

# CS 4620 Midterm 2

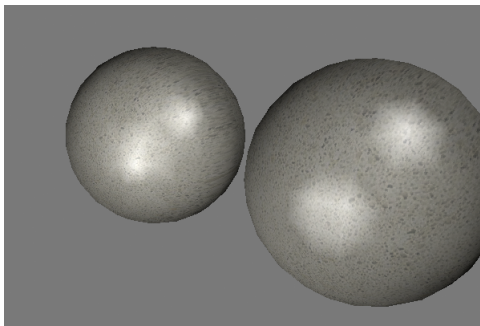
Friday 14 November 2008—50 minutes

## Problem 1: Pipeline shading (4 pts)

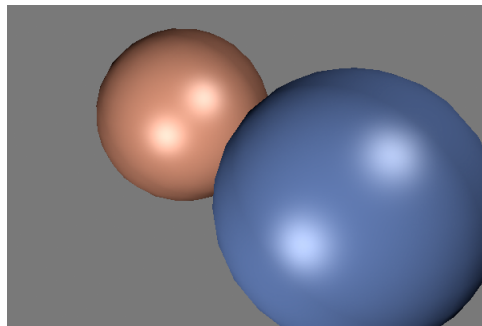
Look at each of the following images rendered in a pipeline system. For each one:

- Explain what per-vertex attributes need to be passed from the application to the vertex stage.
- Describe the computations that need to be done at the vertex stage.
- Explain what attributes are interpolated by the rasterizer for the fragment stage.
- Describe the computations that need to be done at the fragment stage.

You can assume that the depth test is done automatically after the fragment stage. Some attributes you might need include positions, normals, colors, texture coordinates, or scalar values.



(1)

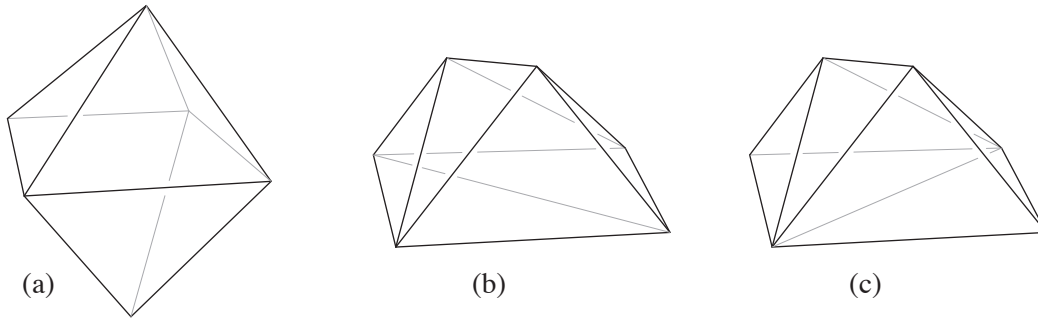


(2)

*Notes:* In (1) the texture is modulated by diffuse lighting. In both images the highlights are white. In both cases we are using local lights and a local viewer.

**Problem 2: Meshes (4 pts)**

Look at these three meshes:



1. Which of these share the same topology? Which share the same geometry?
2. The following incomplete triangle neighbor structure describes one of these meshes. Indicate which one it is, and complete the table so that it describes the whole mesh.

	tris[]			tNbr[]		
<b>0</b>	0	5	1	1		4
<b>1</b>	0	4	5	2		0
<b>2</b>	0	3	4	3		1
<b>3</b>	0	2	3	4		2
<b>4</b>	0	1	2	0		3
<b>5</b>						
<b>6</b>						
<b>7</b>						

**Problem 3: Resampling (4 pts)**

Suppose we are resampling a 6 by 6 pixel image to produce a 10 by 10 pixel image. For each of the following resampling filters, (a) which pixels in the input image affect the value of pixel (5,4) in the output image, and (b) what are those pixels' weights?

1. Box filter
2. Tent filter (linear interpolation)
3. Piecewise bicubic filter (e.g. Mitchell-Netravali)

For (1) and (2) give numeric values; for (3) give the filter values in terms of the 1D filter function  $f(x)$ .