

Virtual Reality

Unit 9

Virtual Reality(VR)

- **Virtual reality** or **virtual realities (VR)**, also known as **immersive multimedia** or **computer-simulated reality**, is a computer technology that replicates an environment, real or imagined, and simulates a user's physical presence and environment to allow for user interaction. Virtual realities artificially create sensory experience, which can include sight, touch, hearing, and smell.
- Most up-to-date virtual realities are displayed either on a computer monitor or with a virtual reality headset (also called **head mounted display**)
- Some simulations include additional sensory information and focus on real sound through speakers or headphones targeted towards VR users

Why Virtual Reality(VR) ?

- VR is able to immerse you in a computer-generated world of your own making: a room, a city, the interior of human body. With VR, you can explore any uncharted territory of the human imagination.

Types of VR(Virtual Reality)

- 1.Windows on World(WoW) (also called Desktop VR)
- 2.Immersive VR
- 3.Telepresence
- 4.Mixed Reality(Augmented Reality)
- 5.Distributed VR

1.Windows on World(WoW)

- Also called Desktop VR.
- Using a conventional computer monitor to display the 3D virtual world.



2.Immersive VR

- Completely immerse the user's personal viewpoint inside the virtual 3D world.
- The user has no visual contact with the physical world.
- Often equipped with a Head Mounted Display (HMD).



3.Telepresence

- A variation of visualizing complete computer generated worlds.
- Links remote sensors in the real world with the senses of a human operator. The remote sensors might be located on a robot. Useful for performing operations in dangerous environments.



4. Mixed Reality (Augmented Reality)

- The seamless merging of real space and virtual space.
- Integrate the computer-generated virtual objects into the physical world which become in a sense an equal part of our natural environment.



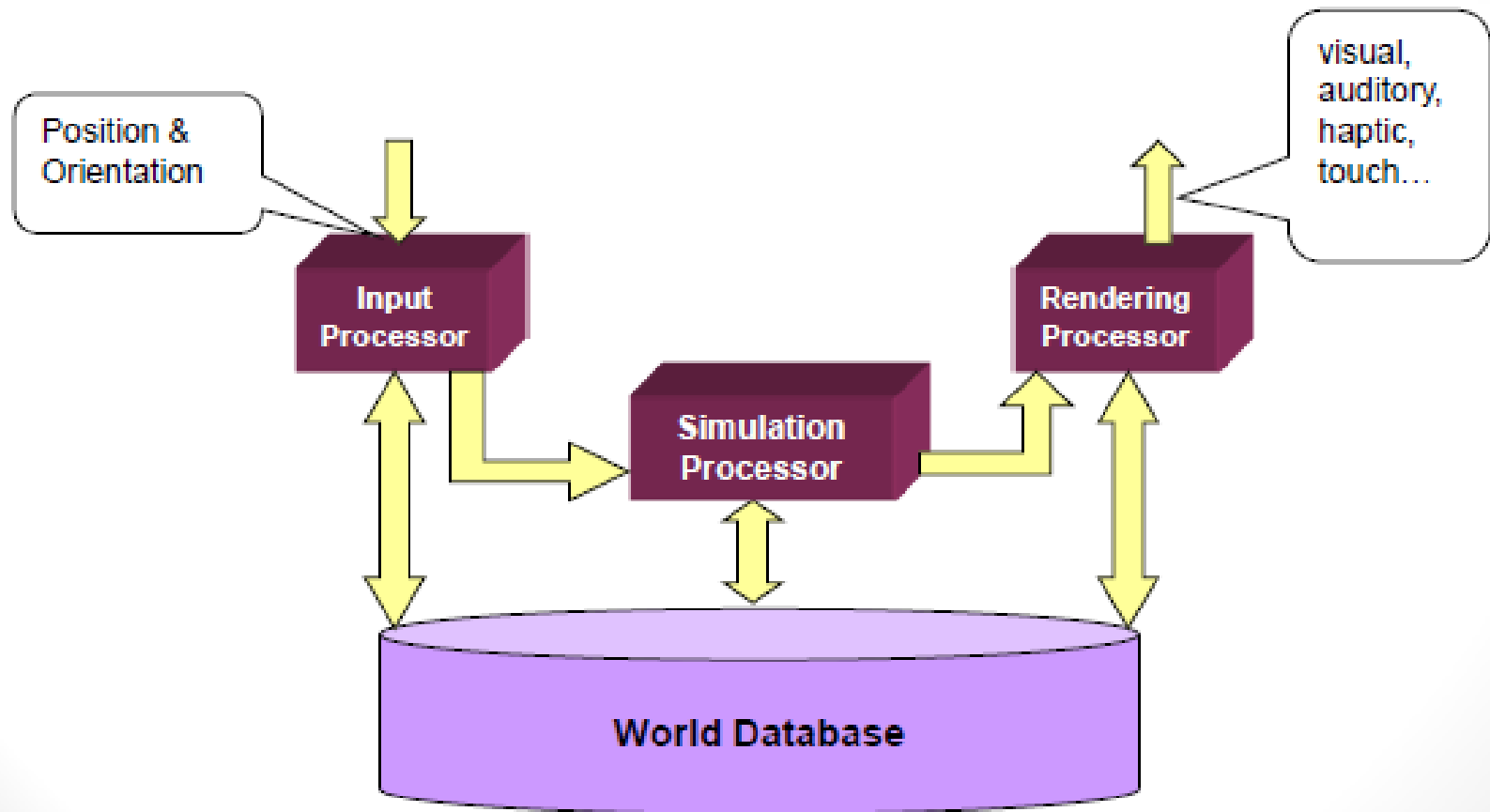
5.Distributed VR

- A simulated world runs on several computers which are connected over network and the people are able to interact in real time, sharing the same virtual world.



