Limitations of the Medium, compensation or accentuation

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Limitations of the medium

- The medium cannot usually produce the same stimulus
- Real scene (possibly imaginary) → Picture → Limited stimulus → Perception

Limitations of the medium

- The picture is flat
- The viewpoint is unique
- The image is finite, it has a frame
- The picture is static
- The contrast is limited
- The gamut (palette) is limited

Limitations of the medium

- Notion pioneered by H. von Helmholtz
  - Physicist and vision scientist (19th century)
- Crucial aspects of art are defined by limitations
  - E.g. composition, color palette

Strategies

- Elimination
  - Technological
- Compensation
  - Pictorial technique
- Accentuation
  - Because limitation can be good

Elimination of flatness

- E.g. Stereo images, head-mounted displays, holograms, autostereoscopic displays, sculpture
**Compensation of flatness**
- Enhancement of occluding silhouettes, aerial perspective, etc.
- Some cues are missing
  - Here stereo, parallax
- Compensated through other channels
  - Occlusion

**Occlusion**
- Titian

**Other compensations of flatness**
- Accentuate pictorial cues
  - Aerial perspective
  - Convergence of parallels
  - Relative sizes of objects
  - Texture gradient
  - Shading and shadows
  - Position wrt horizon

**Accentuation of flatness**
- Here, occlusion boundaries are blurred
  - To enhance the 2D composition

**Special effects: relate different depths**
The limitation is good

- Relate objects at different depths
- But still have a 3D impression thanks to compensation

Dissonance

- Magritte

These strategies are general

- Elimination
  - Technological, extend the medium
- Compensation
  - Through different channels
  - Allow to juggle between accentuation & elimination
- Accentuation
  - Because limitations can be a plus

These strategies are general

- For most media
  - Limitation can be more or less pronounced
- Are also relevant if the medium is NOT limited!
  - In order to increase effects

Plan

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The picture is static

- Pose (not at rest)
- Motion Blur & path
- Multiple snapshot
- Composition
- Op’ Art
**Egyptian vs. Greek**

- Cartoons
- Even when there is no limitation!

**Path of Movement – Motion Blur**

- Luxo Jr., Pixar

**Motion Blur**

- Velasquez: does not imitate a camera!

**Multiple snapshots**
Multiple Snapshots

- Marcel Duchamp
  *Nude Descending a Staircase*
  1912

Multiple snapshots

- Sassetta,
  *The Meeting of St Anthony and Saint Paul*,
  1440

Viewpoint

- + lines + pose

Composition - lines

- + Balance

La Gioconda

- Sfumato

La Gioconda

- Sfumato
- [Dr. Livingstone]
- Multiresolution vision
A Paradigm...

The limitation is good!

• Tak Kwong Chan
  The Horse –
  Away He Goes 1980
• Static and dynamic quality

The limitation is good!

• Static+dynamic allows us to visualize everything

Plan

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Contrast limitation

• Real world: \(10^{-6}\) to \(10^6\) \(\text{cd/m}^2\)
• Picture
  – Max contrast 1:500
  – Typically 1:50

Two problems

• The image intensity does not match the real conditions

Low contrast

Sunny scene

Watched in a dark room
**Hunt and Stevens effect**
- Perceived contrast increases with luminance
- Colors are more vivid in bright environments
- Hence gamma correction
  - Well, at least one form of gamma correction

**Two problems**
- The image intensity does not match the real conditions
- The contrast is not sufficient

**Photography & contrast management**
- Try to preserve texture (details)

**Photography & contrast management**
- Try to preserve texture (details)
- When the picture is shot
- Film processing
- Printing

**Filterering: red**

**Gradient Filter**
- The sky is too bright
  - Gradient filter for the top of the photo
Three Point Lighting

- Key light
  - Main and visible lighting
- Fill light
  - Fill-in shadows
- Back light
  - Emphasize silhouette
  - Make subject stand out
- Independent lighting

Portrait lighting

- Strong back light
- Enhances occlusion
- Enhance subjective brightness of main character

Fill-in

- Add flash to illuminate the interior
- Brings interior to the level of the exterior

Fill-in & planes of light

- Lighting: contrast & flatness

The Print

- W. Eugene Smith photo of Albert Schweitzer
- 5 days to print!
- Composition thanks to limitation
**Dodging and Burning**
- Locally darken or lighten
- Mask to expose some areas less
- Has to be done for each print!

**The limitation is good!**
- Wolfrang Weber
  - *The Lash Bird Dancer On Madagascar*
  - Late 20s

**Tuesday at 8:30, technical session**
- Three papers about digital contrast management
  - Gradient Domain High Dynamic Range Compression
    - Raanan Fattal, Dani Lischinski, Michael Werman
  - Photographic Tone Reproduction for Digital Images
    - Erik Reinhard, Mike Stark, Peter Shirley and Jim Ferwerda
  - Fast Bilateral Filtering for the Display of High-Dynamic-Range Images
    - Frédo Durand and Julie Dorsey