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COIMBATORE

DEPARTMENT OF CIVIL ENGINEERING

19CET308 – AR VR IN CIVIL ENGINEERING

III YEAR / VI SEMESTER

Unit 3 : Working with AR & VR Devices

Topic 2 : VR Headsets

VR Headsets

VR Headsets

➤ A VR headset is a head-mounted device that includes a display screen, stereo sound, sensors, and compatible controllers to deliver an immersive and interactive audiovisual experience.

➤ When a user puts on a VR headset, they can no longer see the world around them, but instead only see VR content projected on the display screen such as 360-degree videos and VR games, workspaces, or meeting rooms for other activities.

VR Headsets
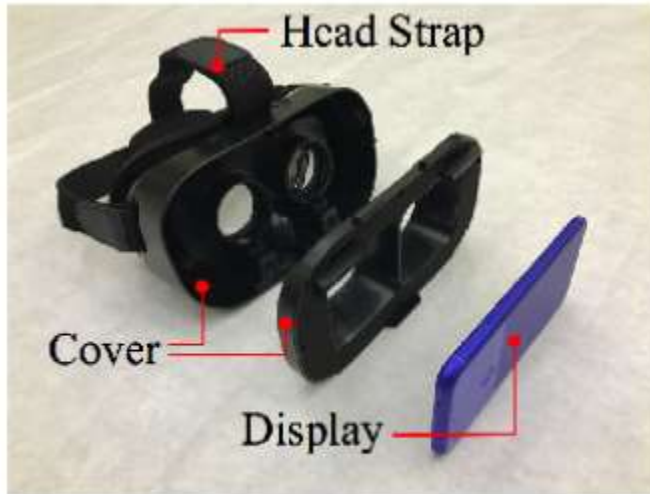
(a) VR headset (Front)
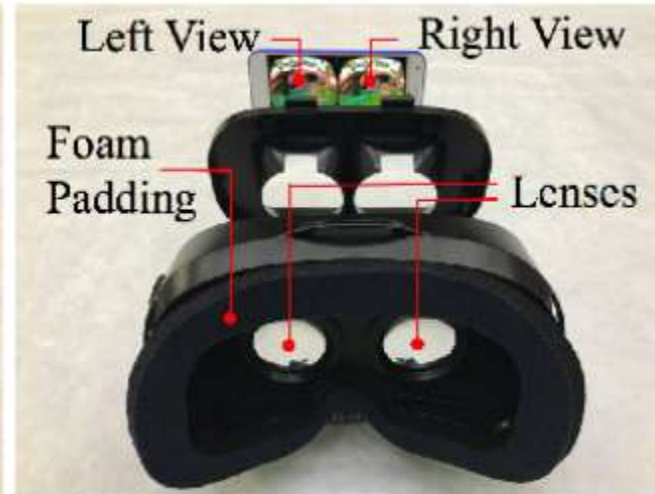
(b) VR headset (Back)

VR Headsets

➢ Along with the headset itself, the user will rely on a set of VR controllers to navigate the experience.

➢ As mentioned, the device offers an interactive experience, requiring a controller to point to objects, select, drag, and drop, scroll up or down, navigate between different VR spaces, and other functions.

➢ More futuristic models may provide haptic gloves, where users can navigate through the virtual world using their fingers, gestures, touch, and other naturalized movements.

