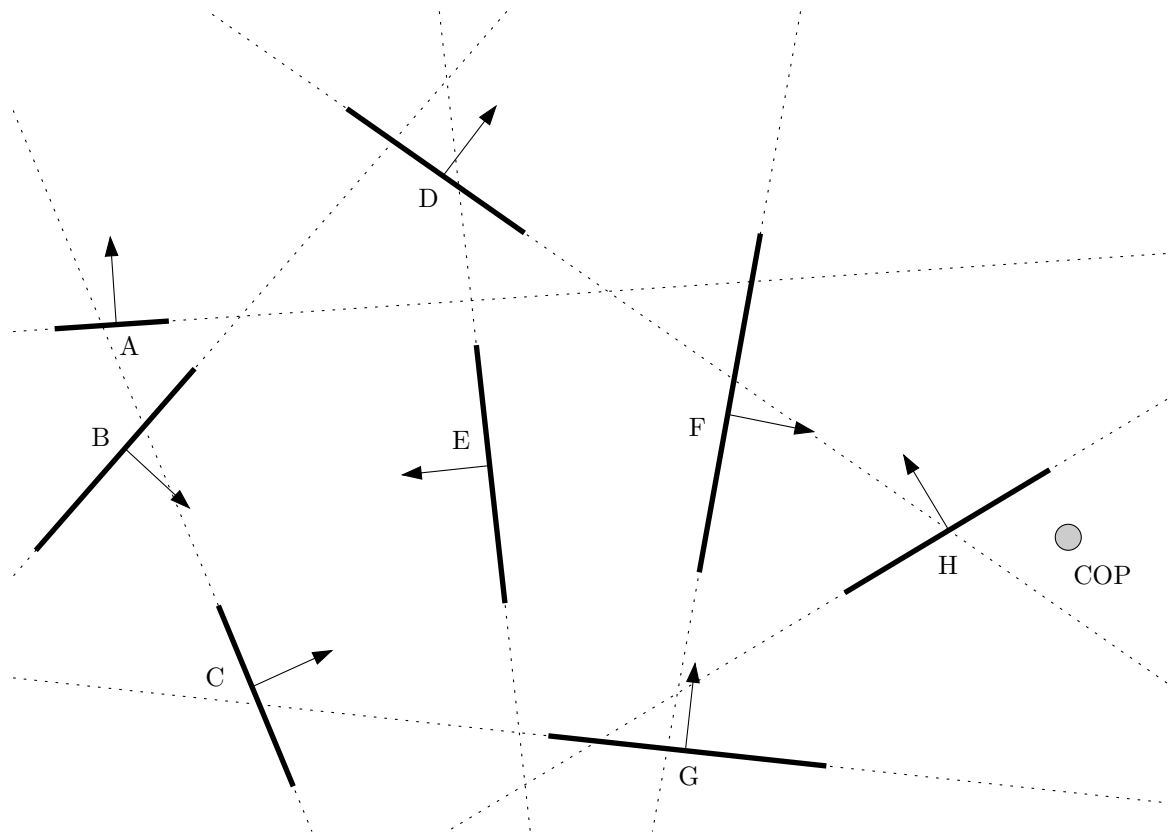


2007/2008 Graphics Tutorial 6

Problem 1 The scene below consists of 8 line segments, and the center of projection *COP* (i.e., the camera view point). The normal vectors of the segments point to the visible side. The dotted lines are not part of the input, but indicate where the supporting lines of the segments intersect the other segments.



1. Explain how a BSP tree for a set of segments (or polygons in 3D) is constructed.
2. Give a BSP tree for the situation in the image.
3. Explain how the projection order for a set of segments (polygons) is determined using a BSP tree.
4. Give the projection order for the situation in the image, using the tree you constructed in subproblem 2.
5. Explain what back face elimination is, and indicate how the application thereof influences your answer to the previous subproblem.

Problem 2 *In the lecture on triangle rasterization we discussed an algorithm for rasterizing (general) polygons. The algorithm exploits scan-line coherence to improve efficiency. What is scan-line coherence, and how is it exploited by the scan-line conversion algorithm?*

Problem 3 *The scan-line conversion algorithm uses two data structures: the Edge Table and the Active Edge Table. Suppose that we are rasterizing a polygon that has an edge from pixel (2, 10) to (5, 4).*

1. *What information of the edge (i.e., what numbers, and what do they represent) is stored in the Edge Table?*
2. *In what entry of the edge table is the edge stored?*
3. *What does the entry of the edge in the Active Edge Table look like when scan-line $y = 8$ is rasterized?*

Problem 4 *Explain how Gouraud shading, Phong shading and z -buffering can be incorporated in the scan-line conversion algorithm.*

Problem 5 *When we do z -buffering with scan-line conversion, we have to specify the z -coordinates of the vertices of the polygon. Should we use the z -coordinates of the polygon in world coordinates (i.e., as given in the 3D model), or the transformed z -coordinates in the canonical view volume, or doesn't it matter? Explain your answer.*

Problem 6 *Suppose we have a model with only diffusely reflecting objects. Could there be any advantage in choosing Phong interpolation over Gouraud interpolation?*