Analysis of Information
The Visual Variables

- Size
- Value
- Texture
- Color
- Orientation
- Shape
- 2D Plane

- 8 variables to work with
- The components of graphic system
The Level of Variables

- Level = perceptual properties
- A value variation is capable of representing an ordered component; a shape variable is not.
The Level of Variable

• Selective
  – Allow us to immediately isolate all the correspondences that have the same category (such as same color, same shape, etc.)
  – i.e. fundamental perceptual features

• Associative
  – Permit immediate grouping of all the correspondences differentiated by this variable but are common in other variables
    • Squares, triangles, circles of the same color and size are considered the same group – Shape is associative
    • White, gray, block circles of the same size are not seen as the same – Color is not associative

• Ordered
  – When the order is immediate and universal (e.g. gray level intensity)

• Quantitative
  – When the visual distance can be immediately expressed by a numerical ratio (e.g. line length)
The Level of Organization of The Plane

- A variation in planar position is selective (figure 3)
- A variation in position is associative (figure 3)
- A variation in position/angle is ordered (figure 4)
- A variation in position is quantitative (figure 6)
Imposition

- Utilization of two planar dimensions
- Mainly depends on the nature of the correspondences (data) expressed on the plane
- Divided into four **groups**
  - Diagrams
  - Networks
  - Maps
  - Symbols
Types of Imposition

- An arrangement dispersed over the entire plane (type)
  - Rectilinear
  - Circular
  - Orthogonal
  - Polar
- Thus imposition includes two stages
  - Group of imposition
  - Type of imposition
Example

• Traffic accident victims
  – Invariant: victim of a traffic accident in France in 1958
  – Components
    • Q of person according to
    • Four different categories (28951 pedestrians, 17247 in bicycles, 74887 in motorcycles, 63071 in vehicles)
Rectilinear Imposition

- Figure 1, 2, 4, 5

The bar means the total is portrayed
Orthogonal Imposition

- Figure 6-10: the partial quantities are not added but are related to the same base
- The total is not portrayed, but the parts are easy to compare
Rectilinear Elevation

- Figure 11-15
- The quantities are represented by area
- Different parts are juxtaposed (11-13) or superimposed (14-15)
Circular Imposition

• Eyes are good at detecting angle, 17 and 19 are easier to grasp than 18
Polar Imposition

• Curving the orthogonal
• The total is not portrayed, and the parts are not easy to compare
Circular Elevation

• Curving Rectilinear elevation
The Retinal Variables

• When introducing the third component, the graphic representation must utilize the retinal variables
Associative Perception

Associative  

Not Associative

SHAPE

ORIENTATION

COLOR

TEXTURE

VALUE

SIZE
Selective and Ordered

Selective: \( \neq \)

Ordered: 0
Quantitative

Size
Level of Organization

Associative: ≡

Selective: ≠

Ordered: O

Quantitative: Q
The Value Variation

• Continuous progression which the eye perceives in a series of grays ranging from black to white (strongest value being black)

• The ratio between the total amount of black and white perceived on a given surface

• Independent of color (hue)
Length of Value Variation

• A value variation is ordered
• For selective perception, not to exceed size of seven steps of value
• The contrast between gray and white increases as the mark becomes smaller (when a large white is involved)
• Value variation is disassociative (not possible to disregard it visually)
Principle Properties of Value

• Value is ordered, and we cannot reorder it
• Value is not quantitative (no ratio can be easily seen)
Principle Properties of Value

- Requires to transform a series of numbers to a series of value scales (there is not a single rule)
Texture Variation

• Texture is the number of separable marks contained in a unitary area
Size and Texture

• The length of a given texture is directly linked to the size of the marks
• The larger the mark, the greater the number of separable steps
  – Area representation: larger marks, hence furnish the greatest number of steps
  – Linear representation: limited to three or four selective steps
  – Point representation: two or three steps
The Vibratory Effect

• A uncomfortable sensation of vibration
• Create a remarkable selective possibility when used properly
The Vibratory Effect

• A uncomfortable sensation of vibration
• Create a remarkable selective possibility when used properly
• Occur at 50% of value
The Vibratory Effect

- A uncomfortable sensation
- Create a remarkable sense when used properly
- Occur at 50% of value
Creating Vibration

- Linear representation – relatively easy
- Point representation – by external or internal complexity
Orientation Variation

- We are sensitive to the variation of orientation only when the mark has a linear aspect
  - The ratio of height/width > 4/1
  - The number of orientations need to be limited
  - It is the difference in angle between parallel signs that constitutes the perceptible stimulus
- Better to limit to use 4 different orientations. Selectivity diminishes with more orientations.
Shape Variation

• There are infinite number of shapes
• It is the similarity recognized in the shape which constitutes the stimulus
• Shape is associative, but not selective
  – They cannot be grouped at a single glance
• Point representation – two similar shapes are difficult to identify
• Linear representation – a line can differ in the shape
• Area representation – maximize the selectivity by contrasting other variables: size, value, and texture
Shape Variation
Color Variation

• The perceptible difference which can be perceived between uniform areas having the same value
• Tone – defined by two parameters: Hue and Value (luminance)
Color Variation
Color Saturation

• A color can be added with more white (change in saturation) and black (change in value)
• A saturated color is neither with any white or black
• The saturated color is not of constant value but varies in color according to the color
Visual Perception of Colors

• Immediate visual perception of colors follows the order of the values

Blue and red are ‘similar’ Order according to the values
Visual Perception of Colors

• Color variation is not ordered
  – Variations in color but not value cannot be used to represent ordered component

• Selectivity is at a maximum near the saturated colors
  – Light values: around yellow – from green to orange
  – Medium values: blue to red
  – Dark values: blue to red (of dark values)
Color Variation
Visual Perception of Colors

• The smaller the mark, the less distinguishable are the colors
  – The length of a color variation is thus the function of the size of marks
• The series of pure tone is disassociative
• Light color should be avoided for linear and point representation (not very visible)
• Color is selective, not ordered