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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*.

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.

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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.

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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.

3 Terms and definitions

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 http://www.electropedia.org/

3.1
3D object
collection of vertices in 3D space, connected by various geometric entities such as triangles, lines, curved surfaces, etc.

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3.2
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

3.3
camera sensor
sensor (3.26) that detects and converts an optical image into an electronic signal

3.4
closed-circuit television
CCTV
video surveillance which uses video cameras to transmit a signal to a specific place on a limited set of monitors

3.5
chemical sensor
sensor (3.26) that can analyse and provide information about the chemical composition of its environment, that is, a liquid or a gas phase

3.6
electric sensor
sensor (3.26) that examines the change in electrical or magnetic signals based on an environmental input

3.7
environment sensor
sensor (3.26) that monitors relative ambient humidity, illuminance, ambient pressure and ambient temperature

3.8
flow sensor
sensor (3.26) for detecting the rate of fluid flow

3.9
force sensor
sensor (3.26) for force detecting resistor whose resistance changes when force or pressure is applied

3.10
globally navigation satellite system
GNSS
satellite navigation system with global coverage

3.11
globally unique identifier
GUID
unique reference number used as an identifier in computer systems

3.12
light sensor
photodetector which detects changes in quantities of optical signal

3.13
mixed and augmented reality
MAR
integration of real and virtual worlds including *mixed reality* (3.14) and *augmented reality* (3.2)

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3.14
mixed reality
MR
merging of real and virtual worlds to generate new environments where physical and synthetic objects co-exist and interact

3.15
mixed reality system
system that can process *mixed reality* (3.14) applications with manipulation functions such as read, write, import, export, modify, display, etc.

3.16
movement sensor
detector to detect a change in position of an object relative to its surroundings or the change in the surroundings relative to an object

3.17
oxygen sensor
electronic device that measures the proportion of oxygen (O_2) in the gas or liquid being analysed

3.18
particle sensor
detector to detect, track, and/or identify high-energy particles

3.19
physical device
real device containing a *sensor* (3.26) which is represented by a virtual device in a virtual environment

3.20
physical sensor
Internet of things (IoT) *sensor* (3.26) which has the functionality of a *physical device* (3.19) in a 3D virtual world

3.21
position sensor
sensor (3.26) that permits position measurement

3.22
pressure sensor
sensor (3.26) that measures pressure, typically of gases or liquids

3.23
programmable logic controller
PLC
digital computer used for automation of typically industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures

3.24
proximity sensor
sensor (3.26) able to detect the presence of nearby objects without any physical contact

3.25
radio frequency identification
RFID
wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects

3.26
sensor
device to detect events or changes in its environment and send the information to other electronics

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