

UNIT 1 INTRODUCTION

PART - A

1. Define Augmented Reality.

Augmented Reality (AR) is a technology that combines computer-generated elements, such as images, videos, or 3D models, with the real-world environment to create an interactive and enhanced perception of reality.

2. Define virtual Reality

Virtual Reality (VR) is a technology that creates a computer-generated simulation of an entirely artificial or virtual environment, which users can interact with and immerse themselves in. VR aims to replace or replicate the real world with a digitally generated environment that can be explored and experienced as if it were real.

3. Classify technologies of AR.

- Marker based AR
- AR not based on markers
- AR based on projections
- AR based on overlaps

4. Define the three I's of Virtual reality.

- Immersion
- Interaction
- Imagination

5. What are the components in an interactive VR system?

VR Software system, VR cloud, 360 AV (audio/video) capture, Response evaluation, and user with interface.

6. Outline the approaches of VR.

- Geometry based VR
- Image based VR
- Hybrid VR

7. Define Trajectories and Hybrid space in VR.

Trajectories refer to the paths that objects, elements, or even users follow within the virtual environment. These paths can be predefined by designers or developers to guide the movement of objects or to create specific experiences for users.

Hybrid space in virtual reality (VR) refers to a concept where elements from both the physical world and the virtual world are combined to create an integrated and interactive experience

8. What is 3D graphics in VR?

3D computer graphics are graphics that uses a three dimensional representation of geometric data that are stored in a computer for the purpose of performing calculations and representing 2D images. Those geometric data are not graphics until they are presented on a screen.

9. List the major items required to build up a 3D world in virtual reality

- Lighting
- 3D objects
- Camera
- Scenes

10. Define Rendering.

Refers to the process of generating a 2D image or animation from a 3D scene or model. This process involves calculating the appearance of objects, surfaces, lighting, and camera perspectives to create a visual representation of the 3D scene that can be displayed on a screen or in a printed format.

11. Classify trackers.

- Mechanical trackers
- Magnetic trackers
- Ultrasonic trackers
- Optical trackers

12. What is Collaborative AR Interfaces?

Collaborative AR interface include the use of multiple displays to support remote and Co located activities. 3D interface are used to improve physical collaborative workspace by colocated sharing. In remote sharing AR is able to smoothly integrate Multiple device with multiple locations to enhance teleconferences. Remote sharing can be used for enhancing teleconference. Such interface can be integrated with medical applications for performing diagnostics, surgery or even maintenance routine.

13. Define 3d Position trackers.

3D Position Trackers, often referred to as 3D motion tracking systems, are devices or technologies used to precisely monitor and record the movement and orientation of objects or points in three-dimensional space.

14. Define Latency

3D trackers, latency is the time lag between an object position orientation change and the sensor detecting that change. Latency should be minimized because high latency are significant negative impact on simulation.

15. What are the general tracking technologies used for augmented reality?

Mechanical, magnetic sensing, GPS, ultrasonic inertia and optics are the general tracking technology used for AR.

16. What is Graphics display?

The graphic displays a computer interface that presents a composite view of the world to one or more users interacting with the virtual world.

17. What is Personal Graphics display?

Graphic display that renders a virtual scene for viewing by the single user is called a personal graphic display. Such images can be monocular or stereoscopic.

18. Define Sound display.

sound displays is a computer interface that provides synthetic sound feedback to a user interacting with the virtual world. Sound can be mono or binary binaural.

19. What is High capacity display?

High definition graphic display that allows multiple user in close proximity to simultaneously view stereoscopic or flat images of the virtual world is called high capacity.

20. Define Navigation and Manipulation interface.

It is a device that enables interactive change of perspective and exploration of the natural environment through this election and manipulation of virtual objects of interest.

21. Define Gesture Interface.

Guesture interface is a device that measures the real time position of a user fingers to enable natural gesture recognition based interaction with the virtual environment.

