Group – 8

TOPIC : MONITOR BASED SYSTEMS

2021UCS1577 – J MUNIYANDI
2021UCS1578 – NABEEL AHMED
2021UCS1579 – VANSH NARULA
2021UCS1580 – LOKESH
2021UCS1581 – RAVEESH GUPTA
2021UCS1582 – PARVESH SAINI
2021UCS1583 – DEVESH KUMAR SHARMA
2021UCS1584 – VARSHA
2021UCS1585 – NITISH JANGRA
2021UCS1587 – TEJAS MISHRA

Monitor Based Systems

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What is AR?

AR technology that superimposes digital content like images, sounds, and other sensory enhancements on the real world. By merging digital information with the physical environment, AR provides a more interactive and enriched view of reality.

Unlike Virtual Reality (VR), which immerses users in a completely digital environment, AR overlays digital elements on the actual environment, enabling users to interact with both at the same time.

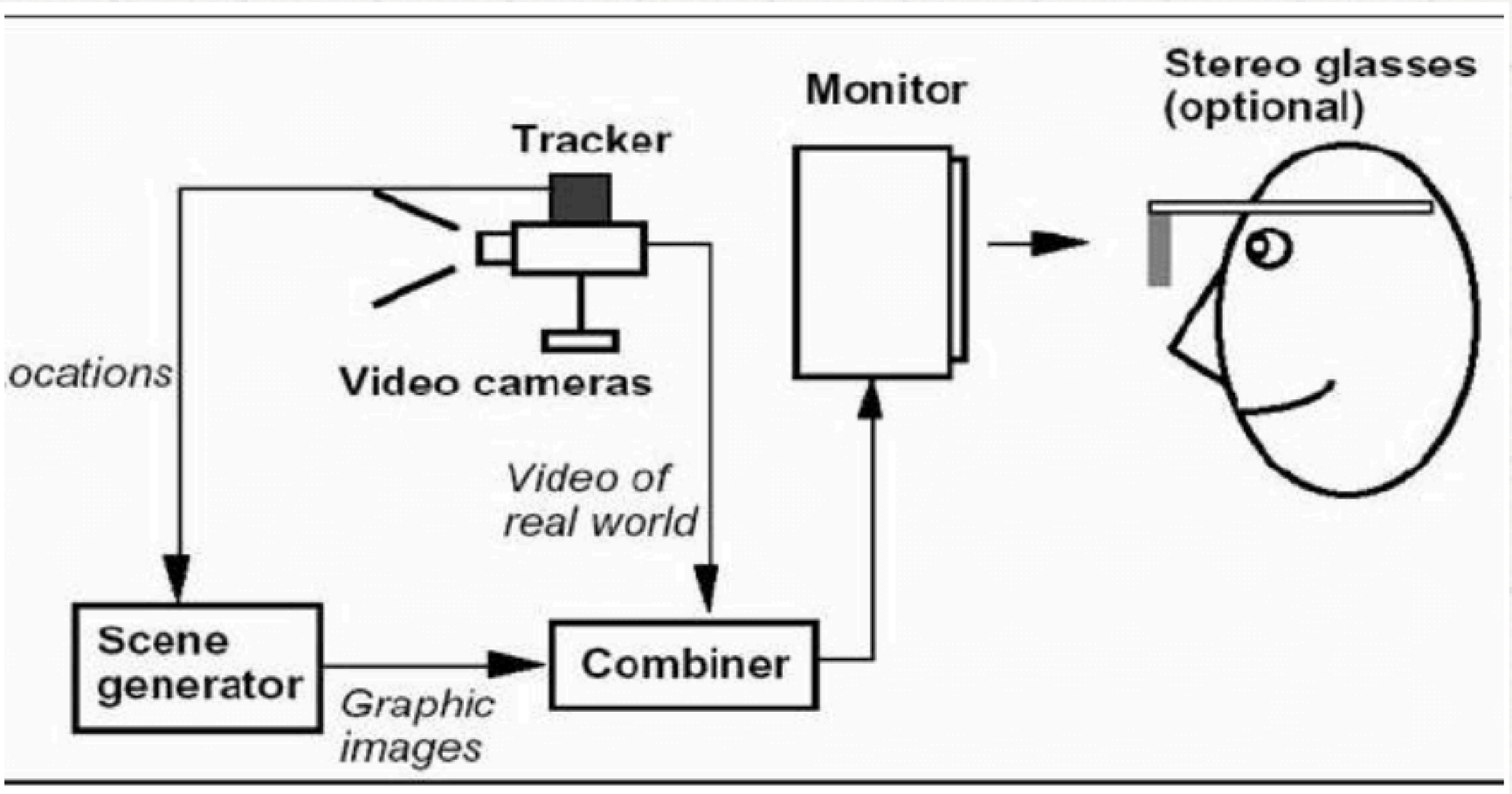
Monitor-Based AR

- Monitor-Based AR projects AR experiences onto screens like computer monitors, TVs, or projection surfaces rather than wearable devices. In this setup, a camera captures real-world scenes, and AR elements are displayed on the monitor as an overlay.

