
**Information technology — Media context
and control —**

**Part 5:
Data formats for interaction devices**

*Technologies de l'information — Contrôle et contexte de supports —
Partie 5: Formats des données pour dispositifs d'interaction*



Reference number
ISO/IEC 23005-5:2011(E)

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Published in Switzerland

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

ISO/IEC 23005-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 23005 consists of the following parts, under the general title *Information technology — Media context and control*:

- *Part 1: Architecture*
- *Part 2: Control information*
- *Part 3: Sensory information*
- *Part 4: Virtual world object characteristics*
- *Part 5: Data formats for interaction devices*
- *Part 6: Common types and tools*
- *Part 7: Conformance and reference software*

Introduction

ISO/IEC 23005 (MPEG-V) provides an architecture and specifies associated information representations to enable interoperability between virtual worlds, e.g. digital content provider of a virtual world, gaming (serious), simulation, DVD, and the real world, e.g. sensors, actuators, vision and rendering, robotics (e.g. for revalidation), (support for) independent living, social and welfare systems, banking, insurance, travel, real estate, rights management and many others.

Virtual worlds (often referred to as 3D3C for 3D visualization and navigation and the 3Cs of Community, Creation and Commerce) integrate existing and emerging media technologies (e.g. instant messaging, video, 3D, VR, AI, chat, voice, etc.) that allow for the support of existing and the development of new kinds of social networks. The emergence of virtual worlds as platforms for social networking is recognized by businesses as an important issue for at least two reasons:

- 1) it offers the power to reshape the way companies interact with their environments (markets, customers, suppliers, creators, stakeholders, etc.) in a fashion comparable to the Internet;
- 2) it allows for the development of new (breakthrough) business models, services, applications and devices.

Each virtual world, however, has a different culture and audience making use of these specific worlds for a variety of reasons. These differences in existing Metaverses permit users to have unique experiences. Resistance to real-world commercial encroachment still exists in many virtual worlds, where users primarily seek an escape from real life. Hence, marketers should get to know a virtual world beforehand and the rules that govern each individual universe.

Although realistic experiences have been achieved via devices such as 3D audio/visual devices, it is hard to realize sensory effects only with presentation of audiovisual contents. The addition of sensory effects leads to even more realistic experiences in the consumption of audiovisual contents. This will lead to the application of new media for enhanced experiences of users in a more realistic sense.

Such new media will benefit from the standardization of control and sensory information which consists of sensory effect metadata, sensory device capabilities/commands, user sensory preferences, and various delivery formats. The MPEG-V architecture can be applicable for various business models for which audiovisual contents can be associated with sensory effects that need to be rendered on appropriate sensory devices.

This part of ISO/IEC 23005 contains the tools for exchanging information for interaction devices. To be specific, it specifies normative command formats for controlling sensory devices and data formats for receiving information from sensors. It also specifies some non-normative examples.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents.

ISO and the IEC take no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured ISO and the IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO and the IEC. Information may be obtained from the companies listed in Annex B.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified in Annex B. ISO and the IEC shall not be held responsible for identifying any or all such patent rights.

Information technology — Media context and control —

Part 5: Data formats for interaction devices

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of the data formats for interaction devices, i.e., Device Commands and Sensed Information, required for providing interoperability in controlling interaction devices and in sensing information from interaction devices in real as well as virtual worlds as depicted in Figure 1.

This part of ISO/IEC 23005 aims to provide data formats for industry-ready interaction devices: sensors and actuators. The same data formats for interaction devices can be utilized by various applications supported by different MPEG technologies. Not only ISO/IEC 23005 but also other International Standards such as ISO/IEC 23007 (MPEG-U) and scene representation specifications (for example ISO/IEC 14496-20) can simply refer to this part of ISO/IEC 23005 to use the defined data formats.

Two cases can occur for controlling a virtual world by using the MPEG tools. When the virtual world is using a scene description defined by MPEG tools (BIFS, Laser, etc.), the sensors and actuators can be directly connected to it through an MPEG-U interface. When the virtual world is defined by non MPEG tools, an adaptation engine and common formalism for effects are needed. In Figure 1, the first case is illustrated by VirtualWorld2 and the second by VirtualWorld1.

