Conveying Shape: Lighting and Texturing

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Visual Cues

SGI flight 1987   GE Apollo Simulator 1963
Lighting and Shading

Shape from Shading

Fig 11.1 Common fate: all convex or concave
Fig 11.2 Single light source constraint
Fig 11.3 Global inference
Fig 11.4 Light source above
Fig 11.12 Hollow mask; reverse assumption

V. S. Ramachandran, 2-D or not 2-D – that is the question
Estimating Orientation

From Koenderink, van Doorn, Kappers [1992, 1996]

Goals of Lighting

Power of lighting
- Show form and orientation of surface
- Emphasize high curvature with highlights
- Show silhouette clearly
- Separate object from background
- Rake bumps and surface textural details

Unintended side effects
- Over- and under-exposure
- Unintended shadows
- Distracting highlights and glare
Lighting Design


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Lighting Design

Multiblitz lighting system, RTS Inc.

Basic Portrait Lighting Set-Up Guide, Warehouse Photography
Best Ambient, Diffuse, Specular

Edges + Highlights
Constant Luminance/Tone

\[ L = \text{lerp}\left( \frac{1 + \hat{\mathbf{N}} \cdot \hat{\mathbf{L}}}{2}, C_{\text{cool}}, C_{\text{warm}} \right) \]

\[ Y(C_{\text{cool}}) \approx Y(C_{\text{warm}}) \]

Luminance and Tone

Blue to yellow + object color
Anisotropic Metallic Objects
Metallic Shading

Phong  Metal  Metal+Edges  Metal+Tone

The Lit Sphere [Sloan et al.]
Reflection Lines

From Farin and Harnsford

Photo-Retouching

Fig. 12-18 Photo before retouching. (North American Aviation, Inc.)

T. A. Thomas, Technical illustration
Photo-Retouching

Fig. 12-19  Photo after retouching. (North American Aviation, Inc.)

T. A. Thomas, Technical illustration

Illustration

Photo & Illustration by William L. Brudon,
Texturing

From V. Interrante
http://www-users.cs.umn.edu/~interran(texture)/index.html
Texturing

From V. Interrante
http://www-users.cs.umn.edu/~interran/texture/index.html
Summary

Goals of lighting and shading
- Reveal shape
- Separate foreground from background
- Show surface detail

Lighting design is extremely challenging
Surface-oriented texture powerful cue