Lighting and Shading

Textbook Chapter 14

Today

- Announcements
  - Assignment 2 grading this week, sign up asap
  - Assignment 3 out this week (before Wednesday)
  - Quiz 2 will be on March 4 (note: a Wednesday)
- Phong reflection model
Light blob from PVC plastic

- PVC blob
  - Note that this figure just describes the result of light that comes in from the specific shown direction $\vec{I}$. For other incoming directions we would need a different blob to visualize the resulting scattering.
  - The plastic will appear brightest when observed in the directions clustered about the ‘bounce’ direction of the light: $B(\vec{I})$
Lighting & Shading

Capture qualitative features of the BRDF

Phong reflection model:

- **Diffuse**
  - independent of \( \vec{v} \)
  - but depends on \( \vec{\omega} \)
  - "rough surface"

- **Specular**
  - depends on both \( \vec{\omega} \) and \( \vec{v} \)
  - "shiny surface"

Intensity \( I = \vec{L} \cdot \vec{N} \)

\[
= \frac{I}{L} |\vec{m}| \cos \theta \\
= \cos \theta \quad \text{if } \vec{L} \text{ and } \vec{m} \text{ are unit vectors}
\]

In practice, to avoid -ve light!

\( I = \max (0, \cos \theta) \)

Note: this is the intensity of reflected light as a function of \( \vec{v} \)

A simple mathematical model:

\[
I = (B(\vec{L}) \cdot \vec{v})^p \\
\]

\( p \) is a "shininess" exponent

\( \vec{v} \gg \lambda \)

\( B(\vec{L}) \)
Effect of exponent $\theta$

$\cos \theta$ on any number between 0 ≤ 1

How to compute bounce vector?

$\vec{\mathbf{n}} \cdot \vec{\mathbf{v}} = |\vec{\mathbf{n}}| \cos \theta$

when $|\vec{\mathbf{n}}| = 1$.

$B(\vec{\mathbf{v}}) = -\vec{\mathbf{v}} + 2 (\vec{\mathbf{v}} \cdot \vec{\mathbf{n}}) \vec{\mathbf{n}}$

In GLSL there is a useful function called "reflect"

$B(\vec{\mathbf{v}}) = \text{reflect}(-\vec{\mathbf{v}}, \vec{\mathbf{n}})$

Next class: read chapter 3.6