

**AUGMENTED REALITY**

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**What is augmented reality?**

Augmented Reality (AR) refers to deploying virtual image over real-world objects.

**How is it different from virtual reality?**

Unlike in virtual reality where the user's perception of reality is completely based on virtual information, in augmented reality (AR) the user is provided with additional computer generated information that enhances their perception of reality.

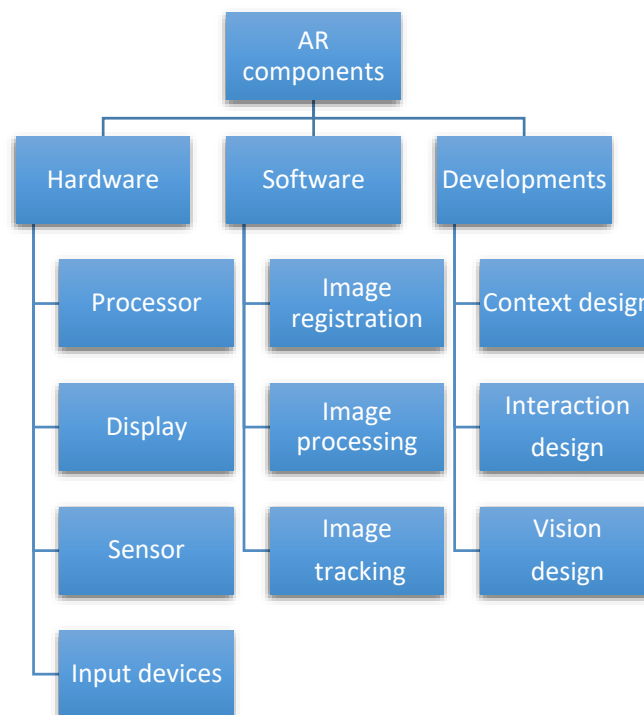
**Components of AR:**

Figure 1: Components of AR

**Types of AR:**

There are two broad types of augmented reality, these being: **marker-based and markerless**

1. **Marker-based AR** uses image recognition to identify objects that have been pre-programmed into your AR platform. Fiducial markers- something placed in the field as a reference, helps the AR device determine the position and orientation of its camera.  
-Example: Cisco made its devices scan-able to show people how to install them, overlaid in AR.

2. **Marker less AR** is a bit difficult to implement. Not having markers means that nothing has been pre-programmed into your device. The recognition algorithm in your device looks for patterns, colours, or other features that might tip it off.
- Example: Pokemon Go game tracks your location via GPS, then uses geographic data and your phone's clock to choose when and where to have Pokemon characters appear.



### Three main approaches used in the working of AR:

#### 1) **SLAM (Simultaneous Localization and Mapping):**

- SLAM is a set of algorithms which are capable of solving simultaneous localization and mapping problems.
- This approach of AR is used while solving the most complex simulation problems.
- Localization of sensors along with time mapping of the structure of surrounding environment is done simultaneously.
- It enables instant tracking, object and scene recognition and extended tracking
- It is used in robot cleaners, unmanned vehicles and automatic forklifts.

#### 2) **Recognition based:**

- Recognition based AR primarily uses camera to identify objects.
- Natural feature tracking and Marker-based AR technologies are implemented.
- Through this method marker image recognition along with calculation of its position and orientation can be done.
- One marker is recognized; it is converted into a virtual 3D version of the object for the user to be able to observe it from various angles.
- This feature is widely used for image tracking in magazines, product packaging, books, user manuals and catalogues.

#### 3) **Location based:**

- Location based AR relies on technologies that provide data about the location and the augmented reality visualizations are activated based on the inputs.

- It utilises GPS, digital compass, velocity meter, or accelerometer as its main components.
- This type is also called markerless AR technology.
- This AR feature is ideal for gaming, navigation, retail and tourism applications.



### Applications and scope:

#### Applications:

- 1) **Navigation:** Helps indicate destination, directions and meter, weather, terrain, road conditions and traffic information as well as alerts to potential hazards in vehicles path.
- 2) **Healthcare:** Can be used to provide guidance during diagnostic and therapeutic interventions and help maintain patient imaging records, including functional videos, to be accessed and overlaid.
- 3) **Social interaction:** AR can make it possible to initiate conversations and make friends for users with people in physical proximity. This can also be potentially used in the educational field.
- 4) **Military:** AR improves soldier's awareness of the battlefield by evolving MRO by superimposing digital data, into their real-world view—so they can visually identify service needs in 3D.
- 5) **Emergency management:** Real-time analyses, geo-searches and the capability to examine event histories with an augmented reality engine all help gather better understanding of the state of the resources under observation and prevent a disaster.
- 6) **Industrial design:** Computer aided design systems as visualization tools make it easy for designers in product design process. Using augmented reality in product design enables rapid visualization.
- 7) **Tourism:** AR is a perfect tool for tourism as it enhances tourist experience and accelerates joy while exploring the world. Interactive maps make them a better fit.
- 8) **Video games:** Augmented reality that is used in gaming uses existing environment and converts it into playing filed. It does not require a confined area to create an immersive environment.

- 9) **Broadcasting live events:** Use of AR for live broadcasting of events creates interactive environment and enriches audience experience. It is a perfect medium for event screening.

**All in all,** augmented reality has paved the way to better understanding and inferences through immersive media, like dazzling visual overlays, buzzy haptic feedback, or other sensory projections – into our real-world environments.