

This is a preview - [click here to buy the full publication](#)

INTERNATIONAL STANDARD

ISO/IEC 18038

First edition
2020-04

Information technology — Computer graphics, image processing and environmental representation — Sensor representation in mixed and augmented reality



Reference number
ISO/IEC 18038:2020(E)

© ISO/IEC 2020



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Concepts	4
4.1 Overview.....	4
4.2 Scope of physical sensor representation.....	5
4.3 Physical sensor types.....	6
4.3.1 General.....	6
4.3.2 Camera sensor.....	7
4.3.3 Chemical sensor.....	7
4.3.4 Electric sensor.....	8
4.3.5 Environment sensor.....	8
4.3.6 Flow sensor.....	8
4.3.7 Force sensor.....	9
4.3.8 Light sensor.....	9
4.3.9 Movement sensor.....	10
4.3.10 Navigation sensor.....	10
4.3.11 Particle sensor.....	11
4.3.12 Position sensor.....	11
4.3.13 Pressure sensor.....	12
4.3.14 Proximity sensor.....	12
4.3.15 Sound sensor.....	13
4.3.16 Temperature sensor.....	13
4.3.17 Other sensors.....	14
4.4 Sensor representation.....	14
4.4.1 Overview.....	14
4.4.2 Precise location and orientation of a physical sensor.....	16
4.4.3 Sensor properties and interface.....	19
4.4.4 Sensor representation data model.....	19
5 Sensor 3D scene graph	19
5.1 Definition of a sensor 3D scene graph.....	19
5.2 Physical properties and interfaces with real worlds.....	21
5.2.1 General.....	21
5.2.2 Physical properties of a physical sensor.....	21
5.2.3 Physical interfaces with real worlds of a physical sensor.....	22
5.2.4 A data structure for the physical properties and interfaces for a physical sensor.....	23
6 System architecture for physical sensor representation	25
6.1 System architecture for physical sensors.....	25
6.2 System framework.....	26
6.2.1 General.....	26
6.2.2 3D MAR world representation.....	27
6.2.3 GNSS synchronized 3D virtual worlds.....	27
6.2.4 Sensor devices and their properties.....	28
6.2.5 Interfaces with 3D sensor objects.....	28
6.2.6 Interfaces with physical sensor devices.....	28
7 XML definition of physical sensor representation	28
7.1 Structure of mixed and augmented reality scene.....	28
7.1.1 MARScene.....	28
7.1.2 MARObject.....	28

7.1.3	3D object	28
7.1.4	Shape	28
7.1.5	Physical sensor	28
7.1.6	Sensor type	28
7.1.7	Physical properties	29
7.1.8	Physical interface	29
7.2	XML schema definition	29
7.2.1	MARSceneType	29
7.2.2	GeoPositionType	30
7.2.3	LatitudeType and LongitudeType	30
7.2.4	GeoBoundingBoxType	31
7.2.5	LengthType	32
7.2.6	OrientationType	33
7.2.7	MARObjectType	35
7.2.8	ThreeDObjectType	35
7.2.9	ShapeType	36
7.2.10	AbstractSensorType	37
7.2.11	PhysicalPropertiesType	40
7.2.12	UUIDType, EventType and ControlType	40
7.2.13	PhysicalInterfaceType	41
7.2.14	IPAddressType and PortType	43
8	Conformance	44
8.1	Conformance criteria	44
8.2	Conformance area	45
Annex A (informative) Examples of physical sensor types and parameters		46
Annex B (informative) Schema for sensor MAR representation		54
Annex C (informative) Example XML schema extension for physical sensor representation		55
Annex D (informative) Example of sensor MAR representation based on the sensor MAR schema		56
Annex E (informative) Implementation examples of sensor MAR representation		57
Bibliography		61

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see <http://patents.iec.ch>).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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)

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.

Introduction

This document defines a representation model for physical sensors to be included in a 3D mixed-reality world. It defines 3D modelling, rendering, simulation, and interfaces for physical sensors. It defines a set of principles, concepts, and functionalities for physical sensors applicable to the complete range of 3D mixed reality standards. It includes the following content:

- terms and definition for sensor interfaces;
- requirements and scope;
- a representation model of physical sensors that can be included in a 3D scene;
- 3D modelling, rendering, and simulation of physical sensors in a 3D scene;
- representation of the attributes of physical sensors in a 3D scene;
- representation of I/O data streaming of physical sensors in a 3D scene;
- representation of the interfaces for controlling physical sensors in a 3D scene;
- functionalities and base components;
- relevant physical sensor properties;
- interfaces with virtual and real worlds;
- use cases.

The objectives of this document are as follows:

- provide a reference model for physical sensor-based 3D mixed-reality applications;
- manage and control physical sensors with their physical properties in 3D mixed reality environments;
- provide an exchangeable information model necessary for transferring and storing data between sensor-based mixed-reality applications;
- support user interfaces with 3D mixed-reality worlds;
- support physical sensor interfaces with 3D mixed-reality worlds.

Information technology — Computer graphics, image processing and environmental representation — Sensor representation in mixed and augmented reality

1 Scope

This document defines the framework and information reference model for representing sensor-based 3D mixed-reality worlds. It defines concepts, an information model, architecture, system functions, and how to integrate 3D virtual worlds and physical sensors in order to provide mixed-reality applications with physical sensor interfaces. It defines an exchange format necessary for transferring and storing data between physical sensor-based mixed-reality applications.

This document specifies the following functionalities:

- a) representation of physical sensors in a 3D scene;
- b) definition of physical sensors in a 3D scene;
- c) representation of functionalities of each physical sensor in a 3D scene;
- d) representation of physical properties of each physical sensor in a 3D scene;
- e) management of physical sensors in a 3D scene;
- f) interface with physical sensor information in a 3D scene.

This document defines a reference model for physical sensor-based mixed-reality applications to represent and to exchange functions of physical sensors in 3D scenes. It does not define specific physical interfaces necessary for manipulating physical devices, but rather defines common functional interfaces that can be used interchangeably between applications.

This document does not define how specific applications are implemented with specific physical sensor devices. It does not include computer generated sensor information using computer input/output devices such as a mouse or a keyboard. The sensors in this document represent physical sensor devices in the real world.

2 Normative references

There are no normative references in this document.