

Write Up

# Augmented Reality

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## Introduction

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

AR can be defined as a system that incorporates three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e. additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one.

Augmented reality 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, incorporating AR cameras into smartphone applications and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated. Information about the environment and its objects is overlaid on the real world.

## History

Augmented reality was first achieved, to some extent, by a cinematographer called Morton Heilig in 1957. He invented the Sensorama which delivered visuals, sounds, vibration and smell to the viewer. Of course, it wasn't computer controlled but it was the first example of an attempt at adding additional data to an experience.

Then in 1968, Ivan Sutherland the American computer scientist and early Internet influence, invented the head-mounted display as a kind of window into a virtual world. The technology used at the time made the invention impractical for mass use.

In 1975, Myron Krueger, an American computer artist developed the first "virtual reality" interface in the form of "Videoplace" which allowed its users to manipulate and interact with virtual objects and to do so in real-time.

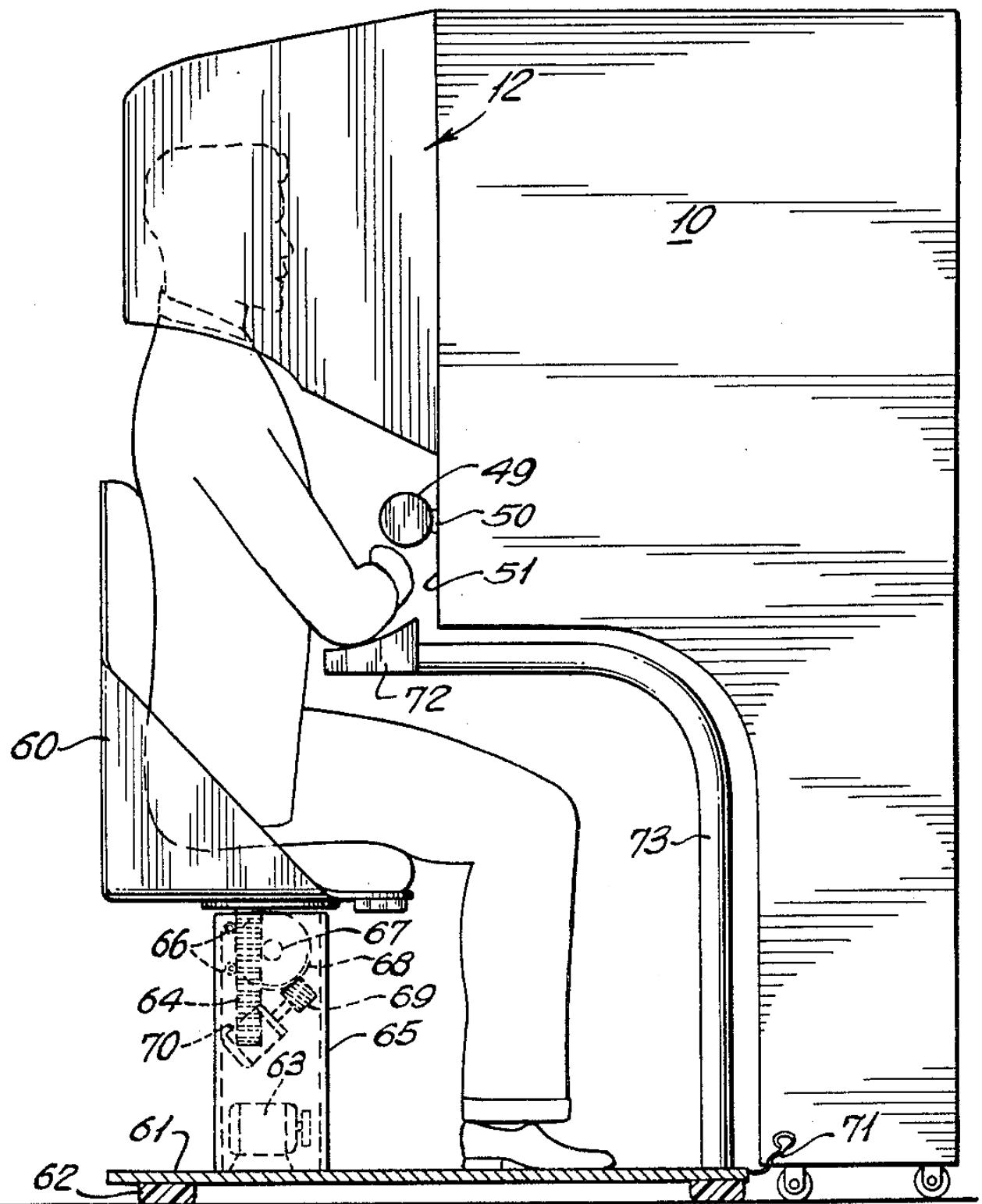
Steve Mann, a computational photography researcher, gave the world wearable computing in 1980.

