UNIT – II

VR MODELING

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants – Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface
Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

VR MODELING

2.1)MODELING

Modeling, in the context of computer graphics, refers to the process of creating digital representations of objects, scenes, or systems. It involves the use of mathematical and computational techniques to define and manipulate visual elements in a virtual environment. Modeling is a fundamental aspect of computer graphics and is employed in various fields, including animation, gaming, simulation, and virtual reality.

GEOMETRIC MODELING

Geometric modeling specifically deals with the representation and manipulation of geometric shapes and structures within a digital environment. This field encompasses techniques for describing the geometry, topology, and spatial relationships of objects. Geometric models serve as the foundation for creating realistic and visually appealing virtual scenes.

2.1.1)VIRTUAL OBJECT SHAPE

The shape of virtual objects refers to their external form or appearance within a digital space.

Achieving realistic and visually convincing shapes is crucial for creating immersive virtual environments. Various techniques are employed to represent and manipulate the shape of virtual objects:

1. POLYGONAL MODELING

- Description: Polygonal modeling represents objects using interconnected polygons (typically triangles or quads). This approach is widely used in computer graphics for its efficiency and versatility.
- Application: Commonly used in video games, computer-aided design (CAD), and animation.

2. PARAMETRIC MODELING

- Description: Parametric modeling involves defining objects using

mathematical parameters or equations. This allows for precise control over shape characteristics.
- Application: Widely used in CAD systems for engineering and industrial design.

3. NURBS (NON-UNIFORM RATIONAL B-SPLINES) MODELING
- Description: NURBS modeling uses mathematical curves and surfaces defined by control points and weights. It provides smooth and flexible representations of shapes.
- Application: Commonly used in industrial design, automotive design, and animation.

4. VOLUMETRIC MODELING
- Description: Volumetric modeling represents objects as a volume of space. This approach is suitable for describing complex shapes with internal structures.
- Application: Used in medical imaging, scientific visualization, and fluid dynamics simulations.

5. IMPLICIT MODELING
- Description: Implicit modeling represents objects through mathematical functions or equations. The surface is defined as the zero set of a mathematical function.
- Application: Applied in medical imaging, terrain modeling, and procedural content generation.

6. PROCEDURAL MODELING
- Description: Procedural modeling involves the use of algorithms to generate shapes and structures. This allows for the creation of complex and varied scenes.
- Application: Used in generating landscapes, natural environments, and cityscapes in computer graphics.

7. POINT CLOUD MODELING
- Description: Point cloud modeling represents objects as a collection of individual points in 3D space. This approach is often used in scanning real-world objects for digital reconstruction.

- Application: Applied in 3D scanning, reverse engineering, and cultural heritage preservation.

8. SPLINE MODELING

- Description: Spline modeling uses curves (splines) to define shapes. It is commonly used for creating smooth and continuous surfaces.
- Application: Widely used in automotive design, animation, and architectural visualization.