Lighting and Shading

Textbook Chapter 14

(some slides courtesy of Min Kim)

1

Announcements

- Assignment 3 out now, due March 10 (Monday midnight)
- Assignment 2 spotlight today
- Pixar talk on Friday

2

UBC Department of Computer Science presents:

"Art, Physics, and Computer Science":
How Pixar Blends Art, Science, and Fun to
Make Animated Feature Films.

.

Dr. Wayne Wooten - Pixar Animation Studios
Friday, February 28, 2014, 4:00 to 5:00 pm
Hugh Dempster Pavilion (DMP) 310

Pixar, recently receiving the 2012 Animated Feature Oscar for the movie "Brave", has developed some of the world's most advanced techniques for generating computer animated feature films. In this talk I plan to discuss the research and development that occurs at Pixar and the technologies behind the film production process. My talk will concentrate on new lighting techniques, based on global illumination, that have made significant advancements to the way visual effects and animated features are produced. Sequences from various feature films and shorts will be used as a case study to show how the various pieces of technology come together to create the final frames you see in Pixar's movies.

3

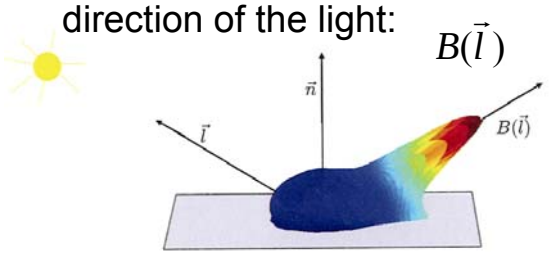
Today

- A2 spotlight
- A3 demo
- Phong reflection model, contd.
- Transforming normals

4

Recap: 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 $\vec{l}$. 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:

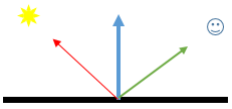


5

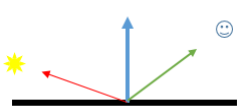
C³ Review: Diffuse

- If all the surfaces are non-specular (diffuse only), which of the following points is the brightest to the corresponding camera? Assume all the cameras and light sources are at the same distance away.

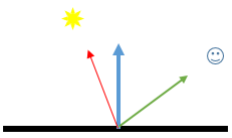
a)



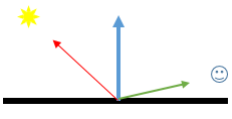
c)



b)



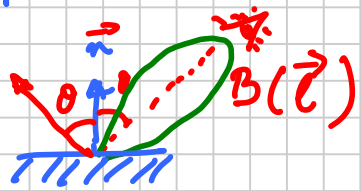
d)



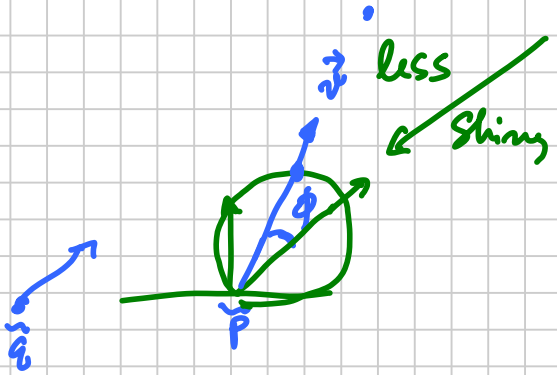
Phong Reflection Model cont'd...

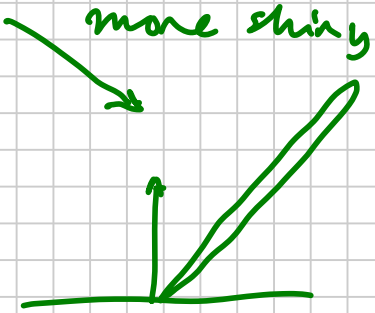
Note Title 2014-02-26

Diffuce + Specular + Ambient



Bounce vector

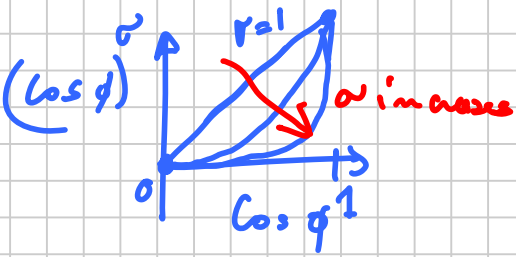




light intensity

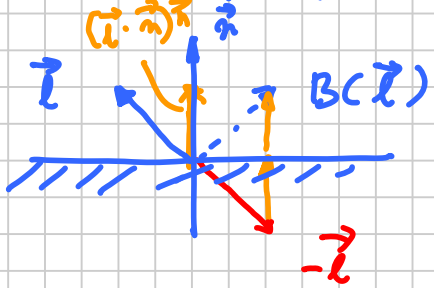
$$L = \left(B(\vec{l}) \cdot \vec{v} \right)^{\alpha}$$

← shininess exponent



How to compute Bounce vector?

Better alternative to book picture



Note: $\vec{n}$ is a unit vector, but $\vec{l}$ need not be

$$\vec{l}\cdot\vec{n} = |\vec{l}|\,\underbrace{|\vec{n}|}_{1}\cos\theta$$

So, $B(\vec{l}) = 2(\vec{l}\cdot\vec{n})\vec{n} - \vec{l}$

in coordinates. $= 2(\bar{l}^T\bar{n})\bar{n} - \bar{l}$

In GLSL there is a useful fn. called

reflect $(-l, n)$

↑ note

---

§ Normals

Suppose

$$\bar{p}_{new} = \underline{\bar{A}}\,\bar{p}$$

$$\bar{n}_{new} \stackrel{?}{=} \underline{\bar{A}}\,\bar{n}$$ ✗ wrong

normals transform differently because they are really functions on vectors

$$\bar{n}_{new} = \left(\underline{\bar{A}}^{-1}\right)^{T} \bar{n}$$