

More Lighting Models

CS116B

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Outline

- More on Basic Illumination Models

Adding Emissivity and Multiple Light Sources

- Our model from last day for the outgoing light intensity from a single light source hitting an object was:

$$I = k_a * I_a + I_{diff} + I_{spec}$$

- Sometimes we also add an emissivity constant to this, if the object we are shining on also emits light. Then get $I = k_a * I_a + I_{diff} + I_{spec} + I_{emis}$.
- We could generalize this to allow for treating for different wavelength of light by having a different equation for each wavelength λ (or to keep thing simple restrict λ to be red, green, or blue):

$$I^\lambda = k^\lambda_a * I^\lambda_a + I^\lambda_{diff} + I^\lambda_{spec} + I^\lambda_{emis}$$

- Use \mathbf{I} to represent the three intensities $\langle I^{red}, I^{blue}, I^{green} \rangle$
- Finally, if we have multiple light source, we add them vector wise to get

$$\mathbf{I}^{tot} = \mathbf{I}_{a, global} + \sum_i \mathbf{I}_i$$

- Notice it is common to have a global ambience which in the first term in the above sum.

Basic Illumination Model with Intensity Attenuation and Spotlights

- To get the realistic effect mentioned last day that light source should weaken in intensity with the square of the distance to the object, let d_i denote the distance to light source i . Let $f(d) = 1/(a + bd + cd^2)$.
- Then could compute intensity as: $I_{a, global} + \sum_i I_i * f(d_i)$.
- To add further make some of the light spot light would calculate intensity as: $I_{a, global} + \sum_i I_i * f(d_i) * \cos^{a(i)} \varphi_i$. Here $a(i)$ controls how focused a spotlight is light i and here φ_i is the angle with light i .

RGB Color Considerations

- So far know the color and intensity of the light falling on the object.
- But what about the properties of the object itself, like what color it is, etc.
- We specify for the material an object is made up of, the RGB values for its color with respect to ambient, diffuse, etc light.
- Will say next day, how the final color we see is determined.
- Leo - will give some demo's of his code now.