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

**Part 2:
Control information**

*Technologies de l'information — Contrôle et contexte de supports —
Partie 2: Informations de contrôle*

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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.

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 of all such patent rights.

ISO/IEC 23005-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This second edition cancels and replaces the first edition (ISO/IEC 23005-2:2011), which has been technically revised.

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 of the control information for the media. It addresses the normative aspects of the control information including device capability description, user preference information, and also illustrates 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 2: Control information

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of the tools required to provide interoperability in controlling devices in real as well as virtual worlds. In Figure 1, the scope of this part of ISO/IEC 23005 with tools defined in this part of ISO/IEC 23005 is shown. The adaptation engine (RV or VR engine), which is not within the scope of standardization, takes six inputs [sensory effects (SE), user's sensory effect preferences (USEP), sensory devices capabilities (SDC), sensor capability (SC), sensor adaptation preferences (SAP), and sensed information (SI)] and outputs sensory devices commands (SDCmd) and/or sensed information (SI) to control the devices in real world or virtual world objects. It is applicable to the interfaces between the adaptation engine and the capability descriptions of actuators/sensors in the real world, the user's sensory preference information, which characterize devices and users, and the sensor adaptation preferences information, which characterize sensors and users, so that appropriate information to control devices (actuators and sensors) can be generated. In other words, user's sensory preferences, sensory device capabilities, sensor adaptation preferences, and sensor capabilities are within the scope of this part of ISO/IEC 23005.

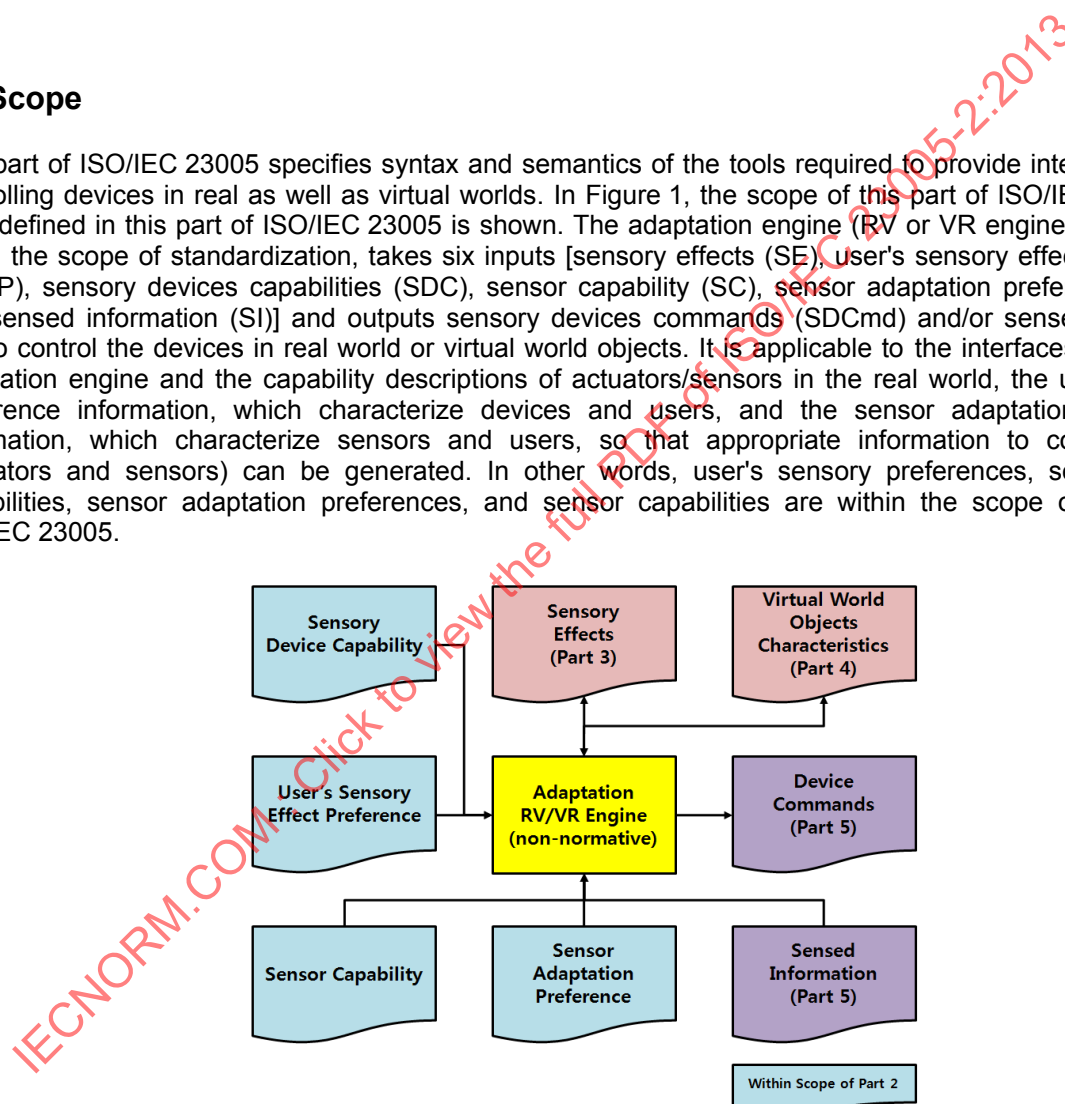


Figure 1 — Scope of the Control Information

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15938-5:2003, *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*

ISO/IEC 21000-7, *Information technology — Multimedia framework (MPEG-21) — Part 7: Digital Item Adaptation*

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.