Of course back then these weren't "virtual reality" or "augmented reality" because virtual reality was coined by Jaron Lainier in 1989 and Thomas P Caudell of Boeing coined the phrase "augmented reality" in 1990.

The first properly functioning AR system was probably the one developed at USAF Armstrong's Research Lab by Louis Rosenberg in 1992. This was called Virtual Fixtures and was an incredibly complex robotic system which was designed to compensate for the lack of high-speed 3D graphics processing power in the early 90s. It enabled the overlay of sensory information on a workspace to improve human productivity

There were many other breakthroughs in augmented reality between here and today; the most notable of which include:

- Bruce Thomas developing an outdoor mobile AR game called ARQuake in 2000
- ARToolkit (a design tool) being made available in Adobe Flash in 2009
- Google announcing its open beta of Google Glass (a project with mixed successes) in 2013
- Microsoft announcing augmented reality support and their augmented reality headset HoloLens in 2015



## The Present Day

Augmented reality is achieved through a variety of technological innovations; these can be implemented on their own or in conjunction with each other to create augmented reality. They include:

- **General hardware components** – the processor, the display, the sensors and input devices. Typically a smartphone contains a processor, a display, accelerometers, GPS, camera, microphone etc. and contains all the hardware required to be an AR device.
- **Displays** – while a monitor is perfectly capable of displaying AR data there are other systems such as optical projection systems, head-mounted displays, eyeglasses, contact lenses, the HUD (heads up display), virtual retinal displays, EyeTap (a device which changes the rays of light captured from the environment and substitutes them with computer generated ones), Spatial Augmented Reality (SAR – which uses ordinary projection techniques as a substitute for a display of any kind) and handheld displays.
- **Sensors and input devices** – include GPS, gyroscopes, accelerometers, compasses, RFID, wireless sensors, touch recognition, speech recognition, eye tracking and peripherals.
- **Software** – the majority of development for AR will be in developing further software to take advantage of the hardware capabilities. There is already an Augmented Reality Markup Language (ARML) which is being used to standardize XML grammar for virtual reality. There are several software development kits (SDK) which also offer simple environments for AR development.

There are apps available for or being researched for AR in nearly every industrial sector including:

- Archaeology, Art, Architecture
- Commerce, Office
- Construction, Industrial Design
- Education, Translation
- Emergency Management, Disaster Recovery, Medical and Search and Rescue
- Games, Sports, Entertainment, Tourism
- Military
- Navigation

## The Role of Augmented Reality In Gaming

After the introduction of virtual in the real world, AR came into existence which is a creative and immersive experience that allows users to feel happy after interacting personally with the digital environment. Augmented reality is a combination of game visuals along with the audio content with respect to the user environment in real-time which helps in the establishment of an artificial environment. In the gaming industry, AR is used to create a playing zone within the existing artificial environment. This technology is known to overwhelm the users if played on smartphones, tablets or gaming systems. The first commercial application of AR technology was the yellow-colored “first down” line that appeared in the football game held in the year 1998.

In the gaming industry, this technology has made a powerful impact after the introduction of the interactive experience of a real-world environment where every object of the real-world gets augmented. It has caused a great impact on the technological world covering healthcare, e-commerce, marketing, automotive, education, defense, retail, etc. The valuation of the augmented reality gaming segment is on the way to achieve the targeted amount of approx \$385 billion by 2023.



