AR/VR/MR

Decoding AR & VR

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Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR) represent the forefront of immersive technologies, reshaping how we interact with digital content and our surroundings. In this introduction, we'll explore the basic concepts of AR, VR, and MR, and their applications in various industries. Additionally, we'll touch upon the importance of rigorous testing in ensuring the quality and functionality of AR, VR, and MR applications.

Types of VR

Non-Immersive VR: This type of VR is characterized by a limited sense of immersion. It usually involves viewing a computer-generated environment on a screen, such as a desktop or a mobile device. Non-immersive VR can include 360-degree videos or interactive applications where users can navigate a virtual space with basic controls.

Semi-Immersive VR: Semi-immersive VR offers a greater level of immersion compared to non-immersive VR. It typically involves using head-mounted displays (HMDs) that cover the user's field of view. These displays provide a more immersive experience by blocking out the physical world to a certain extent. However, the user may still be aware of their real-world feel completely transported to a virtual environment. It usually involves using advanced HMDs, often accompanied by motion-tracking sensors and controllers. Fully immersive VR can provide a more convincing sense of being present in a virtual world, with realistic visuals and interactive experiences.

Augmented Reality (AR): Although not strictly considered VR, augmented reality blends virtual elements with the real world. AR overlays digital content onto the user's real-world environment, typically viewed through a transparent display, such as smart glasses or a smartphone. Users can see and interact with virtual objects while maintaining an awareness of their physical surroundings.

Mixed Reality (MR): Mixed reality combines elements of both virtual reality and augmented reality. MR systems enable users to interact with virtual objects that are anchored and integrated into the real-world environment. This allows for more seamless blending of digital content and physical reality, with objects appearing to coexist and interact with the real world.

Difference between VR, AR and MR? Three real life examples.

Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) are all technologies that enhance our perception of the physical and digital worlds. While they share similarities, there are key differences between them.

Virtual Reality (VR):
Virtual Reality immerses users in a completely simulated digital environment, isolating them from the real world. It typically involves wearing a head-mounted display (HMD) that tracks the user's movements and displays a computer-generated 3D environment. VR provides a sense of presence and allows users to interact with and explore virtual worlds.
Real-life examples:

Gaming: VR gaming allows players to fully immerse themselves in a virtual game world, interacting with virtual objects and environments. Games like "Beat Saber" and "Half-Life: Alyx" provide immersive experiences through VR headsets.

Training and Simulations: VR is used in various industries for training purposes. For example, pilots can practice flying in a virtual cockpit without the risks associated with real flight. Medical professionals can simulate surgeries or learn complex procedures in a safe environment.

Virtual Tours and Travel: VR enables virtual tours of real-world locations. Museums, historical sites, and travel agencies use VR to provide immersive experiences, allowing users to explore distant places without physically being there.

Augmented Reality (AR):
Augmented Reality overlays digital content onto the real-world environment, enhancing it with additional information or virtual objects. AR is typically experienced through smartphones,

Real-life examples:
Mobile Apps: AR is popularized through mobile apps like "Pokémon Go," where virtual creatures are superimposed onto the real-world environment, encouraging users to explore their surroundings to capture and interact with them.

Navigation and Wayfinding: AR can be used to provide real-time directions, street names, and points of interest overlaid onto a live camera feed, helping users navigate unfamiliar areas.

Retail and Shopping: AR is used by retailers to enhance the shopping experience. Customers can use AR apps to visualize how furniture would look in their homes before making a purchase, or try on virtual clothes without physically trying them on.

Mixed Reality (MR):
Mixed Reality combines elements of both VR and AR, allowing digital objects to interact with the real world and vice versa. MR systems enable users to see and interact with virtual content while still maintaining awareness of their physical surroundings. They often use transparent displays or smart glasses.

Real-life examples:
Industrial Design and Prototyping: MR is utilized in product design and prototyping. Engineers can overlay virtual 3D models onto physical objects, enabling them to visualize and manipulate designs in real-time.

Remote Collaboration: MR enables people in different locations to collaborate and interact in a shared virtual space. They can see and communicate with each other as if they were physically present, enhancing remote teamwork and communication.

Architecture and Construction: MR can assist architects and construction professionals in visualizing and analyzing building designs. Virtual models can be overlaid onto real-world construction sites, allowing for better planning, evaluation, and communication of design concepts.

What are the challenges while testing VR applications:
Time Restrictions: Testing AR/VR applications requires additional time due to the complexity of the technology involved. QA teams need to account for the time required to set up the necessary hardware, such as VR headsets or AR devices, and ensure they are properly calibrated.

Additionally, the testing process itself can be time-consuming as it involves thoroughly exploring the virtual environment and interactions. The time restrictions can pose challenges in meeting project deadlines and may require careful planning and allocation of resources.VR testing can often leave testers experiencing motion sickness, vision impairment and headaches. Thirty minutes is the recommended time frame to use AR or VR devices, which can create a backlog of tests. QA testers may spend more time reporting augmented reality and virtual reality bugs and less time testing the experience of the product. Furthermore, AR and VR QA testers must be supervised during testing to prevent injuries within the testing group, which can limit when the configurations, making it crucial to test early in the development cycle. If testing is delayed until the later stages of development, it becomes challenging to identify and fix critical issues that may arise due to hardware limitations, performance bottlenecks, or compatibility problems. QA teams should collaborate closely with development teams from the beginning to ensure comprehensive testing throughout the project's lifecycle.QA teams often don't have access to test VR software or review augmented reality test cases until the product is well underway in development. This leads to catching augmented reality defects and virtual reality bugs late in the development cycle.

