Hidden Surfaces and Shading

CS 351-50

10.22.03
if \( f_1(E) < 0 \) then
draw \( T_1 \)
draw \( T_2 \)
else
draw \( T_2 \)
draw \( T_1 \)

\( f_1(p) = 0 \) is the implicit plane equation of the plane containing \( T_1 \)
Lambert’s law

\[ L \cdot \mathbf{n} \]
Phong Shading

\[ \mathbf{L} \quad \mathbf{n} \quad \mathbf{r} \quad \mathbf{e} \]
Phong Shading
Diffuse shaded model

\[ I = c_r(c_a + c_l \max(0, L \cdot n)) \]  with \( c_r = c_l = 1 \) and \( c_a = 0 \).
Just Highlights and Edge Lines
Hand-tuned Phong shading
Shading used by Artists

Complementary Shading

Final Image

From “The Book of Color” by Jose Parramon, 1993
Tints, Tones, and Shades

From Birren (1976)
Creating Tones

Green to Gray (tone)
Model Shaded using Tones
Using Color Temperature
Warm to Cool Hue Shift
Constant Luminance Tone Rendering
Creating Undertones

Warm to Cool Hue Shift

Green with Warm to Cool Hue Shift
Model tone shaded with cool to warm undertones
Combining Tones with Undertones

Green with Tone and Undertone
Model shaded with tones and undertones
Phong Shaded Spheres
Spheres with New Shading
Phong Shading Formula

\[ c = c_r (c_a + c_l \max(0, L \cdot n)) + c_l c_p \cos (h \cdot n)^n \]
New Shading Formula

\[ I = k_w \ c_{\text{warm}} + (1 - k_w) \ c_{\text{cool}} \]

where

\[ k_w = (1 + (L \cdot n))^{.5} \]
New Shading
OpenGL Approximation

Without Highlights

Light RGB Intensities

$L_1 = (0.5, 0.5, 0.0)$

$L_2 = (-0.5, -0.5, 0)$
New Shading
OpenGL Approximation

With highlights
Conclusion

Phong Shaded

New Shading Without Edge Lines