DIA: Digital Item Adaptation (see ISO/IEC 21000-7)

MPEG-21: multimedia framework (ISO/IEC 21000-5)

XML: Extensible Markup Language (see XML)

4 Control 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 control 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 part of ISO/IEC 23005 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:dia="urn:mpeg:mpeg21:2003:01-DIA-
NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-CT-NS" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
xmlns:scdv="urn:mpeg:mpeg-v:2012:01-SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2012:01-
SEPV-NS" xmlns:sapv="urn:mpeg:mpeg-v:2012:01-SAPV-NS"
targetNamespace="urn:mpeg:mpeg-v:2012:01-CIDL-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-2" id="MPEG-V-
CIDL.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:mpeg21:2003:01-DIA-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
21_schema_files/dia-2nd/UED-2nd.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-CT-NS" schemaLocation="MPEG-V-
CT.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
schemaLocation="DCDV.xsd"/>
```

```

    <import namespace="urn:mpeg:mpeg-v:2012:01-SCDV-NS"
    schemaLocation="SCDV.xsd"/>
    <import namespace="urn:mpeg:mpeg-v:2012:01-SEPV-NS"
    schemaLocation="SEPV.xsd"/>
    <import namespace="urn:mpeg:mpeg-v:2012:01-SAPV-NS"
    schemaLocation="SAPV.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 Mnemonics for binary representations

The mnemonics are defined in 4.2 of ISO/IEC 23005-6.

4.4 Common header for binary representations

The common header is defined in 4.3 of ISO/IEC 23005-6.

4.5 Root element and top-level tools

4.5.1 Introduction

This Subclause specifies the root element and the top-level tools which can follow root element in control information. The root element is the only element which can appear as the topmost element when the control 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.

4.5.2 XML representation syntax

```

<!-- ##### -->
<!-- Root Element -->
<!-- ##### -->
<element name="ControlInfo" type="cidl:ControlInfoType"/>

<complexType name="ControlInfoType">
  <sequence>
    <element name="SensoryDeviceCapabilityList"
      type="cidl:SensoryDeviceCapabilityListType" minOccurs="0"/>
    <element name="SensorDeviceCapabilityList"
      type="cidl:SensorDeviceCapabilityListType" minOccurs="0"/>
    <element name="UserSensoryPreferenceList"
      type="cidl:UserSensoryPreferenceListType" minOccurs="0"/>
    <element name="SensorAdaptationPreferenceList"
      type="cidl:SensorAdaptationPreferenceListType" minOccurs="0"/>
  </sequence>
</complexType>

<complexType name="SensoryDeviceCapabilityListType">
  <sequence>
    <element name="SensoryDeviceCapability"
      type="cidl:SensoryDeviceCapabilityBaseType" maxOccurs="unbounded"/>

```

```

    </sequence>
</complexType>

<complexType name="SensorDeviceCapabilityListType">
    <sequence>
        <element name="SensorDeviceCapability"
            type="cidl:SensorCapabilityBaseType" maxOccurs="unbounded"/>
    </sequence>
</complexType>

<complexType name="UserSensoryPreferenceListType">
    <sequence>
        <element name="USPreference" type="cidl:UserSensoryPreferenceBaseType"
            maxOccurs="unbounded"/>
    </sequence>
</complexType>

<complexType name="SensorAdaptationPreferenceListType">
    <sequence>
        <element name="SAPreference"
            type="cidl:SensorAdaptationPreferenceBaseType" maxOccurs="unbounded"/>
    </sequence>
</complexType>

```

4.5.3 Binary representation syntax

ControlInfoType{	(Number of bits)	(Mnemonic)
SensoryDeviceCapabilityListFlag	1	bslbf
SensorDeviceCapabilityListFlag	1	bslbf
UserSensoryPreferenceListFlag	1	bslbf
SensorAdaptationPreferenceListFlag	1	bslbf
If (SensoryDeviceCapabilityListFlag) {		
SensoryDeviceCapabilityList		SensoryDeviceCapabilityListType
}		
If (SensorDeviceCapabilityListFlag) {		
SensorDeviceCapabilityList		SensorDeviceCapabilityListType
}		
If (UserSensoryPreferenceListFlag) {		
UserSensoryPreferenceList		UserSensoryPreferenceListType
}		

ControllInfoType{	(Number of bits)	(Mnemonic)
If (SensorAdaptationPreferenceListFlag) {		
SensorAdaptationPreferenceList		SensorAdaptationPreferenceListType
}		
}		
SensoryDeviceCapabilityListType {		
NumOfSensoryDevCap	32	uimsbf
for(i=1;i<NumOfSensoryDevCap;i++){		
IndividualSensoryDevCapType	8	bslbf
SensoryDeviceCapability		SensoryDeviceCapabilityType specified by IndividualSensoryDevCapType
}		
}		
SensorDeviceCapabilityListType {		
NumOfSensorCap	32	uimsbf
for(i=1;i<NumOfSensorCap;i++){		
IndividualSensorCapType	8	bslbf
SensorCapability		SensorCapabilityType specified by IndividualSensorCapType
}		
}		
UserSensoryPreferenceListType {		
NumOfUserSensoryPref	32	uimsbf
for(i=1;i<NumOfUserSensoryPref;i++){		
IndividualUserSensoryPrefType	8	bslbf