VR Headsets

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VR Headsets

Basic Components VR Headsets

1. An array of sensors

2. Lenses and screens

3. Immersive audio

4. Controllers
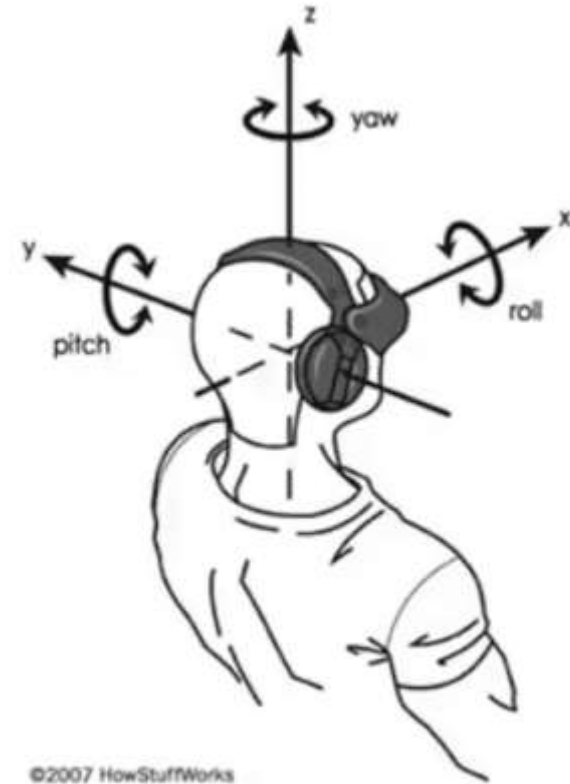
Basic Components VR Headsets

An array of sensors

➢ Unlike 2D video, virtual reality is not a passive experience.

➢ Users interact with virtual worlds, which adapts according to the user's continuous inputs.

➢ To achieve this, VR headsets come with a number of sensors, and some devices even have a six degrees of freedom (6DoF) system for head tracking.

➢ Using gyroscopes, accelerometers, and other sensors, a 6DoF system tracks head movements and repositions the display accordingly.

➢ Some headsets also have eye-tracking sensors that can understand when eyes focus on a VR object or location.

Basic Components VR Headsets

6DoF has the following characteristics:

1. Allows learners to move freely throughout their environment

2. Learners can look left and right, up and down, and rotate their head

3. Requires more in-depth development and programming

4. Allows learners to move digital objects throughout the environment

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Basic Components VR Headsets

Lenses and screens

➤ The lenses and screen setup makes up the bulk of the VR headset's hardware.

➤ There are <u>stereoscopic lenses</u> positioned between the screen and your eyes that distort the image into appearing three-dimensional.

➤ Additionally, images in VR headsets appear to move side-to-side to recreate a 360-degree experience and is achieved by subtly moving the display content in response to head tracking data.

Basic Components VR Headsets

Immersive audio

➢ A stereo audio feed comes from two directions or one for each ear, but in the real world, users have a much more layered experience of sound where audio is directly linked to our perception of distance and space.

➢ VR headsets mimic this experience using 360-degree or immersive audio technology.

Basic Components VR Headsets

Controllers

➢ Finally, VR headset controllers are your bridge between the real and the virtual worlds.

➢ Interestingly, there are a variety of controllers you can use, apart from the usual set of two handheld controllers that come with most headsets.

What makes a Good VR Headset?

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What makes a Good VR Headset?

Key features that characterize a good VR headset:

1. **Light form factor:**

   ✓ The screen and sensors can add to the headset's bulk, and anything heavier than 500-600 grams will be difficult to use on a regular basis.

   ✓ This is why Apple's upcoming mixed reality (MR) headset's current 150-gram weight is such a breakthrough.

2. **Easy to use controllers:**

   ✓ The controllers will inevitably have numerous buttons, wheels, and sticks to help navigate in VR.

   ✓ They must be ergonomically designed and provide a seamless user experience.

3. **Onboard storage:**

   ✓ While most VR headsets rely on the Internet and the cloud, it is good to have at least 32GB of onboard storage to install applications, ensure timely updates, and store a few files without slowing down the system.