PART – B

1. Explain the components of an interactive VR.

VR Software system, VR cloud, 360 AV (audio/video) capture, Response evaluation, and user with interface.

2. Explain the benefits of VR.

- Enhanced training and education
- Improved remote collaboration
- Increased accessibility
- Architecture and design visualization
- Entertainment and gaming

3. Outline the various AR Input devices

1. Displays
2. Input devices
3. Tracking
4. Computers

4. Explain Gesture Interfaces in detail.

- Definition
- Gesture Input devices

- Gesture output devices

5. Summarize the role of tracker and list its types.

- Mechanical trackers
- Magnetic trackers
- Ultrasonic trackers
- Optical trackers

6. Explain various Displays used in VR technology.

1. Human visual system
2. Personal Graphics display.
3. Large volume display

7. Explain Human Auditory system.

The auditory system processes sound cues and plays a significant role in enhancing the immersive experience of VR environments.

Scenario : Virtual Reality Flight Simulation

**UNIT II VR MODELING
PART-A**

1. What is VR Modeling?

VR 3D modeling means creating 3D model of an object or design using VR technology using controllers in six degrees of freedom instead of a flat screen with the mouse and keyboard.

2. What are the different modelling in VR?

Geometric modeling

Kinematics modeling

Physical modeling

Behaviour modeling

3. State the difference between local and global illumination?

The local scene illuminates the interaction between objects and light sources through isolation and neglecting the interdependencies between objects. It results in a realistic way which represents the reflection between objects and shadows through global illumination models. The method which shades objects based on light intensity interpolation is gouraud shading. This requires a normal of each vertex to a Polygon mesh describing the surface of the virtual objects to be known.

4. What are splines?

Splines is a geometric object that represents a 1 dimensional object where the path of the line is dependent on a set of ordered vertices. In a 3DS Max, splines are contained in primitive objects called shapes.

5. Define Geometric Modeling

It is explaining about the shape of virtual objects (triangles, vertices, splines), as well as their appearance such as surface texture, surface illumination and color.

6. Define Kinematic Modeling.

The location of a 3D objects is a world system which coordinates the motion. Individual world object kinematics is owned by parent child hierarchical relations with the motion of parent object affecting the child. It is a way to develop the world with the motions of a virtual camera. The camera image needs to be transformed and projected in a 2D display window in order to provide a visual feedback to the user.

7. Define Physical modelling

Physical modeling includes weight, inertia, surface roughness, compliance(hard or soft) deformation(elastic or plastic) etc. These features together with the object behavior bring more realism to the virtual world model.

8. What are the different types of bounding boxes?

Bounding box are classified into oriented and axis aligned. oriented bounding boxes of prism aligned with the object major axes and which change its orientation dynamically as object rotates. axis aligned bounding box is aligned with world this system which coordinates.

9. What is Level of detail management.

Level of detail management combines a method used to improve the graphics pipeline throughout by selecting object level of a detail appropriately.

10. What is cell-based segmentation? How can it be improved?

The model size was very small enough to fit in RAM memory. There was no need to retrieve the data from the hard drive. Larger models need to be rendered in such a way to impact the memory that swaps on simulation Frame rate is minimized. This involves partitioning the large model into smaller ones then rendering those were startic or adaptive LOD management.

11. What is Collision detection?

Collision detection determines whether two or more objects are in contact with each other. This will be considered in to form a haptic clipping since only objects that collide are processed by haptics rendering pipeline.

12. Compare elastic Virtual objects with plastic virtual objects.

Elastic virtual objects :These objects have 3D surface that deform proportionally to the magnitude of the contact force.

Plastic virtual objects:

These objects have a different force when deformed. the undeformed plastic objects behave initially as an elastic.

13. What is meant by a virtual wall?

These are a special category of virtual objects that are neither elastic or plastic. A real world is rigid, such it produces a large and a sudden feedback force with the contact.

14. Define Model management.

Model management combines techniques designed to help VR engines render to complex virtual environments at interactive rates without a significant impact on the simulation quality.