ControlInfoType{	(Number of bits)	(Mnemonic)
USPreference		USPreferenceType specified by IndividualUserSensoryPrefType
}		
}		
SensorAdaptationPreferenceListType {		
NumOfSensorAdaptationPref	32	uimsbf
for(i=1;i< NumOfSensorAdaptationPref;i++){		
IndividualSensorAdaptationPrefType	8	bslbf
SAPreference		SAPreferenceType specified by IndividualSensorAdaptationPrefType
}		
}		

4.5.4 Semantics

Semantics of the ControlInfo type :

Name	Definition
ControlInfo	The root element that serves as the topmost element in the control information description.
SensoryDeviceCapabilityListFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
SensorDeviceCapabilityListFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
UserSensoryPreferenceListFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition														
SensorAdaptationPreferenceList Flag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.														
ControlInfoType	The root type provides basic structure that the control information description should follow through the root element. This field, which is present in the binary representation, indicates the type of the <code>ControlInfo</code> element. There should be used at least one element among <code>ControlInfoType</code>.														
SensoryDeviceCapabilityList	Optional wrapper element that serves as the placeholder for the list of sensory device capability descriptions.														
SensorDeviceCapabilityList	Optional wrapper element that serves as the placeholder for the list of sensor device capability descriptions.														
UserSensoryPreferenceList	Optional wrapper element that serves as the placeholder for the list of device user preference descriptions.														
SensorAdaptationPreferenceList	Optional wrapper element that serves as the placeholder for the list of sensor device adaptation preference descriptions.														
SensoryDeviceCapabilityListType	Wrapper element type which allows multiple occurrences of sensory device capability descriptions.														
NumOfSensoryDevCap	This field, which is only present in the binary representation, specifies the number of <code>SensoryDeviceCapability</code> instances accommodated in the <code>SensoryDeviceCapabilityList</code> .														
IndividualSensoryDevCapType	This field, which is only present in the binary representation, describes which <code>SensoryDeviceCapability</code> type shall be used. In the binary description, the following mapping table is used, <table border="1"> <thead> <tr> <th>Terms of Device</th><th>Binary representation for device type (8bits)</th></tr> </thead> <tbody> <tr> <td>Light device</td><td>00000000</td></tr> <tr> <td>Flash device</td><td>00000001</td></tr> <tr> <td>Heating device</td><td>00000010</td></tr> <tr> <td>Cooling device</td><td>00000011</td></tr> <tr> <td>Wind device</td><td>00000100</td></tr> <tr> <td>Vibration device</td><td>00000101</td></tr> </tbody> </table>	Terms of Device	Binary representation for device type (8bits)	Light device	00000000	Flash device	00000001	Heating device	00000010	Cooling device	00000011	Wind device	00000100	Vibration device	00000101
Terms of Device	Binary representation for device type (8bits)														
Light device	00000000														
Flash device	00000001														
Heating device	00000010														
Cooling device	00000011														
Wind device	00000100														
Vibration device	00000101														

