AS 5493:2025
ISO/IEC 3721:2023

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# Information technology — Computer graphics, image processing and environmental data representation — Information model for mixed and augmented reality content — Core objects and attributes (ISO/IEC 3721:2023, IDT)



AS 5493:2025

This Australian Standard® was prepared by IT-031, Modelling and Simulation. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 21 May 2025.

This Standard was published on 6 June 2025.

The following are represented on Committee IT-031:

ANZLIC — the Spatial Information Council
Australian Border Force
Department of Defence (Australian Government)
IoT Alliance Australia
Queensland Health
Simulation Australasia

This Standard was issued in draft form for comment as DR AS 5493:2025.

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ISBN 978 1 76175 188 2

AS 5493:2025
ISO/IEC 3721:2023

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First published as AS 5493:2025.

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To conform to a Standard, all requirements in the Standard need to be met.

A requirement is any statement in the Standard which uses the word "shall".

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(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

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A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

# Preface

This Standard was prepared by the Standards Australia Committee IT-031, Modelling and Simulation.

The objective of this document is to specify the information model for representing the mixed and augmented reality (MAR) scene/contents description, namely, information constructs for —

(a) representing the virtual reality scene graph and structure such that a comprehensive range of mixed and augmented reality contents can also be represented;

(b) representing physical objects in the mixed and augmented reality scene targeted for augmentation;

(c) representing physical objects as augmentation to other (virtual or physical) objects in the mixed and augmented reality scene;

(d) providing ways to spatially associate aforementioned physical objects with the corresponding target objects (virtual or physical) in the mixed and augmented reality scene;

(e) providing other necessary functionalities and abstractions that will support the dynamic MAR scene description such as event/data mapping, and dynamic augmentation behaviours; and

(f) describing the association between these constructs and the MAR system which is responsible for taking and interpreting this information model and rendering/presenting it out through the MAR display device.

This document is identical to, and has been reproduced from, ISO/IEC 3721:2023, *Information technology — Computer graphics, image processing and environmental data representation —Information model for mixed and augmented reality content — Core objects and attributes.*

As this document has been reproduced from an international document, a comma is to be read as a full point when referring to a decimal marker.

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The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 24, *Computer graphics, image processing and environmental data representation*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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# Introduction

Mixed and Augmented Reality (MAR) refers to a spatially coordinated combination of media/information components that represent, on the one hand the physical real world and its objects and on the other, those that are virtual, synthetic and computer generated. MAR, as an information medium, strives to provide rich experience based on realism, presence and augmentation.

In this document, a comprehensive set of information constructs for representing mixed and augmented reality (MAR) contents is described. This set of components extends the conventional ones used for representing virtual reality (VR) contents, as MAR environments are technically realized as virtual environments. The principles and requirements for the extension are laid out and the details of the component model including (but not limited to) those for representing *physical* real world objects, extending the virtual scene graph/structure to that for MAR (with the physical objects), how to spatially the physical objects into the MAR scene graph, associating these content components to the MAR system, and other miscellaneous constructs (e.g. event mapping, MAR events/ behaviours, video backdrops, etc.). This document is designed for the ease, generality and extendibility, and this is demonstrated with various examples and implementation results. The model will serve as a sound basis for establishing standard and interoperable file formats MAR contents in the future.

The document also provides definitions for terms as related to these MAR content informational components and their attributes.

The target audience of this document are mainly MAR system developers and contents designers interested in specifying MAR contents to be played by an MAR system or browser. The standard will provide a basis for further application standards or file formats for any virtual and mixed reality applications and content representation.

The extension will be self-contained in the sense that it is independent from the existing virtual reality information constructs, focusing only on the mixed and augmented reality aspects.

However, this document only specifies the information model, and neither promotes nor mandate to use a specific language, file format, algorithm, device, implementation method, and standard. The standard model is to be considered as the minimal basic model that can be extended for other purposed in actual implementation,

This document is based on the MAR Reference model (ISO/IEC 18039) that specifies for the contents-browser/player type reference architecture. The MAR content (in ISO/IEC 18039) is specified as the input that describes the scene and objects' behaviours, given to the browser/player which in turn parses, simulates and renders it to the display. The standard is the information model for the content.

As an extension to the virtual reality based contents or scene structure, this standard is very much related to the existing standard for VR scene representation such as ISO/IEC 19775-1 (X3D) and other related on-going standards such as the image-based object/environment representation for VR/MAR (ISO/IEC 23488) as well. There are also specific object models relevant to this standard such as those for the live actors and entities (ISO/IEC 18040 and ISO/IEC 23490) and MAR system sensor components (ISO/IEC 18038).

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# Information technology — Computer graphics, image processing and environmental data representation — Information model for mixed and augmented reality content — Core objects and attributes (ISO/IEC 3721:2023, IDT)

## 1 Scope

This document specifies the information model for representing the mixed and augmented reality (MAR) scene/contents description, namely, information constructs for:

a) representing the virtual reality scene graph and structure such that a comprehensive range of mixed and augmented reality contents can also be represented;

b) representing physical objects in the mixed and augmented reality scene targeted for augmentation;

c) representing physical objects as augmentation to other (virtual or physical) objects in the mixed and augmented reality scene;

d) providing ways to spatially associate aforementioned physical objects with the corresponding target objects (virtual or physical) in the mixed and augmented reality scene;

e) providing other necessary functionalities and abstractions that will support the dynamic MAR scene description such as event/data mapping, and dynamic augmentation behaviours;

f) describing the association between these constructs and the MAR system which is responsible for taking and interpreting this information model and rendering/presenting it out through the MAR display device.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of 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 18039, *Information technology — Computer graphics, image processing and environmental data representation — Mixed and augmented reality (MAR) reference model*

ISO/IEC 18040, *Information technology — Computer graphics, image processing and environmental data representation — Live actor and entity representation in mixed and augmented reality (MAR)*

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in from ISO/IEC 18039 and ISO/IEC 18040 and the following apply.

ISO and IEC maintain terminology 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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