DRAFT International Standard

ISO/IEC DIS 20538

Information technology — Computer Graphics, image processing and environmental data representation — Human information data model for VR-based smart cities

ICS: 35.180; 13.020.20; 35.040.30

ISO/IEC JTC **1**/SC **24**

Secretariat: **BSI**

Voting begins on:
2025-06-11

Voting terminates on:
2025-09-03

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ISO/IEC DIS 20538:2025(en)

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Published in Switzerland

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Foreword

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

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Introduction

This document defines the concept of a human information data model that represents human information in a 3D virtual smart city. The human information data model includes its visual information, semantic properties related to human information, physical properties, and physical sensor information obtained from sensors for representing human information in a 3D virtual environment. This document contains the following:

— Terms, definitions, and concepts of a human information data model for a 3D virtual smart city

— Requirements for a human information data model for a 3D virtual smart city

— Definition of human information that can be specified in a 3D virtual smart city

— Representation of human-related information including sensor information that can be represented in a 3D virtual smart city

— Functionalities and base components for a human information data model for a 3D virtual smart city

— Use cases

The objectives of this document are as follows:

— Provide a reference model for human information representation in a 3D virtual smart city

— Provide a reference model to manage and monitor human information with sensors in a 3D virtual smart city

— Provide a method of defining and representing exchangeable information for developing human-related information applications in mixed and augmented reality

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Information technology — Computer Graphics, image processing and environmental data representation — Human information data model for VR-based smart cities

1 Scope

This document defines a data model for representing human information including sensor information in a 3D virtual environment that simulates a real smart city. It includes concepts, a data model, and how to integrate human information with sensors into a 3D virtual smart city. It specifies an exchangeable information data model necessary for transferring and storing human information in a 3D virtual smart city.

This document includes the following functionalities:

a) Representation of human information in a 3D virtual smart city

b) Representation of human information with sensors in a 3D virtual smart city

c) Representation of human semantic and physiological information for a 3D virtual smart city

d) Definition of an interchangeable data model for human information for a Virtual smart city

This document does not define specific physical interfaces necessary for manipulating sensor devices, but rather defines common functional data interfaces that can be used interchangeably between applications.

This document does not define how specific applications are implemented with specific 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 the functions of human related devices in the real world in relation to 3D data models for a 3D virtual smart city.

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

ISO/IEC 19774-1:2019, *Information technology — Computer graphics, image processing and environmental data representation — Part 1: Humanoid animation (HAnim) architecture*

ISO/IEC 19774-2:2019, *Information technology — Computer graphics, image processing and environmental data representation — Part 2: Humanoid animation (HAnim) motion data animation*

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
3D object
collection of polygons in 3D space, connected by various geometric entities such as vertices, edges, plain faces, curved surfaces, etc.

3.1.2
Body Mass Index
BMI
simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults and defined as the weight in kilograms divided by the square of the height in meters (kg/m^2)

[SOURCE: ISO 21856:2022(en), 3.7]

3.1.3
Electrocardiogram
ECG
dominant cardiac monitoring technique to identify cardiovascular abnormalities and to detect irregularities in heart rhythms

3.1.4
head-mounted display
HMD
display device, worn directly on the head or as part of a helmet that places a small display optic in front of each eye

3.1.5
health parameter
health indicator that can represent the status of human health

3.1.6
human anatomy
biological science that concerns the discovery, analysis, and representation of the structural organization of the human body

[SOURCE: ISO 1828:2012(en), 3.8.2]

3.1.7
human information
human related information that can represent appearance, physical properties, and semantic properties

3.1.8
informative avatar
avatar that is represented by and includes appearance, semantic properties, and physiological properties

3.1.9
physical material
material that makes up a physical object can be used for specifying physical properties and for representing haptic perception.

3.1.10
physical property
property relating to that which is material or digital input from the real world such as sensor information, for an object

3.1.11
physical sensor
IoT sensor which has the functionality of a physical device in a 3D virtual world

[SOURCE: ISO/IEC 18038:2020(en)]

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3.1.12
physiological property
property of a living organism that is related to the organism's bodily function

3.1.13
polygon
closed plane figure, having three or more, usually straight, or sides

3.1.14
semantic property
property that contributes to the function or meaning of an object, and that has aspects of a linguistic unit, such as a morpheme, word, or sentence

3.1.15
smart glass
switchable glass that can change its optical properties, becoming opaque or tinted, in response to electrical and thermal signals

3.1.16
virtual environment
interactive and immersive computing environment where 2D, 3D, or 4D virtual objects can exist in a scene

3.1.17
virtual human
digital human that refers to a computer-generated three-dimensional (3D) character which looks and behaves like a human; a virtual human represents a real person in the virtual world.

