Today

- Announcements
  - Assignment 3 is available, at the usual place
- Assignment 3 demo
- Phong reflection model
- Blinn-Phong reflection and the halfway vector
- Odds and ends
Note about Assignment 3

- This assignment has a slightly different flavor from the previous two
  - This is mostly classical OpenGL material. Simple and lots of sample code available on the Web. Please do look at this code, but implement it yourself so that you really understand what’s going on
  - Grading will focus on whether you understand the parts you implemented

Switch to tablet
Diffuse

"Lambertian"

Specular

"Shiny part"

Intensity of viewed light is
independent of \( L \)
but dependent on \( n \)

Intensity of reflected light
\[
I = I_0 |n| \cos \theta
\]

\( \cos \theta \) if these are unit vectors.

To avoid negative light
\[
I = \max (0, \cos \theta)
\]

Bounce vector

\[
B = -l + 2 (l \cdot n) n
\]

Aside
\[
\begin{bmatrix}
-1 + 2n n^T & 0 & 0 \\
0 & -1 + 2n n^T & 0 \\
0 & 0 & -1 + 2n n^T
\end{bmatrix} l
\]

3x3 matrix
To model dependence on $\tilde{u}$ simplest idea

$\nu > 1$

Idea 1: $S = \tilde{B} \cdot \tilde{v}$

Idea 2: $S = (\tilde{B}(\tilde{u}) \cdot \tilde{v})^\nu$

$\nu$ is called the "Shininess exponent"
Demo

- https://threejs.org/docs/scenes/material-browser.html#MeshPhongMaterial

Lighting and Shading

- Phong shading vs. Gouraud shading
  - Gouraud == per-vertex normals and illumination. Interpolate vertex colors to fragments
  - Phong == Interpolate vertex normals, per-fragment illumination

- Phong reflection vs. Phong shading
  - P. reflection == an approximation of BRDF, into specular + diffuse + ambient

- Global illumination and ambient
  - Ambient term is a crude approximation of global illumination