Assignment - 3

Ques 1 List the operating characteristics for the following display technologies : raster refresh systems, vector refresh systems, plasma panels, and LCDs.

Ans – Raster Refresh System :–

Electron beam is swept across the screen, one row at time, from top to bottom. Each row is reffered to as a scan line. As the electron beam moves across a scan line, the beam intensity turns on and off to create a pattern of illuminated spots.

Vector Refresh system :–

The system cycles through the set of commands in the display file, drawing each component line in turn. After all line drawing commands have been processed, the system cycles back to the first command in the list.

Plasma panels :—

Constructed by filling the region between two glass panels with a mixture of gases that usually includes neon, a series of vertical conducting ribons is placed on one gas panel and a set of horizontal LCDs :

LCDs :—

Operating by producing a picture by pressing polarized light from the surroundings or from an internal light source through a liquid-crystal material that can be aligned to either block or transmit the light.

Ques 2 List some applications appropriate for each of the display technologies in Exercise 2-1 ?

Ans —

a) Raster Refresh system :—

Its application is Home television sets and printers are examples of other systems [illegible] system.

b) Vector Refresh system :—

Its application is line drawing applications such as architectural and engineering layouts.

c) Plasma panels :—

used in portable monitors graphics displays in applications required rugged.

d) LCDs :—

LCDs are commanly used in small systems, such as laptop, computer and calculations.

Ques 3: Determine the resolution (Pixel per centimeter) in the x and y directions for the video monitor in use on your system. Determine the aspect ratio, and explain how relative proportions of objects can be maintained on your system.

Ans – Resolution is number of points per centimeter that can be plotted horizontally and vertically. Simply stated that the total no. of points in each direction.

In my system resolution is 1280 x 1024 pixel.

Aspect ratio : The aspect ratio is an another property of video monitors which is now often defined as the number of pixels column divided by the number of scan lines that can be displayed by the system.

Ques4 Consider three different raster systems with resolusions of 640 by 480, 1280 by 1024 and 2560 by 2048. What size frame buffer (in bytes) is needed for each of these systems to store 12 bits per pixel? How much storage is required for each system if 24 bits per pixel are to be stored?

Solution: Frame buffer size for each of the system is:

1) $640 \times 480 \times 12$ bits

$= \frac{640 \times 480 \times 12}{8}$ bytes

$= 450$ KB

2) $1280 \times 1024 \times 12$ bits

$= \frac{1280 \times 1024 \times 12}{8}$ bytes

$= 1920$ KB

3.) $2560 \times 2048 \times 12$ bits

$\frac{2560 \times 2048 \times 12}{8}$ bytes

$= 7680$ KB

for 24 bits of storage per pixel each of the above values is doubled.

Ques 5 Suppose an RGB system is to be designed using an 8 inch by 10 inch screen with a resolution of 100 pixel per inch in each direction. If we want to store 6 bits per pixel in the frame buffer, how much storage (in bytes) do we need for the frame buffer?

Solution: Storage needed for the frame buffer is —

$$= (8 \text{ inch} \times 100 \text{ pixel per inch}) \times (10 \text{ inch} \times 100 \text{ pixel/inch}) \times 6 \text{ bits}$$

$$= \frac{8 \times 100 \times 10 \times 100 \times 6}{8} \text{ bytes}$$

$$= 586 \text{ KB}$$ Answer

Ques 6: How long would it take to load a 640 x 480 frame buffer with 12 bits per pixel, if 10^5 bits can be transferred per second?
How long would it take to load a 24 bit per pixel frame buffer with a resolution of 1280 by 1024 using this same transfer rate?

Solution: Given,

Resolution = 640 x 480

1 pixel = 12 bits

transfer rate = 10^5 bits/sec

Total frame size = 640 x 480 x 12 bits

Time required to load 640 x 480 frame buffer =

$$\frac{640 \times 480 \times 12}{10^5}$$

= 36.864 seconds Ans

Similarly,

Time to load 1280 x 1024 frame buffer =

$$\frac{1280 \times 1024 \times 24}{10^5}$$

= 314.5728 seconds.

Ques7: Suppose we have a computer with 32 bits per word and a transfer rate of 1 mip (one million instructions per second). How long would it take to fill the frame buffer of a 300-dpi (dot per inch) laser printer with a page size of 8 1/2 by 11 inches?

Solution: Given,

1 word = 32 bits

transfer rate = 1 mip

$= 10^6$ words per second

[∵ 1 million = 10^6 words]

laser printer has 300 dpi i.e

1 inch = 300 dots

size of frame buffer = $8\frac{1}{2} \times 11$ inches

$= 8\frac{1}{2} \times 300 \times 11 \times 300$ dots

$= 17 \times 150 \times 11 \times 300$

$= 8,415,000$

Assume 1 dot = n bits then,

Size of frame buffer = $8,415,000\ n$ bits

Transfer rate = 32×10^6 bps

Time required to fill the frame

$$= \frac{8145000\ n}{32 \times 10^6}$$

$$= \frac{8145}{32} \times 10^{-3}\ n$$

$$= 254.531 \times 10^{-3}\ n$$

$$= 0.2545\ n \text{ seconds}$$ Ans

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Ques 8: Consider two raster systems with resolution of 640 by 480 and 1280 by 1024. How many pixels could be accessed per second in each of these systems by a display controller that refreshes the screen at a rate of 60 frames per second? What is the access time per pixel in each system?

Solution:

Pixels access through 640 × 480 resolution

$= (640 \times 480) \times 60$

$= 18432000$ pixel / second

Time to access each pixel

$= \frac{1}{18432000}$

$= 0.000000005$ seconds

Pixel access through 1280 × 1024 resolutions

$= (1280 \times 1024) \times 60$

$= 78643200$ pixel per second

Time to access each pixel

$$= \frac{1}{78643200}$$

$$= 0.000000001 \text{ sec}$$

Ques 9: Suppose we have a video monitor with a display area that measures 12 inches across and 9.6 inches high. If the resolution is 1280 by 1024 and the aspect ratio is 1. Calculate the diameter of each screen point?

Solution We know that,

Pixel on screen = length on monitor when aspect ratio is 1 then

Considering the length 1280 pixels = 12 inches

$$\Rightarrow 1 \text{ pixel} = \frac{12}{1280} \doteq 0.009375 \text{ inches}$$

Consider, the width 1024 pixels = 9.6 inches

$$\Rightarrow 1 \text{ pixel} = \frac{9.6}{1024} = 0.009375$$

So,

diameter of point on screen = 0.009375 inches

Ques 0: How much time is spent in scanning across each row of pixel during screen refresh on a raster system with a resolution 1280 × 1024 and a refresh rate of 60 frames / second?

Solution: Given,

resolution = 1280 × 1024

refresh rate = 60 frames / sec

That means system contain 1024 scan lines and each scan lines contain 1280 pixels,

refresh rate = 60 frames / sec

So, 1 frame takes = $\frac{1}{60}$ sec,

Since, resolution = 1280 × 1024

1 frame buffer consist of 1024 scan lines

It means that 1024 scan lines takes

= $\frac{1}{60}$ sec

Therefore, 1 scan lines takes,

= $\frac{1}{60 \times 1024}$

= 16.21 μs Ans