CHAPTER 5

AUGMENTED REALITY (AR)

What is Augmented Reality

- Augment it derives from the Latin “augere” meaning ‘to increase’.
- **AR** is to combine, or mix, the view of the real environment with additional, virtual content that is presented through computer graphics; Virtual content is aligned and registered with the real objects.
- A digital layer is superimposed on the physical world, integrating the physical, real environment with virtual details to enhance or “augment” the real-world experience. Experienced with: **Smartphones**, **tablets**, **smart glasses** and other **head-mounted displays(HMD)**.
- Augmented reality holds the promise of creating direct, automatic, and actonable links between the physical world and

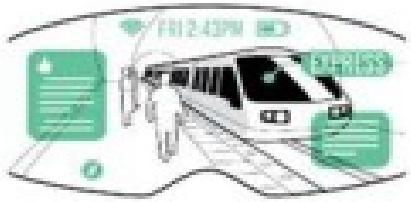
con’t…

- **AR** deals with the combination of real-world and computer-generated data.
- **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.
- **Augmented Reality** (AR) as a real-time direct or indirect view of a physical real-world environment that has been enhanced/augmented by adding virtual computer-generated information to it.
- A live direct or indirect view environment whose elements ar generated sensory input such as s data.



con’t…

- ✓ **AR** Supplements the real world with the virtual(computer generated) objects that appear to coexist in the same space as the real world



Augmented Reality is parts of the real world being overlapped so that you are able to use parts of both unlike MR which is mixed reality rather than an overlap.



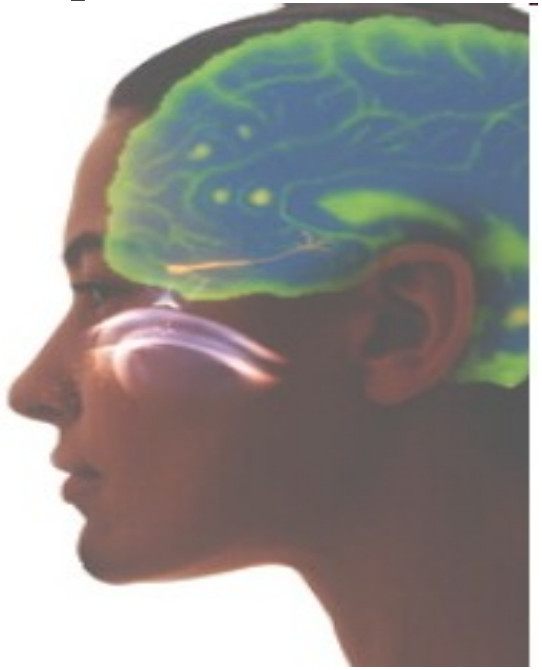
con’t…

- Adds digital elements to a live view often by using the camera on a smartphone.
- It does that by adding a computer-simulated layer of infor



con’t…

- The basic idea of augmented reality is to superimpose graphics, audio and other sense enhancements over a real-world environment in real-time.
- The graphics will then change to accommodate the user’s eye or h



Simulated augmented reality medical image

Virtual Reality (VR)

- Creates an interactive, completely digital environment that provides a fully enclosed, synthetic experience incorporating auditory and visual feedback, experienced often through the use of a head-mounted device (HMD).
- VR is a computer interfaces which tries to mimic real world beyond the flat monitor to give an immersive 3D (Three Dimension) visual experiences.
- VR generating a three dimensional image which appears to surround the user and it creates a totally artificial environment.
- 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

con’t…

- Advanced VR environment will engage all five senses (taste, sight, smell, touch, sound).
- It is also called a computer-simulated reality
- Examples of VR devices such as HTC Vive, the PlayStation VR,the valve index Oculus Rift or Google Cardboard and other headsets are opaque, blocking out your surroundings when you wear them
- 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) as well.
- Most standalone VR headsets work in combination with smartphones – you insert a smartphone, wear a headset, and immerse in the virtual reality.

con’t…

- **Virtual Reality** which basically means that it is able to draw the user into an immersive simulation. The real environment can be totally replaced with the sounds and sights giving you the feel as though you are actually present in the digital world and part of it.
- **VR** is a computer generated, interactive, 3D environment in which a person is immersed : virtual, interactive and immersive
- VR is about escaping the real world and going someplace you couldn’t normall



Virtual Reality isn’t the real world but instead a simulation that draws the user into the virtual reality.





