Immersive Technology *

Glossary

* Immersive Technology:

The ultimate aim of immersive technologies such as those under the XR umbrella is to have the user feel as if the virtual experience has become their primary environment, temporarily replacing that which is real and physical.

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When first encountering the world of Extended Reality (XR), it's completely normal that certain unfamiliar terms might interrupt your immersive experience. But worry not - that's where this glossary comes in!

If at any point you find yourself questioning the difference between the Metaverse and Web 4.0, avatars and holograms, facial tracking and motion capture, feel welcome to consult this handy guide to all things XR.

Ambisonics:

Ambisonics is a means of recording audio for use in 360-degree video. A minimum of four statically-positioned microphones are used to capture sound from every direction.

ARCore:

Released by Google in 2018, this platform allows Augmented Reality experiences to be built which are compatible with both Android and Apple devices. It uses the devices' built-in cameras to track their location and orientation, thereby understanding the user's direct environment.

ARKit:

A development platform for iPads and iPhones, working through the devices' inbuilt cameras. The IKEA app which allows customers to virtually 'place' an object within their home before purchase was developed using this platform.

Augmented Reality (AR):

Unlike Virtual Reality, Augmented Reality (AR) does not separate the user entirely from the physical world around them. AR refers to virtual experiences (often but not exclusively using headsets) in which virtual elements are superimposed upon the user's real surroundings.

Avatar:

An avatar is a virtual representation of a user within an online environment. There is no requirement for this to resemble the person's appearance in reality.

Degrees of Freedom (6DOF, 3DOF):

The higher the number of degrees of freedom possessed by a virtual object, the greater the number of ways in which this object will be able to move within a 3D environment. With six degrees as a maximum, three correspond to the x, y, and z axes and the remaining three to movements along those axes. VR headsets are, broadly speaking, either 6DOF or 3DOF.

Digital Twin:

A virtual, immersive environment designed to accurately replicate one which exists in the physical world, for example, a university campus.

Extended Reality (XR):

An umbrella term which covers all technology under the distinct categories of 'mixed reality', 'augmented reality', and 'virtual reality'.

Eye Tracking:

Within VR headsets, eye tracking is employed to estimate the direction of the user's eyes while using an app. This information helps decrease the quantity of processing power required to render a virtual environment, yet it also remains an area of considerable controversy concerning data privacy.

Face Tracking:

Face tracking software can be implemented within VR to track expression and lip movement. In some cases, this can be utilised to improve avatars' sense of realism by, theoretically, accurately conveying the user's emotions.

In-side-out and Outside-in tracking:

In-side-out tracking is a method of tracking employed within a VR context to determine the position of the headset. In this case, the cameras are located upon the headset itself. With outside-in-tracking, trackers are placed in stationary locations while monitoring the headset and user.

(VR) Game Engine:

A platform which facilitates the development of VR applications by providing developers with tools and frameworks. Functionalities typically include those for rendering 3D graphics, audio integration, and scene management. Amongst the best known are Unity and Unreal Engine.

Haptics:

Haptic technology refers to that able to create the impression of touch for its user by applying, for example, vibrations. Within a VR context, this technology frequently takes the form of a glove and can be used to increase the wearer's sense of immersion.

Hologram:

3D images composed of light and sound which, in AR and MR environments, are often able to be interacted with when appearing in the headset user's field of vision. When viewing a hologram, the user sees both the natural light of their surroundings and the light from their display. Holograms cannot exist within VR.

Head-mounted Display (HMD):

Head-mounted Display is a term which refers to any form of display device which is mounted onto a platform, allowing it to be worn on the head and over the user's eyes. XR headsets are the prime example.

Hotspots:

While navigating an XR environment, the user may encounter interactive elements able to be clicked upon to reveal further information. These static, interactive points are referred to as 'hotspots'.
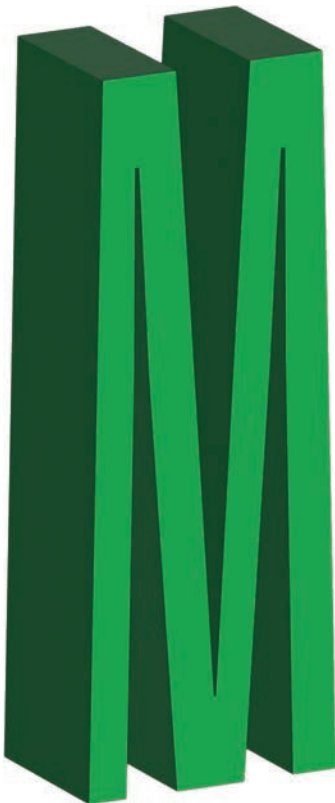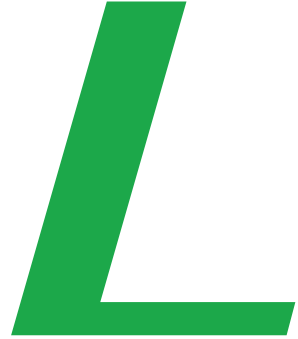
Latency:

Latency refers to the amount of time required for a user's actions to register with the technology and be acted upon within a VR environment.

