Angel: Interactive Computer Graphics, Seventh Edition

Chapter 3 Solutions

3.7 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.

3.8 In picking we have the additional problem that the point in screen coordinates may not correspond to a point on any object or may transform back to points on multiple objects. In the later case we may need additional information such as depth to decide which object to select.

3.11 Consider a three position switch. The three positions can correspond to velocities of 0, +1 and -1. We can integrate to get positions from these velocities. Thus, we have no change (0), a constantly increasing position (+1), and a constantly decreasing position (-1).

3.13 Let (x_1, y_1) be the end of the arm of length l_1. Assuming that the lower-left corner is the origin

$$x_1 = l_1 \cos\theta$$
$$y_1 = l - 1 \sin\theta$$

If (x_2, y_2) is the position of the end of the second arm, we can use a similar formula measured from (x_1, y_1)

$$x_2 = x_1 + l_2 \sin\phi$$
$$y_2 = y_1 + l_2 \sin\phi$$

3.14 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).

3.20 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.