

CPSC 314, Written Homework 2

Out: Fri Feb 25
Due: Fri Mar 4, 4pm
Value: 5% of final grade
Total Points: 100

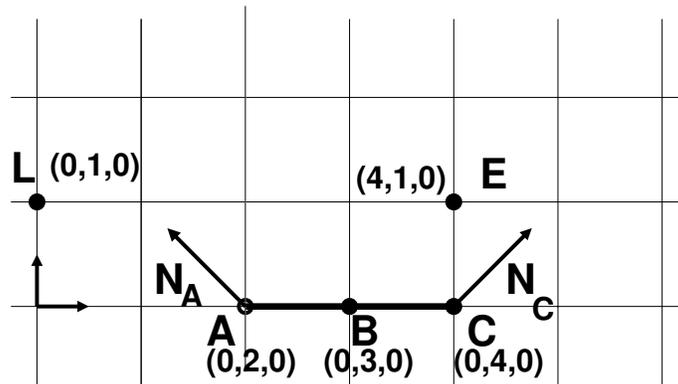
Lighting (36 pts)

1. (12 pts) Give the ambient, diffuse, specular, and combined total illumination at each of points A, B, and C under the flat shading model (assume the point used for the flat shading calculation is A). Show your work. In all cases use the Phong illumination model given by

$$I = I_a k_a + k_d I_L (N \cdot L) + k_s I_L (R \cdot V)^n$$

with parameters

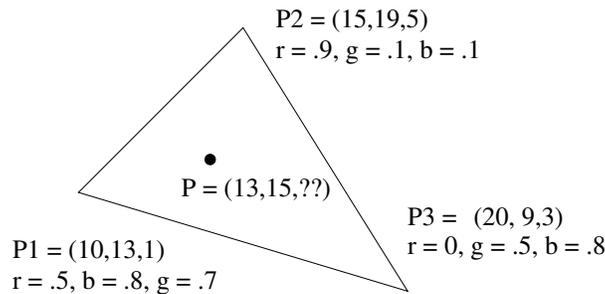
$$I_a = (.3, .3, .3), I_L = (1.0, 1.0, 1.0), k_a = (.2, .2, .2), k_d = (.5, .5, .9), k_s = (.9, .9, .1), n = 10.$$



2. (12 pts) Same as above, for the Gouraud shading model.
 3. (12 pts) Same as above, for the Phong shading model.

Interpolation (30 pts)

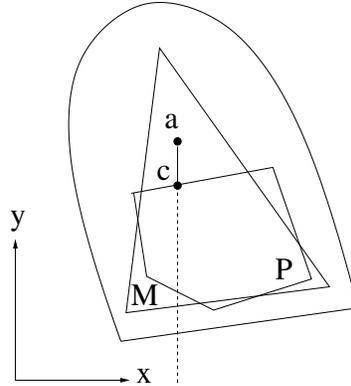
4. (10 pts) Interpolate the value of z and the red color component r for the point P by writing a plane equation in x , y , and z , and solving this for the given point P . Show your work.



5. (5 pts) Interpolate the value of z and r for the point P above using bilinear interpolation. Show your work.
 6. (15 pts) Determine the barycentric coordinates α , β , and γ of point P above. Interpolate z and r using these coordinates. Show your work.

Color (12 pts)

- (4 pts) If a light with RGB color triplet $(1, .5, 0)$ shines on a surface with diffuse color $(0, 1, 1)$, what is the resulting color triplet?
- (8 pts) Point a , shown in the 2D CIE chromaticity diagram, lies within the monitor gamut M but not the printer gamut P . One way to do gamut mapping is shown, using the intersection between the y coordinate of the point and the boundary of the gamut. Sketch a better approach, and concisely explain why it is better.



Scan Conversion (22 pts)

- (6 pts) Briefly describe how to use parity when scan converting a general polygon.
- (16 pts) Give an algorithm for scan-converting a line with the Bresenham approach that works in the third octant (lines with slope between infinity and negative 1), rather than the first octant as described in class (lines with slope between 0 and 1).