- In the context of augmented reality (AR), monitor-based systems use standard 2D or 3D screens to superimpose digital information over real-world objects, offering an AR experience without requiring specialized devices like headsets or smart glasses.

- It provides an affordable and accessible way to experience AR without needing special hardware, making it ideal for collaborative environments like exhibitions or classrooms.

System Components



System Components for a monitor-based AR system

1. Display Monitor

- The display monitor is where users view the augmented reality content. This can be any screen, like a computer monitor, TV, or tablet, that displays digital overlays on the real-world view.

2. Camera

- The camera captures real-world images and streams them in real-time, allowing the AR software to recognize and track physical environments. It acts as the 'eyes' of the AR system.

3.Computing Device

- The computing device (PC, laptop, or mobile device) processes the camera feed and manages AR overlays. It runs the AR software, processes visual data, and generates digital elements to be superimposed on the live feed.

4.Augmented Reality Software

- The software processes images, detects objects or markers, generates digital content, and blends this content seamlessly with the real-world camera feed.

- **Examples:** AR SDKs: ARCore (Google), ARKit (Apple), and Vuforia

5.Tracking System

- The tracking system keeps virtual objects aligned with the real-world environment by detecting the position and orientation of physical objects in real time. It ensures virtual elements remain fixed in relation to the physical world, even if the camera or objects move.

Advantages

Accessibility and Affordability

- Monitor-based AR is more accessible than headset-based AR systems, as it utilizes standard displays like monitors or TVs. This reduces the need for costly headsets or AR glasses, making it more affordable for both developers and users.

Easy Setup and Usage

- Setup is straightforward, requiring only a display and camera, making it ideal for environments where specialized equipment or complex installation might be impractical. Users need minimal training, as the interaction mechanisms are often familiar, such as mouse or touch controls.

Multi-User Viewing

- Monitor-based AR allows multiple people to view the AR experience simultaneously, making it excellent for collaborative environments like education, group presentations, and retail demonstrations.

Disadvantages

Limited Immersion and Depth Perception

- Monitor-based AR lacks the immersive quality of wearable AR systems like headsets or smart glasses, which create a 3D experience that feels more natural. Users view AR content through a 2D screen, which reduces the sense of depth and realism, making the experience less engaging, especially for applications requiring full immersion.

Single Point of View

- With monitor-based AR, users are limited to a single, fixed viewpoint aligned with the camera. This can make it difficult to view AR content from different angles or perspectives, limiting the user's ability to interact with or inspect digital objects realistically.

Reduced Interaction Capabilities

- Interaction in monitor-based AR is often limited to direct screen interaction (via mouse, keyboard, or touchscreen) or gesture-based systems that aren't as intuitive as natural hand gestures or head movements in immersive AR.

Monitor-Based AR vs. Head-Mounted AR

MONITOR-BASED AR

- Provides a less immersive experience as digital content is separate from the real world on a fixed screen.
- More comfortable for extended use, as it requires no wearable equipment.
- Has a fixed field of view limited by screen size, restricting user mobility.
- Typically less expensive and easier to set up, as it only requires a compatible monitor or device.

