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Part 1: Terminology and concepts

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Foreword

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Introduction

Virtual Reality, Augmented Reality, Mixed Reality (VR/AR/MR)-based systems are being developed and used across private, public, and voluntary sectors. Many fields including education and training, healthcare, medicine, and manufacturing are applying VR/AR/MR technologies to develop visualized systems that enhance reality, interaction, and immersiveness. VR/AR/MR technologies should be integrated with digital transformation in systems developed in these areas. This document defines terminology and concepts to support the consistent use of VR/AR/MR in systems integration across multiple sectors.

Terminology and concepts used to describe VR/AR/MR contexts and systems integration may differ from those used in the real world across many domains. Providing consistency in this terminology can enhance understanding and support the effective implementation and evaluation of such systems. There are many examples of VR/AR/MR application systems across different sectors. For example, 3D virtual environments may be used as LET locales, and 3D avatars may represent educators, teachers, trainers, assistants, learners, students, trainees, and other participants."

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Information technology — VR/AR/MR systems integration —

Part 1:
Terminology and concepts

1 Scope

This document defines terminology and concepts for application systems developed using VR, AR, and MR technologies. These systems require standardized terminology and concepts to ensure consistent meaning across various application services.

The integration of VR/AR/MR-systems enables users to view and interact with virtual environments, objects, and materials through computers or mobile devices, incorporate real world information, and communicate within these environments. Depending on the application, virtual humans may appear as user avatars.

This document defines

— Terminology related to VR/AR/MR based systems integration

— Concepts necessary to understand and conduct using VR/AR/MR based systems integration

— Requirements for systems integration using VR/AR/MR technologies to generate application services

This document does not address the following items: personal information, evidence information. assessment methods, metrics information, education management, curricular development information.

2 Normative references

This document shall be based on the following documents of which their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 9234:2025, *Information technology — Information modelling for virtual, augmented and mixed reality based education and training systems*

ISO/IEC 18038:2020, *Information technology — Computer graphics, image processing and environmental representation — Sensor representation in mixed and augmented reality*

3 Terms, definitions, acronyms, and abbreviations

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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3.1 Terms and definitions

3.1.1
2-dimensional data
2D data
data to be organized in 2-dimensional data for visual information that consists of x and y values for images

3.1.2
360-degree video
video where a view in every direction is recorded at the same time, and is shot using a collection of cameras

3.1.3
3D video
video content that presents stereoscopic or depth-based visual information so that viewers perceive three-dimensional spatial depth in the displayed scene.

3.1.4
3-dimensional data
3D data
data to be organized in 3-dimensional data for visual information that consists of x, y, and z values for graphics objects

3.1.5
4-dimensional data
4D data
data to be organized in 4 dimensions for visual information that consists of x, y, and z values plus one additional data point, e.g., time for animation

3.1.6
application programming interface
API
connection between computers or between computer programs. It is a type of software interface, offering service to other software

[SOURCE: ISO/IEC 18038:2020]

3.1.7
artificial intelligence interface
AI interface
user interface that uses artificial intelligence technologies to interact with users in an intelligent way

3.1.8
augmented reality
AR
interactive experience of a real-world environment whereby the objects that reside in the real-world are augmented by computer-generated perceptual information

[SOURCE: ISO/IEC 18038:2020]

3.1.9
AR device
hardware that enables users to experience augmented reality, where digital information is overlaid onto the real-world environment

3.1.10
AR glass
augmented reality smart glasses allow users to interact with virtual and real worlds in real-time with the help of advanced imaging and sensor technologies

3.1.11
avatar
electronic image or a 3D object that represents and may be manipulated by a computer user

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3.1.12
blockchain
distributed ledger with confirmed blocks organized in an append-only, sequential chain using cryptographic links

Note 1 to entry: Blockchains are designed to be tamper-resistant and to create final, definitive and immutable ledger records.

[SOURCE: ISO 22739:2020, 3.6]

3.1.13
closed-circuit television
CCTV
closed-circuit television camera to transmit a signal to a specific location on a limited set of monitors; also known as video surveillance

3.1.14
data model
abstract model that organizes elements of data and standardizes how they relate to one another and to the properties of real world entities

3.1.15
data structure
data organization and storage format, usually chosen for efficient access to data

3.1.16
digital asset
anything that exists only in digital form and comes with distinct usage rights, or distinct permissions for use

3.1.17
digital resource
information, materials, or assets that exist in digital format and can be accessed, stored, managed, or shared using computers, networks, or other electronic technologies

3.1.18
digital twin
digital representation of an intended or actual real-world physical object or process that serves as an effectively indistinguishable digital counterpart of it

3.1.19
digital textbook
digital representation of a target entity with data connections that enable convergence between the physical and digital states at an appropriate rate of synchronization

[SOURCE: ISO/IEC 20924(en), 3.3.4]

3.1.20
education
process of receiving or giving systematic instruction, especially at a school or university

[SOURCE: ISO/IEC 19896-1:2018]

3.1.21
handheld device
small, portable electronic device that can be held and operated by one or both hands

3.1.22
haptic
relating to the sense of touch, in particular relating to the perception and manipulation of objects using the senses of touch and proprioception

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3.1.23
haptic glove
wearable device that simulates tactile sensations of virtual objects

3.1.24
head-mounted display
HMD
display device, worn on the head or as part of a helmet that has a small display optic in front of one or both eyes

3.1.25
information retrieval
science of searching for information in a document, for documents themselves, for metadata, and for texts, images or sounds in databases

3.1.26
knowledge database
collection of information about a subject that is used to provide help and understanding

3.1.27
learning
acquisition of knowledge, skills or attitudes

[SOURCE: ISO/IEC 2382-36:2019, 3.1.1]

3.1.28
learning management system
LMS
Software system designed for the purpose of performing administrative and technical support processes associated with e-learning

[SOURCE: ISO/IEC 2382-36:2019, 3.3.1]

3.1.29
live action avatar
form of cinematography or videography that uses photography instead of animation.

