SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Coimbatore – 641035.
B.E / B.Tech – Internal Assessment - II
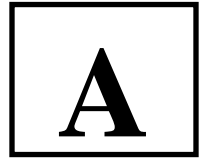**Academic Year 2023-2024 (ODD)**
SEVENTH SEMESTER

19CSE402- VIRTUAL REALITY AND DIGITAL ENTERTAINMENT

Time: 1$^{1/2}$ Hours   **Maximum Marks: 50**

Answer Key

Answer All Questions

PART A — (5 x 2 = 10 Marks)

1.Illustrate on 3D digitizer.

  3D Digitizers, a cornerstone of modern interactive technology, are often overlooked despite being integral to many devices we use daily. These sophisticated components enable the conversion of analog signals, like the stroke of a pen or a touch, into digital form that a computer can interpret and process. As technology advances, digitizers play a crucial role in enhancing user interaction with digital devices, making them more intuitive and immersive.

2. What is meant by object picking in virtual reality?

  Object picking is a common task in virtual environments that precedes tasks like moving or manipulating objects. It involves selecting an object from a group of objects. There are several methods for object picking in virtual reality, including voice, gaze, laser, and virtual hands. Multi-object selection methods are also available for productivity apps that require the user to perform tasks like selecting, moving, and manipulating multiple objects simultaneously. The aim of these methods is to improve the user's performance and accuracy in selecting objects in space.

3.What is Haptic Technology in virtual reality?

  Haptic technology refers to tactile feedback technology that provides a sense of touch by applying forces, vibrations, or motions to the user. It is used to create an experience of touch in virtual reality (VR) environments and complements its features by providing a life like experience.

4.Tell the principles of force feedback.

Force feedback is a type of haptic technology that provides a sense of touch by applying forces, vibrations, or motions to the user .

The principles of force feedback are as follows:

  Stiffness: The force required to deflect an object from its original position.
  Damping: The rate at which the force decreases as the object moves away from its original position.
  Inertia: The resistance of an object to changes in its motion.
  Texture: The surface characteristics of an object that affect the friction between it and another object.
  Temperature: The temperature of an object can affect the user's perception of its texture.

These principles are used to create realistic sensations and precise control in virtual reality environments.

5.Write the classification of haptic devices.

Haptic devices are broadly categorized into two types:

1.Active Haptic Devices and

2.Passive Haptic Devices.

Active Haptic Devices are controlled by the computer and supply tactile or force feedback to the user through electronic, electric, or mechanical means. Examples of active haptic devices include joysticks, game controllers, and haptic gloves.

Passive Haptic Devices do not require any external power source and provide haptic feedback through the use of materials with specific mechanical properties. Examples of passive haptic devices include textured surfaces, shape-changing interfaces, and deformable materials2.

There are other ways to categorize haptic devices based on their usage, such as graspable, wearable, and touchable devices

PART B — (13+13+14=40 Marks)

6a.Classify the advantages of cockpits flight simulation.

- Enhance training
- Maintain proficiency
- Practice ATC communication
- Improve navigation skills
- Mitigate risk
- Flight simulators can also save time and money by allowing pilots to practice on a computer at home or in a flight school's flight simulator before using the avionics in a real airplane.

6b.Categorize the different stages of real time graphics pipeline in Virtual Reality.
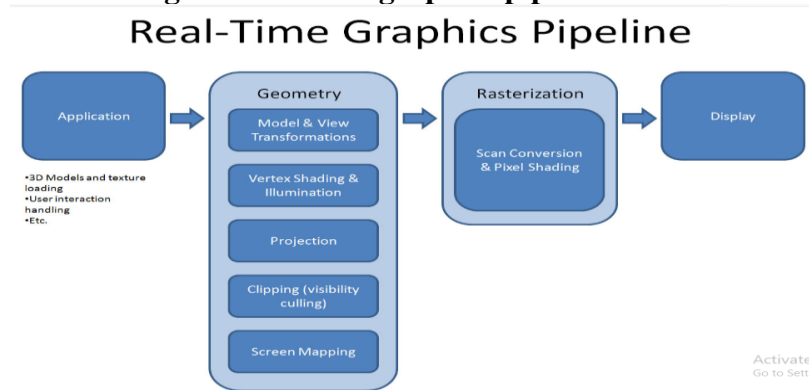
• Application – anything that the programmer wants. Interactions, loading of models, etc. Feed scene information into Geometry stage.

• Geometry – Take scene information and transform it into 2D coordinates o Modeling transformations (modeling to world) o View transformations (world to view) o Vertex shading o Projection (view to screen) o Clipping (visibility culling)

• Rasterization – Draw pixels to a frame buffer

• Display

7a.Conclude the different applications and advantages of touch and force feedback in haptic technology.

Haptic technology is a field that involves the use of tactile and kinesthetic components to create interfaces that provide force feedback about virtual objects created by a computer . Touch feedback is

used to simulate the sensation of touch, while force feedback is used to simulate the sensation of motion .

Applications

- Medicine
- Entertainment
- Education
- High risk training
- Art
- Consumer products: smart phones

- Advantage of Touch feedback is useful in applications such as mobile devices, where it can be used to provide haptic feedback when a user interacts with the device's touch screen . It can also be used in gaming, where it can be used to simulate the sensation of touch when a user interacts with virtual objects .

