Addis Ababa Science and Technology University

College of Mechanical and Electrical Engineering

Introduction to Emerging Technologies

Augmented Reality

Contents

Learning Outcomes

After successful completion of this chapter, the students be able to:

- Explain augmented reality
- Explain the features of augmented reality
- Explain the difference between AR, VR, and MR
- Explain the architecture of augmented reality systems
- Describe the application areas of augmented reality

Brainstorming

What do you think about Augmented Reality?

Can you give an example of AR?

What is AR?

- **Augmented reality (AR)** is a form of emerging technology that allows users to overlay computer-generated content in the real world. AR refers to a live view of a physical real-world environment whose elements are merged with augmented computer-generated images creating a mixed reality. The augmentation is typically done in real-time and in semantic context with environmental elements.
- **Augmented Reality (AR)** is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics or GPS data.

…What is AR?

- **Augmented reality** is the integration of digital information with the user's environment in real-time. Unlike virtual reality, which creates a totally artificial environment, augmented reality uses the existing environment and overlays new information on top of it.

Source: internet

Virtual Reality (VR)

- VR is fully immersive, which tricks your senses into thinking you’re in a different environment or world apart from the real world. Using a head-mounted display (HMD) or headset, you’ll experience a computer-generated world of imagery and sounds in which you can manipulate objects and move around using haptic controllers. It is also called a computer-simulated reality.

Source: Introduction to emerging technologies page 83

…Virtual Reality (VR)

- VR refers to computer technologies using reality headsets to generate realistic sounds, images and other sensations that replicate a real environment or create an imaginary world. Advanced VR environment will engage all five senses (taste, sight, smell, touch, sound).
- Most VR headsets are connected to a computer (Oculus Rift) or a gaming console (PlayStation VR) but there are standalone devices (Google Cardboard is among the most popular). Most standalone VR headsets work in c th smartphones – you insert a smartphone, wear a he merse in the virtual reality

Source: Introduction to emerging technologies page 83

Augmented Reality (AR)

- In augmented reality, users see and interact with the real world while digital content is added to it by using the camera.
- Examples of AR include Snapchat lenses and the game Pokemon Go.
- Augmented Reality (AR) is a live, direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, vid

Source: Introduction to emerging technologies page 84

Mixed Reality (MR)

- Mixed Reality (MR) or hybrid reality, is the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real-time. It means placing new imagery within a real space in such a way that the new imagery is able to interact, to an extent, with what is real in the physical world we know

Source: Introduction to emerging technologies page 85

…Mixed Reality (MR)

Examples of MR: playing a virtual video game, grab your real-world water bottle, and smack an imaginary character from the game with the bottle.

The key characteristic of MR is that

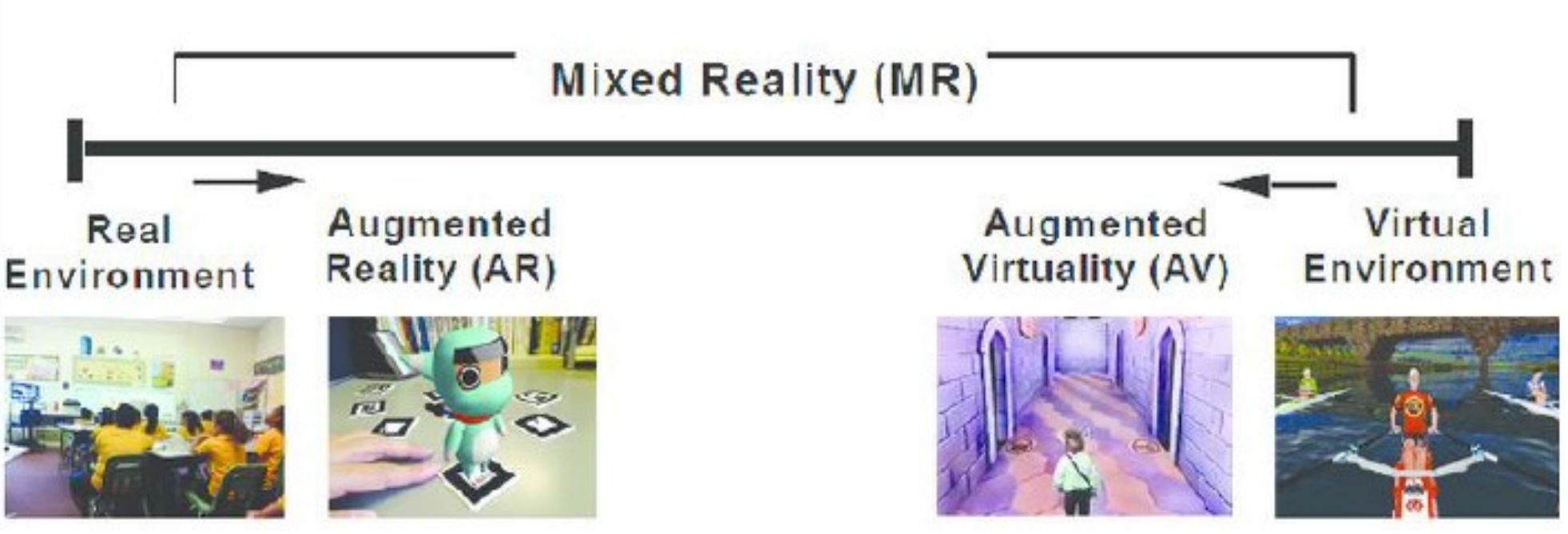
- The synthetic content and the real-world content are able to react to each other in real-time.
- Imagination and reality have never been so intermingled.

