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**Automation systems and  
integration — Industrial data —  
Visualization elements of digital twins**

**iTeh STANDARD PREVIEW**  
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Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/e3c81a12-64d6-4f13-af7f-bc4b2c2d6677/iso-prf-tr-24464>

Member bodies are requested to consult relevant national interests in ISO/IEC JTC 1/SC 24 before casting their ballot to the e-Balloting application.

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# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms, definitions and abbreviated terms</b> .....	<b>1</b>
3.1 Terms and definitions.....	1
3.2 Abbreviated terms.....	2
<b>4 Motivation</b> .....	<b>3</b>
<b>5 Digital twin visualization</b> .....	<b>3</b>
5.1 Core technologies of digital twin.....	3
5.1.1 General.....	3
5.1.2 Sensor.....	3
5.1.3 Data.....	4
5.1.4 Analytics.....	4
5.1.5 Actuator.....	4
5.1.6 Integration.....	4
5.2 Visualization elements of digital twin.....	4
5.3 Detail elements of digital twin visualization.....	5
<b>6 Use cases</b> .....	<b>7</b>
<b>7 Differences compared with augmented reality (AR) and cyber physical system (CPS)</b> .....	<b>11</b>
<b>Annex A (informative) Analysis of international standards for the digital twin visualization</b> .....	<b>12</b>
<b>Annex B (informative) Fidelity measure</b> .....	<b>16</b>
<b>Bibliography</b> .....	<b>18</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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](http://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 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](http://www.iso.org/patents)).

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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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 4, *Industrial data*.

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](http://www.iso.org/members.html).

## Introduction

This document analyses visualization elements to be shared or integrated between an avatar (digital replica) and a physical asset. Three component models of the digital twin, which are physical asset, avatar, and realtime interface, are adopted and elaborated in this document. The fidelity measure of the interface between the avatar and the physical asset is discussed.

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# Automation systems and integration — Industrial data — Visualization elements of digital twins

## 1 Scope

This document analyses visualization elements that are key components of the interface between the physical asset and the avatar (digital replica of the physical asset).

## 2 Normative references

There are no normative references in this document.

## 3 Terms, definitions and abbreviated terms

### 3.1 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/>

#### 3.1.1

##### **administration shell**

bridge between a tangible asset and the IoT world

#### 3.1.2

##### **asset**

economic resource, or something of value

#### 3.1.3

##### **avatar**

digital replica of a physical asset

#### 3.1.4

##### **digital twin**

compound model composed of a physical asset, an avatar and an interface

#### 3.1.5

##### **fidelity**

level of accuracy whereby a copy reproduces its source

#### 3.1.6

##### **level of detail**

decrease in complexity of a 3D model representation as it moves away from the viewer or according to other metrics such as object importance, viewpoint-relative speed or position

#### 3.1.7

##### **physical asset**

asset which exist in the real world

**3.1.8**

**accuracy**

measurement deviation from true value and its scatter

Note 1 to entry: Accuracy consists of trueness (proximity of measurement results to the true value) and precision (repeatability or reproducibility of the measurement).

**3.1.9**

**reality**

sum or aggregate of all that is real or existent, as opposed to that which is only imaginary

**3.1.10**

**realtime**

guarantee response within specified time constraints

Note 1 to entry: Often referred to as "deadlines".

**3.1.11**

**shape**

form of an object or its external boundary, outline, or external surface, as opposed to other properties such as color, texture or material type

**3.1.12**

**STEP model**

product model which is described according to ISO 10303

**3.1.13**

**synchronization**

joining up of multiple processes at a certain point, in order to reach an agreement or commit to a certain sequence of action

**3.1.14**

**visualization**

technique for creating images, diagrams, or animations to communicate a message

**3.2 Abbreviated terms**

AI	artificial intelligence
AR	augmented reality
CAD	computer aided design
CAE	computer aided engineering
CG	computer graphics
CPS	cyber physical system
DPI	dot per inch
DTw	digital twin
LoD	level of detail
MAR	mixed and augmented reality
MR	mixed reality
O&M	operation and maintenance



- P&ID piping & instrumentation diagram
- RPM revolution per minute
- VR virtual reality
- XR extended reality

## 4 Motivation

There is a need for standardization of visualization elements that should be shared or integrated between a physical asset and an avatar (or digital replica)<sup>[1]</sup>. As defined in this document, the digital twin is composed of a physical asset, an avatar, and an interface. [Figure 1](#) shows this separation of the concept (three components model) and visualization elements of the digital twin.

