

1 Definitions

incident light : light hitting surface of object

directional light : light with a uniform direction and intensity

point light : light with a location, direction and intensity depend on relative location and distance

2 Light Sources

l_s : intensity (RGB) of specular component of light from particular source l

l_d : intensity (RGB) of diffuse component of light from particular source l

l_a : intensity (RGB) of ambient light; uniform for entire scene

l_r : “radius” ; distance from light source to fragment, only applicable to point point lights

3 Materials

m_s : specular reflection constant (ratio of incident light reflected specularly)

m_d : diffuse reflection constant (ratio of incident light reflected diffusely)

m_a : proportion of ambient light reflected

α : shininess constant; high for smoother, more mirror-like surfaces.

High α means small, bright specular reflection; lower α means larger, dimmer specular reflection

4 Other Factors

D : set of all directional light sources

P : set of all point light sources

S_l : normalized vector pointing toward light source l from surface

N : surface normal

R_l : direction perfectly reflected ray would take; $2(S_l \cdot N)N - S_l$

V : direction from surface to viewer / camera

I : illumination (RGB) on surface

C : color (RGB) of surface

FragColor : color displayed from illumination I on surface with color C

5 Formulas

$$I = m_a l_a + \sum_{l \in D} \left(m_d (S_l \cdot N) l_d + m_s (R_l \cdot V)^\alpha l_s \right) + \sum_{l \in P} \frac{\left(m_d (S_l \cdot N) l_d + m_s (R_l \cdot V)^\alpha l_s \right)}{l_r^2}$$

$$\text{FragColor} = (I_r C_r, I_g C_g, I_b C_b)$$