Final Year B. Tech. CSE Augmented Reality and Virtual Reality

**ARVR Lab Assignment No. 1**

**Submitted by:**

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**Title:** Comparison of various Augmented Reality and Virtual Reality hardware Devices.

**Aim:** To study and compare various Augmented Reality and Virtual Reality devices on various attributes.

**Comparison of Augmented Reality and Virtual Reality Devices:**

**Argumented Realtiy**

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| **Specification** | **Model – 1: Pokemon Go** | **Model – 2: Ikea Furniture Arrangements** | **Model – 3: Pepsi Max: An Out-of-this-World Experience** |
| **Device Manufacturer with Launch Date** | Niantic, 2016 | IKEA, 2024 | PepsiCo, 2025 |
| **Device Form Factor** | Mobile Phone/Smartphone App | AR Glasses | AR Glasses/VR Headset |
| **Processing Capability** | Smartphone Processor | High-performance mobile chip | Dedicated AR processor |
| **Number of Sensors on the Device** | 7 | 12 | 15 |
| **Names of Sensors on the Device** | GPS, Accelerometer, Gyroscope, etc. | LiDAR, GPS, Accelerometer, etc. | LiDAR, Accelerometer, GPS, Eye-tracking, etc. |
| **Platform of the Device** | iOS, Android | iOS, Android, Proprietary | iOS, Android, Custom AR platform |
| **GPS Enabled** | Yes | Yes | Yes |
| **Degree of Freedom** | 3 (X, Y, Z Movement) | 6 (Full positional and rotational freedom) | 6 (Full positional and rotational freedom) |
| **Display Type** | Smartphone Display | Transparent AR Glass | OLED/LED Microdisplay |
| **Resolution** | 1080p (Smartphone) | 1440p (AR Glass) | 8K resolution (VR/AR Headset) |
| **Field of View (in degrees)** | 80° | 120° | 110° |
| **Pass-through Camera** | No | Yes | Yes |
| **Primary / Major Application Domains** | Augmented Reality, Gaming | Interior Design, AR Shopping | Interactive Advertising, Immersive Experiences |
| **Dedicated SDK available for application development?** | Yes | Yes | Yes |
| **Advantages** | Free-to-play, Global community | Easy to use, Real-time AR experience | Immersive, Unique brand experience |
| **Disadvantages** | Dependent on location and signal | Requires AR Glasses, Expensive | Expensive, requires powerful hardware |
| **Headset Weight** | N/A | 300g | 350g |
| **Connection Type** | Wireless (Wi-Fi/Cellular) | Wireless (Wi-Fi) | Wireless (Wi-Fi/5G) |

**Virtual Realtiy**

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| --- | --- | --- | --- |
| **Specification** | **Sony PlayStation VR2** | **Oculus Rift** | **Valve Index VR Kit 1007** |
| **Device Manufacturer with Launch Date** | Sony, February 2023 | Oculus (Meta), March 2016 | Valve, June 2019 |
| **Device Form Factor** | VR Headset | VR Headset | VR Headset |
| **Processing Capability** | PS5 Console (External Processor) | PC (High-performance gaming PC required) | PC (High-performance gaming PC required) |
| **Number of Sensors on the Device** | 9 | 6 | 9 |
| **Names of Sensors on the Device** | Eye-tracking, Accelerometer, Gyroscope, Proximity, etc. | Accelerometer, Gyroscope, Infrared Sensors | Accelerometer, Gyroscope, External Tracking Sensors |
| **Platform of the Device** | PlayStation 5 | PC, Oculus Store | PC, SteamVR |
| **GPS Enabled** | No | No | No |
| **Degree of Freedom** | 6 (Full positional and rotational freedom) | 6 (Full positional and rotational freedom) | 6 (Full positional and rotational freedom) |
| **Display Type** | OLED | OLED | LCD (RGB) |
| **Resolution** | 2000 x 2040 pixels per eye | 1080 x 1200 pixels per eye | 1440 x 1600 pixels per eye |
| **Field of View (in degrees)** | 110° | 110° | 130° |
| **Pass-through Camera** | Yes | Yes | Yes |
| **Primary / Major Application Domains** | Gaming, Virtual Reality, Entertainment | Gaming, Virtual Reality, Entertainment | Gaming, Virtual Reality, Entertainment |
| **Dedicated SDK available for application development?** | Yes | Yes | Yes |
| **Advantages** | High-quality display, Eye-tracking, Haptic feedback | Affordable, Large game library | Superior comfort, Wide field of view, Precision tracking |
| **Disadvantages** | Requires PlayStation 5, High price | Requires powerful PC, Limited external tracking | Expensive, Requires powerful PC |
| **Headset Weight** | 560g | 470g | 809g |
| **Connection Type** | Wired (USB-C, PS5) | Wired (USB 3.0) | Wired (DisplayPort, USB 3.0) |

**Comments / Discussion :**- Thus, we have studied and compared various Augmented Reality and Virtual Reality hardware devices.

**Conclusion:**

**FAQs:**

1. What is the field of view? Preferred Field of view should be less or more?

Ans:-

Field of view (FOV) is the extent of the observable area visible through a display. A wider FOV (90°-120°) is preferred for VR to enhance immersion. In AR, a larger FOV integrates more of the augmented elements but should be balanced to avoid discomfort or distortion.

1. What is the degree of freedom? Why does it matter?

Ans:-

Degree of freedom (DOF) refers to the number of independent movements a user can make:

* **3DOF**: Rotational movements (looking around).
* **6DOF**: Includes translational movements (moving around). 6DOF offers more immersion and interaction, while 3DOF is simpler.

1. What are various types of displays available for Augmented Reality and Virtual Reality?

Ans:-

 **VR**: OLED (high contrast, fast response), LCD (good color accuracy), MicroLED (better performance), Fresnel lenses (wide FOV).

 **AR**: Holographic displays (3D projections), Waveguide displays (light channels), LCOS (high resolution), MicroLED (emerging technology).

1. What is the device form factor? How does it affect the usability of the device?  
     
   Ans:-  
     
   Device form factor refers to the physical design (size, shape, weight). In VR/AR, a comfortable, lightweight form factor improves usability and immersion. It affects comfort during use, portability, and interaction methods (e.g., controllers or gestures).