Name	Definition																														
	<table> <tr> <td data-bbox="603 286 995 353">Sprayer device</td><td data-bbox="995 286 1406 353">00000110</td></tr> <tr> <td data-bbox="603 353 995 421">Scent device</td><td data-bbox="995 353 1406 421">00000111</td></tr> <tr> <td data-bbox="603 421 995 488">Fog device</td><td data-bbox="995 421 1406 488">00001000</td></tr> <tr> <td data-bbox="603 488 995 555">Color correction device</td><td data-bbox="995 488 1406 555">00001001</td></tr> <tr> <td data-bbox="603 555 995 622">Rigid body motion device</td><td data-bbox="995 555 1406 622">00001010</td></tr> <tr> <td data-bbox="603 622 995 689">Tactile device</td><td data-bbox="995 622 1406 689">00001011</td></tr> <tr> <td data-bbox="603 689 995 757">Kinesthetic device</td><td data-bbox="995 689 1406 757">00001100</td></tr> <tr> <td data-bbox="603 757 995 824">Mobile device position</td><td data-bbox="995 757 1406 824">00001101</td></tr> <tr> <td data-bbox="603 824 995 869">Reserved</td><td data-bbox="995 824 1406 869">00001110-11111111</td></tr> </table>	Sprayer device	00000110	Scent device	00000111	Fog device	00001000	Color correction device	00001001	Rigid body motion device	00001010	Tactile device	00001011	Kinesthetic device	00001100	Mobile device position	00001101	Reserved	00001110-11111111												
Sprayer device	00000110																														
Scent device	00000111																														
Fog device	00001000																														
Color correction device	00001001																														
Rigid body motion device	00001010																														
Tactile device	00001011																														
Kinesthetic device	00001100																														
Mobile device position	00001101																														
Reserved	00001110-11111111																														
SensoryDeviceCapability	Specifies single description of sensory device capability description. The list of single device capabilities are as follows																														
	<table> <tr> <th data-bbox="603 907 925 1025">Terms of Device</th><th data-bbox="925 907 1406 1025">Device capability type</th></tr> <tr> <td data-bbox="603 1025 925 1093">Light device</td><td data-bbox="925 1025 1406 1093">LightCapabilityType</td></tr> <tr> <td data-bbox="603 1093 925 1160">Flash device</td><td data-bbox="925 1093 1406 1160">FlashCapabilityType</td></tr> <tr> <td data-bbox="603 1160 925 1227">Heating device</td><td data-bbox="925 1160 1406 1227">HeatingCapabilityType</td></tr> <tr> <td data-bbox="603 1227 925 1294">Cooling device</td><td data-bbox="925 1227 1406 1294">CoolingCapabilityType</td></tr> <tr> <td data-bbox="603 1294 925 1361">Wind device</td><td data-bbox="925 1294 1406 1361">WindCapabilityType</td></tr> <tr> <td data-bbox="603 1361 925 1429">Vibration device</td><td data-bbox="925 1361 1406 1429">VibrationCapabilityType</td></tr> <tr> <td data-bbox="603 1429 925 1496">Sprayer device</td><td data-bbox="925 1429 1406 1496">SprayerCapabilityType</td></tr> <tr> <td data-bbox="603 1496 925 1563">Scent device</td><td data-bbox="925 1496 1406 1563">ScentCapabilityType</td></tr> <tr> <td data-bbox="603 1563 925 1630">Fog device</td><td data-bbox="925 1563 1406 1630">FogCapabilityType</td></tr> <tr> <td data-bbox="603 1630 925 1697">Color correction device</td><td data-bbox="925 1630 1406 1697">ColorCorrectionCapabilityType</td></tr> <tr> <td data-bbox="603 1697 925 1787">Rigid body motion device</td><td data-bbox="925 1697 1406 1787">RigidBodyMotionCapabilityType</td></tr> <tr> <td data-bbox="603 1787 925 1854">Tactile device</td><td data-bbox="925 1787 1406 1854">TactileCapabilityType</td></tr> <tr> <td data-bbox="603 1854 925 1921">Kinesthetic device</td><td data-bbox="925 1854 1406 1921">KinestheticCapabilityType</td></tr> <tr> <td data-bbox="603 1921 925 2007">Mobile device position</td><td data-bbox="925 1921 1406 2007">MobileDevicePositionCapabilityType</td></tr> </table>	Terms of Device	Device capability type	Light device	LightCapabilityType	Flash device	FlashCapabilityType	Heating device	HeatingCapabilityType	Cooling device	CoolingCapabilityType	Wind device	WindCapabilityType	Vibration device	VibrationCapabilityType	Sprayer device	SprayerCapabilityType	Scent device	ScentCapabilityType	Fog device	FogCapabilityType	Color correction device	ColorCorrectionCapabilityType	Rigid body motion device	RigidBodyMotionCapabilityType	Tactile device	TactileCapabilityType	Kinesthetic device	KinestheticCapabilityType	Mobile device position	MobileDevicePositionCapabilityType
Terms of Device	Device capability type																														
Light device	LightCapabilityType																														
Flash device	FlashCapabilityType																														
Heating device	HeatingCapabilityType																														
Cooling device	CoolingCapabilityType																														
Wind device	WindCapabilityType																														
Vibration device	VibrationCapabilityType																														
Sprayer device	SprayerCapabilityType																														
Scent device	ScentCapabilityType																														
Fog device	FogCapabilityType																														
Color correction device	ColorCorrectionCapabilityType																														
Rigid body motion device	RigidBodyMotionCapabilityType																														
Tactile device	TactileCapabilityType																														
Kinesthetic device	KinestheticCapabilityType																														
Mobile device position	MobileDevicePositionCapabilityType																														

Name	Definition																																
SensoryDeviceCapabilityBaseType	SensoryDeviceCapabilityBaseType shall extend dia:TerminalCapabilityBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.																																
SensorDeviceCapabilityListType	Wrapper element type which allows multiple occurrences of sensor device capability descriptions.																																
NumOfSensorCap	This field, which is only present in the binary representation, specifies the number of SensorCapability instances accommodated in the SensorCapabilityList.																																
IndividualSensorCapType	This field, which is only present in the binary representation, describes which SensorCapability type shall be used. In the binary description, the following mapping table is used, <table> <tr> <th>Term of sensor capability</th><th>Binary representation for sensor type (8 bits)</th></tr> <tr> <td>Light sensor capability</td><td>00000000</td></tr> <tr> <td>Ambient noise sensor capability</td><td>00000001</td></tr> <tr> <td>Temperature sensor capability</td><td>00000010</td></tr> <tr> <td>Humidity sensor capability</td><td>00000011</td></tr> <tr> <td>Distance sensor capability</td><td>00000100</td></tr> <tr> <td>Atmospheric pressure Sensor capability</td><td>00000101</td></tr> <tr> <td>Position sensor capability</td><td>00000110</td></tr> <tr> <td>Velocity sensor capability</td><td>00000111</td></tr> <tr> <td>Acceleration sensor capability</td><td>00001000</td></tr> <tr> <td>Orientation sensor capability</td><td>00001001</td></tr> <tr> <td>Angular velocity sensor capability</td><td>00001010</td></tr> <tr> <td>Angular acceleration sensor capability</td><td>00001011</td></tr> <tr> <td>Force sensor capability</td><td>00001100</td></tr> <tr> <td>Torque sensor capability</td><td>00001101</td></tr> <tr> <td>Pressure sensor capability</td><td>00001110</td></tr> </table>	Term of sensor capability	Binary representation for sensor type (8 bits)	Light sensor capability	00000000	Ambient noise sensor capability	00000001	Temperature sensor capability	00000010	Humidity sensor capability	00000011	Distance sensor capability	00000100	Atmospheric pressure Sensor capability	00000101	Position sensor capability	00000110	Velocity sensor capability	00000111	Acceleration sensor capability	00001000	Orientation sensor capability	00001001	Angular velocity sensor capability	00001010	Angular acceleration sensor capability	00001011	Force sensor capability	00001100	Torque sensor capability	00001101	Pressure sensor capability	00001110
Term of sensor capability	Binary representation for sensor type (8 bits)																																
Light sensor capability	00000000																																
Ambient noise sensor capability	00000001																																
Temperature sensor capability	00000010																																
Humidity sensor capability	00000011																																
Distance sensor capability	00000100																																
Atmospheric pressure Sensor capability	00000101																																
Position sensor capability	00000110																																
Velocity sensor capability	00000111																																
Acceleration sensor capability	00001000																																
Orientation sensor capability	00001001																																
Angular velocity sensor capability	00001010																																
Angular acceleration sensor capability	00001011																																
Force sensor capability	00001100																																
Torque sensor capability	00001101																																
Pressure sensor capability	00001110																																

