TC2008B Modelación de Sistemas Multiagentes con Gráficas Computacionales

Ejemplo de Iluminado con modelo básico

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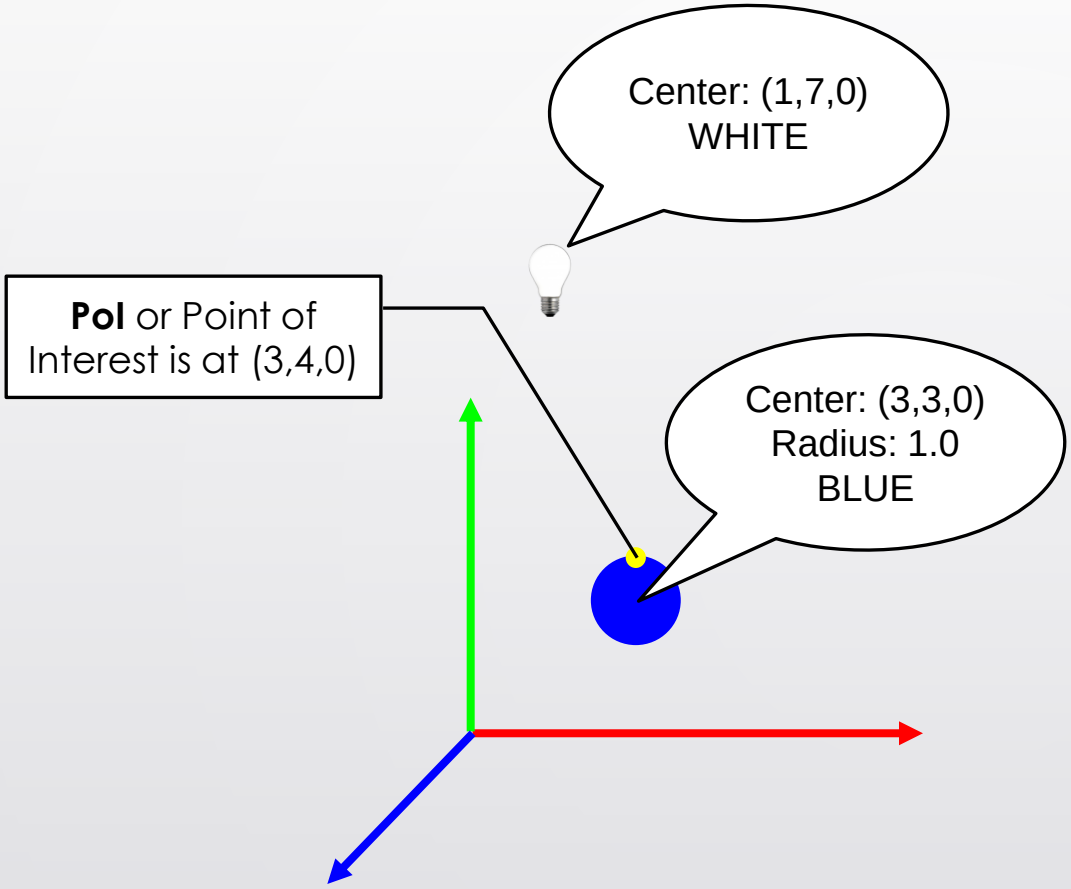


Light Ambient = 0.01 (all channels)

$\alpha = 100.0$

I @ (3,4,0) = ?*

*Calculate Illumination at point (3,4,0)

$k_{sr} = 0, k_{sg} = 0, k_{sb} = 0.5$

$k_{ar} = 0, k_{ag} = 0, k_{ab} = 0.1$

$$I = \left(k_d I_d (\hat{l} \cdot \hat{n})\right) + \left(k_s I_s (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$$I = \left(k_{dr} I_{dr} (\hat{l} \cdot \hat{n})\right) + \left(k_{sr} I_{sr} (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_{ar} I_{ar}\right)$$

$$I = \left(k_{dg} I_{dg} (\hat{l} \cdot \hat{n})\right) + \left(k_{sg} I_{sg} (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_{ag} I_{ag}\right)$$

$$I = \left(k_{db} I_{db} (\hat{l} \cdot \hat{n})\right) + \left(k_{sb} I_{sb} (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_{ab} I_{ab}\right)$$

