Angel: Interactive Computer Graphics, Fifth Edition

Chapter 3 Solutions

3.1 The general problem is how to describe a set of characters that might have thickness, curvature, and holes (such as in the letters a and q). Suppose that we consider a simple example where each character can be approximated by a sequence of line segments. One possibility is to use a move/line system where 0 is a move and 1 a line. Then a character can be described by a sequence of the form $(x_0, y_0, b_0), (x_1, y_1, b_1), (x_2, y_2, b_2), ...$ where b_i is a 0 or 1. This approach is used in the example in the OpenGL Programming Guide. A more elaborate font can be developed by using polygons instead of line segments.

3.11 There are a couple of potential problems. One is that the application program can map different points in object coordinates to the same point in screen coordinates. Second, a given position on the screen when transformed back into object coordinates may lie outside the user's window.

3.19 Each scan is allocated 1/60 second. For a given scan we have to take 10% of the time for the vertical retrace which means that we start to draw scan line n at .9n/(60*1024) seconds from the beginning of the refresh. But allocating 10% of this time for the horizontal retrace we are at pixel m on this line at time .81nm/(60*1024).

3.25 When the display is changing, primitives that move or are removed from the display will leave a trace or motion blur on the display as the phosphors persist. Long persistence phosphors have been used in text only displays where motion blur is less of a problem and the long persistence gives a very stable flicker-free image.