When this part of ISO/IEC 23005 is used in the context of pure ISO/IEC 23005, the adaptation engine (RV or VR engine), which is not within the scope of standardization, performs bi-directional communications using data formats specified in this part of ISO/IEC 23005. The adaptation engine can also utilize other tools defined in ISO/IEC 23005-2, which are user's sensory preferences (USP), sensory devices capabilities (SDC), and sensor capabilities (SC), for fine controls of devices in both real and virtual worlds.

On the other hand, the defined data formats (Sensed Information and Device Command) can be mapped to MPEG-U defined interfaces when this part of ISO/IEC 23005 is utilized in the context of other standards such as MPEG-U Framework. For example, the interface can be provided as ISO/IEC 23007-2 in the context of MPEG-U. Also defined, Sensed Information can be used by scene representation specifications as input data formats for a scene. The Device Command data format can also be used as output data formats to communicate with the outer world by mapping onto the interfaces defined in specific specifications.

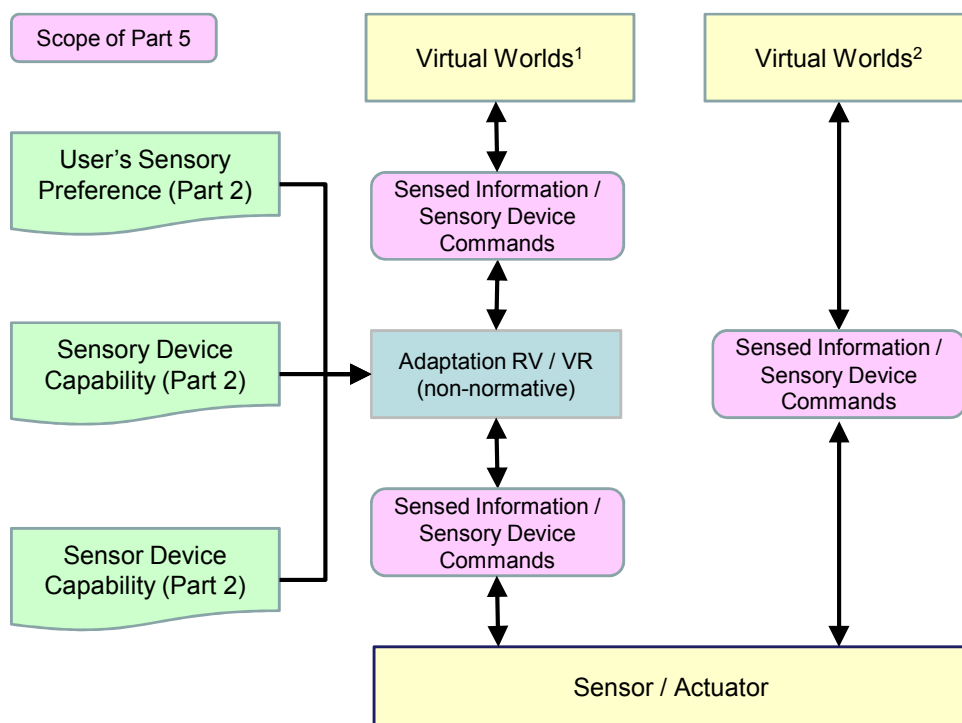


Figure 1 — Scope of the Data formats for interaction devices

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15938-5, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes*

ISO/IEC 23005-6, *Information technology — Media context and control — Part 6: Common types and tools*

3 Terms, definitions, and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO/IEC 23005-6 apply.

3.1 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

CS: Classification Scheme (see ISO/IEC 15938-5)

DAC: Digital-to-Analog Conversion

RV: Real to Virtual

URI: Uniform Resource Identifier (see RFC 2396)

VR: Virtual to Real

XML: Extensible Markup Language (see XML)

4 Interaction Information Description Language

4.1 Introduction

This Clause describes basic structure of the tools in this part of ISO/IEC 23005 in the form of interaction information description language including the schema wrapper conventions, basic data types, root element, and top-level elements.

4.2 Schema wrapper conventions

The Syntax defined in this Clause assumes the following Schema Wrapper to form a valid XML schema document.

