Chapter 2 - Perception

• Sight and visual perception
  – Physiology of visual perception
  – Perception of colors
  – Attentive und pre-attentive perception
  – Gestalt laws

• Hearing und auditive perception
  – Physiology of auditive perception
  – Specifics of auditive perception

• Feeling und proprioception

• Perception of smell and taste
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Cross-Sectional View of the Human Eye

- Iris
- Lens
- Retina
- Fovea
- Optic nerve

Based on Material by A. Butz & A. Krüger
Distribution of Sensor Cells within the Eye

Rods

Cones

Entrance of optic nerve, no cells

Density of sensory cells

Deviation from optical axis in degrees

Based on Material by A. Butz & A. Krüger
Light Sensitivity of Sensor Cells in the Eye

- Violet: 400nm
- Blue: 498nm
- Turquoise: 500nm
- Green: 534nm, 564nm
- Yellow: 600nm
- Red: 700nm

Cones

M
L
S

Based on Material by A. Butz & A. Krüger
Color Blindness

• Frequent: red-green deficiency
• 8% of male population
• Simulation using Photoshop
Saccades

Roadside joggers endure sweat, pain and angry drivers in the name of fitness. A healthy body may seem reward...

http://www.microsoft.com/typography/ctfonts/science_of_word_recognition_files/Figure5.gif


Reading Example:
This person is reading the text for understanding. So even though not every word is fixated, the amount of time spent on each word is indicative of the processing of the word.

Skimming Example:
This person is skimming the text. This is most obvious from the pattern of fixations that are more dispersed and shorter fixation durations that is typical for this type of reading. The main gist maybe understood, but poorer memory for the text usually results.

http://images.scholarpedia.org/w/images/9/93/Readingskimming.jpg
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Based on Material by A. Butz & A. Krüger
Color Space: RGB
Color Space: HSV

- **Hue** (Farbton)
- **Saturation**
- **Value (Brightness)**

![Color Picker](image)

Select foreground color:

- H: 359°
- S: 52%
- V: 64%
- R: 162
- G: 78
- B: 79
- L: 44
- a: 36
- b: 17
- C: 42%
- M: 84%
- Y: 74%
- K: 0%
From Spectrum to Color Circle

Based on Material by A. Butz & A. Krüger
Color Circle According to Johannes Itten (1961)
Effect of Colors: cold/warm, bright/dark

Based on Material by A. Butz & A. Krüger
Pure und Non-Pure Colors
Color Contrasts

- Color-only-Contrast
- Bright-Dark-Contrast
- Cold-Warm-Contrast
- Complementary Contrast
- Complementary Contrast

Simultaneous Contrast

Quality Contrast
Example Simultaneous Contrast

Based on Material by A. Butz & A. Krüger
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Based on Material by A. Butz & A. Krüger
Which Object is Different from the Others?

- Color alone is perceived *pre-attentively*.
- Shape alone is perceived *pre-attentively*.
- Combinations of two properties are perceived *attentively*.
Further Pre-Attentively Perceived Properties

- Grey value
- Elongation
- Curvature
- Added surround box
- Shape
- Added surround color
- Filled
- Sharpness
- Cast shadow
- Convex and concave
- Sharp vertex
- Joined lines
- Misalignment
- Blinking
- Direction of motion
- Phase of motion

http://visualizedd.wordpress.com/process-paragraph/
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Gestalt Laws

- Bars:
  - Left: Horizontal bars
  - Middle: Diagonal bars
  - Right: Vertical bars

- Shapes:
  - Top left: Overlapping squares
  - Top right: Dotted line
  - Bottom right: Connected shapes
Gestalt Laws in Action ;-)

Based on Material by A. Butz & A. Krüger
Gestalt Law Application in Design

http://sixrevisions.com/web_design/gestalt-principles-applied-in-design/
Gestalt Law Application in Design

US Presidential Campaign 2008

http://sixrevisions.com/web_design/gestalt-principles-applied-in-design/
Gestalt Law Application in Design

http://sixrevisions.com/web_design/gestalt-principles-applied-in-design/
The whole is other than the sum of its parts.

Kurt Koffka

http://sixrevisions.com/web_design/gestalt-principles-applied-in-design/
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Human Ear

- Ossicles
- Incus
- Stapes
- Malleus
- Ear-drum
- Auditory canal
- Cochlea
- Nerves to brain
- Vestibular system

Based on Material by A. Butz & A. Krüger
Spatial Hearing through ITD and IID

Based on Material by A. Butz & A. Krüger
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Phonological Loop

approx. 2 seconds

two one eight zero four six five zero

a_terribly_long_word_in_German

ei awei awwer dabba debei do owwe
Auditory Icons and Earcons

• Auditory Icons
  – Like visual icons
  – Represent an object or an operation
  – Often natural sounds

• Earcons
  – Abstract encoding of several values
  – E.g. in a melody
  – E.g. as speed-up of spoken language
  – Meaning has to be trained
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Physiology of Tactile Sense

- http://www.gesundheit.de/sites/de/images/anatomie-lexikon/haut.jpg

Based on Material by A. Butz & A. Krüger

http://www.cerebromente.org.br/n16/mente/large_skin.gif
Weighted Processing of Sensory Information

http://upload.wikimedia.org/wikipedia/commons/thumb/1/13/Sensory_Homunculus.png/879px-Sensory_Homunculus.png

Based on Material by A. Butz & A. Krüger

http://sciencedefined.wordpress.com/2012/01/31/the-skin-is-also-a-map/
Proprioception

- Proprioception
- Kinesthesia

http://quizlet.com/16208920/neurobiology-final01-somatosensory-system-flash-cards/
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Based on Material by A. Butz & A. Krüger
Senses of Smell and Taste

http://www.cerebromente.org.br/n16/mente/senses1.html
Discussion

Based on Material by A. Butz & A. Krüger