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Computer Graphics
Tutorial 7

Ans 1:

One of the most challenging problems in computer graphics is the removal of hidden parts from images of solid objects.

In computer generation, elimination of hidden surfaces is not automatic.

To remove these parts or to create more realistic image, we must apply a hidden line or hidden surface algorithm to set of objects.

The algorithm operates on different kinds of scene models, generate various forms of output or cater images of different complexities.

Ans 2:

The "z-buffer" is a 2D array of values equivalent in size to the colour buffer which stores the pixel colours of a rendered image.

Each value in a z-buffer represents the distance between an object rendered at that pixel and the camera.

Remember that the camera is always at the origin looking down the z-axis. Therefore, the z value of an element represents the distance from that element and camera.

The z-buffer algorithm is the most ~~wite~~ widely used method for solving the hidden surface problem.
It has the following major advantages over other hidden surface removal algorithms:-

- No sorting is required.
- No geometric intersection calculations are required.
- The algorithm is very simple to implement.

3. A human artist creates a painting by painting the background first and then painting layer on layer until the last thing to paint is the elements in the foreground.

This can be simulated in a computer by sorting the models in a scene according to their distance from the camera and then rendering them from back to front. It is a simple algorithm, but it has the following problems:-

- Sorting is time consuming
- The individual surfaces that compose the model must be sorted based on their relationship to the camera.
- If surfaces intersect, they cannot be sorted.

4. The subdivision algorithm is based on the divide and conquer algorithm where the visible area is successively divided into smaller and smaller rectangles until the simplified area is detected.

When we subdivide the window panel against the polygon we may come through the following cases which are:-

- Surrounding Surface: It is the case in which the viewing polygon surface completely surrounds the whole window panel.
- Overlapping Surfaces: It is the case in which the window panel and viewing polygon surface both intersect each other.
- Inside Surfaces: It is the case in which the viewing polygon surface is completely inside the window.
- Disjoint Surface: It is the case in which the viewing surface is completely outside the window.

Ans 5:- Coherence is used to take advantage of the constant value of the surface of the scene.
It is based on how much regularity exists in the scene.
When we moved from one polygon to of one object to another polygon of the same object colour and shearing will remain unchanged.

Types of coherence:-

- Egde Coherence: The visibility of edge changes when it crosses another edge.
- Object coherence: Each object is considered separate from others. In object, coherence comparision is done using an object instead of edge or vertex.

- Face coherence : In this faces or polygons which are generally small are compared with the size of the image.
- Area coherence : It is used with group of pixels covered by same visible surface.
- Depth coherence : Location of various points is separated based on their depths.
- Scan line coherence : The object is scanned using one scan line then using the second scan line.
- Frame coherence : It is used for animated objects.
- Implied edge coherence : If a face penetrates in another, line of intersection is determined by point of intersection.