Crucial Components of VR Evolution

➢ Field of View

➢ Frame Rate

➢ Spatial Audio and Sound Effects

➢ Position and Head Tracking

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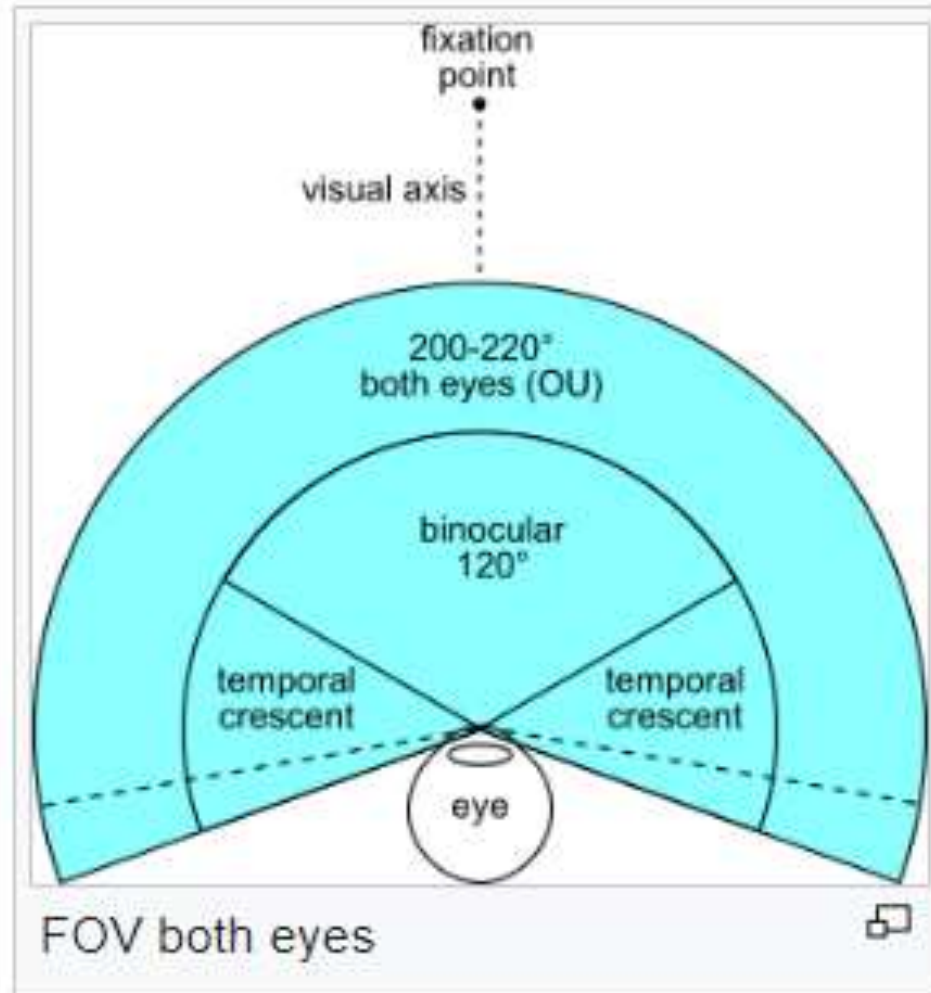# Crucial Components of VR Evolution

Field of View:

➢ Field of view has been a common concern for VR developers.

➢ For VR to immerse us in a new environment, it needs to mimic our field of view.

➢ Unfortunately, human beings are capable of a much wider field of view in general than headsets can typically provide.

➢ The average human can see around 220-degrees of surrounding content.

➢ A VR headset can do around 180 degrees.

➢ The field of view in your headset dictates the world you see around you, and how much it mimics your current environment.

Crucial Components of VR Evolution

Crucial Components of VR Evolution

Frame Rate:

➤ Frame rate is the other visual element that defines how VR works.

➤ Frames need to move at an incredible pace within a VR headset screen to mimic what we see in real life.

➤ Experts believe that the human eye can handle up to 1000 frames per second.

➤ The human brain, however, never receives the same detail as this.

➤ Most developers have found that anything less than 60 FPS causes feelings of disorientation and nausea.

➤ Experts are trying to push more towards 120 FPS.

Crucial Components of VR Evolution

Spatial Audio and Sound Effects:

➢ A lot of people get caught up in the idea of VR being a visual experience. However, the reality is that VR tools attempt to immerse you fully into a different space.

➢ This demands more than just a good view of your surroundings. You also need spatial audio, or 360-degree sound to help you feel like you're in that new environment.

➢ The better the audio, the more immersed you feel, thanks to the sounds that seem to come from behind, above, or to the side of you.

➢ The VR headsets in the modern landscape use spatial audio to convey which direction you need to turn in and support a sense of "realism" when you're moving through different environments and experiences.

Crucial Components of VR Evolution

Position and Head Tracking:

➤ What makes VR truly engaging is the fact that you can move around in a virtual space, and that environment will adjust to your position.

➤ Headsets that use 6 degrees of freedom can check on your position in a room, and show the direction that your head is pointed towards.

➤ This means that you can have complete autonomous movement through a space. Sensors outside of the VR headset can also help you to stay safe when you're moving around in a room.

➤ The haptic feedback sensors and other tracking technologies that are used to embed controller options into VR can make the landscape feel more immersive too.

Thank You!!