15. Mention a few model management approaches

Selection of objects and the level of detail, cell segmentation, off-line pre computations and database management.

16. List the methods involved in object surface construction.

Toolkit editor, importing CAD files, 3D digitizer, scanning the object with a scanner or purchasing models from existing databases.

17. List the types of texture.

Monophony, Heterophony, homophony and polyphony.

18. Define Virtual humans.

Virtual humans (agent) is a 3d character that has a human behaviour. Groups of such agents are called crowns and have crowd behaviour.

19. What is behavioural modeling?

It is an approach used by companies to better understand and predict consumer actions.It uses a available consumer and business spending data to estimate future behaviour in specific circumstances.

20. What is the third dimension of the world?

Mapping the virtual objects to camera coordinates is the first task in the geometry , stage of the rendering pipeline. This is followed by lighting and a perspective projection, clipping and screen mapping.

PART-B

1. Explain in detail on Modeling transformation with matrix representation.

Transformation matrices are used to represent and manipulate the position, orientation, and motion of objects or entities within a virtual environment.

2. What is meant by geometric modelling in the case of virtual reality.

- Virtual object shape
- Object visual Appearance

3. Explain Kinematic modelling in detail

- Transformation matrices
- Object position
- Transformation Invariants
- Object hierarchies
- Viewing the 3d world

4. Describe Physical modelling in detail.

- Collision Detection
- Surface deformation
- Force computation
- Force smoothing and mapping

5. Describe Behaviour modelling in detail.

- Agent behaviour
- Reflex behaviour

6. Write a detailed note on model management in virtual reality system.

- Level of detail segmentation
- Cell segmentation
- Offline computations
- Lighting and bump mapping at rendering stage
- Portals

UNIT 3 VR PROGRAMMING

1. Define API

An authoring environment is an application programming interface (API) based way of creating virtual worlds. A runtime environment allows users to interact with the created world in real time.

2. What is toolkit?

Toolkits are extensible libraries of object - oriented functionality developed for the VR specification. A simulated object is part of a class and inherits its default attributes, Simplifying the programming task.

3. List the general purpose toolkit

Modern general purpose toolkits include Worldtoolkit (WTK), Java 3D and virtual reality modeling language (VRML). Other toolkits include special libraries such as his GHOST for haptic programming and peopleShop, which is primarily used for military simulations.

4. Compare various toolkit

Ans. :

Toolkit		Application domain	I/O devices supported	Library size
World Tool Kit	EDS/Sense8	General purpose	All	>1000 C function
Java 3D	Sun Microsystems	General purpose	Mouse , Keyboard	C and Java
GHOST	SensAble Technologies	Haptics	PHANTOM	C++
PeopleShop	Boston Dynamics	Military	Joystick, Mouse	C/ C++

5. What is a scene graph ?

A scene graph is a hierarchical organization of objects in a virtual world and a view of that world. A scene graph represents a tree structure with nodes connected by branches.

6. Explain Scene graph architecture

The top node in the hierarchy is the root node and parent for the entire diagram. It connects to multiple inner nodes, which are parents to other inner or outer nodes. Outernodes/ leaves have no child nodes. Interior nodes represent visible objects with their properties.

7. What is speciality of worldtoolkit.

It support most of commercial I/O devices , multi platform portability, and substantial code examples that facilitate setting up a new simulation.

The toolkit is mostly used for small to medium size models owing to the requirements to fit the entire virtual world on available system RAM memory.