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:si="urn:mpeg:mpeg21:2003:01-DIA-
XSI-NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS"
xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-CT-NS" xmlns:ns1="urn:mpeg:mpeg-v:2010:01-
DCV-NS" xmlns:ns2="urn:mpeg:mpeg-v:2010:01-SIV-NS"
targetNamespace="urn:mpeg:mpeg-v:2010:01-IIDL-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-x" id="MPEG-V-
IIDL.xsd">
  <import namespace="urn:mpeg:mpeg7:schema:2004"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
7_schema_files/mpeg7-v2.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2010:01-CT-NS"
schemaLocation="CommonXSD.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2010:01-DCV-NS" schemaLocation="DCV.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2010:01-SIV-NS" schemaLocation="SIV.xsd"/>
```

Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```

4.3 Root element and top-level tools

4.3.1 Introduction

This Subclause specifies the root elements and the top-level tools which can follow a root element in interactive information. The root elements are the only elements, one of which can appear as the topmost element when the interactive information specified in this part of ISO/IEC 23005 is instantiated. The top-level tools are defined as the elements which are allowed to appear as the topmost element within the root element.

4.3.2 Syntax

```

<!-- ##### -->
<!-- Root and Top-Level Elements -->
<!-- ##### -->
<element name="InteractionInfo" type="iidl:InteractionInfoType"/>
<element name="DeviceCommand" type="iidl:DeviceCommandBaseType"/>
<element name="SensedInfo" type="iidl:SensedInfoBaseType"/>

<complexType name="InteractionInfoType">
  <choice>
    <element name="DeviceCommandList" type="iidl:DeviceCmdListType"/>
    <element name="SensedInfoList" type="iidl:SensedInfoListType"/>
  </choice>
</complexType>

<complexType name="DeviceCmdListType">
  <sequence>
    <element ref="iidl:DeviceCommand" maxOccurs="unbounded"/>
  </sequence>
</complexType>

<complexType name="SensedInfoListType">
  <sequence>
    <element ref="iidl:SensedInfo" maxOccurs="unbounded"/>
  </sequence>
</complexType>

```

4.3.3 Semantics

Semantics of the InteractionInfo type:

Name	Definition
InteractionInfo	One of the root elements that serve as the topmost element in the interaction information description. This element may have DeviceCommandList and SensedInfoList as its subelements.
DeviceCommand	One of the root elements that serve as the topmost element in the interaction information description. It specifies a single command for a certain device. This element can be instantiated as a root element or subelements of DeviceCommandList.
SensedInfo	One of the root elements that serve as the topmost element in the interaction information description. It specifies a single description of information acquired through a sensor. This element can be instantiated as a root element or subelements of SensedInfoList.
InteractionInfoType	The root type provides basic structure that the interaction information description should follow through the root element.
DeviceCommandList	Optional wrapper element that serves as the placeholder for the sequence of device commands.

Name	Definition
SensedInfoList	Optional wrapper element that serves as the placeholder for the list of information acquired through sensors (SensedInfo).
DeviceCommandBaseType	DeviceCommandBaseType is an abstract type providing a base for individual command (DeviceCommand).
SensedInfoBaseType	SensedInfoBaseType is an abstract type providing a base for description of individual type of sensor.

4.3.4 Examples

The following shows two use cases of InteractionInfo element, which are for listing device commands and for listing sensed informations.

The first example shows the case when the InteractionInfo is used for DeviceCommandList.

```
<iidl:InteractionInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2010:01-SIV-NS SIV.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-CT-NS" xmlns:ns1="urn:mpeg:mpeg-v:2010:01-
DCV-NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2010:01-SIV-NS">
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:FogType" activate="true"
deviceIdRef="fdc1" id="command1" intensity="20"/>
    ...
    <iidl:DeviceCommand xsi:type="dcv:..." .../>
    ...
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

The second example shows the case when the InteractionInfo is used for SensedInfoList.

```
<iidl:InteractionInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2010:01-SIV-NS SIV.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-CT-NS" xmlns:ns1="urn:mpeg:mpeg-v:2010:01-
DCV-NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2010:01-SIV-NS">
  <iidl:SensedInfoList>
    <iidl:SensedInfo xsi:type="a_type_derived_from_SensedInfoBaseType" .../>
    ...
    <iidl:SensedInfo xsi:type="siv:AccelerationSensorType" .../>
    ...
  </iidl:SensedInfoList>
</iidl:InteractionInfo>
```