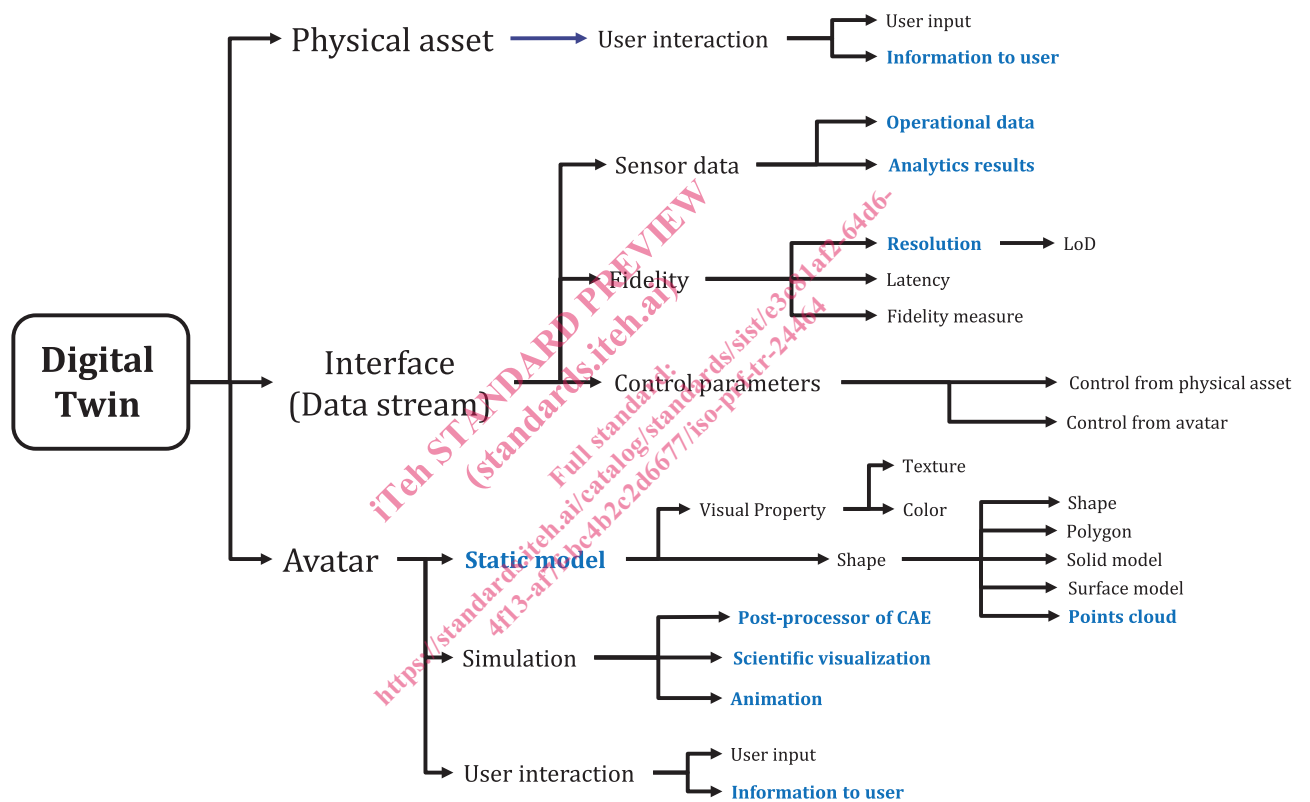


Figure 1 — Classification of terminologies of digital twin visualization

## 5 Digital twin visualization

### 5.1 Core technologies of digital twin

#### 5.1.1 General

Core technologies of the digital twin that Deloitte consulting introduced<sup>[2]</sup> are sensors, actuators, integration, data, analytics. More technologies can be defined for the visualization of digital twins.

#### 5.1.2 Sensor

Sensors that are attached to operating equipment can send the status (such as position, temperature, pressure, vibration, RPM) of the equipment to a user in near-realtime.

5.1.3 Data

Sensor data collected in near-realtime are generated continuously. The result can be a big data that is a collection of operating status information of the equipment.

5.1.4 Analytics

The technology which analyzes big data is called analytics. As a bulk of digital sensor information is collected through the internet, the quantity of data exceeds the amount that human’s analyzing abilities. Consequently, data analyzing technology using a computer with AI capability is being spotlighted.

5.1.5 Actuator

Once big data about the operating status is analyzed by analytics, operating parameters of the product can be optimized and the operating status is adjusted based on the analysis result. The delivery device of modified parameters to drive the machine is an actuator.

5.1.6 Integration

The operating status information and the control information should be shared between the avatar and the physical asset for the integration of the digital twin. The interface component of a digital twin as is defined in this document enables the sharing and integration.

5.2 Visualization elements of digital twin

The relations between keywords which are being discussed among digital twin experts in Korea are shown in Figure 2. Data models or product models in STEP standard (ISO 10303) which are being standardized by ISO/TC184/SC4 can be regarded as elements of avatars. Not only design models, but also models for production or manufacturing are included in ISO 10303. There are also digital models for visualization that are specified in SC4 standards (see Annex A).

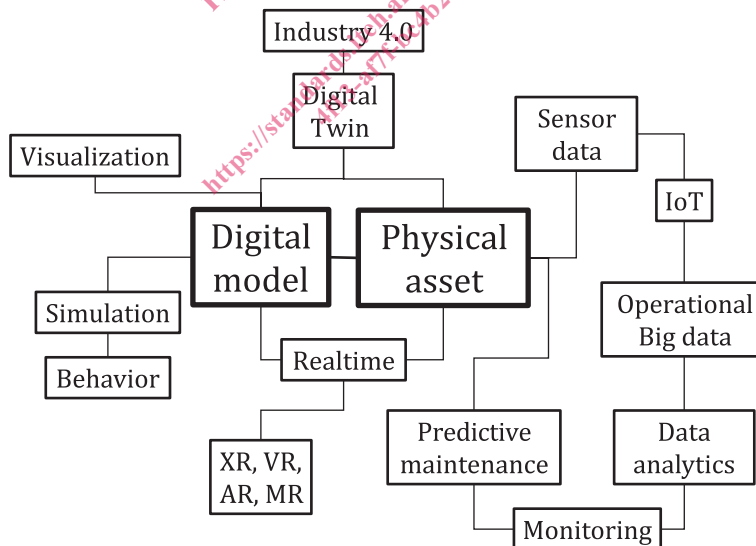


Figure 2 — Sample relations among keywords of digital twins

For the visualization of digital twins, most of the methods of virtual reality (VR) or augmented reality (AR) can be utilized. Visualizing properties such as shape, color, and texture of an avatar or a digital replica should be included, and animation also should be included.

Visualization of sensor data which shows the operating status of a physical asset should also be added for the visualization of digital twins. It is similar to the visualization elements of a post-processor in numerical simulations.