completion

- With no context
- With context
Relatable edges

A

B

C

D

E

F

Relatable Edges

Unrelatable Edges
Illusory contour & completion

- Both “see” a figure from incomplete information
Visual completion

- Clarence Lee, 1977

ONE NINE SEVEN
Visual completion

- Greg Brown (mural)
Completion

• Magritte
Completion

- Degas
- Framing
Completion

- Marc Riboud
- Completion is challenged
Summary

• Grouping
• Figure-ground
• Completion

• As usual pictures can
  – Simplify
  – Challenge
Assignments

• Piranesi
  – Tutorial 1 to 4

• Reading
  – Art and Illusion, Gombrich
  – Summary 1 to 2 pages
  – 2 Discussion issues

• Feedback + 1 picture
Talks

- Start in 2 weeks
- 20-30 minutes
- Discuss your subject with me if not done
Discussion

- The Man Who Mistook his Wife for a Hat
- The Colorblind Painter
- Oliver Sacks
The Colorblind Painter

Two paintings done by Mr. I. shortly before his accident.

A painting of flowers done four weeks after Mr. I.'s accident. The underlying outlines are clear, but camouflaged by a random application of color.

Mr. I. painted pieces of grey fruit to show us the "leaden" universe into which he had fallen.
The Colorblind Painter

A test painting from Mary Collin's Colour-Blindness [left], as reproduced by someone with red-green colorblindness, and by Mr. I. [right].

The sunset scene of which Mr. I. could see virtually nothing—an effect simulated by a black-and-white photocopy of it.

A black-and-white painting done about two months after Mr. I.'s accident, and a painting done two years later—Mr. I. at this time was experimenting with adding single colors, even though he could not see them.
Figure ground simplification

- Isaac D. Fletcher
Figure-ground in design

• Shigeo Fukuda
  1986

• Poster for a one-man exhibition
Grouping

Andy Warhol