The third example shows the case when the `DeviceCommand` is used directly as the root element.

```
<iidl:DeviceCommand xsi:schemaLocation="urn:mpeg:mpeg-v:2010:01-SIV-NS SIV.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-CT-NS" xmlns:dcv="urn:mpeg:mpeg-v:2010:01-
DCV-NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2010:01-SIV-NS" xsi:type="dcv:LightType" id="light1" color="urn:mpeg:mpeg-v:01-
SI-ColorCS-NS:red" intensity="5">
  <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
</iidl:DeviceCommand>
```

The fourth example shows the case when the `SensedInfo` is used directly as the root element.

```
<iidl:SensedInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2010:01-SIV-NS SIV.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-CT-NS" xmlns:ns1="urn:mpeg:mpeg-v:2010:01-
DCV-NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2010:01-SIV-NS" xsi:type="siv:LightSensorType" id="LS001" sensorIdRef="LSID001"
activate="true" value="200" color="#FF0000">
  <iidl:TimeStamp xsi:type="mpegvct:ClockTickTimeType" timeScale="1000"
pts="600000"/>
</iidl:SensedInfo>
```

Note that these examples are only showing a part of the complete XML description to show the use of the root element, `InteractionInfo`, with the choice of `DeviceCommandList` or `SensedInfoList`.

4.4 Device commands

4.4.1 Introduction

This Subclause specifies tools for describing actions that each individual device (actuators) is supposed to take. Instances of following device commands defined in the Clause may be generated as an output of the VR engine and used to drive actuators. The following Subclause defines an abstract complex type of `DeviceCommandBaseType`, which the device command types of individual device should inherit.

4.4.2 Reference coordinate system

The origin of the reference coordinate for sensory devices is located at the position of the user. Each axis is defined as follows. X-axis is in the direction of the right hand side of the user facing the screen. Y-axis is in the reverse direction of gravity. Z-axis is in the direction of the user's facing the screen. The x-, y-, and z-axis are depicted in Figure 2.

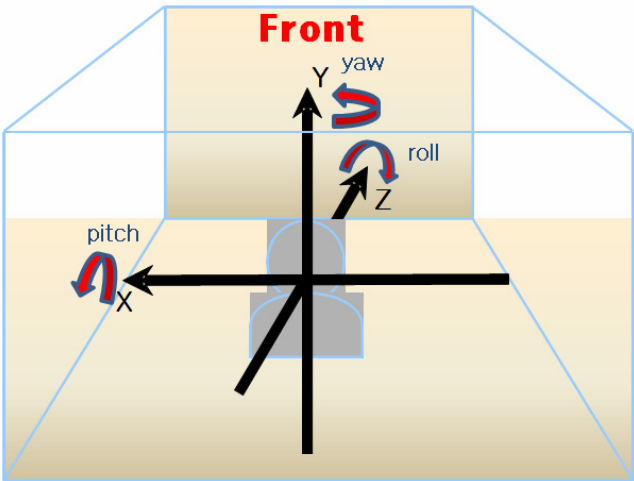


Figure 2 — Reference Coordinate System for Sensory Devices

4.4.3 Device command base type

4.4.3.1 Syntax

```
<!-- ##### -->
<!-- Device command base type -->
<!-- ##### -->
<complexType name="DeviceCommandBaseType" abstract="true">
  <sequence>
    <element name="TimeStamp" type="mpegvct:TimeStampType"/>
  </sequence>
  <attributeGroup ref="iidl:DeviceCmdBaseAttributes"/>
</complexType>
```

4.4.3.2 Semantics

Semantics of the DeviceCommandBaseType:

Name	Definition
DeviceCommandBaseType	Provides the topmost type of the base type hierarchy which each individual device command can inherit.
TimeStamp	Provides the timing information for the device command to be executed. As defined in ISO/IEC 23005-6, there is a choice of selection among three timing schemes, which are absolute time, clocktick time, and delta of clock tick time.
DeviceCmdBaseAttributes	Describes a group of attributes for the commands.

4.4.3.3 Examples

For the examples of the DeviceCommandBaseType, please see the examples of individual types of device commands.

4.4.4 Device command base attributes

4.4.4.1 Syntax

```
<!-- ##### -->
<!-- Definition of Device Command Base Attributes -->
<!-- ##### -->
<attributeGroup name="DeviceCmdBaseAttributes">
  <attribute name="id" type="ID" use="optional"/>
  <attribute name="deviceIdRef" type="anyURI" use="optional"/>
  <attribute name="activate" type="boolean" use="optional" default="true"/>
</attributeGroup>
```

4.4.4.2 Semantics

Semantics of the DeviceCmdBaseAttributes:

Name	Definition
DeviceCmdBaseAttributes	Specifies the common attributes for any type inherits from the DeviceCommandBaseType.
id	To be used to identify each individual device command.
deviceIdRef	To specify an individual device to which the command is associated.
activate	Describes whether the effect shall be activated. A value of <code>true</code> means the device shall be activated (switch on) and <code>false</code> means the device shall be deactivated (switch off).

