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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

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# Foreword

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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*.

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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

## 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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