diffuse specular ambient

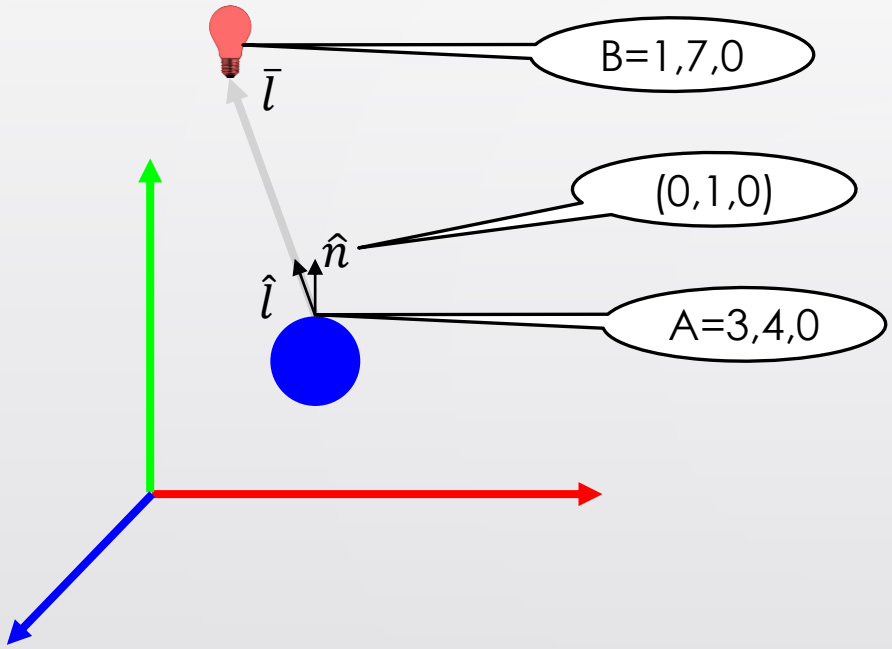
Substitute values. Note that **k** constants belong to the object, and **I** constants belong to the light. The I to the left means color Intensity for each channel.

$$I = \left(0.0 * 1.0(\hat{l} \cdot \hat{n})\right) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$$

$$I = \left(0.0 * 1.0(\hat{l} \cdot \hat{n})\right) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$$

$$I = \left(1.0 * 1.0(\hat{l} \cdot \hat{n})\right) + (0.5 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.1 * 0.01)$$

diffuse specular ambient



$$\bar{l} = B - A = (1,7,0) - (3,4,0) = (-2,3,0)$$

$$\hat{l} = \left(\frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}}, 0\right) \approx (-0.555, 0.832, 0)$$

$$\hat{l} \cdot \hat{n} = (-0.555, 0.832, 0) \cdot (0,1,0) = 0.832$$

$$\boldsymbol{\hat{l} \cdot \hat{n} = 0.832}$$

What do the different vector "hats" mean?

$$I = \left(k_d I_d (\hat{l} \cdot \hat{n})\right) + \left(k_s I_s (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$$I = \left(0.0 * 1.0 (\hat{l} \cdot \hat{n})\right) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$$

$$I = \left(0.0 * 1.0 (\hat{l} \cdot \hat{n})\right) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$$

$$I = \left(1.0 * 1.0 (\hat{l} \cdot \hat{n})\right) + (0.5 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.1 * 0.01)$$

diffuse specular ambient

$$I = \left(k_d I_d (\hat{l} \cdot \hat{n})\right) + \left(k_s I_s (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$I = (0.0 * 1.0 * 0.832) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$

$I = (0.0 * 1.0 * 0.832) + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.0 * 0.01)$

$I = (1.0 * 1.0 * 0.832) + (0.5 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + (0.1 * 0.01)$

diffuse

specular

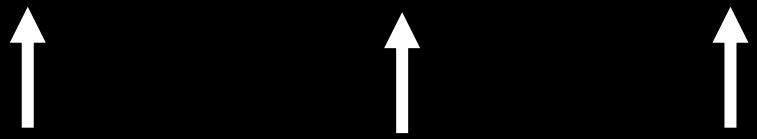
ambient

$$I = \left(k_d I_d(\hat{l} \cdot \hat{n})\right) + \left(k_s I_s(\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$I = 0.000 + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.000$

