Unit 1: Numerical problems

Q 1. A video monitor has a display area measuring 12 inch by 9.6 inch. If the resolution is 1280x1024 and the aspect ratio is 1. What is the diameter of each screen point?

Sol. A.S. of 1 means that a vertical line plotted and horizontal line plotted with equal number of points have the same length. Therefore the diameter of each screen point can be calculated by:

$$d = \frac{\text{horizontal display length}}{\text{horizontal resolution}} = \frac{\text{vertical display length}}{\text{vertical resolution}}$$

$$= \frac{12}{1280} = \frac{9.6}{1024} = 9.375 \times 10^{-3} \text{ inch}$$

Q2. How long it will take to load a 640x480 frame buffer with 12 bits per pixel if 10^5 bits can be transferred per second? How long it will take to load a 24-bits per pixel frame buffer with a resolution of 1280x1024 using the same transfer rate?

Sol. (i) Resolution = 640x480 and total number of bits required to load the frame buffer = 12-bits per pixel

$$B = 640*480*12 = 3.6864x10^6$$

Transfer rate is 10^5 bits/sec,

Therefore, time required to load the frame buffer is

$$T = B/ 10^5 \text{ seconds}$$

$$=3.6864x10^6 / 10^5 \text{ seconds}$$

- (ii) Do it by yourself.

Q3. What is the fraction of the total refresh time per frame spent in retrace of the electron beam for a non-interlaced raster system with a resolution of 1280x1024, a refresh rate of 60Hz, a horizontal retrace time of 5µsec and a vertical retrace time of 500 microseconds?

Sol. Total horizontal retrace time = $1024 * 5 * 10^{-6}$

total vertical retrace time = $500 * 10^{-6}$

total retrace time = $1024 * 5 * 10^{-6} + 500 * 10^{-6}$

$$T = \frac{\text{Total retrace time}}{\text{refresh time}} = \frac{1024 \times 5 \times 10^{-6} + 500 \times 10^{-6}}{1 / 60}$$

Q4. Consider the line from (0,0) to (4,6). Use the simple DDA algorithm to rasterize the line.

Q5. Consider the line from (0,0) to (-6,-6). Use the simple DDA algorithm to rasterize the line.

Q6. Consider the line from (5,5) to (13,9). Use the Bresenham's algorithm to rasterize the line.