3.1.18
virtual smart city
replicated smart city that is represented and simulated in a 3D virtual environment using VR technologies

3.1.19
virtual world
collection of one or more virtual reality (VR) files and other multimedia content that, when interpreted by a VR browser, presents an interactive experience to the user consistent with the author's intent

[SOURCE: ISO/IEC 18038:2019(en), 3.32]

3.1.20
visual material
material that can be used for specifying visual properties with color, transparency, and other visual effects

3.1.21
wearable device
gadget such as a smartwatch, fitness tracker, and smart glasses, that can be worn on the human body for such purposes as accessing information and tracking health.

3.1.22
visual property
characteristic or quality that can be seen; refers to features that affect how something appears to the eyes, such as color, shape, size, brightness, and texture; in computer graphics, includes geometric and appearance information.

3.2 Acronyms and abbreviations

Table 3.1 lists the abbreviated terms used in this document.

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Table 3.1 — Abbreviated terms

Abbreviation	Abbreviated term
2D	2- dimensional
3D	3-dimentional
4D	4-dimensional
AR	Augmented Reality
BMI	Body Mass Index
ECG	Electrocardiogram
GNSS	Global Navigation Satellite System
HAnim	Humanoid Animation
HMD	Head-mounted display
IoT	Internet of Things
ID	Identifier
IP	Internet Protocol
MAR	Mixed and Augmented Reality
MR	Mixed Reality
VE	Virtual Environment
VR	Virtual Reality
XML	Extensible Markup Language

4 Concepts

4.1 General

VR-based smart cities should provide for monitoring and management of human information data of real city resident.[1] To achieve this, human information should be able to be collected, represented and managed for a virtual smart city in a way that simulates real city functionally. This clause defines concepts for representing human information and how to organize that information in relation to a virtual environment that corresponds to a smart city. For example, human information can be represented and monitored in a virtual smart city that provides the functionality of a smart health system (Figure 4.1).

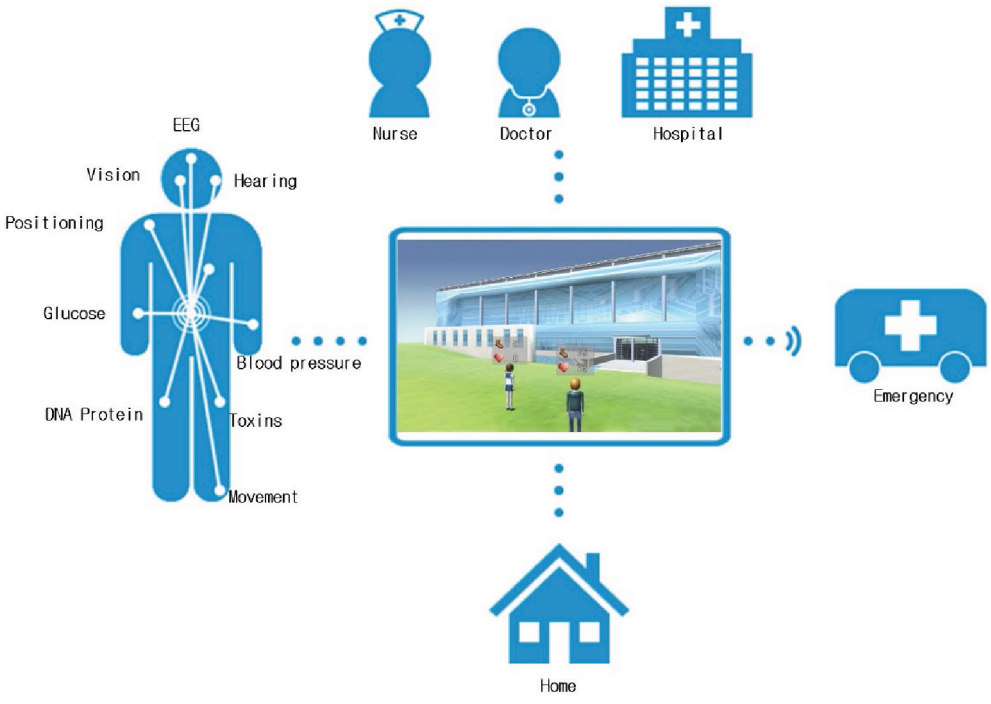


Figure 4.1 — Human information for smart health

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