Architecture of VR System

- Input Processor, Simulation Processor, Rendering Processor and World Database.



Architecture of VR System

Input Processor

- Control the devices used to input information to the computer. The object is to get the coordinate data to the rest of the system with minimal lag time.
- keyboard, mouse, 3D position trackers, a voice recognition system, etc.

Architecture of VR System

Simulation Processor

- Core of a VR system.
- Takes the user inputs along with any tasks programmed into the world and determine the actions that will take place in the virtual world.

Architecture of VR System

Rendering Processor

- Create the sensations that are output to the user.
- Separate rendering processes are used for visual, auditory, haptic and other sensory systems. Each renderer take a description of the world state from the simulation process or derive it directly from the World Database for each time step.

Architecture of VR System

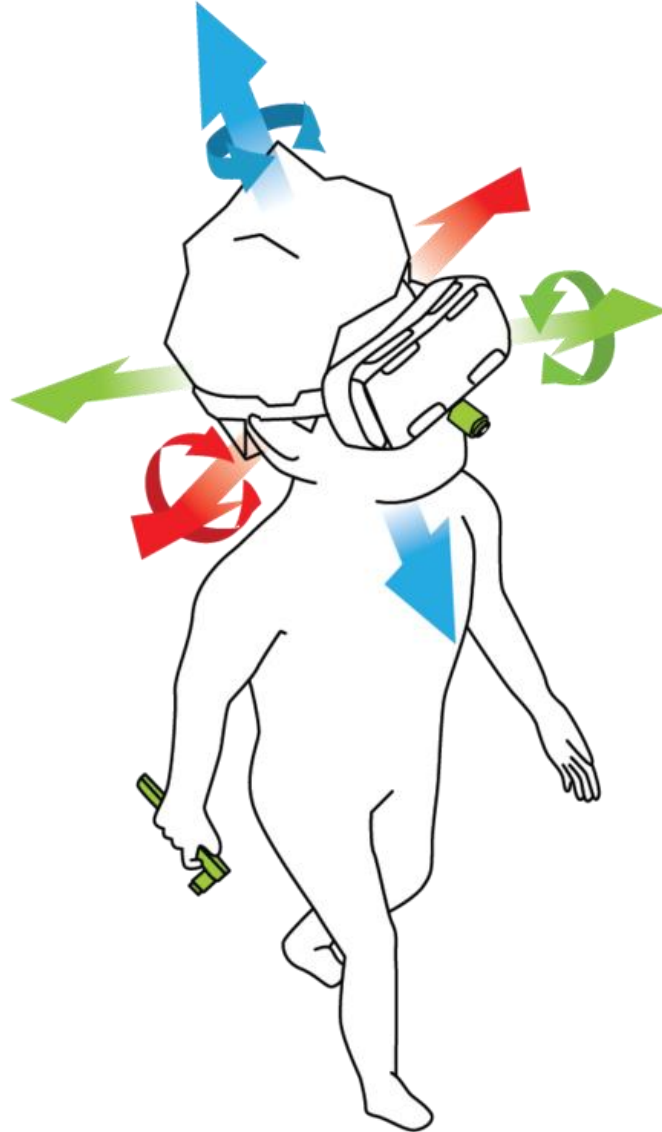
World Database (World Description Files)

- Store the objects that inhabit the world, scripts that describe actions of those objects.

3D Position Trackers

- **Positional tracking** detects the precise position of the head-mounted displays, controllers, other objects or body parts within Euclidean space.
- Positional tracking registers the exact position due to recognition of the rotation (pitch, yaw and roll) and recording of the translational movements.
- Since virtual reality is about emulating and altering reality it's important that we can track accurately how objects (like the head or the hands) move in real life in order to represent them inside VR. Defining the position and orientation of a real object in space is determined with the help of special sensors or markers.
- Sensors record the signal from the real object when it moves or is moved and transmit the received information to the computer.

3D Position Trackers



3D Position Trackers

- **Wireless tracking**
- **Optical tracking**
- **Tracking With Markers**
- **Marker less Tracking**
- **Inertial Tracking**
- **Sensor Fusion**
- **Acoustic Tracking**
- **Magnetic Tracking**



Application of VR

- Education and training
- Video Games
- Fine art
- Heritage and archaeology
- Architecture design
- Urban Design
- Therapy
- Theme parks
- Concerts
- Retail
- Film
- Media
- Motion pictures