Name	Definition																				
	<table> <tr> <td>Motion sensor capability</td><td>00001111</td></tr> <tr> <td>Intelligent camera sensor capability</td><td>00010000</td></tr> <tr> <td>Bend sensor capability</td><td>00010001</td></tr> <tr> <td>Gas sensor capability</td><td>00010010</td></tr> <tr> <td>Dust sensor capability</td><td>00010011</td></tr> <tr> <td>Multi interaction point sensor capability</td><td>00010100</td></tr> <tr> <td>Gaze tracking sensor capability</td><td>00010101</td></tr> <tr> <td>Global position sensor capability</td><td>00010110</td></tr> <tr> <td>Altitude sensor capability</td><td>00010111</td></tr> <tr> <td>Reserved</td><td>00011000-11111111</td></tr> </table>	Motion sensor capability	00001111	Intelligent camera sensor capability	00010000	Bend sensor capability	00010001	Gas sensor capability	00010010	Dust sensor capability	00010011	Multi interaction point sensor capability	00010100	Gaze tracking sensor capability	00010101	Global position sensor capability	00010110	Altitude sensor capability	00010111	Reserved	00011000-11111111
Motion sensor capability	00001111																				
Intelligent camera sensor capability	00010000																				
Bend sensor capability	00010001																				
Gas sensor capability	00010010																				
Dust sensor capability	00010011																				
Multi interaction point sensor capability	00010100																				
Gaze tracking sensor capability	00010101																				
Global position sensor capability	00010110																				
Altitude sensor capability	00010111																				
Reserved	00011000-11111111																				

SensorDeviceCapability

Specifies single description of sensor device capability description.
The list of single commands are as follows,

Term of Sensor	Sensor capability type
Light sensor	LightSensorCapabilityType
Ambient noise sensor	AmbientNoiseSensorCapabilityType
Temperature sensor	TemperatureSensorCapabilityType
Humidity sensor	HumiditySensorCapabilityType
Distance sensor	DistanceSensorCapabilityType
Atmospheric pressure Sensor	AtmosphericPressureSensorCapabilityType
Position sensor	PositionSensorCapabilityType
Velocity sensor	VelocitySensorCapabilityType
Acceleration sensor	AccelerationSensorCapabilityType

Name	Definition																														
	<table> <tr> <td data-bbox="705 295 1086 383">Orientation sensor</td><td data-bbox="1086 295 1447 383">OrientationSensorCapabilityType</td></tr> <tr> <td data-bbox="705 383 1086 470">Angular velocity sensor</td><td data-bbox="1086 383 1447 470">AngularVelocitySensorCapabilityType</td></tr> <tr> <td data-bbox="705 470 1086 557">Angular acceleration sensor</td><td data-bbox="1086 470 1447 557">AngularAccelerationSensorCapabilityType</td></tr> <tr> <td data-bbox="705 557 1086 645">Force sensor</td><td data-bbox="1086 557 1447 645">ForceSensorCapabilityType</td></tr> <tr> <td data-bbox="705 645 1086 732">Torque sensor</td><td data-bbox="1086 645 1447 732">TorqueSensorCapabilityType</td></tr> <tr> <td data-bbox="705 732 1086 819">Pressure sensor</td><td data-bbox="1086 732 1447 819">PressureSensorCapabilityType</td></tr> <tr> <td data-bbox="705 819 1086 907">Motion sensor</td><td data-bbox="1086 819 1447 907">MotionSensorCapabilityType</td></tr> <tr> <td data-bbox="705 907 1086 994">Intelligent camera sensor</td><td data-bbox="1086 907 1447 994">IntelligentCameraCapabilityType</td></tr> <tr> <td data-bbox="705 994 1086 1081">Bend sensor</td><td data-bbox="1086 994 1447 1081">BendSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1081 1086 1169">Gas sensor</td><td data-bbox="1086 1081 1447 1169">GasSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1169 1086 1256">Dust sensor</td><td data-bbox="1086 1169 1447 1256">DustSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1256 1086 1344">Multi interaction point sensor</td><td data-bbox="1086 1256 1447 1344">MultiInteractionPointSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1344 1086 1431">Gaze tracking sensor</td><td data-bbox="1086 1344 1447 1431">GazeTrackingSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1431 1086 1518">Global position sensor</td><td data-bbox="1086 1431 1447 1518">GlobalPositionSensorCapabilityType</td></tr> <tr> <td data-bbox="705 1518 1086 1606">Altitude sensor</td><td data-bbox="1086 1518 1447 1606">AltitudeSensorCapabilityType</td></tr> </table>	Orientation sensor	OrientationSensorCapabilityType	Angular velocity sensor	AngularVelocitySensorCapabilityType	Angular acceleration sensor	AngularAccelerationSensorCapabilityType	Force sensor	ForceSensorCapabilityType	Torque sensor	TorqueSensorCapabilityType	Pressure sensor	PressureSensorCapabilityType	Motion sensor	MotionSensorCapabilityType	Intelligent camera sensor	IntelligentCameraCapabilityType	Bend sensor	BendSensorCapabilityType	Gas sensor	GasSensorCapabilityType	Dust sensor	DustSensorCapabilityType	Multi interaction point sensor	MultiInteractionPointSensorCapabilityType	Gaze tracking sensor	GazeTrackingSensorCapabilityType	Global position sensor	GlobalPositionSensorCapabilityType	Altitude sensor	AltitudeSensorCapabilityType
Orientation sensor	OrientationSensorCapabilityType																														
Angular velocity sensor	AngularVelocitySensorCapabilityType																														
Angular acceleration sensor	AngularAccelerationSensorCapabilityType																														
Force sensor	ForceSensorCapabilityType																														
Torque sensor	TorqueSensorCapabilityType																														
Pressure sensor	PressureSensorCapabilityType																														
Motion sensor	MotionSensorCapabilityType																														
Intelligent camera sensor	IntelligentCameraCapabilityType																														
Bend sensor	BendSensorCapabilityType																														
Gas sensor	GasSensorCapabilityType																														
Dust sensor	DustSensorCapabilityType																														
Multi interaction point sensor	MultiInteractionPointSensorCapabilityType																														
Gaze tracking sensor	GazeTrackingSensorCapabilityType																														
Global position sensor	GlobalPositionSensorCapabilityType																														
Altitude sensor	AltitudeSensorCapabilityType																														
SensorCapabilityBaseType	SensorCapabilityBaseType shall extend dia:TeminalCapabilityBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor device capability metadata types.																														
UserSensoryPreferenceListType	Wrapper element type which allows multiple occurrences of user preference descriptions on sensory effects.																														

