Lighting and Shading

Textbook Chapter 14
(some slides courtesy of Min Kim)

Today: Modeling Material Appearance

- Rich variety of materials: characterized by surface reflectance and scattering
Announcements

- Assignment 3 will be out before Wednesday, due March 9 (Sunday midnight)
- Assignment 2 spotlight on Wednesday
Shading & Lighting

Essential for perception of shape

Known to artists.

Current trends:
- Physically based rendering
- Painterly or "NPR"
  Non-photo realistic rendering
  e.g. "Toon shading"

8 Basic definitions

- Light \( \vec{L} \)
- Normal \( \vec{N} \)
- View \( \vec{V} \)
- Camera \( \vec{C} \)

[See PVC blob example]
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: $B(\vec{I})$

Recall: Given any vector $\vec{w}$ (not necessarily of unit norm) and a unit normal vector $\vec{n}$, we can compute the bounce vector (mirror reflection) of $\vec{w}$ as

$$B(\vec{w}) = 2(\vec{w} \cdot \vec{n})\vec{n} - \vec{w}$$
A simplified model used in early computer graphics (still used in real-time applications)

Phong Reflection Model

(ambient + Diffuse + Specular)

Like diffuse but independent of $\mathbf{n}$

$\mathbf{I} \propto \mathbf{m} \cdot \mathbf{L} = \cos \theta$

Actually $\max (0, \cos \theta)$ to avoid negative light

Extensions: we defined point light source,
- directional light
- spot light

For next class
Review Book 3.6
How normals transform