4.4.4.3 Examples

The following is a snippet of an XML document showing the use of the DeviceCmdBaseAttributes. It shows a device command specified by the identifier of `command1` to activate a device type `any_specific_device_command_type` with device identifier `fdc1`.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:any_specific_device_command_type"
activate="true" deviceIdRef="fdc1" id="command1"/>
    ...
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

4.5 Sensed information description tools

4.5.1 Introduction

This Subclause specifies tools for describing information acquired through each individual sensor. Instances of following sensed information defined in the Clause may be generated as an output of the sensors. The following subclause defines an abstract complex type of `SensedInfoBaseType`, which the sensed information types for each individual sensor should inherit.

4.5.2 Global coordinate for sensors

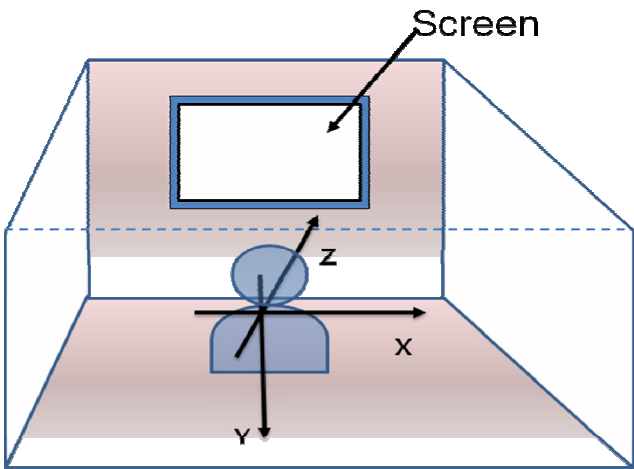


Figure 3 — Reference coordinate for sensors

The reference coordinate for sensors is defined adapting the right handed coordinate system. Each axis is defined as follows: Y-axis is in the direction of gravity; Z-axis is in the direction of user's front (in common sense) which is orthogonal to the y-axis; X-axis is in the direction of user's right side which is also orthogonal to both y-axis and z-axis. The x-, y-, and z-axis are depicted in Figure 3. The default origin of the reference coordinate for sensors is the position of the user. The origin of the coordinate system differs depending on the type of the sensor.

4.5.3 Sensed information base type

4.5.3.1 Syntax

```
<!-- ##### -->
<!-- Sensed information base type -->
<!-- ##### -->
<complexType name="SensedInfoBaseType" abstract="true">
  <sequence>
    <element name="TimeStamp" type="mpegvct:TimeStampType" minOccurs="0"/>
  </sequence>
  <attributeGroup ref="iidl:sensedInfoBaseAttributes"/>
</complexType>
```

4.5.3.2 Semantics

Semantics of the SensedInfoListType:

Name	Definition
SensedInfoBaseType	Provides the topmost type of the base type hierarchy which each individual sensed information can inherit.
sensedInfoBaseAttributes	Describes a group of attributes for the sensed information.

Name	Definition
TimeStamp	Provides the time information at which the sensed information is acquired. As defined in ISO/IEC 23005-6, there is a choice of selection among three timing schemes, which are absolute time, clocktick time, and delta of clock tick time.

4.5.4 Sensed information base attributes

4.5.4.1 Syntax

```

<!-- ##### -->
<!-- Definition of Sensed information Base Attributes -->
<!-- ##### -->
<attributeGroup name="sensedInfoBaseAttributes">
  <attribute name="id" type="ID" use="optional"/>
  <attribute name="sensorIdRef" type="anyURI" use="optional"/>
  <attribute name="linkedlist" type="anyURI" use="optional"/>
  <attribute name="groupID" type="anyURI" use="optional"/>
  <attribute name="activate" type="boolean" use="optional"/>
  <attribute name="priority" type="nonNegativeInteger" use="optional"
default="0"/>
</attributeGroup>

```

4.5.4.2 Semantics

Semantics of the sensedInfoBaseAttributes:

Name	Definition
sensedInfoBase Attributes	Describes a group of attributes for the commands.
id	Unique identifier for identifying individual sensed information
sensorIdRef	References a sensor device that has generated the information included in this specific sensed information.
linkedlist	Describes the multi-sensor structure that consists of a group of sensors in a way that each record contains a reference to the ID of the next sensor.
groupID	Identifier for a group multi-sensor structure to which this specific sensor belongs.
activate	Describes whether the sensor shall be activated. A value of "true" means the sensor shall be activated and "false" means the sensor shall be deactivated.