$I = 0.000 + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.000$

$I = 0.832 + (0.5 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.001$



diffuse specular ambient

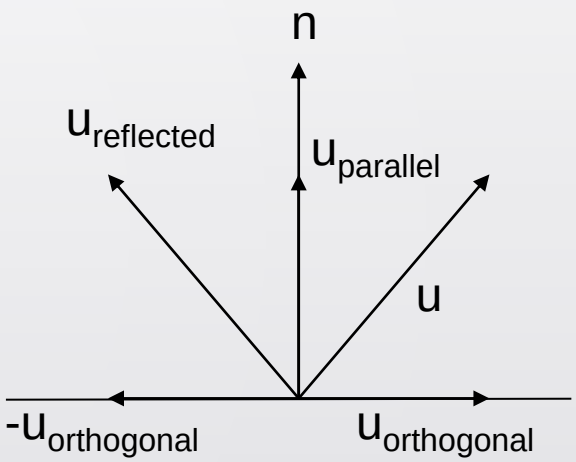
We are looking for $\bar{u}_{reflected}$ from $\bar{u}$.

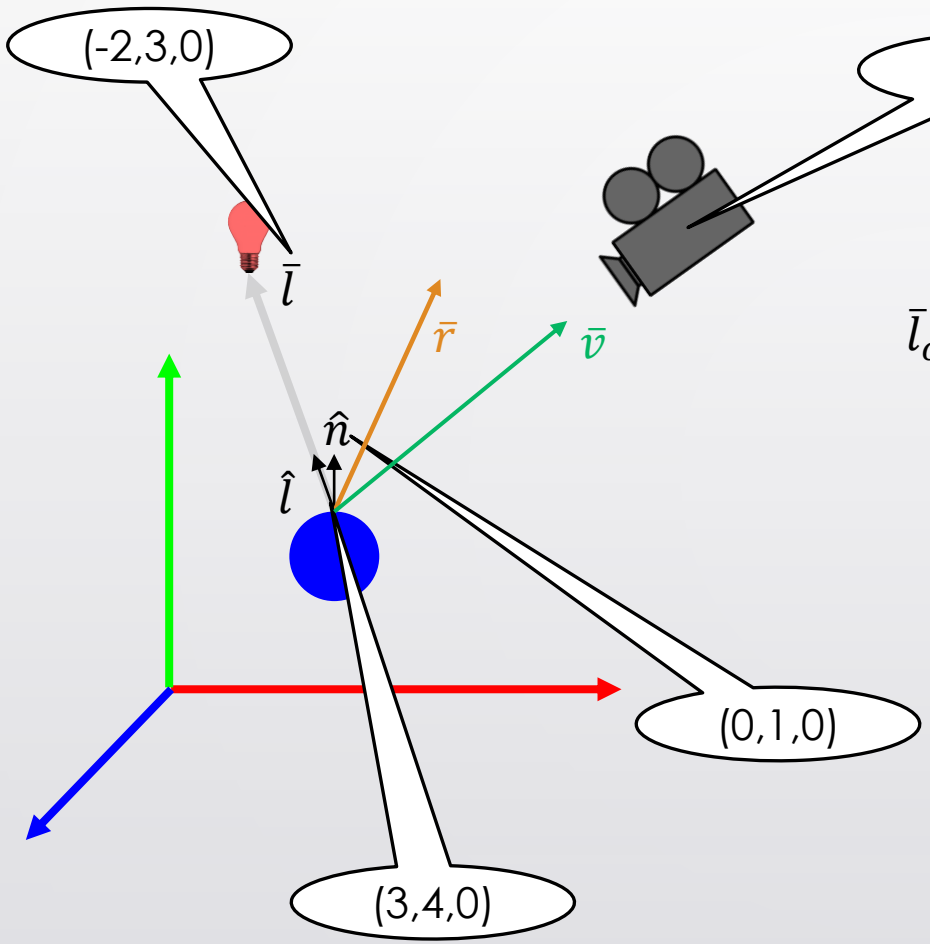
Define vectors $\bar{u}_{parallel}$ and $\bar{u}_{orthogonal}$

