Why does art work?

Why Does Art Work?

- Do Rules exist, What are the Rules?
- How did these Rules come about?
- What Brain mechanisms are involved?

“The Neurological Basis of Aesthetic” by Ramachandran and Hirstein

- Studies of the Human Visual System
- Artistic Technique & Art History
- Organize Results and Advocate Testing
  Ongoing fMRI, Galvanic Skin Response, BP & Heart Rate, Eye Tracking, Etc, ...

Ramachandran and Hirstein’s Eight “Laws” of Art

- The Peak Shift Principle
- Perceptual Grouping and Binding
- Isolation of a Single Visual Cue
- Problem Solving
- Contrast Extraction
- Symmetry
- Generic Viewpoint
- Use of Metaphor
The Peak Shift Principle

- Exaggerated elements are attractive.

Training Set

Testing Set

Photograph

Peak Shifted Photograph

Peak Shifted Color

Peak Shifted Color

Peak Shift in Form
The Peak Shift Principle

- Exists Across Visual Modalities
  Outline, Color, Form, Motion, Highlight, Depth are all susceptible to Peak Shift.
- Reward and Non-Reward Stimulus
  Must be Close

Learning Speedup Via Peak Shift

- 10 Training Passes
- 1-2 Training Passes per Condition

Applying the Peak Shift Principle to CG

- Contact Cues in Animation
- Distance Perception in VR
- Perceptually based Anti-Aliasing
- Limit Geometric Complexity
- Temporal Anti-Aliasing

Perceptual Grouping

- Similarity
  Items that are the same are grouped. (Shape)

Perceptual Grouping

- Similarity
  Group by intensity.
- Similarity
  Intensity overcomes shape.
Perceptual Grouping

- **Proximity**
  Items that are physically close are grouped.

![Proximity Example](image1)

- **Continuity**
  Items that form or are joined by a line are grouped.

![Continuity Example](image2)

- **Closure**
  Items that form closed regions are grouped.

![Closure Example](image3)

- **Common Fate**
  Items that move together are grouped.

![Common Fate Example](image4)

- **Past Experience**
  Items are interpreted based on surrounding items.

![Past Experience Example](image5)
Perceptual Binding

• Center item appears as the number 13.

Perceptual Grouping

• Change the Surround

Perceptual Grouping

• Center item appears as the number 13.

Images courtesy of Professor Charles Schmidt, Rutgers University

Applying Gestalt Grouping to CG

Anthony A. Apodaca, Larry Gritz

Perceptual Binding

Perceptual Binding
Isolation of a Single Visual Cue

• Helps focus a viewer's attention.
  Based on the observation that differentiated brain cells exist for the perception of color, depth, form, etc.

Grinvald et al.
Peak Shift applied on Single Visual Module

Peak Shifted Line Art Faces

Herman Grid, Count Black Spots at Intersections

Apparent Movement

Op Art

Bridget Riley

Idea of Movement

Duchamp
Applying Visual Cue Research to CG

- Take advantage of new computational models of Human Vision
- Tone Mapping
- Motion planning
- Anti-Aliasing

Problem Solving

- Perceptual “problem solving” is reinforcing.

In Scene Elements

Arcimboldo

Problem Solving in the Subject Matter

Wyeth

Sometimes the Problem is Obvious

Contrast Extraction

- Contrast is reinforcing.
- Color
- Size
- Position
Contrast (Intensity)

Contrast (Size and Number)

Contrast (position)

Symmetry
- Symmetry is attractive.

Generic Viewpoint
- Unique Vantage Points are Suspect.
Generic Viewpoint

Generic Viewpoint in CG

- Choosing a Viewing Angle.
  Blantz et al., Perception 99
- Avoiding confusing self occlusion.
  Gooch et al., EGRW 01

Use of Metaphor

- Visual puns and metaphors enhance art.

  Metaphor: an implied comparison between two things of unlike nature that still have something in common.

This is Not a Pipe

This is a Pipe Knot

Conclusion

- This is just a Frame Work
- Not Everything is Included
- Look for more & better results in the future
Thanks

• NPR BOF, Tuesday 7:00, Menger Hotel

www.cs.utah.edu/~bgooch

Broadway Boogie-Woogie

Mondrian

Three Hotels on Broadway Boogie-Woogie

Caywood

Format

• One
• Two
• Three