CS 559: Computer Graphics

Homework 4

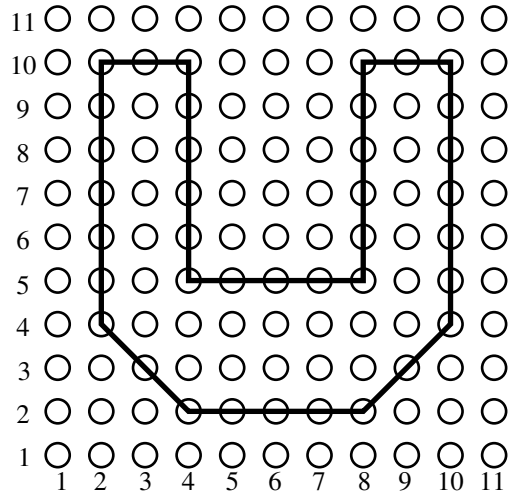
This homework must be done individually. Submission date is Tuesday, Nov 5 in class. Several questions are easiest to answer if you fill in the diagrams on the question sheet. I suggest that you print a copy of the questions and draw on it, then submit it with your other answers.

Question 1:

Fill out a table with the per-pixel values for x_i, y_i and d_i when Bresenham's algorithm is applied to the line from (2,1) to (9,3). There will be seven sets of values.

Question 2:

Consider the task of filling of the polygon shown:



a. Write out the edge table.

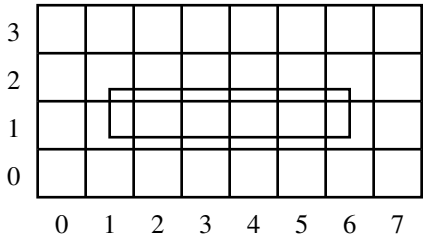
b. Show the active edge list for rows 1 to 11.

c. Draw a diagram showing which pixels are filled. You might just want to draw on the figure above.

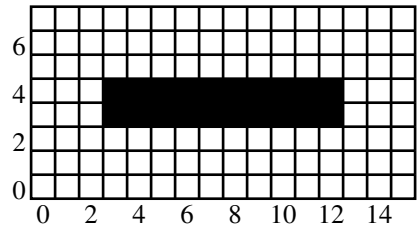
Question 3:

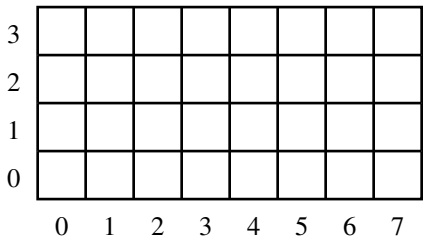
Consider a one pixel wide line from (1,1.25) to (6,1.25), with square endcaps. The outline of the line is shown on the figure below.

a. Assume we are doing unweighted area sampling, with the alpha of each pixel set in proportion to the amount of the pixel covered by the line. Give the alpha values of all the non-zero pixels.



b. Below is the same line, drawn at twice the resolution using some version of point sampling, which fills whole pixels. Halve the size of this image by averaging 2×2 blocks of pixels.





c. Assume you are working with a black line on a white background. Is the result of compositing the area sampled line the same as the result of super-sampling?

Question 4:

Consider the hidden surface removal algorithms presented in class. The table below has rows labeled with the algorithms, and columns labeled with statements about properties of visibility algorithms. The full form of all the statements is:

a. Requires knowledge about all the polygons before it can begin.

b. Writes each pixel at most once.

c. Handles transparency without any help from the user.

Fill in the table with T or F indicating whether each statement is true of false for each algorthm.

	All polygons reqd.	Writes once	Easy transparency
Z-buffer			
A-buffer			
Depth Sorting			
Scanline HSR			
Warnock Subdivison			