## GAME I: Pokemon GO

Pokémon Go is a 2016 augmented reality (AR) mobile game developed and published by Niantic in collaboration with Nintendo and The Pokémon Company for iOS and Android devices. A part of the Pokémon franchise, the game is the result of a collaboration between Niantic, Nintendo and The Pokémon Company. It uses mobile devices with GPS to locate, capture, train, and battle virtual creatures, called Pokémons, which appear as if they are in the player's real-world location. The game is free-to-play; it uses a freemium business model combined with local advertising and supports in-app purchases for additional in-game items. The game launched with around 150 species of Pokémons, which had increased to around 600 by 2020.

After establishing a game account, players create and customize their own avatars. Once created, an avatar is displayed on a map based on the player's geographical location. Features on the map include 'PokéStops' and 'Pokémon Gyms'. These PokéStops can be equipped with items called 'Lure Modules', which attract additional wild, and occasionally rare, Pokémons. Gyms serve as battle locations for team-based king of the hill matches. PokéStops and Gyms are typically located at places of interest.

As players move within their real world surroundings, their avatars move within the game's map. Different Pokémons species reside in different areas of the world; for example, Water-type Pokémons are generally found near water. When a player encounters a Pokémons, it may be viewed either in AR mode or with a live rendered, generic background. If the player flees, the Pokémons will face the spot it was last engaged, except Nosepass, which will always face north because of its Pokédex entry. AR mode uses the camera and gyroscope on the player's mobile device to display an image of a Pokémons as though it were in the real world. Players can take screenshots of the Pokémons they encounter either with or without the AR mode activated.



## Minecraft Earth

Minecraft Earth was an augmented reality sandbox game developed by Mojang Studios and published by Xbox Game Studios. A spin-off of the video game Minecraft, it was first announced in May 2019, and was available on Android and iOS. The game was free-to-play, and was first released in early access on 17 October 2019. The game received its final update in January 2021 and officially shut down on 30 June 2021.

Minecraft Earth utilized information from OpenStreetMap for map information and was built on Microsoft Azure for its augmented reality features. The game is free-to-play, and supports Android and iOS smartphones.

During Microsoft Build 2015, Microsoft's HoloLens team unveiled an augmented reality version of Minecraft. On 8 May 2019, a teaser trailer was released which showed a Muddy Pig. Minecraft Earth was announced during Minecraft's 10th anniversary in May 2019. Microsoft created a website for players to sign up for the closed beta that was released during mid-2019, and Microsoft intended to release the game in a gradual rollout. Multiplayer gameplay was showcased at the Apple Worldwide Developers Conference in June 2019.

The game was nominated for "Best VR/AR Game" at the Game Critics Awards, and won the Coney Island Dreamland Award for Best AR/VR Game at the New York Game Awards. Time Magazine listed Minecraft Earth as one of the Best 100 Inventions of 2019.

On 5 January 2021, developer Mojang Studios announced that they were releasing the final build of Minecraft Earth, citing the COVID-19 pandemic as a factor. Mojang added that they would be ending support for Minecraft Earth on 30 June 2021.



## The Future of Augmented Reality

Jessica Lowry, a UX Designer, writing for the Next Web says that AR is the future of design and we tend to agree. Already mobile phones are such an integral part of our lives that they might as well be extensions of our bodies; as technology can be further integrated into our lives without being intrusive (a la Google Glass) – it is a certainty that augmented reality provides opportunities to enhance user experiences beyond measure.

This will almost certainly see major advances in the much-hyped but still little seen; Internet of Things. UX designers in the AR field will need to seriously consider the questions of how traditional experiences can be improved through AR – just making your cooker capable of using computer enhancements is not enough; it needs healthier eating or better cooked food for users to care.

The future will belong to AR when it improves task efficiency or the quality of the output of an experience for the user. This is the key challenge of the 21st century UX profession.

## Conclusion

AR or augmented reality has gone from pipe dream to reality in just over a century. There are many AR applications in use or under development today, however – the concept will only take off universally when UX designers think about how they can integrate AR with daily life to improve productivity, efficiency or quality of experiences. There is an unlimited potential for AR, the big question is - how will it be unlocked?