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Department of Computer Science
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{ Mid-Term Assignment }

Name	**Mohammad Basir**
ID	**13142**
INSTRUCTOR Name	**Sanaa Jeehan**
Course Title:	**Computer Graphics**

Question No: 01

a. **What is the main limitation of Bump Mapping?**

Answer :

Bump maps achieve this effect by changing how an illuminated surface reacts to light, without modifying the size or shape of the surface.

The **primary limitation** with **bump mapping** is that it perturbs only the surface normals without changing the underlying surface itself. Silhouettes and shadows therefore remain unaffected, which is especially noticeable for larger simulated displacements .

Bump mapping is limited in that it does not modify the shape of the underlying object. On the left, a mathematical function defining a bump map simulates a crumbling surface on a sphere, but the object's outline and shadow remain those of a perfect sphere. On the right, the same function is used to modify the surface of a sphere by generating an isosurface. This models a sphere with a bumpy surface with the result that both its outline and its shadow are rendered realistically

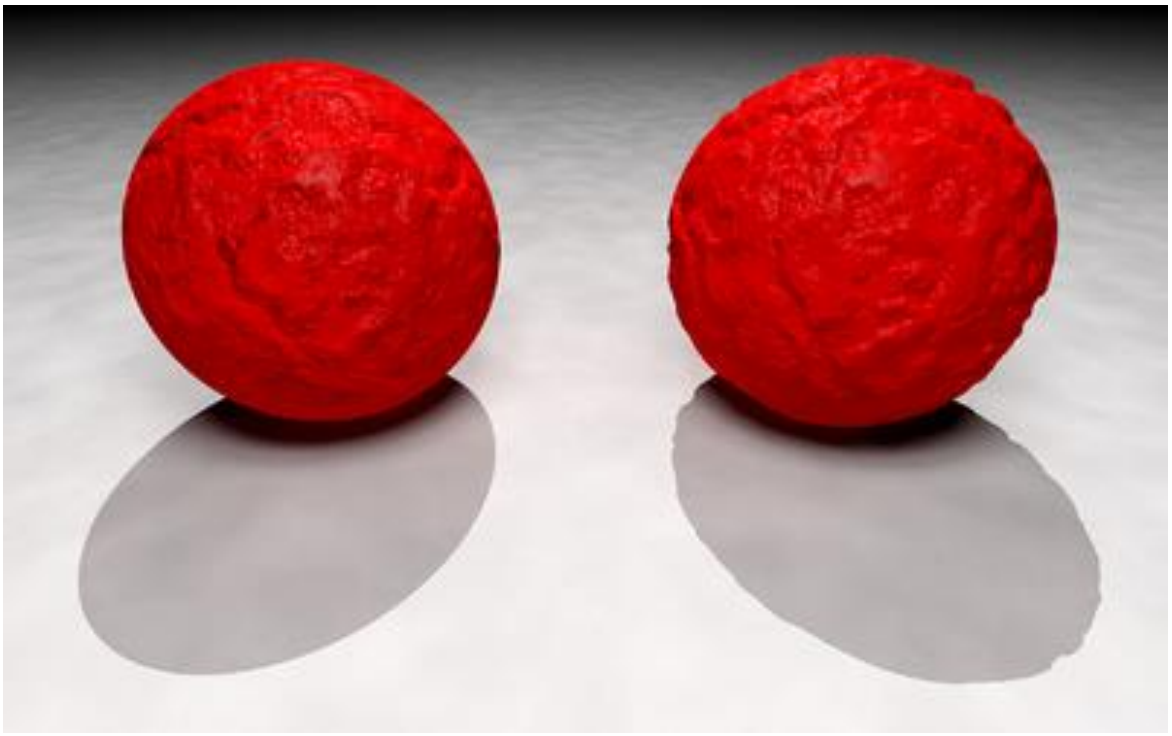

FIG : NO 1

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b) **Texture Mapping can be compared to which normal life activity?**

Answer :

Texture mapping is the electronic equivalent of applying wallpaper, paint, or veneer to a real object.

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c) How is Resolution expressed?

Answer :

PIXEL is a visible point on the monitor/screen .
which is lit when electron beam hit it.

Resolution measures the number of pixels in a digital image or display. It is defined as width by height, or W x H, where W is the number of horizontal pixels and H is the number of vertical pixels. For example, the resolution of an HDTV is 1920 x 1080.

In computers, resolution is the number of pixels (individual points of color) contained on a display monitor, expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis.

- Resolution is maximum number of pixels that can be plotted without overlap
- Expressed as: # horizontal X # vertical pixels.
- Depends on:
  - phosphor used
  - focusing system (how small a point)
  - Speed/precision of deflection system
  - video memory size (raster scan)

