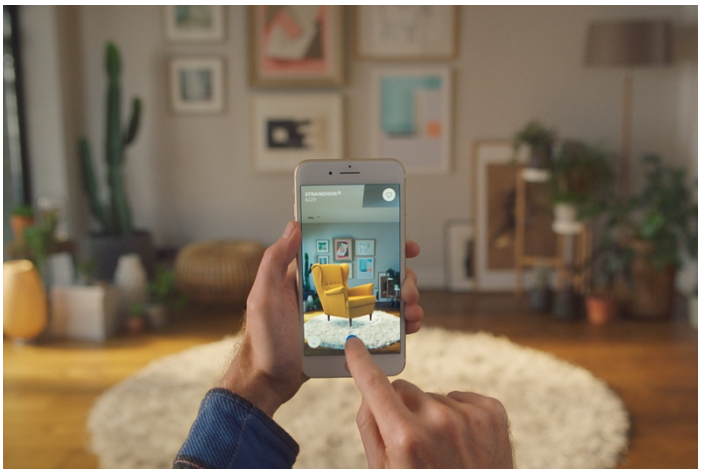
STREAM lab - Augmented Reality and Virtual Reality

Augmented Reality (AR)



Definition:

Augmented Reality or AR, is a technology that adds digital elements like images, sounds, or text onto the real world. For example, AR can help you see what a piece of furniture would look like in your living room before you buy it, all by using your phone or tablet.

How Does AR Work?

AR works through devices such as smartphones, tablets, or AR glasses. These devices have cameras and sensors that capture the real world around you. The AR software processes this real-world information and then adds digital objects to it. For example, if you are using an AR app to see what a new chair would look like in your living room, the camera captures the room, and the app places a digital image of the chair in that space on your screen. The sensors help the app understand where the digital object should be placed so that it looks like it is really there.

Key Components of Augmented Reality (AR)

Device (Smartphone, Tablet, or AR Glasses):
This is what you use to see AR. It could be your phone, a tablet, or special glasses that show you the AR experience.

Camera:
The camera on your device takes a picture or video of the real world around you. For example, it can show your living room on your screen.

Sensors:
Sensors are like little tools inside your device that know how it is moving or where it is pointing. They help the device understand its surroundings so it can place digital things in the right spot.

AR Software:
The software is like the brain of the AR experience. It takes the image from the camera and the information from the sensors, then adds digital objects (like a chair) to the real world on your screen.

Display:
The display is the screen on your phone or tablet (or the lenses in AR glasses). This is where you see the real world mixed with the digital objects. For example, you might see your living room on your screen with a new digital chair added.

Uses of AR in Different Industries:

- **Education**: AR can be used to visualize complex topics, like showing a 3D model of the human heart to help students understand how it works.

- **Healthcare**: Surgeons can use AR to get a better view of a patient's anatomy during operations, helping them perform more precise surgeries.

- **Retail**: AR allows customers to try out products virtually. For example, you can see how a new pair of glasses would look on your face without physically trying them on.

- **Entertainment**: AR can enhance your experience in museums! It can bring exhibits to life. For instance, when you point your device at a painting, AR might show you how the artwork was created, display information about the artist, or even animate the painting.

Virtual Reality (VR)

Definition:

Virtual Reality, or VR, is a technology that creates an entirely digital environment for you to explore. By wearing a VR headset, you can feel like you are in a completely different place, such as visiting a virtual museum or walking through a historical site, even though you are actually standing in your room.

How Does VR Work?

VR works by using a headset that completely covers your eyes blocking out the real world. The headset displays a 3D digital world that changes as you move your head. This creates the illusion that you are in a different place. The VR system also tracks your movements, allowing you to look around and explore this digital world as if you were really there. Some VR systems include controllers that let you interact with objects in this virtual space, like picking up items or pressing buttons.

Key Components of VR

VR Headset:

- The headset is like special goggles that cover your eyes completely. It shows you a 3D digital world, making you feel like you're in a different place, like under the ocean or in outer space**.**

Motion Tracking Sensors:

- These are like little helpers inside the headset that track where you are looking. If you turn your head to the left, the digital world turns with you, so it feels like you're really there.

Device:

- The VR headset needs to be connected to a computer or a smartphone. This device is the "brain" that creates the digital world and makes everything work smoothly.

Uses of VR in Different Industries:

- **Education**: VR can take students on virtual field trips to historical sites, like ancient Rome, allowing them to explore the environment as if they were there.

- **Healthcare**: Doctors use VR to practice complex surgeries in a risk-free environment, helping them improve their skills before operating on real patients.

- **Training**: Professionals like pilots and engineers use VR for training simulations, allowing them to practice their skills in a safe, controlled environment.

- **Entertainment**: VR allows people to take virtual tours of places they might not be able to visit in real life, like exploring the surface of Mars. This makes the experience feel as if you are truly there, walking through these incredible places.

Differences Between AR and VR

1. **How They Work:**

    - AR (Augmented Reality): AR adds digital elements to your view of the real world. You can still see everything around you, but with extra things like images, information, or objects added on top.

    - VR (Virtual Reality): VR creates a completely new, virtual world that you can explore. When you use VR, you can't see the real world at all—only the virtual one.

2. **Experience:**

    - AR: You stay in the real world but see digital content overlaid on top of it. For example, you might look at your kitchen table and see a virtual model of a new lamp you want to buy.

    - VR: You enter a different world that is fully virtual. It's like being inside a completely new place, such as walking on the moon or exploring an underwater world.

3. **Equipment:**

    - AR: You usually need a smartphone, tablet, or special AR glasses to see the digital content while still seeing the real world around you.

    - VR: You need a VR headset that covers your eyes and ears, blocking out the real world so you can be fully immersed in the virtual world.

4. **Purpose:**

    - AR: AR is often used to enhance the real world with additional information or to try out how something would look or work in a real environment (like seeing how a new piece of furniture would fit in your room).

    - VR: VR is used to create new experiences or simulate environments that would be difficult, impossible, or expensive to visit in real life (like practicing surgery or taking a trip to ancient Egypt).