8. What are the WTK functions used.

WTK functions use an object oriented naming convention and organized in classes. These classes include geometry, nodes, viewpoints, windows, lightings, sensors, paths, motion links and others

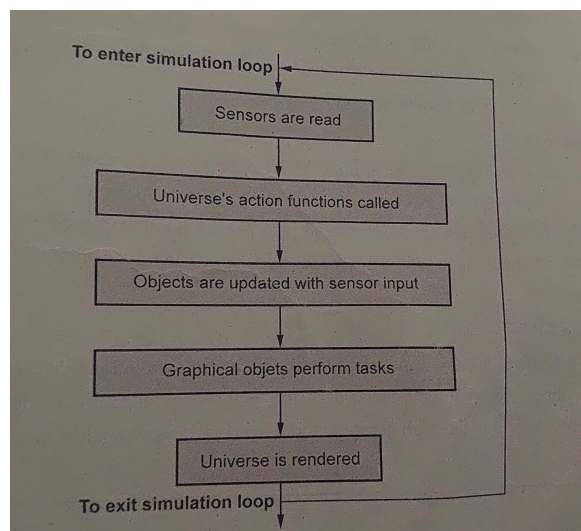
9. How are model geometry and appearance created.

Virtual object geometry can be created from scratch in WTK using geometric primitives as well as vertices and polygons. Another method is to import already creative Jam entry from AutoCAD and Pro engineer authoring tool that outputDXF files. Other file formats can be imported include those created by 3D Studio, Wave and Multi Gen and VRML as well as neutral file formats.

10.What is the role of sensor during WTK simulation

During simulation, User input is Sampled via into device called sensors. This input is read in real time every WTK simulation cycle to minimize latency. The data is then used to update the visual objects position, shape, velocity. The resulting screen is graphically displayed on users HMD or other display

10. Draw the simulation loop in WTK



12 What is WTK Networking

WTK provides networking through the World2World library extensions. Unlike typical client/server architecture where the server handles both administrative and data communication tasks, World2World uses a two-tier client/server architecture. Server tasks are split between Server Manager and multiple simulation servers. The Server Manager is the first point of contact for new clients (users) requesting a connection to the simulation

13 What is JAVA 3D

Java 3D is one of the Java APIs developed for object-oriented programming of interactive 3D graphics applications. Java 3D uses low-level OpenGL and Direct3D graphics library functions and the graphics accelerators that implement them. Java 3D is a free download from the Internet.

14 What is Java 3DScene Graph

A virtual world or universe has a collection of scene graphs, typically one per application. It has a locale node that anchors multiple branch diagrams to the world. Only top associated with a locale are live and therefore rendered in the scene. Deleting the branch diagram reverses the process

15 Define Java 3D Networking

Java 3D does not provide an integrated solution for networked virtual environments, but relies on Java's powerful networking capabilities. This allows Java 3D applications to run applets on web pages or as standalone applications.

16 What is VRTP?

The Virtual Reality Transfer Protocol (VRTP) currently addresses the need to reduce the development effort required to create 3D-enabled websites. Currently under research, VRIP combines desktop-optimized client/server and peer-to-peer communication. It includes a region of interest management layer similar to WTK and supports the distribution of VRML and low 3D scene diagrams.

17 Define GHOST.

GHOST makes it easy to program haptic effects in simulations that use OpenGL-based graphics pipelines. The VR engine renders the graphics and haptic rendering pipelines separate processes. Due to the high computational overhead, each pipeline preferably has its own dedicated CPU.

Part- B&C

1. Summarize various toolkits

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GHOST	SensAble Technologies	Haptics	PHANTOM	C++
PeopleShop	Boston Dynamics	Military	Joystick, Mouse	C/ C++

2. Discuss the creation of virtual object geometry in WTK.

Model geometry and appearance

3. With an example of scene diagram, explain implementation scene graph in WTK.

The top node in the hierarchy is the root node and parent for the entire diagram. It connects to multiple inner nodes, which are parents to other inner or outer nodes. Outer nodes/ leaves have no child nodes. Interior nodes represent visible objects with their properties

4. Explain WTK movable nodes to construct a virtual hand.

Virtual hand

5. Explain the sensors and action functions in VR.

➤ Sensors

- Action functions

6. Explain working of WTK simulation loop.

Simulation loop

7. With a neat diagram, explain java 3d scene graph.

Scene graph

8. Discuss the construction java 3d Scene graph for single and Multiple view platform node.

Scene graph

9. Make a comparative analysis of Java 3D and WTK.

Java 3D and World toolkit

UNIT-4 APPLICATIONS

PART-A

1. What are the five classic components of VR System.

VR Engine

I/O Devices

Software and databases

User

task

2. What are the experiments should be performed for conducting VR human factor studies.

Usability studies look at ways to improve system or application design in order to make them easy to use.