Name	Definition
NumOfUserSensoryPref	This field, which is only present in the binary representation, specifies the number of USPreference instances accommodated in the UserSensoryPreferenceList.
IndividualUserSensoryPrefType	This field, which is only present in the binary representation, describes which USPreference type shall be used.

In the binary description, the following mapping table is used,

Terms of Effect	Binary representation for effect type (8bits)
Light effect	00000000
Flash effect	00000001
Heating effect	00000010
Cooling effect	00000011
Wind effect	00000100
Vibration effect	00000101
Sprayer effect	00000110
Scent effect	00000111
Fog effect	00001000
Color correction effect	00001001
Rigid body motion effect	00001010
Tactile effect	00001011
Kinesthetic effect	00001100
Reserved	00001101-11111111

Name	Definition																												
USPreference	Specifies single description of user preference description on sensory effect. The list of single device capabilities are as follows <table> <tr> <th>Terms of Effect</th><th>Terms of user preference</th></tr> <tr> <td>Light effect</td><td>LightPrefType</td></tr> <tr> <td>Flash effect</td><td>FlashPrefType</td></tr> <tr> <td>Heating effect</td><td>HeatingPrefType</td></tr> <tr> <td>Cooling effect</td><td>CoolingPrefType</td></tr> <tr> <td>Wind effect</td><td>WindPrefType</td></tr> <tr> <td>Vibration effect</td><td>VibrationPrefType</td></tr> <tr> <td>Scent effect</td><td>ScentPrefType</td></tr> <tr> <td>Fog effect</td><td>FogPrefType</td></tr> <tr> <td>Spraying effect</td><td>SprayingPrefType</td></tr> <tr> <td>Color correction effect</td><td>ColorCorrectionPrefType</td></tr> <tr> <td>Rigid body motion effect</td><td>RigidBodyMotionPrefType</td></tr> <tr> <td>Tactile effect</td><td>TactilePrefType</td></tr> <tr> <td>Kinesthetic effect</td><td>KinestheticPrefType</td></tr> </table>	Terms of Effect	Terms of user preference	Light effect	LightPrefType	Flash effect	FlashPrefType	Heating effect	HeatingPrefType	Cooling effect	CoolingPrefType	Wind effect	WindPrefType	Vibration effect	VibrationPrefType	Scent effect	ScentPrefType	Fog effect	FogPrefType	Spraying effect	SprayingPrefType	Color correction effect	ColorCorrectionPrefType	Rigid body motion effect	RigidBodyMotionPrefType	Tactile effect	TactilePrefType	Kinesthetic effect	KinestheticPrefType
Terms of Effect	Terms of user preference																												
Light effect	LightPrefType																												
Flash effect	FlashPrefType																												
Heating effect	HeatingPrefType																												
Cooling effect	CoolingPrefType																												
Wind effect	WindPrefType																												
Vibration effect	VibrationPrefType																												
Scent effect	ScentPrefType																												
Fog effect	FogPrefType																												
Spraying effect	SprayingPrefType																												
Color correction effect	ColorCorrectionPrefType																												
Rigid body motion effect	RigidBodyMotionPrefType																												
Tactile effect	TactilePrefType																												
Kinesthetic effect	KinestheticPrefType																												
UserSensoryPreferenceBaseType	UserSensoryPreferenceBaseType shall extend dia:UserCharacteristicBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.																												
SensorAdaptationPreferenceList Type	Wrapper element type which allows multiple occurrences of user preference descriptions on sensor adaptation.																												
NumOfSensorAdaptationPref	This field, which is only present in the binary representation, specifies the number of SAPreference instances accommodated in the SensorAdaptationPreferenceList.																												
IndividualSensorAdaptationPref Type	This field, which is only present in the binary representation, describes which SAPreference type shall be used. In the binary description, the following mapping table is used, <table> <tr> <th>Term of sensor adaptation preference</th><th>Binary representation for sensor type (8bits)</th></tr> </table>	Term of sensor adaptation preference	Binary representation for sensor type (8bits)																										
Term of sensor adaptation preference	Binary representation for sensor type (8bits)																												