1) $\bar{u}_{parallel} = \bar{n}(\bar{n} \cdot \bar{u})$

2) $\bar{u}_{orthogonal} = \bar{u} - u_{parallel}$

3) $\bar{u}_{reflected} = \bar{u}_{parallel} - \bar{u}_{orthogonal}$





$$\bar{n} \cdot \bar{l} = (0,1,0) \cdot (-2,3,0) = 3$$

$$\bar{l}_p = \bar{n}(\bar{n} \cdot \bar{l}) = (0,1,0) * 3 = (0,3,0)$$

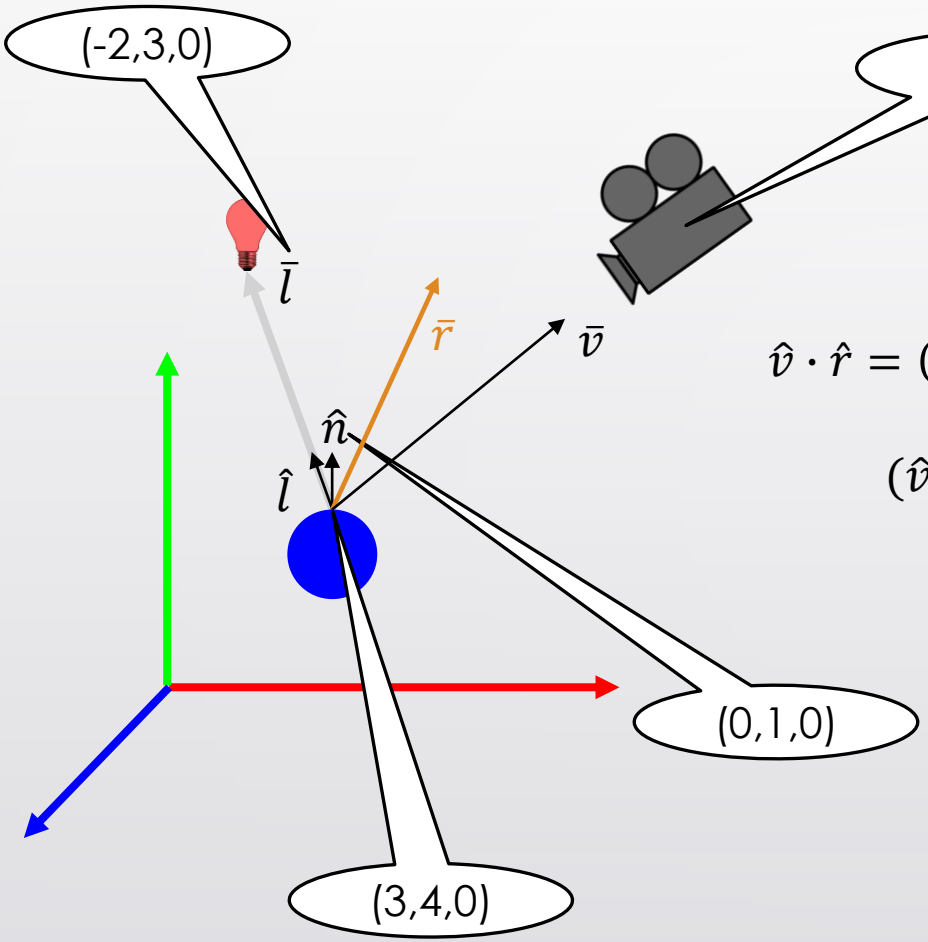
$$\bar{l}_o = \bar{l} - \bar{l}_p = (-2,3,0) - (0,3,0) = (-2,0,0)$$

$$\bar{r} = \bar{l}_p - \bar{l}_o = (0,3,0) - (-2,0,0) = (2,3,0)$$

$$\hat{r} = \left(\frac{2}{\sqrt{13}}, \frac{3}{\sqrt{13}}, 0\right) \approx (0.555, 0.832, 0)$$

$$\bar{v} = (7,7,0) - (3,4,0) = (4,3,0)$$

$$\hat{v} = \left(\frac{4}{\sqrt{25}}, \frac{3}{\sqrt{25}}, 0\right) = (0.8, 0.6, 0)$$



$$\hat{v} \cdot \hat{r} = (0.8, 0.6, 0) \cdot (0.555, 0.832, 0) = 0.94299033$$

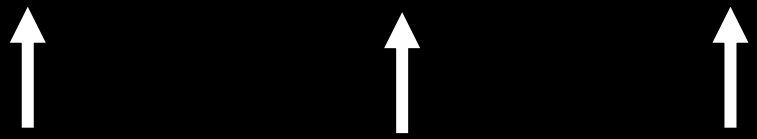
$$(\hat{v} \cdot \hat{r})^{\alpha} = 0.94299033^{100} = 0.00282309$$

$$I = \left(k_d I_d(\hat{l} \cdot \hat{n})\right) + \left(k_s I_s(\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$I = 0.000 + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.000$