User performance studies are conducted to measure the user response to a given simulation and a particular hardware system.

User safety studies are conducted to better understand simulation sickness causes and effects as well as increase the user's safety (and minimize physical injury)

Finally, sociological studies, as their name implies, are designed to measure factors related to effects of VR on society.

3 Define trial and session.

A trial represents a single instance of the experiment to be performed as part of a human factors study. A sequence of repeated trials constitutes a session Sessions (and sometimes trials) are separated by rest periods for the participant in the study.

4.What is the difference between experimental and control groups?

Experimental

- The subjects in the experimental group perform the experiments as specified in the protocol.
- They receive the treatment, manipulation, or stimulus that is the focus of the study

Control groups

- The subjects in the control group do not perform the experiments as specified in the protocol, they are not exposed to the experimental treatment or stimulus
- They do not receive the treatment or stimulus being studied

5. What is an Institutional Review Board (IRB)?

Institutional Review Board (IRB), an office within the research organization conducting the study that is mandated by law to oversee the proper conduct of human factors studies. No such study can begin without an approval from the IRB, which is typically given for a year and then renewed/updated.

6.Define is cybersickness.

Cybersickness is a form of motion sickness that results from interaction with or immersion in virtual environments. Its main symptoms are eye strain, disorientation, postural instability, sweating, pallor, drowsiness, nausea and (in rare cases) vomiting.

7. What is rehabilitation ?

Rehabilitation is the process that helps individuals recover, restore, or improve their physical, mental, or cognitive abilities after an illness, injury, or surgery. It involves a Applicative comprehensive approach,

utilizing therapies, exercises and interventions tailored to the individual's needs, with the aim of promoting recovery, enhancing function and improving overall well-being.

8 How does VR impact rehabilitation ?

By adding virtual reality, the rehabilitation becomes VR augmented (when used in addition to classical therapy) or VR based (when replacing classic therapy altogether). In VR augmented and VR based rehabilitation, individuals can simulate tasks that resemble activities of daily living, while also being able to store detailed data in online databases.

9 What are types of rehabilitation?

Rehabilitation can be classified as orthopedic, neurological (post-stroke or traumatic brain injury) and cognitive.

10 What advantages does VR offer for rehabilitation, particularly for post stroke patients?

Virtual reality can potentially be a lifesaver to the millions of stroke survivors due to its ability to deliver controlled, repetitive and intensive therapy. Furthermore, VR based or VR augmented rehabilitation is very engaging and easily adaptable to individual patient's abilities. Finally, its use of computerized technology and multiplexing makes VR a force amplifier for the current army of therapists.

Example: Holden and her colleagues at the Massachusetts Institute of Technology developed a system for motor training of arm reach motions of chronic post-stroke patients

11 What is telerehabilitation?

Virtual reality can create an interactive, entertaining environment (through the use of 3D graphics and video games) and allow supervised rehabilitation at home. This type of rehabilitation, called telerehabilitation, gives a remote therapist the possibility of monitoring (in real time or not) the actions of a home-bound patient using the Internet. Other advantages associated with VR - augmented and VR -based rehabilitation are the ability to simulate tasks similar to activities of daily living and to store fine-grained data in online databases.

12 What is "virtual heritage"?

In 2000 the Virtual Heritage Network was formed as a UNESCO affiliate in order to help the preservation of heritage sites in VR. It maintains a very informative Web site showing current projects, conferences, publications and related links.

13 Give types of PC video games ?

The types of PC games are Strategy games, adventure games, sports (flying, driving). role-playing games and online games.

14, List out the domains of VR applications in manufacturing ?

