

Augmented reality

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Glossary

- ▶ **AR (AUGMENTED REALITY)** - A technology that superimposes a computer-generated image on a user's view of the real world, providing a composite view. AR can be experienced using a smartphone or tablet screen, or wearable devices such as connected glasses (Google, Microsoft, Magic Leap and Apple are all working on AR headset solutions).
- ▶ **VR HEADSET** - A VR headset consists of a goggle-like device which includes a display and lenses to let you explore virtual reality environments. There are currently two main types of HMDs: tethered and mobile (or portable).
- ▶ **FIELD OF VIEW** - The field of view, measured in degrees, is the extent of the observable world that is seen at any given moment. In VR, FOV is the extent of your natural vision that is filled by the headset's display. Humans have a FOV of around 180° , but most HMDs offer between 50° and 110° .

AR? What does it mean?

- ▶ **Augmented reality (AR)** is an interactive experience of a real-world environment where the objects that reside in the real-world are "augmented" by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory.



Pic 1 - Virtual Fixture, first AR system

How does it works?

- ▶ Augmented Reality (AR) is used to enhance natural environments or situations and offer perceptually enriched experiences. With the help of advanced AR technologies (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulable. Information about the environment and its objects is overlaid on the real world. This information can be virtual or real, e.g. seeing other real sensed or measured information such as electromagnetic radio waves overlaid in exact alignment with where they actually are in space. Augmented reality also has a lot of potential in the gathering and sharing of tacit knowledge. Augmentation techniques are typically performed in real time and in semantic context with environmental elements. Immersive perceptual information is sometimes combined with supplemental information like scores over a live video feed of a sporting event. This combines the benefits of both augmented reality technology and heads up display technology (HUD).

Hardware

- ▶ Hardware components for augmented reality are: processor, display, sensors and input devices. Modern mobile computing devices like smartphones and tablet computers contain these elements which often include a camera and MEMS sensors such as accelerometer, GPS, and solid state compass, making them suitable AR platforms.



Picture 2 - Microsoft HoloLens

Software

- ▶ A key measure of AR systems is how realistically they integrate augmentations with the real world. The software must derive real world coordinates, independent from the camera, from camera images. That process is called image registration, and uses different methods of computer vision, mostly related to video tracking. Many computer vision methods of augmented reality are inherited from visual odometry.
- ▶ Usually those methods consist of two parts. The first stage is to detect interest points, fiducial markers or optical flow in the camera images. This step can use feature detection methods like corner detection, blob detection, edge detection or thresholding, and other image processing methods. The second stage restores a real world coordinate system from the data obtained in the first stage. Some methods assume objects with known geometry (or fiducial markers) are present in the scene. In some of those cases the scene 3D structure should be precalculated beforehand.

ARML

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- ▶ Augmented Reality Markup Language (ARML) is a data standard developed within the Open Geospatial Consortium (OGC), which consists of XML grammar to describe the location and appearance of virtual objects in the scene, as well as ECMAScript bindings to allow dynamic access to properties of virtual objects.

The Danger of AR

- ▶ There is a danger that will make individuals overconfident and put their life at risk because of it. Pokémon GO with a couple of deaths and many injuries is the perfect example of it. "" The paper Death by Pokémon GO extrapolated what that might mean nationwide and concluded “the increase in crashes attributable to the introduction of Pokémon GO is 145,632 with an associated increase in the number of injuries of 29,370 and an associated increase in the number of fatalities of 256 over the period of July 6, 2016, through November 30, 2016.” The authors valued those crashes and fatalities at between \$2bn and \$7.3 billion for the same period.

Who do the best AR solutions?

- ▶ **Groove Jones** is an award-winning creative and technology studio, recognized for the work we are doing for world-class brands like - [Amazon.com](https://www.amazon.com), AT&T, FX, MasterCard, McDonald's, Samsung, Toyota, & Lexus. Our team hails from diverse disciplines, from creating location-based entertainment and amusement park rides, developing enterprise Apps and video games, to directing broadcast commercials and feature motion pictures.
- ▶ **ScienceSoft** is a software development company with 29 years of experience in IT and more than 500 specialists on board. Since their development of an app very similar to IKEA Place in 2014, the company has been providing professional augmented reality services.

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