LiDAR:

Abbreviated from 'Light Detection and Ranging', LiDAR is a method though which ranges can be measured according to the amount of time it takes a laser to reflect off an object's surface and return to the receiver.

Metaverse:

The Metaverse is a wholly virtual space able to be simultaneously shared by many users and within which they are able to interact. The term 'metaverse' is, however, not accepted by everyone with some preferring 'virtual world', 'multiverse', 'omniverse', and 'Web 4.0'.

Mixed Reality (MR):

Much like AR, Mixed Reality (MR) scenarios are those in which the headset-wearing user sees virtual elements superimposed upon their view of reality. Unlike in AR, in MR, these superimposed elements are able to be interacted with, often in a similar way to those in reality.

Motion Capture:

The process by which an individual's movements are captured to create a 3D skeleton, later used to animate virtual models. This process is often undertaken with the aid of a motion capture suit which documents movements through trackers and markers carefully positioned upon the suit itself.

Non-fungible Tokens (NFT):

NFTs are wholly digital assets, purchasable through cryptocurrencies and stored on the blockchain - a decentralised digital ledger which records the initial terms of the asset's ownership in 'smart contracts', updating these - should they change - without deleting previous versions.

N

O

OpenXR:

OpenXR is a royalty-free open standard which enables developers to create applications able to run across a wide variety of Extended Reality devices. Amongst its many aims is that of unifying the XR field, reducing the often-encountered issue of many applications functioning on a single headset alone.

Parallax:

The effect which causes the position of an object to appear slightly altered when viewed through a camera lens as opposed to through the viewfinder.

Photogrammetry:

The method of creating an accurate 3D virtual object by carefully merging a series of photos taken of a physical object.

P

Spatial Mapping:

Also referred to as 3D reconstruction, spatial mapping is the process of constructing a 3D map of a real-world environment, allowing a device to understand and interact with this space.

Stereoscopic vs Monoscopic:

With monoscopic VR, both of the user's eyes are shown an identical image. With stereoscopic VR, a marginally different image is shown to each eye, replicating more closely the manner in which we view reality. In other words, a technique used to enable a three-dimensional effect, adding an illusion of depth to a flat image.

Spatial Audio:

If spatial audio is used within a VR setting, audio content remains confined to a certain area within the VR environment. If the user walks towards one corner of a virtual room the music may become louder. As they walk away, it once again dims.

Stitching:

The process of combining multiple videos or images to create a theoretically seamless 360-degree video.

Spatial Computing:

The digitisation of interactions and activities which once took place within the physical world alone in a manner which allows this new virtual realm to blend seamlessly with the physical world. As originally defined by Simon Greenwold (2003), spatial computing is "human interaction with a machine in which the machine retains and manipulates referents to real objects and spaces" ("Spatial Computing" MIT Graduate Thesis).

Teleportation:

Within XR environments, it is not always necessary for the user to navigate the space by physically walking. Often, an alternative mode of movement is 'teleportation', namely pointing to the desired end destination and clicking a button to arrive there instantly.

U

User Experience (UX):

User Experience is the all-encompassing term for the experience had by the user when interacting with a particular product or company.

User Interface (UI):

The user interface is how the user interacts with the computer system from a practical, design, and interaction-oriented perspective. Layout, colour, font, and framing are all components key to UI design.

Virtual Production:

A method of film production which uses, amongst others, technologies such as CGI (computer-generated imagery), AR, and motion capture to create digital environments. Often, large LED screens are used in place of the more traditionally established green screens to enhance the impression of realism.

Virtual Reality (VR):

Wholly virtual and immersive environments and experiences taking place within a headset worn by the user. When looking through the headset, the user sees only virtual content. What stands in front of them in reality can no longer be seen.

Volumetric Capture:

A filming technique which captures a three-dimensional physical space, rendering this into a video which can be viewed either upon a conventional screen (e.g. that of a laptop) or through a Virtual Reality headset. Unlike with 360 video, where the user views the scene from a single pre-determined perspective, volumetric capture permits the user's movement and exploration of the environment in greater depth.

W

WebVR:

An up-and-coming JavaScript-based API which facilitates XR content's increased accessibility through traditional web browsers. Beyond the browser itself, no further plug-ins are necessary to view and create Extended Reality content.
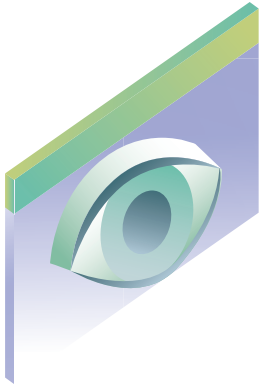
Web 4.0:

The fourth generation of the World Wide Web, characterised by an increase in interaction, collaboration, and narrower distinctions between the real and virtual worlds. At present, Web 4.0 is still in its early stages of development, but its impact is already (and will continue to be) considerable.

360-degree Video:

A method of recording real-life footage using specialised cameras, often employed to create Virtual Reality environments. When viewed within a VR headset, the user is able to turn 360 degrees, continuously viewing the filmed environment around them just as they would any real environment.

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