The domains of VR applications in manufacturing are

- Ergonomics analysis
- Assembly validation
- Virtual prototyping Plant design
- Training maintenance
- Marketing

15 What is volumetric visualization

Volumetric visualization in turn implies volumetric graphics, volumetric hardware acceleration, special displays to present such underground seismic data and data obtained from ultrasound, CT, or MRI imaging or from atmospheric and oceanographic modeling to the user in a volumetric way and new human-computer interaction techniques.

16 Comparison between surface graphics and volume graphics

Surface Graphics

Sensitive to scene and object complexity

Variable, depends on scene and object complexity

Object space aliasing-None

Transformation-Continuous, performed on geometric definition of objects

Volume Graphics

Insensitive to scene and object complexity

Object space aliasing- Frequent

Large but constant-Memory

Transformation-Discrete, performed on pixel blocks

17 What seismic data

Seismic data refers to measurements or recordings of seismic waves, typically obtained through seismic surveys. Seismic data are three dimensional and thus well suited for visualization in VR. The discovery of new oil reservoirs is based on visualization and interpretation of seismic data.

18 What is virtual prototype

Virtual prototyping serves as a means to replace the costlier physical counterpart. Apart from cost savings, virtual prototypes have the advantages of flexibility (it is easier to change software than to build a new physical mockup), online documentation and the ability to be viewed remotely (for design approval and marketing).

19 What is assembly verification?

This is another stage in prototype development whenever products are composed of multiple parts. This stage is needed to determine whether parts designed separately fit together correctly without unwanted interference (collisions). Another aim of assembly verification is to determine whether the assembly, once put together, can easily be taken apart.

20 What is ergonomic analysis?

Ergonomic analysis traditionally occurs after the creation of a physical prototype to evaluate usability and serviceability. However, virtual prototyping speeds up this process enabling early stage ergonomic studies through software tools that incorporate customizable humanoid models into VR simulations, supported by a computational engine that calculates variables like reach envelope, joint torques and field of view.

PART-B

1. Explain in detail about VR Methodologies and terminologies.

- Data collection and analysis
- Usability engineering methodology

2. How is VR being used in education(at college, high school, and elementary school levels). Give examples and comment.

VR in education

3. Describe cyber sickness and explain its causes.

- Neutral conflict
- Influence on system characteristics
- Influence on user characteristics
- Influence of User degree of interactivity
- Temporal aspects

4. What is the visible human database and how was it created? Describe some of its applications.

- Virtual anatomy
- Triage and diagnostics
- Surgery
- Rehabilitation

5. What is virtual cockpit? Give examples.

Air force use of VR

6. In what ways is VR used in the automotive industry (both in prototyping and in ergonomic analysis)?

VR applications in manufacturing

7. Explain about VR use in robot programming.

Application of VR in Robotics

UNIT 5 AUGMENTED REALITY

PART A

1. What is augmented reality?

Augmented Reality (AR) aims to present information that is directly registered to the physical environment, AR goes beyond mobile computing in that it bridges the gap between virtual world and real world, both spatially and cognitively.

2. Virtual reality vs augmented reality: What is the difference?

Virtual Reality (VR) and Augmented Reality (AR) are two distinct technologies that provide immersive experiences, but they differ in how they present and interact with digital content

Virtual Reality (VR) Virtual reality refers to a computer-generated simulation that immerses the user in a completely virtual environment, VR typically involves wearing a Head-Mounted Display (HMD) or goggles that cover the user's eyes and ears, creating a sense of presence within the simulated environment. The goal of VR is to transport users to a different reality, completely detached from the physical world. Users can explore and interact with the virtual environment using specialized controllers or other input devices.

Augmented Reality (AR) Augmented reality, on the other hand, overlays digital content on the real world. AR enhances the user's perception of the physical environment by adding virtual elements in real-time. This is usually achieved through the use of a smartphone, tablet, or AR glasses, which allow users to see the real world while digital information is superimposed on top of it. AR can provide additional information, graphics, or interactive elements that are contextually relevant to the user's surroundings.