HEAD-MOUNTED AR

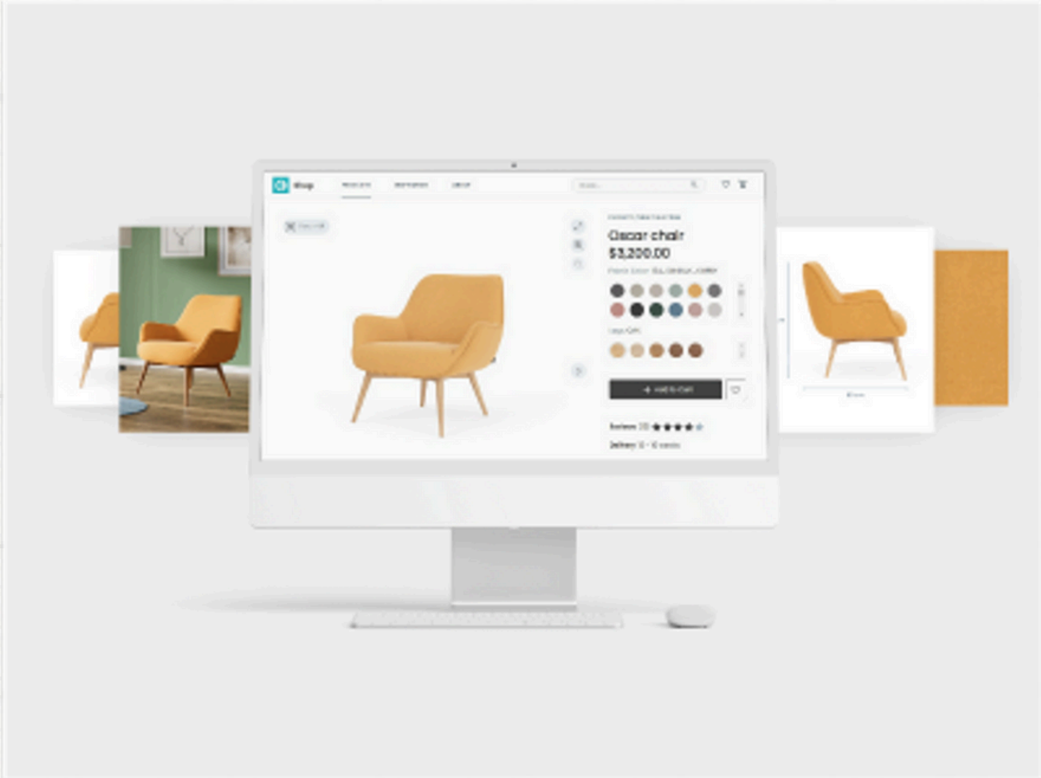
- Offers a more immersive experience by blending digital content directly into the user’s view.
- Can cause discomfort over long periods due to the device's weight and fit.
- Allows a dynamic, wide field of view with mobility, as AR content moves with the user.
- Generally more expensive and complex, requiring specialized headsets with AR capabilities.

Use Cases of Monitor-Based AR

Retail Product Visualization with Monitor-Based AR

- AR in retail enhances the shopping experience by allowing customers to view and even try out products virtually. For instance, a customer can visualize how a piece of furniture will look in their home or try on makeup virtually.

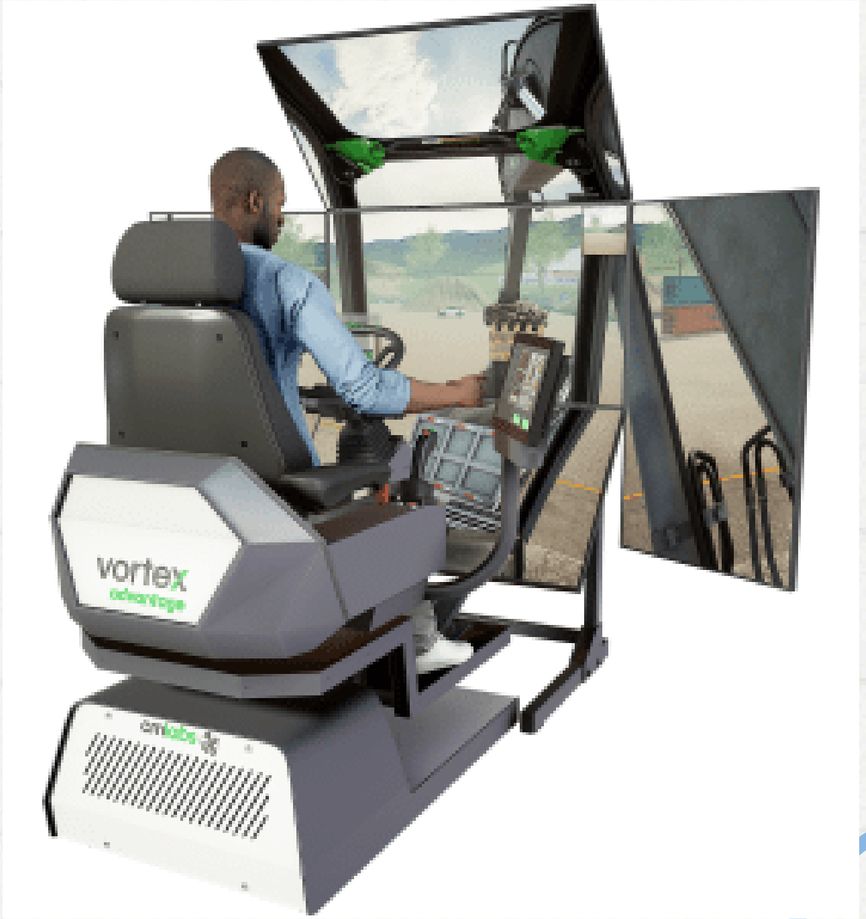
- This reduces the gap between online and in-store shopping, giving customers the confidence to make purchases based on accurate visual representation.