Name	Definition
priority	Describes a priority for sensed information with respect to other sensed information sharing the same point in time when the sensed information become adapted. A value of one indicates the highest priority and larger values indicate lower priorities. The default value of the priority is one. If there are more than one sensed information with the same priority, the order of process can be determined by the Adaptation engine itself. NOTE 1: The priority might be used to apply the sensed information on the virtual world object characteristics – defined within a group of sensors – according to the capabilities of the adaptation VR. EXAMPLE 1: The adaptation RV processes the individual sensed information of a group of sensors according to their priority in descending order due to its limited capabilities. That is, the sensed information with the lower priority might get lost.

4.5.4.3 Examples

The example of the BaseAttributes is given in the examples of sensed information vocabulary.

5 Device Command Vocabulary

5.1 Introduction

This Clause describes syntax and semantics of the device command vocabulary to implement commanding of individual devices.

5.2 Schema wrapper conventions

The Syntax defined in this Clause assumes the following Schema Wrapper to form a valid XML schema document.

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:dcv="urn:mpeg:mpeg-v:2010:01-DCV-
NS" xmlns:iidl="urn:mpeg:mpeg-v:2010:01-IIDL-NS" xmlns:mpegvct="urn:mpeg:mpeg-
v:2010:01-CT-NS" targetNamespace="urn:mpeg:mpeg-v:2010:01-DCV-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-x" id="MPEG-V-DCV.xsd">
  <import namespace="urn:mpeg:mpeg-v:2010:01-IIDL-NS"
schemaLocation="IIDL.xsd"/>
  <import namespace="urn:mpeg:mpeg7:schema:2004"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
7_schema_files/mpeg7-v2.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2010:01-CT-NS"
schemaLocation="CommonXSD.xsd"/>
```

Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```

5.3 Light type

5.3.1 Syntax

```
<!-- ##### -->
<!-- Definition of DCV Light Type -->
<!-- ##### -->
<complexType name="LightType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="color" type="mpegvct:colorType" use="optional"/>
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.3.2 Semantics

Semantics of the `LightType`:

Name	Definition
<code>LightType</code>	Tool for describing a command for a lighting device to follow.
<code>color</code>	Describes the list of colors, which the lighting device can provide, that shall be used either as a reference to a classification scheme term using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003 or as RGB value. A CS that may be used for this purpose is the <code>ColorCS</code> defined in A.2.2 of ISO/IEC 23005-6. EXAMPLE <code>urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue</code> would describe the color Alice blue.
<code>intensity</code>	Describes the intensity that the lighting device shall emit in percentage with respect to the maximum intensity that the specific device can generate.

5.3.3 Examples

This example shows the description of a device command of light effect with the following semantics. The displaying device for the light effect is "light1". The intensity shall be 5% with the color "red" from the classification scheme described in A.2.2 of ISO/IEC 23005-6.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand          xsi:type="dcv:LightType"          id="light1"
color="urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red" intensity="5">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.4 Flash type

5.4.1 Syntax

```
<!-- ##### -->
<!-- Definition of DCV Flash Type -->
<!-- ##### -->
<complexType name="FlashType">
  <complexContent>
    <extension base="dcv:LightType">
      <attribute name="frequency" type="positiveInteger" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.4.2 Semantics

Semantics of the FlashType:

Name	Definition
FlashType	Tool for describing a flash device command.
intensity	Describes the intensity of the flash effect in terms of illumination in percentage with respect to the maximum light intensity that the specific device can generate.
frequency	Describes the number of flickering in percentage with respect to the maximum frequency that the specific flash device can generate.
Color	Describes the color of the flash effect as a reference to a classification scheme term or as RGB. A CS that may be used for this purpose is the ColorCS defined in A2.2 of ISO/IEC 23005-6.