3.1.30
metaverse
persistent, shared, and interoperable virtual environment that integrates physical and digital worlds, enabling users to interact, create, and exchange value through immersive technologies and networked platforms

3.1.31
mirror world
representation of the real world in digital form, which attempts to map real-world structures in a geographically accurate way

3.1.32
mixed reality
MR
merging of real and virtual worlds to generate new environments where physical and synthetic objects co-exist and interact

3.1.33
non-fungible token
NFT
Unique digital identifier that is recorded on a blockchain and is used to certify ownership and authenticity

3.1.34
real world information
knowledge and experiences gained through interactions with people and the physical environment

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3.1.35
scene graph
general data structure commonly used by vector-based graphics editing applications and modern computer games

Note 1 to entry: It arranges the logical and often spatial representation of a graphical scene.

3.1.36
scene graph data model
hierarchical data structure, often represented as a tree or graph, used in computer graphics and computer vision to organize and represent the relationships between objects within a scene

3.1.37
semantic information
information that carries significance or meaning for a given system or conceptual entity

3.1.38
smart glasses
eye or head-worn wearable computers that offer useful capabilities to the user.

Note 1 to entry: Many smart glasses include displays that add information alongside or to what the wearer sees

3.1.39
smart watch
wearable computer in the form of a watch, which provides a local touchscreen interface for daily use, while an associated smartphone app can provide management and telemetry

3.1.40
training
development of skills and/or understanding through procedurally defined learning activities focused on a specific application

[SOURCE: ISO/IEC 2382-36:2019]

3.1.41
video avatar
digital character, humanoid or non-humanoid, representing a user or entity within a video

3.1.42
virtual city
digitally created or simulated representation of an urban environment that models the physical, social, and functional characteristics of a real or imagined city, typically used for visualization, analysis, planning, simulation, or interactive experiences.

3.1.43
virtual classroom
online learning environment that allows teachers and students to communicate, interact, collaborate, and explain ideas

3.1.44
virtual conference
online conference where individuals and organizational teams can connect and collaborate with each other via online meetings and webinars in a virtual environment

3.1.45
virtual device
device that has no associated hardware

3.1.46
virtual doctor
healthcare provide who delivers medical consultation, diagnosis, monitoring, or treatment to patients through digital communication technologies or virtual platforms instead of in-person clinical interactions.

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3.1.47
virtual environment
computer-simulated environment that allows users to interact with it

3.1.48
virtual human
software fictional character or human being

3.1.49
virtual life
simulation that models aspects of real life

3.1.50
virtual object
entity that is any object in the virtual environment

3.1.51
virtual patient
computer-generated or digitally represented patient used to simulate clinical scenarios for education, training, assessment, or healthcare system development.

3.1.52
virtual resource
resource created through software which appears to exist as a physical entity and can be processed in a computing environment

3.1.53
virtual school
digital learning environment in which students and teachers interact and conduct educational activities within a virtual or immersive environment

3.1.54
virtual student
avatar who learns in a virtual classroom

3.1.55
virtual teacher
avatar who teaches in a virtual class

3.1.56
virtual user interface
software user interface that controls a piece of equipment without direct manipulation via a physical user interface or screen attached to that same equipment

3.1.57
virtual training
training delivered in a virtual or simulated environment, or when instructor and learner are in separate locations

Note 1 to entry: virtual instruction environments are designed to simulate the traditional classroom or learning experience

3.1.58
virtual reality
VR
interactive and immersive computer-generated experience taking place in a synthetic and simulated environment

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3.1.59
VR/AR/MR based education
education using virtual, augmented and mixed environments where real and synthetic objects generated by VR, AR, and MR technologies co-exist and interact

[SOURCE: ISO/IEC 9234]

3.1.60
VR/AR/MR based learning
learning using virtual, augmented and mixed environments where real and synthetic objects generated by VR, AR and MR technologies co-exist and interact

[SOURCE: ISO/IEC 9234]

3.1.61
VR/AR/MR based training
training using virtual, augmented and mixed environments where real and synthetic objects generated by VR, AR and MR technologies co-exist and interact

[SOURCE: ISO/IEC 9234]

3.1.62
wearable device
battery-powered electronic device that is worn on or attached to the body

3.2 Acronyms and abbreviations

Table 1 lists the abbreviated terms used in this draft.

Table 1 — Abbreviated terms

Abbreviation	Abbreviated term
2D	2-dimensional
3D	3-dimensional
API	Application Programming Interface
AR	Augmented Reality
CCTV	Closed-circuit television
GUI	Graphical User Interface
HMD	Head Mounted Display
ICT	Information and Communications Technology
IT	Information Technology
LET	Learning, Education, and Training
LMS	Learning Management System
MAR	Mixed and Augmented Reality
NFT	Non-fungible token
MR	Mixed Reality
VR	Virtual Reality

4 Concepts

4.1 Overview

VR/AR/MR systems integration involves the use of technologies and approaches that may incorporate elements from real-world contexts to generate virtual worlds. VR, AR, and MR are foundational technologies for the metaverse; however, they do not encompass the full scope of metaverse technologies and services, such as virtual life and social activities within virtual worlds. Among these three (VR, AR, and MR) technologies, VR has the longest history. The term VR has been used since around 1994 when ISO/IEC 14772 Virtual Reality Modelling Language (VRML) was discussed and developed as an international standard.[1,2]

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