$I = 0.000 + (0.0 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.000$

$I = 0.832 + (0.5 * 1.0 * (\hat{v} \cdot \hat{r})^{\alpha}) + 0.001$



diffuse specular ambient

$$I = \left(k_d I_d (\hat{l} \cdot \hat{n})\right) + \left(k_s I_s (\hat{v} \cdot \hat{r})^{\alpha}\right) + (k_a I_a)$$

$I = 0.000 + (0.0 * 1.0 * 0.00282309) + 0.000$

$I = 0.000 + (0.0 * 1.0 * 0.00282309) + 0.000$

$I = 0.832 + (0.5 * 1.0 * 0.00282309) + 0.001$

diffuse specular ambient

$$I = \left(k_d I_d (\hat{l} \cdot \hat{n})\right) + \left(k_s I_s (\hat{v} \cdot \hat{r})^{\alpha}\right) + \left(k_a I_a\right)$$

$I = 0.000 + 0.00000000 + 0.000$

$I = 0.000 + 0.00000000 + 0.000$

$I = 0.832 + 0.00141155 + 0.001$

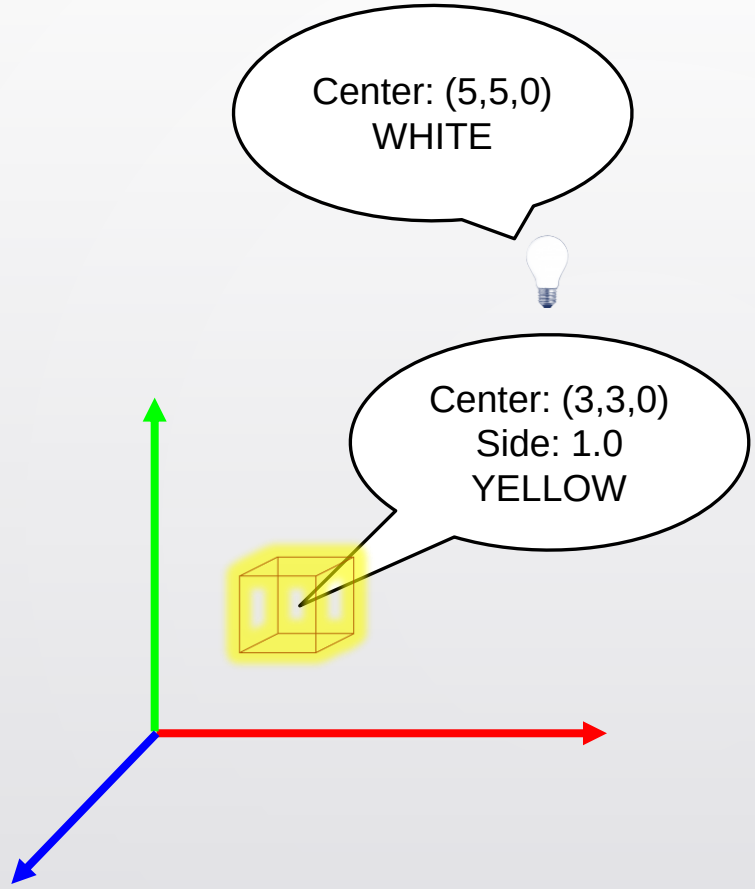
diffuse specular ambient

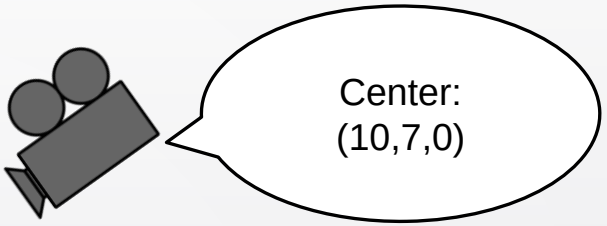
$I = 0$

$I = 0$

$I = 0.83446184$

At point (3,4,0), illumination will be (0, 0, 0.834)





Practice

Ambient = 0.05 for all channels

$\alpha = 50.0$

I @ (3.5,3,0) = ?

$k_{sr} = 0.4$, $k_{sg} = 0.4$, $k_{sb} = 0.0$

$k_{ar} = 0.1$, $k_{ag} = 0.1$, $k_{ab} = 0.0$