Coms 331   Rasterizing Polygons - Part 1   Fall 2007
Homework 34

In the following exercises, let the vertices of the polygon be $P_1 = (0,0), P_2 = (6,0), P_3 = (10,3), P_4 = (8,9), P_5 = (0,9), P_6 = (5,5)$.

1. Draw the polygon $P_1P_2P_3P_4P_5P_6$ and determine its bounding box.

2. Write the list of edges in the edge table (ET), eliminating any horizontal edges.

3. Sort the edges in the ET by the y-coordinates of their lower endpoints.

4. Starting the scan line at the bottom of the bounding box, for every edge whose lower endpoint is on the scan line, create an active edge table (AET) entry. This should include

    (a) the y-coordinate of the upper endpoint,

    (b) the reciprocal slope of the line segment,

    (c) the current x-intercept with the scan line.

    You should have the entries $(5, 1, \frac{1}{2})$ and $(3, \frac{4}{3}, 6\frac{2}{3})$.

5. Sort the AET entries by their x-intercepts.

6. Shade all pixels from the first entry to the second, from the third to the fourth, etc. Observe the rule that a polygon owns all pixels whose centers are in its interior or on one of its left edges. You should have shaded pixels $(0,0)$ through $(6,0)$.

7. Update the AET.

    (a) Increment the scan line number.

    (b) Delete any entry for which its upper endpoint is on the scan line.

    (c) Update the x-intercepts of the AET entries by adding the reciprocal slope to the current x-intercept.

    (d) Add new AET entries for edges whose lower endpoint is on the scan line.

    The new AET entries should be $(5, 1, 1\frac{1}{2})$ and $(3, \frac{4}{3}, 8)$.

8. Repeat the previous three exercises until the polygon is fully shaded.

9. In the top row (row 8), which pixels are shaded?