3. In which sectors can AR be used?

- Industry and construction
- Medical
- Navigation
- Advertising and commerce
- Maintenance and training
- Personal information display
- Television
- Games.

4. What are the characteristics of AR system?

- Combines real and virtual
- Interactive in real time
- Registered in 3D

5. What are the components of AR system?

- A tracking component
- A registration component
- A visualization component
- A spatial model

6. What are the stages of marker tracking pipeline?

- Capturing an image using camera with a known mathematical representation
- Marker detection by searching for quadrilateral shapes
- Pose estimation from a homography
- Pose refinement by non linear reprojection error minimization
- AR rendering with recovered camera pose

7. Define PTAM.

Parallel Tracking and Mapping (PTAM) is a modern approach, which decouples the tracking from mapping. PTAM lets both tracking and mapping execute in parallel threads, but permits them to have different update frequencies.

8. Define SLAM.

Simultaneous Tracking Mapping and Localization (SLAM) is a computational technique used in the field of robotics and augmented reality to construct a map of an unknown environment while simultaneously estimating the robot's or user's position within that environment. SLAM enables a device to understand and navigate its surroundings in real time without relying on pre-existing maps or external localization information.

9. What is survey knowledge.

It comprises the understanding of overall spatial relationships between landmarks and routes. It develops through repeated navigation or the use of secondary sources. Different type of spatial knowledge are applied based on the frame of reference during navigation tasks. Exo centric tasks focus on one's own orientation and distance, relying on route knowledg .Exocentric tasks involve estimating distances between distant points, benefiting from survey knowledge.

10 What is nodes, districts, edges?

Nodes: Nodes are pivotal points where users make decisions by selecting paths, playing a vital rol in route planning and way finding

Districts: Districts are larger areas in the environment, such as parks of shopping boulevards.

Edges act as boundaries that divide the environment, such as roads or rivers that necessitle specific crossings. The perception of what qualifies as an edge depends on the context, with pedestrians viewing streets as boundaries while drivers perceive them as routes.

11 Describe the wearable augmented reality setup.

A wearable AR setup consisting of a backpack with a note-book, a head-mounted display fitted with inertial orientation tracker and camera and a handheld tablet and stylus, which are also optically tracked using markers.

12 Write the Iterative Closest Point (ICP) algorithm?

For each point in the current depth image, the closest point in the previous depth image is determined. Per-point normals are computed using finite differences on the input data and then used to compute a point-to-plane distance metric to determine the data associations.Using these point associations, the rigid transformation that minimizes the residual error is computed. This transformation is applied to all points.

13 What is vocabulary tree

A vocabulary tree is a search tree in which the original leaves corresponding 11 to features are omitted. The intermediate nodes directly above the original leaves, each associated with a visual word (a quantized descriptor), become the new leaves.

14 What is agile displays?

Agile displays refer to dynamic and customizable visual interfaces that can adapt to user interactions and environmental cues in real-time. These AR displays enable interactive and personalized experiences by dynamically adjusting the presented content, layout, or behavior to meet the specific needs and context of the user.

15 What is magic lenses?

Magic lenses in Augmented Reality (AR) refer to a technique where virtual content is seamlessly overlaid onto the real world, enhancing the user's perception and interaction.

PART-B

1. Explain in detail about the components of AR SYSTEMS.

- A tracking component
- A registration component
- A visualization component
- A spatial model

2. Explain in detail about computer vision for AR with a case study.

- Computer vision
- Case study

3. Explain the case study of outdoor tracking.

Case study

4. Explain simultaneous localization and mapping.

SLAM case study

5. Explain in detail about tangible interfaces.

Tangible interfaces

6. Explain in detail about modelling and annotation

- Specifying geometry

- Specifying appearance
- Semi automatic reconstruction
- Free form modeling

7. Explain in detail about Augmented paper and multi view interface.

- Augmented paper
- multi view interface