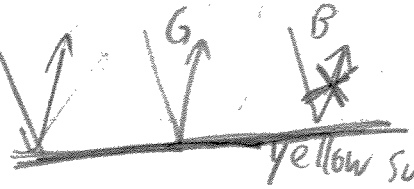
Ref

Yellow light can be modelled as a mix of red + green.

A yellow surface:



QUESTIONS

- What do we see when a yellow surface is lit with:
  - (a) white light? $(1,1,1) \times (1,1,0) = (1,1,0)$ yellow
  - (b) blue light? $(0,0,1) \times (1,1,0) = (0,0,0)$ black
  - (c) red light? $(1,0,0) \times (1,1,0) = (1,0,0)$ red
  - (d) yellow light? $(1,1,0) \times (1,1,0) = (1,1,0)$ yellow
  - (e) green light? $(0,1,0) \times (1,1,0) = (0,1,0)$ green
- Do specular highlights have the colour of the light or the surface?

Specular reflections have the colour of the light.

QUESTIONS

specular highlights will be white.

- Give the Phong equation parameters that are needed to render a shiny yellow material with a single white light.

$$I = I_a k_a + I_L k_d (N \cdot L) + I_L k_s (R \cdot V)^n$$

$$= \begin{bmatrix}1\\1\\1\end{bmatrix}\begin{bmatrix}0.2\\0.2\\0\end{bmatrix} + \begin{bmatrix}1\\1\\1\end{bmatrix}\begin{bmatrix}0.7\\0.7\\0\end{bmatrix}(\vec{N}\cdot\vec{L}) + \begin{bmatrix}1\\1\\1\end{bmatrix}\begin{bmatrix}0.4\\0.4\\0.4\end{bmatrix}(\vec{R}\cdot\vec{V})^{100}$$

n = 100 is shiny

- What is the colour of the darkest pixel this model can produce?

with $(N \cdot L) = 0$ and $(R \cdot V) = 0$, $I = \begin{bmatrix}0.2\\0.2\\0\end{bmatrix}$ i.e., just the ambient.

- What is the colour of the brightest pixel this model can produce?

with $(N \cdot L) = 1$ and $(R \cdot V) = 1$, $I = \begin{bmatrix}0.2\\0.2\\0\end{bmatrix} + \begin{bmatrix}0.7\\0.7\\0\end{bmatrix} + \begin{bmatrix}0.4\\0.4\\0.4\end{bmatrix} = \begin{bmatrix}1.3\\1.3\\0.4\end{bmatrix}$

$\begin{bmatrix}1\\1\\0.4\end{bmatrix}$ clamp

Note: clamp $N \cdot L$ and $R \cdot V$ to always be ≥ 0. (no negative light!)

Sketch the ambient, diffuse, specular, and total illumination for the following scene as function of x. Assume the Phong illumination model,
i.e., $I = k_a I_a + k_d I_d (N \cdot L) + k_s I_s (R \cdot V)^n$,
where $k_a = 0.3, k_d = 0.7, k_s = 0.7, I_a = I_d = I_s = 1.0, n = 100$.