Name	Definition
Light sensor adaptation preference	00000000
Ambient noise sensor adaptation preference	00000001
Temperature sensor adaptation preference	00000010
Humidity sensor adaptation preference	00000011
Distance sensor adaptation preference	00000100
Atmospheric pressure sensor adaptation preference	00000101
Position sensor adaptation preference	00000110
Velocity sensor adaptation preference	00000111
Acceleration sensor adaptation preference	00001000
Orientation sensor adaptation preference	00001001
Angular velocity sensor adaptation preference	00001010
Angular acceleration sensor adaptation preference	00001011
Force sensor adaptation preference	00001100
Torque sensor adaptation preference	00001101
Pressure sensor adaptation preference	00001110
Motion sensor adaptation preference	00001111
Intelligent camera sensor adaptation preference	00010000
Reserved	00010001-11111111
SAPreference	Specifies single description of user preference description on sensor adaptation. The list of single device capabilities are as follows

Name	Definition																																				
	<table> <tr> <td>Term of Sensor</td><td>Sensor adaptation preference type</td></tr> <tr> <td>Light sensor</td><td>LightAdaptationPrefType</td></tr> <tr> <td>Ambient noise sensor</td><td>AmbientNoiseAdaptationPrefType</td></tr> <tr> <td>Temperature sensor</td><td>TemperatureAdaptationPrefType</td></tr> <tr> <td>Humidity sensor</td><td>HumidityAdaptationPrefType</td></tr> <tr> <td>Distance sensor</td><td>DistanceAdaptationPrefType</td></tr> <tr> <td>Atmospheric pressure Sensor</td><td>AtmosphericPressureAdaptationPrefType</td></tr> <tr> <td>Position sensor</td><td>PositionAdaptationPrefType</td></tr> <tr> <td>Velocity sensor</td><td>VelocityAdaptationPrefType</td></tr> <tr> <td>Acceleration sensor</td><td>AccelerationAdaptationPrefType</td></tr> <tr> <td>Orientation sensor</td><td>OrientationAdaptationPrefType</td></tr> <tr> <td>Angular velocity sensor</td><td>AngularVelocityAdaptationPrefType</td></tr> <tr> <td>Angular acceleration sensor</td><td>AngularAccelerationAdaptationPrefType</td></tr> <tr> <td>Force sensor</td><td>ForceAdaptationPrefType</td></tr> <tr> <td>Torque sensor</td><td>TorqueAdaptationPrefType</td></tr> <tr> <td>Pressure sensor</td><td>PressureAdaptationPrefType</td></tr> <tr> <td>Motion sensor</td><td>MotionAdaptationPrefType</td></tr> <tr> <td>Intelligent camera sensor</td><td>IntelligentCameraAdaptationPrefType</td></tr> </table>	Term of Sensor	Sensor adaptation preference type	Light sensor	LightAdaptationPrefType	Ambient noise sensor	AmbientNoiseAdaptationPrefType	Temperature sensor	TemperatureAdaptationPrefType	Humidity sensor	HumidityAdaptationPrefType	Distance sensor	DistanceAdaptationPrefType	Atmospheric pressure Sensor	AtmosphericPressureAdaptationPrefType	Position sensor	PositionAdaptationPrefType	Velocity sensor	VelocityAdaptationPrefType	Acceleration sensor	AccelerationAdaptationPrefType	Orientation sensor	OrientationAdaptationPrefType	Angular velocity sensor	AngularVelocityAdaptationPrefType	Angular acceleration sensor	AngularAccelerationAdaptationPrefType	Force sensor	ForceAdaptationPrefType	Torque sensor	TorqueAdaptationPrefType	Pressure sensor	PressureAdaptationPrefType	Motion sensor	MotionAdaptationPrefType	Intelligent camera sensor	IntelligentCameraAdaptationPrefType
Term of Sensor	Sensor adaptation preference type																																				
Light sensor	LightAdaptationPrefType																																				
Ambient noise sensor	AmbientNoiseAdaptationPrefType																																				
Temperature sensor	TemperatureAdaptationPrefType																																				
Humidity sensor	HumidityAdaptationPrefType																																				
Distance sensor	DistanceAdaptationPrefType																																				
Atmospheric pressure Sensor	AtmosphericPressureAdaptationPrefType																																				
Position sensor	PositionAdaptationPrefType																																				
Velocity sensor	VelocityAdaptationPrefType																																				
Acceleration sensor	AccelerationAdaptationPrefType																																				
Orientation sensor	OrientationAdaptationPrefType																																				
Angular velocity sensor	AngularVelocityAdaptationPrefType																																				
Angular acceleration sensor	AngularAccelerationAdaptationPrefType																																				
Force sensor	ForceAdaptationPrefType																																				
Torque sensor	TorqueAdaptationPrefType																																				
Pressure sensor	PressureAdaptationPrefType																																				
Motion sensor	MotionAdaptationPrefType																																				
Intelligent camera sensor	IntelligentCameraAdaptationPrefType																																				
SensorAdaptationPreferenceBaseType	SensorAdaptationPreferenceBaseType shall extend dia:UserCharacteristicBaseType as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.																																				