Multiple Testing Platforms: AR/VR applications are typically designed to run on various platforms, such as different VR headsets (e.g., Oculus Rift, HTC Vive) or AR devices (e.g., HoloLens, Magic Leap). Each platform may have unique hardware specifications, input methods, tracking systems, or rendering capabilities. Testing across multiple platforms introduces complexity, as QA teams need to verify that the application functions correctly and performs optimally on each supported platform. It requires extensive device coverage, specialized testing equipment, and expertise in handling platform-specific nuances.To effectively test VR software and AR applications, a multi-level analysis across multiple output streams is required. In other words, a QA tester must go beyond one platform of testing during AR and VR testing for accurate results.

Testing must include:

- Testing the actual AR VR experience on both the device and desktop environment
- Reviewing tester conversation and body language during testing
- Gathering physiological data about the tester, as captured by the wearable device or test supervisor observation

Which areas can we use VR applications?

- **Gaming and Entertainment:** VR provides immersive gaming experiences, allowing players to feel like they are part of the game world. It can also be used for virtual tours, interactive storytelling, and cinematic experiences.

- **Education and Training:** VR can enhance learning by creating virtual environments for simulations, training, and educational experiences. It can be used in fields such as medicine, engineering, aviation, and military training.

- **Architecture and Design:** Architects and designers can use VR to create and explore virtual models of buildings and spaces. This enables clients and professionals to visualize and experience designs before construction begins.

- **Healthcare and Therapy:** VR is used in pain management, rehabilitation, exposure therapy, and mental health treatments. It can create realistic simulations to aid in medical training, phobia treatment, and anxiety reduction.

- **Virtual Collaboration:** VR allows people to meet and collaborate in virtual environments, regardless of their physical locations. It is particularly useful for remote teams, teleconferencing, and virtual meetings.

marketing efforts by giving potential visitors a taste of what they can expect.

- **Manufacturing and Product Design**: VR helps in visualizing and prototyping products before they are manufactured. It assists in design reviews, ergonomics testing, and production planning.

- **Real Estate:** VR enables virtual property tours, allowing potential buyers or tenants to explore properties remotely. It saves time and resources by narrowing down choices before physical visits.

- **Sports and Fitness:** VR applications can simulate sports environments and provide raining experiences for athletes. It can also be used for virtual fitness classes and personal training sessions.

- **Art and Creativity:** VR opens up new possibilities for artistic expression, allowing artists to create immersive and interactive virtual artworks and experiences.

Disadvantages of VR applications

- **Cost:** VR systems can be expensive, requiring high-end computers or specialized gaming consoles, along with the VR headset and controllers. This cost can be a barrier for many individuals, limiting widespread adoption.

- **Hardware Requirements:** VR experiences demand powerful hardware to run smoothly, including a capable graphics card, CPU, and sufficient memory. Not all users have access to or can afford the necessary hardware upgrades, limiting their ability to enjoy VR.

- **Physical Discomfort:** Extended use of VR can lead to discomfort and motion sickness, often referred to as "simulator sickness." This occurs due to a mismatch between the visual cues in the virtual environment and the physical sensations experienced by the body, leading to dizziness, nausea, and headaches.

- **Health Concerns:** Along with motion sickness, VR may cause other health issues. Prolonged use can strain the eyes and lead to eye fatigue, eye strain, and potentially long-term vision problems. Additionally, users may experience postural issues or collisions with objects in the real world while immersed in the virtual environment.

- **Social Isolation:** VR is an immersive technology that isolates users from the physical world. While this can be appealing for gaming or solitary experiences, it may limit social interactions, preventing face-to-face communication and physical connections with others.

- **Limited Accessibility:** VR experiences may not be accessible to everyone, particularly individuals with disabilities. People with visual impairments, hearing impairments, or mobility limitations may face difficulties interacting with VR content, making it an exclusionary technology for certain populations.

diverse and engaging content, leading to a reduced replay value and potentially limiting the long-term appeal of VR.

- **Safety Concerns:** When fully immersed in a virtual environment, users may be unaware of potential dangers or hazards in the real world. Accidents can happen if users trip over objects or collide with walls, furniture, or other people while their attention is focused on the virtual space.

- **Addiction Potential**: VR can be highly immersive and captivating, leading to potential addiction or excessive use. Spending excessive amounts of time in virtual worlds may result in neglect of real-world responsibilities, relationships, and daily activities.

VR devices lenses:
Virtual Reality (VR) systems typically use two primary types of lenses: fresnel lenses and hybrid lenses. These lenses are designed to provide an immersive visual experience by optimizing the way the display interacts with the user's eyes.

Fresnel Lenses: Fresnel lenses are commonly used in VR headsets due to their thin and lightweight design. They consist of a series of concentric ridges or steps on the surface, which helps reduce the overall thickness and weight of the lens while maintaining the required optical properties. Fresnel lenses are efficient in focusing light and provide a wide field of view for the user. They can bend and direct light rays effectively, allowing the VR headset to create a larger virtual environment.

Hybrid Lenses: Hybrid lenses are a more recent development and aim to improve upon the limitations of traditional fresnel lenses. These lenses combine different optical elements to achieve better image quality and reduce the "screen-door effect" caused by the visible gaps between pixels. Hybrid lenses may include a combination of fresnel elements, aspherical elements, and other lens technologies to provide a clearer and more immersive visual experience. They can help enhance the sharpness, color accuracy, and reduce visual artifacts in VR displays.

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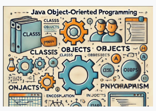

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