2.5 VIEWING THE 3D WORLD:

Viewing the 3D world in computer graphics involves rendering three-dimensional scenes onto a two-dimensional display, typically a monitor or screen. This process considers the virtual camera's position, orientation, and perspective to create a realistic visual representation of the scene. Key components of viewing the 3D world include:

1. CAMERA POSITION AND ORIENTATION:

- The virtual camera's position and orientation determine the viewpoint from which the scene is observed. Changes in camera parameters impact the view of the 3D world.

2. PERSPECTIVE PROJECTION:

- Perspective projection simulates the way objects appear smaller as they move farther away from the viewer. It helps create a sense of depth and realism in the rendered scene.

3. ORTHOGRAPHIC PROJECTION:

- Orthographic projection represents objects without perspective, maintaining their size regardless of distance. It is often used for technical drawings and certain visualization needs.

4. VIEWING FRUSTUM:

- The viewing frustum defines the volume of space that the camera can see. Objects outside this frustum are not rendered, optimizing the rendering process.

5. VIEWING TRANSFORMATION:

- The viewing transformation involves transforming objects and the scene to a coordinate system that aligns with the virtual camera's viewpoint.

6. CLIPPING:

- Clipping removes portions of objects that fall outside the viewing frustum, ensuring only visible parts are rendered.

7. DEPTH BUFFERING (Z-BUFFERING):

Depth buffering is used to determine the visibility of objects at each pixel. It helps avoid rendering obscured or hidden surfaces

8. FIELD OF VIEW (FOV):

- The field of view is the extent of the observable world at any given moment. Adjusting the FOV affects how much of the scene is visible in the rendered image.

PHYSICAL MODELING:

Physical modeling in computer graphics involves simulating real-world physical phenomena to create realistic and dynamic virtual environments. This can include the simulation of physics, lighting, materials, and other aspects. Key aspects of physical modeling include:

1. PHYSICS SIMULATION:

- Physics simulation involves applying principles of physics to simulate realistic object behavior, such as gravity, collisions, and fluid dynamics.

2. MATERIAL SIMULATION:

- Simulating materials involves replicating the visual and physical properties of real-world materials, including reflection, refraction, and absorption of light.

3. LIGHTING MODELS:

- Lighting models simulate how light interacts with surfaces. This includes shading models, reflections, and the simulation of different light sources.

4. PARTICLE SYSTEMS:

- Particle systems simulate the behavior of individual particles, such as smoke, fire, or rain, contributing to realistic visual effects.

5. FLUID SIMULATION:

- Fluid simulation replicates the movement and behavior of liquids and gases. It is used in animations, gaming, and virtual environments.

6. RIGID BODY DYNAMICS:

- Rigid body dynamics simulate the motion and interactions of rigid objects. This is commonly used in physics-based animations and simulations.

7. SOFT BODY DYNAMICS:

- Soft body dynamics simulate the deformable nature of soft materials, such as cloth or rubber. It is applied in character animations and simulations of flexible objects.