Mixed Reality (MR)

- **Mixed Reality** is the merge of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time.
- Augmented reality is delivered through a handheld mobile device i.e. a smartphone or a tablet, mixed reality is delivered through head mounted see-through glasses.
- 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.
- In MR, you interact with and manipulate both physical and virtual items and environments, using next-generation sensing and imaging technologies.
- MR allows you to see and immerse yourself in the world around

Virtual reality (VR), Augmented Reality (AR) vs Mixed reality (MR)

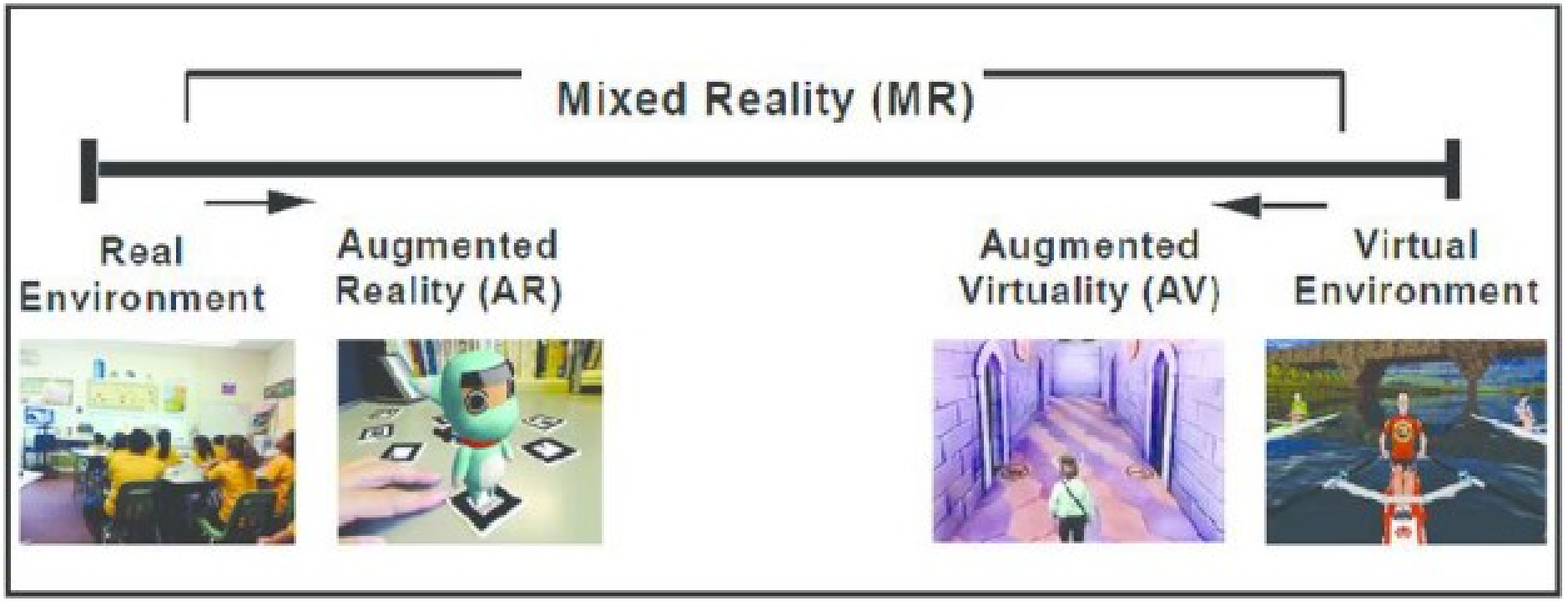
- Both considered immersive technologies, but they aren't the same.
- The main different is that:

Hardware requirement

- **VR** is completely Artificial or digital environment.
- **VR** programs require specialized VR headsets, noise-canceling headphones, cameras to track room space and boundaries, and sometimes even motion capture technology.
- **AR** overlay digital content on top of real world.
- **MR** is digital overlay that allows interactive virtual elements to integrate and interact with the real-world environment.
- **MR** hardware is still emerging and hasn't quite broken into the mainstream consumer market, most likely due to the price.
- **MR** applications sometimes require exponentially more processing

Con’t…

- **Virtual Reality**:VR is content which is 100% digital and can be enjoyed in a full immersive environment .
- **Augmented Reality**: AR overlays digital content on top of the real world
- **Mixed Reality** : MR is a digital overlay that allows interactive virtual



Con’t…



Virtual Reality (VR)

Completely digital environment. Fully enclosed, synthetic experience with no sense of the real world.



Augmented Reality (AR)

Real world with digital information overlay. Real world remains central to the experience, enhanced by virtual details.



Mixed Reality (MR)

Real and the virtual are intertwined. Interaction with and manipulation of both the physical and virtual environment.

The architecture of AR Systems

- Augmented Reality Systems (ARS) were usually designed with a basis on three main blocks, those are:
  - Infrastructure Tracker Unit:
    - Collecting data from the real world
    - The objects in the real and virtual worlds must be properly aligned with respect to each other, or
    - The illusion that the two worlds coexist will be compromised.
  - Processing Unit: Mixed the virtual content with the real content
  - Visual Unit: Video output
    - It is also known as Display unit (Head Mounted Display)

Con’t…

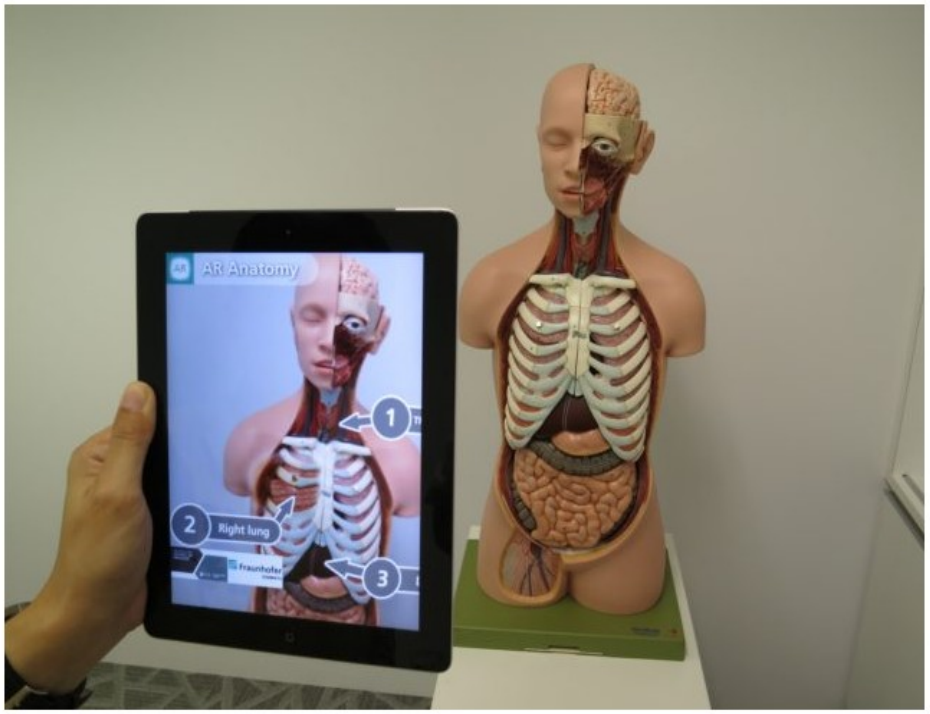
- Visual Unit can be classified into two types of system, depending on the followed visualization technology:

  1. Video see-through: It uses a Head-Mounted Display (HMD) that employs a video-mixing and displays the merged images on a closed-view HMD.