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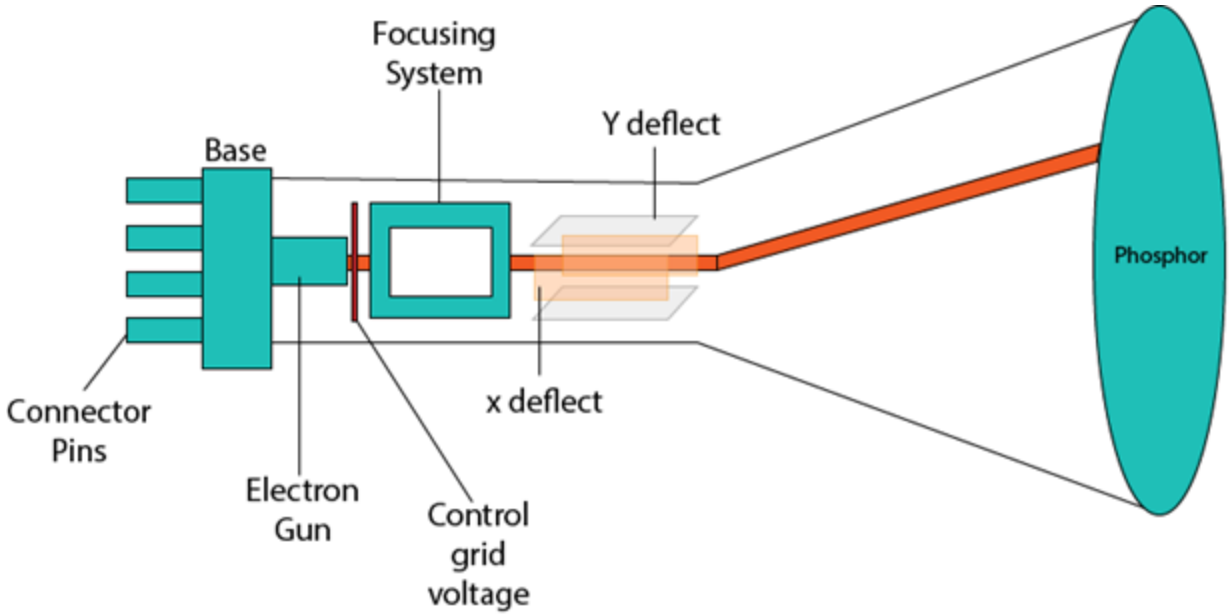
d) **What are the main components of CRT?**

Answer :



Cathode Ray Tube

Components of CRT:

Main Components of CRT are:

1. Electron Gun
2. Control Electrode
3. Focusing system
4. Deflection Yoke
5. Phosphorus-coated screen

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d) Which technologies have replaced the CRTs?

Answer :

Since the late 2000s, CRTs have been largely superseded by newer "flat panel" display technologies such as LCD, plasma display,

and OLED displays, which have lower manufacturing costs and power consumption, as well as significantly less weight and bulk.

Technologies to replace CRT monitors

>> Reduced volume, weight, power needs

>> Thinner: can hang on a wall

>> Higher resolution (High Definition)

- Two categories

Emissive and non-emissive .

Emissive displays are devices that convert electrical energy into light; where the image is produced directly on the screen. **Non-emissive** displays use optical effects to convert sunlight into graphical patterns and shapes; where the light is produced behind the screen and the image is formed by filtering this light.

Question No: 02

a. Compare the working of Vector and Raster Display Systems.

Answer :

The main difference between vector and raster graphics is that raster graphics are composed of pixels, while vector graphics are composed of paths.

Unlike **raster** graphics, which are comprised of colored pixels arranged to display an image, **vector** graphics are made up of paths, each **with a** mathematical formula (**vector**) that tells the path how it **is** shaped and **what** color it **is** bordered with or filled by.

VECTOR DISPLAY

Also called random, stroke, calligraphic displays

Draw object by electron beam, beam can move in any direction .

RESTER DISPLAY

The screen is divided into lines, and each lines has many dots. The beam scans each line, the beam intensity is creased at a light dot .

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VECTOR

- Early computer displays: basically an oscilloscope –Control X,Y with vertical/horizontal plate voltage
- Often used intensity as Z
- Refresh Buffer stores plotting commands
  - So Frame Buffer often called "Display File”
  - provides DPU with needed endpoint coordinates
  - Pixel size independent of frame buffer, provides very high resolution

RESTOR

- Raster: A rectangular array of points or dots
- Scan line: A row of pixels
- Resolution: number of pixels per scan line times the number of scan lines e.g. 640 X 480, 1024 X 768
- Each Pixel on screen visited during each scan
    - Scan rate must be >= 30Hz to avoid flicker

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b) How does an Interlaced Display different than normal display?

Answer :

An interlaced display is a cathode-ray tube (CRT) display in which the lines are scanned alternately in two interwoven rasterized lines.

Most CRT computer monitors scan each line in turn from top to bottom at the lowest resolution levels (640 x 480 and 800 x 600 pixel s). However, at the higher resolutions, such as 1024 x 768 or 1200 x 800, the frame is sometimes scanned in interlaced fashion: first the odd-numbered lines, and then the even-numbered lines. This allows for a lower refresh rate without producing flicker.

The refresh rate (number of frames scanned per second) varies, but it is normally between 60 and 100 hertz . Refresh rates slower than 60 Hz produce distracting screen flicker, which can cause headaches and eye fatigue.

For serious animated-graphics work and video editing, a non-interlaced display recommended. The refresh rate should be as high as the system will allow, ideally 70 Hz or more.

- All even then all odd screen lines scanned
- Typically 1/60 second each

Same image presented twice in 1/30 second

Image changed at 1/2 non-interlaced frequency

- less demands on image generation system
- can be less expensive
- 30 Hz is borderline for flicker
- lower quality image (seeing half the image at a time)

THE END ***