

CPSC 314, Written Homework 3

Out: Mon Mar 7

Due: Mon Mar 14, 4pm

Value: 5% of final grade

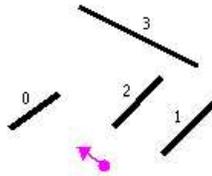
Total Points: 100

Clipping (30 pts)

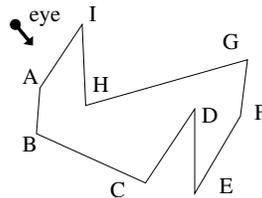
1. (15 pts) Clip the line segment with endpoints $(-17,-3)$, $(5,9)$ to the box $(-1,-1)$, $(1,-1)$, $(1,1)$, $(-1,1)$. Use the Cohen-Sutherland algorithm and show intermediate work at each step, including outcodes. Use the following clipping order: left, bottom, right, top.
2. (15 pts) Clip the triangle with points $P1 = (-.3, 1.4)$, $P2 = (.8, -1.8)$, $P3 = (-1.3, -.2)$ against the box $(-1,-1)$, $(1,-1)$, $(1,1)$, $(-1,1)$. Use the Sutherland-Hodgeman algorithm and show your intermediate work.

Visibility (45 pts)

3. (15 pts) Build a BSP tree for the following scene using the polygons (shown as lines) as cutting planes. You should build your BSP tree by inserting the polygons into the BSP tree in numerical order. Represent the labelled side of each cutting plane as the right child in the tree and the unlabelled side as the left child. Show your work.



4. (15 pts) Traverse your BSP tree to produce a painter's algorithm ordering from the given eyepoint. Show your work.
5. (5 pts) How will a BSP tree deal with 3 cyclically-overlapping polygons?
6. (10 pts) For the following scene, the polygons forming a closed solid are represented by edges. Which faces would be removed by backface culling for the given eyepoint?



Textures (20 pts)

7. (10 pts) Given the triangle $T = (P1,P2,P3)$ with $P1 = (0,0,5)$, $P2 = (2,2,-10,5)$, and $P3 = (4,0,0,5)$ and with texture (s, t) coordinates at the vertices defined as $(0,0)$, $(.5,1)$, and $(1,0)$ respectively, compute the texture coordinates at the midpoint P of the triangle. Use the standard barycentric coordinate formula.
8. (10 pts) Find the texture coordinates at triangle midpoint P as above, but this time using perspective-correct barycentric interpolation.

Pipeline (5 pts)

9. (5 pts) Sketch the rendering pipeline and indicate where the following are performed: a) clipping b) Gouraud shading.