…Mixed Reality (MR)

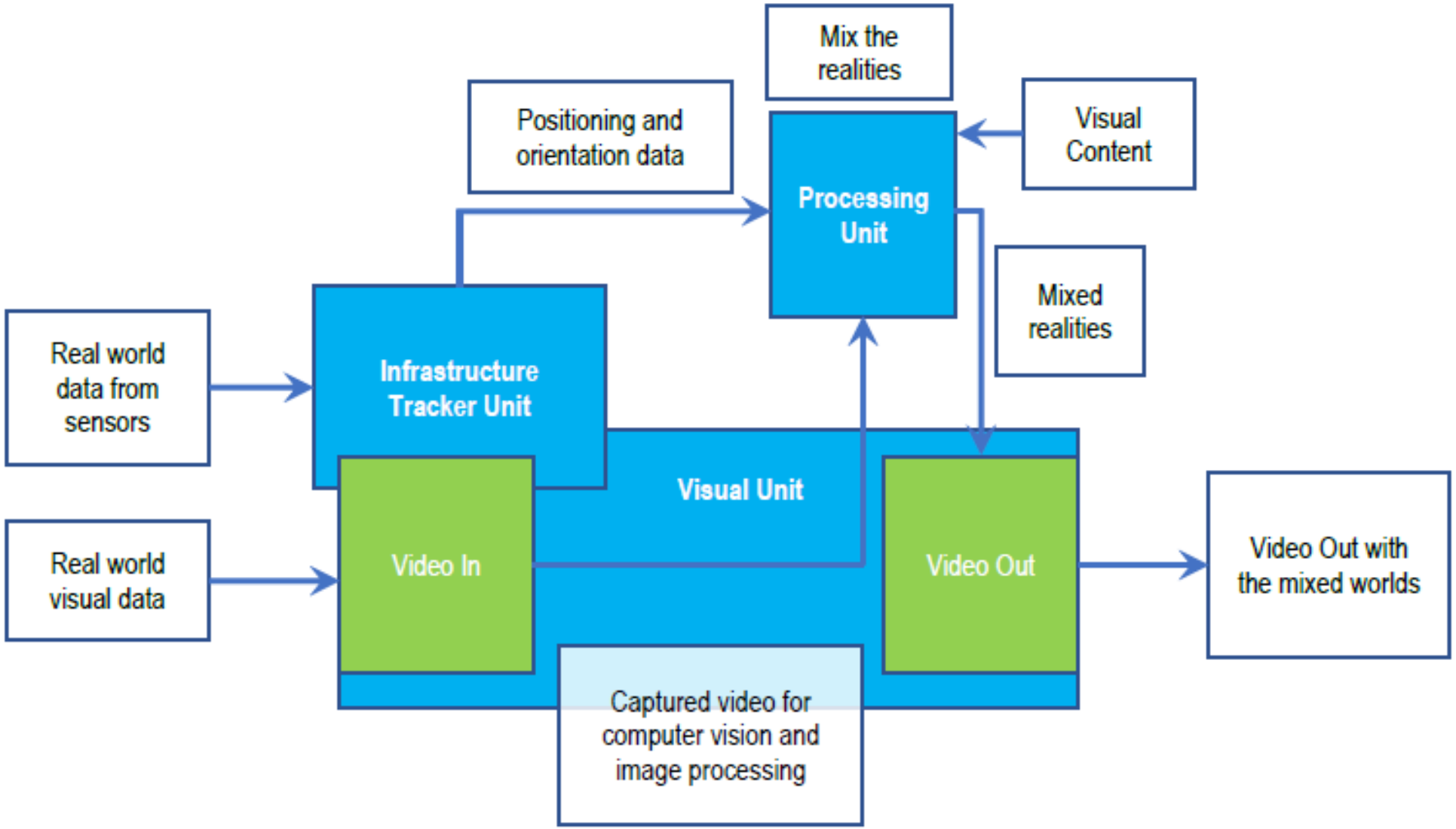
- MR allows you to see and immerse yourself in the world around you even as you interact with a virtual environment using your own hands—all without ever removing your headset.
- It provides the ability to have one foot (or hand) in the real world, and the other in an imaginary place, breaking down basic concepts between real and imaginary, offering an experience that can change

Source: Introduction to emerging technologies page 85

AR, VR and MR differences



Source: Introduction to emerging technologies page 82



Source: Introduction to emerging technologies page 87

Challenges of ARS

- HMDs lack in several aspects, such as ergonomics, high prices and relatively low mobility due to their sizes and connectivity features.
- HMDs interaction with the real environment, which places virtual interactive zones to the user, making the collision with these zones hard due to the difficulty to interact with multiple points in different depths.
- Alternative approaches to solve HMD is the use of monitors and tablets. Monitors are used as an option for the indirect view since the user does not look directly into the mixed [illegible] lets are used in direct view since the user points the [illegible] scene and looks directly into the mixed world. Bo[illegible]nes still have difficulties in getting a collision.

Applications of AR Systems

In education:

- Affordable learning materials
- Interactive lessons
- Higher engagement
- Higher retention
- Boost intellectual curiosity

Source: internet

Applications of AR Systems

In Medicine:

- Describing symptoms
- Nursing care
- Surgery
- Ultrasounds
- Diabetes management

Source: internet

…Applications of AR Systems

In Entertainment

- games
- music
- TV
- eSports
- heater

Source: internet

Review Questions

- Briefly explain AR,VR, and MR?
- What is the difference between augmented, virtual and mixed reality?
- Briefly explain the architecture of AR?
- Write down the challenges of AR?
- Write down some applications of AR system in education, entertainment and medicine?

END!!