  2. Optical see-through: It uses an HMD that employs optical combiners to merge the images within an open-view HMD.

Applications of AR Systems

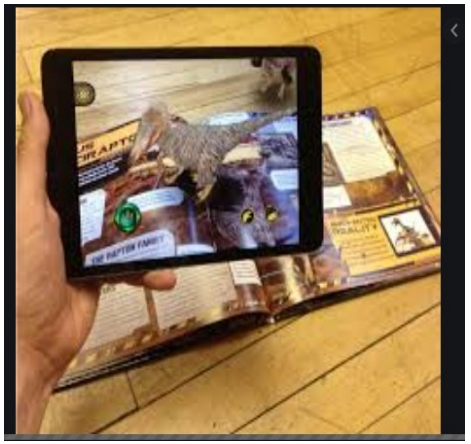
1. AR in education



- ✓ Reasons using AR in education
  - ❖ affordable learning materia
  - ❖ interactive lessons
  - ❖ higher engagement
  - ❖ higher retention
  - ❖ boost intellectual curiosity







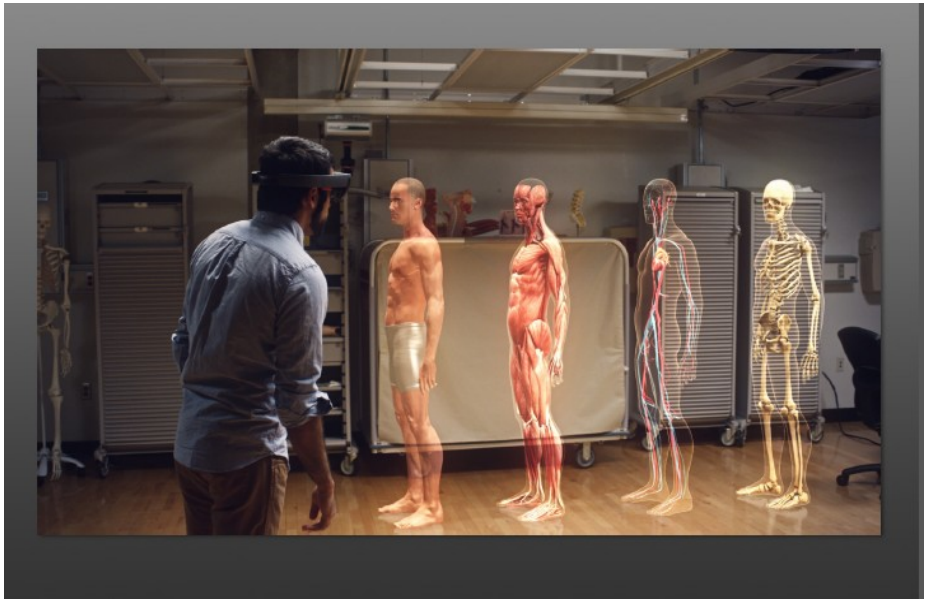
2. AR In Medicine

- ✓ AR has already made significant changes in the following medical areas:
  - ❖ surgery (minimally invasive surgery);
  - ❖ education of future doctors;
  - ❖ diagnostics;
  - ❖ AR tools may also aid to detect the signs of depression and other mental illnesses by reading from facial expressions, voice tones, and physical gestures.