- Advantage of Force feedback is useful in applications such as robotics, where it can be used to provide haptic feedback when a user interacts with a robot . It can also be used in virtual reality, where it can be used to simulate the sensation of motion when a user interacts with virtual objects .

- In general, haptic technology has many advantages. It can improve the user experience by providing more realistic and immersive interactions with virtual objects . It can also improve safety by providing haptic feedback that warns users of potential hazards.

7b.Express how VR system can be used for Entertainment.

- People spend a lot of time and money on video games, social networks, cinema, amusement parks, music concerts, and sports games. Most likely, virtual reality will not replace these entertainments, but it can make them more inclusive and immersive. In the last few years, using virtual reality for entertainment has been mainly experimental. Now the VR entertainment market is entering the commercial stage and boasting some profitable projects. Various virtual reality entertainment options are discussed that will even make proper investment decisions.
- Theatre
- Cinema
- Museum
- Amusement Park
- Gallery
- Live Music Concerts
- Live Sports Games
- Hobby Lesson
- Games

8a.Identify any visualization development toolkit for real-time simulation. Explain the same in detail.

There are several visualization development toolkits available for real-time simulation.

- VTK (The Visualization Toolkit).
  It is an open-source software that provides tools for manipulating and displaying scientific data. It comes with state-of-the-art tools for 3D rendering, a suite of widgets for 3D interaction, and extensive 2D plotting capability . VTK is used worldwide in commercial applications as well as in research and development.
- GLG Toolkit . It is an extremely flexible and robust graphical framework for building visual interfaces that display real-time data, such as operator displays for Process Control and

Monitoring, SCADA/HMI mimics and diagrams, Traffic, Telemetry and Network Monitoring displays, and other mission-critical applications.

8b.Analyze how the human factors can relevant to the haptic systems with neat diagram.
- The human haptic system is made up of two subsystems: the motor subsystem and the sensory subsystem .
- The sensory subsystem is further divided into two modalities: kinesthetic and tactile senses.
- The kinesthetic sense provides information about the position and movement of the body, while the tactile sense provides information about the texture, shape, and temperature of objects.
- Human factors are relevant to haptic systems because they can affect the user's ability to perceive haptic feedback.
- For example, age, gender, and experience can all affect a user's ability to perceive haptic feedback.
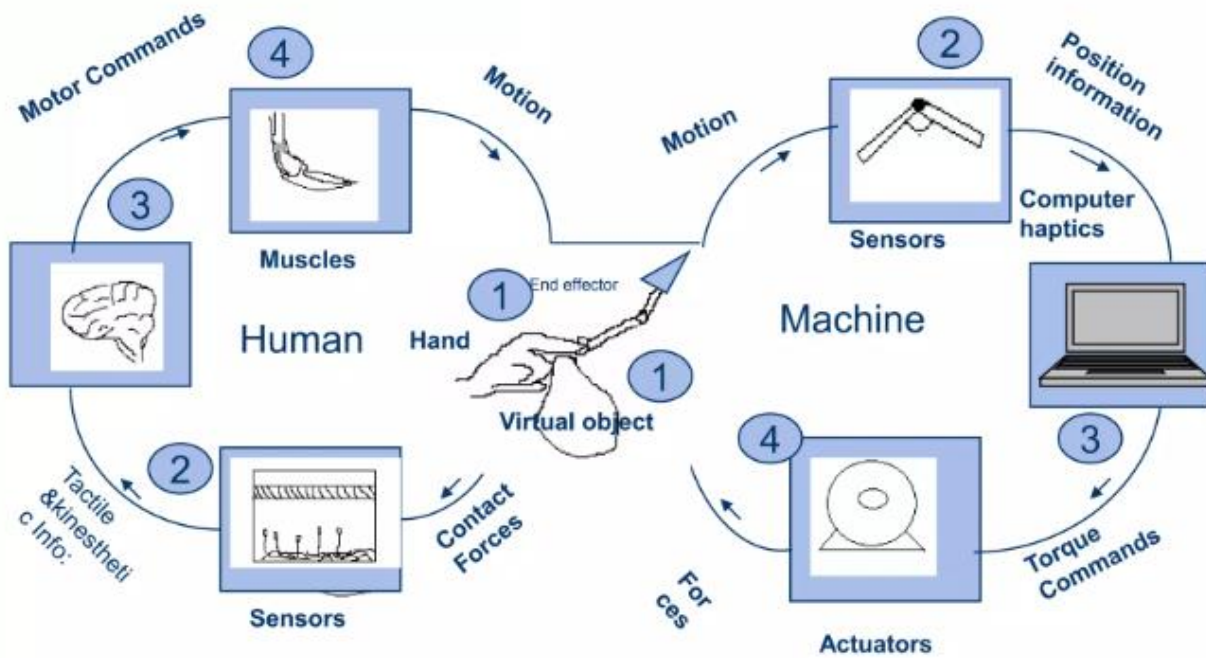
(Note: U-Understand   R-Remember   Ana-Analyze App-Apply)

Prepared by   **Verified by**   **HOD**