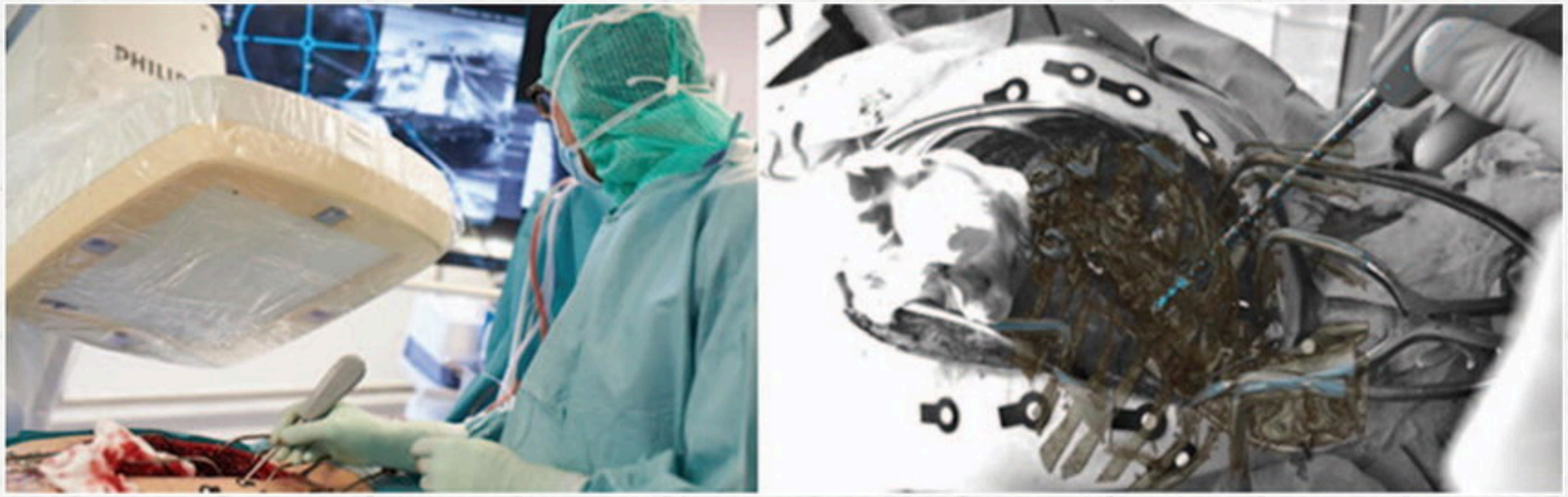
Training Simulators with Monitor-Based AR

- AR-enhanced simulators provide a safe and realistic environment for training individuals, especially in high-risk scenarios like driving, aviation, or heavy machinery operations.

- By augmenting real-time video feeds with additional information, trainees can experience real-world challenges and scenarios without the risk associated with actual field practice.



Medical Imaging with Monitor-Based AR



- AR in medical imaging helps healthcare professionals by overlaying virtual guides, labels, and anatomical information onto real-world images displayed on monitors, such as X-rays, MRI scans, or live video from surgical cameras.

- This provides enhanced visualization, aiding in accurate diagnosis, surgical planning, and in-procedure navigation.

Education with Monitor-Based AR

- In education, AR allows students to visualize complex topics. Monitor-based AR can be used to explore 3D anatomical models in biology or historical sites in history, making learning interactive.

- Monitor-based AR is used in training settings, allowing learners to safely practice procedures before handling them in real life. Medical training, for example, allows students to practice surgical techniques virtually.

Future Innovations

Enhanced Interactivity through Gesture Control

- Future AR systems are likely to incorporate advanced gesture recognition technologies, allowing users to interact with virtual elements more intuitively without relying on traditional input devices (mouse, keyboard).

Integration of AI and Machine Learning

- The integration of AI and machine learning can significantly enhance the capabilities of monitor-based AR systems, making them smarter and more adaptive.

Cross-Platform AR Experiences

- Future AR applications are expected to support seamless cross-platform functionality, allowing users to experience AR on multiple devices, from monitors to mobile devices and AR glasses.

Thank you