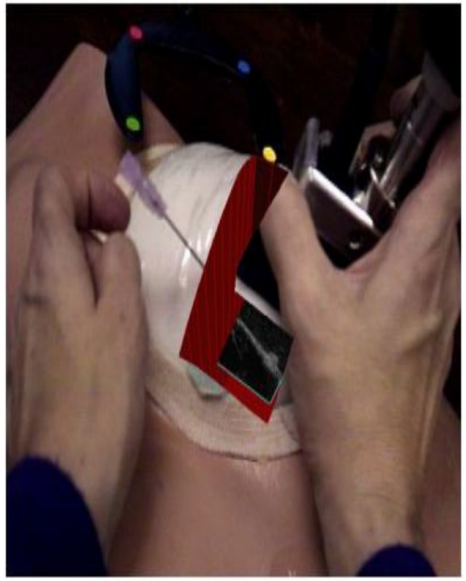
Con’t…

In medicine, AR has the following applications:

- A ways to learn about human anatomy
- Describing symptoms
- Nursing care
- Surgery
- Ultrasounds
- Diabetes management
- Navigation







Con’t…

- ✓ Generally, AR provides the following benefits to patients and healthcare workers:
  - ❖ Reduce the risks associated with minimally invasive surgery.
  - ❖ Better informed decisions about the right treatment and illness prevention.
  - ❖ Make procedures more tolerable.
  - ❖ Better aftercare
  - ❖ Medical training and education.
  - ❖ Assistance in medical procedures and routine tasks.

3. AR In Entertainment

- ❖AR in games
- ❖AR in music
- ❖AR on TV
- ❖AR in eSports
- ❖AR in the theater

4. AR In Military

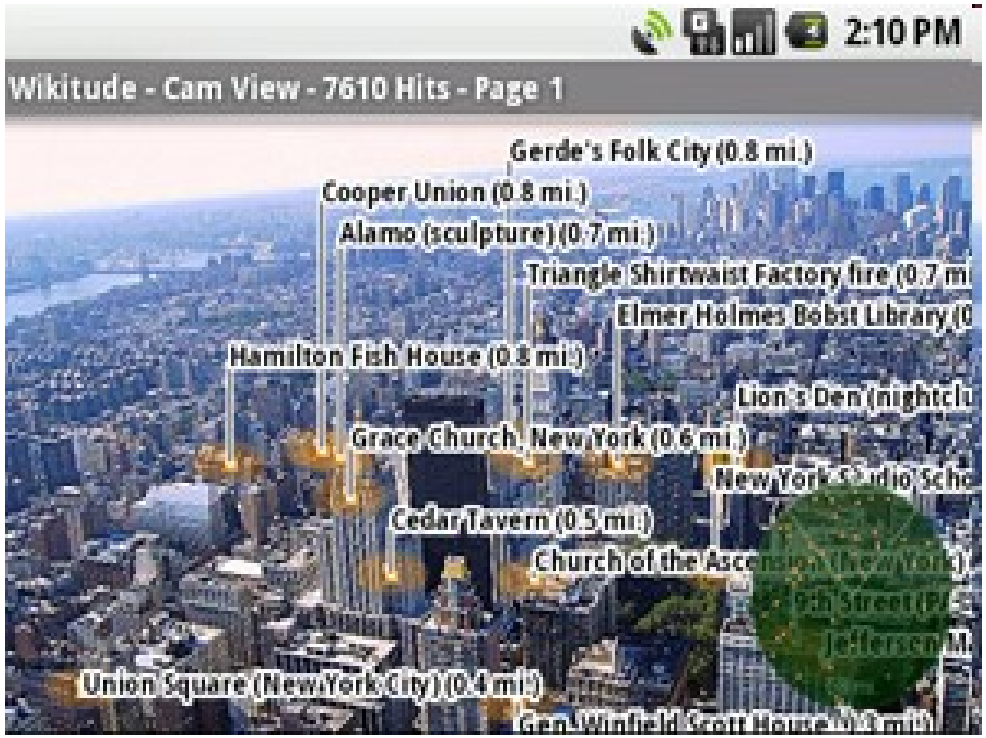
- Military camera
- Military training



5. AR In travel guide

- Mobile travel guide for the Android platform (open source OS for cell phones).
- Plan a trip or find about current surroundings in real-time.







Thank You!