4.5.5 Examples

The followings are some examples of the `ControlInfo` type:

The following example shows an instantiation of `SensoryDeviceCapabilityList`. The `SensoryDeviceCapabilityList` allows multiple occurrences of `SensoryDeviceCapability` elements. For the details of `SensoryDeviceCapability` elements, please see the examples of individual sensory device capability types.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2012:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2012:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2012:01-SEPV-NS">
  <cidl:SensoryDeviceCapabilityList>
    <cidl:SensoryDeviceCapability xsi:type="dcdv:LightCapabilityType">
      .
      .
      .
    </cidl:SensoryDeviceCapability>
    .
    .
    .
  </cidl:SensoryDeviceCapabilityList>
</cidl:ControlInfo>
```

The following example shows an instantiation of `SensorDeviceCapabilityList`. The `SensorDeviceCapabilityList` allows multiple occurrences of `SensorDeviceCapability` elements. For the details of `SensorDeviceCapability` elements, please see the examples of individual sensor device capability types.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2012:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2012:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2012:01-SEPV-NS">
  <cidl:SensorDeviceCapabilityList>
    <cidl:SensorDeviceCapability
      xsi:type="scdv:AmbientNoiseSensorCapabilityType">
      .
      .
      .
    </cidl:SensorDeviceCapability>
    .
    .
    .
  </cidl:SensorDeviceCapabilityList>
</cidl:ControlInfo>
```

The following example shows an instantiation of `UserSensoryPreferenceList`. The `UserSensoryPreferenceList` allows multiple occurrences of `USPreference` elements. For the details of `USPreference`, please see the examples of user's sensory preference on individual sensory effects.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2012:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2012:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2012:01-SEPV-NS">
  <cidl:UserSensoryPreferenceList>
    <cidl:USPreference xsi:type="sepv:CoolingPrefType">
      .
      .
      .
    </cidl:USPreference>
    .
    .
    .
  </cidl:UserSensoryPreferenceList>
</cidl:ControlInfo>
```

The following example shows an instantiation of `SensorAdaptationPreferenceList`. The `SensorAdaptationPreferenceList` allows multiple occurrences of `SAPreference` elements. For the details of `SAPreference`, please see the examples of user's preference on individual sensor adaptation.

```
<cidl:ControlInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-CIDL-NS CIDL.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
xmlns:sapv="urn:mpeg:mpeg-v:2012:01-SAPV-NS" xmlns:scdv="urn:mpeg:mpeg-v:2012:01-
SCDV-NS" xmlns:sepv="urn:mpeg:mpeg-v:2012:01-SEPV-NS">
  <cidl:SensorAdaptationPreferenceList>
    <cidl:SAPreference xsi:type="sapv:IntelligentCameraAdaptationPrefType">
      .
      .
      .
    </cidl:SAPreference>
    .
    .
    .
  </cidl:SensorAdaptationPreferenceList>
</cidl:ControlInfo>
```

4.6 Sensory device capability description

4.6.1 Introduction

This Subclause specifies tools for describing device capabilities of sensory devices. The following Subclause defines an abstract complex type of `SensoryDeviceCapabilityBaseType`, which the device capability description of individual sensory device should inherit.

4.6.2 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.

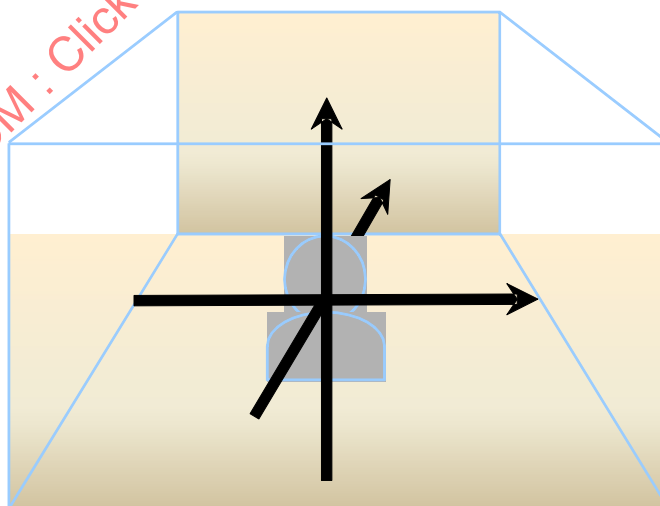


Figure 2 — Reference Coordinate System for Sensory Devices

4.6.3 Sensory device capability base type

4.6.3.1 XML representation syntax

```
<!-- ##### -->
<!-- Sensory Device capability base type -->
<!-- ##### -->
<complexType name="SensoryDeviceCapabilityBaseType" abstract="true">
  <complexContent>
    <extension base="dia:TerminalCapabilityBaseType">
      <attributeGroup ref="cidl:sensoryDeviceCapabilityAttributes"/>
    </extension>
  </complexContent>
</complexType>
```

4.6.3.2 Binary representation syntax

SensoryDeviceCapabilityBaseType{	(Number of bits)	(Mnemonic)
TerminalCapabilityBase		TerminalCapabilityBaseType
sensoryDeviceCapabilityAttributes		sensoryDeviceCapabilityAttributesType
}		

4.6.3.3 Semantics

Semantics of the `SensoryDeviceCapabilityBaseType` type:

Name	Definition
SensoryDeviceCapabilityBaseType	SensoryDeviceCapabilityBaseType shall extend <code>dia:TerminalCapabilityBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.
sensoryDeviceCapabilityAttributes	Describes a group of attributes for the device capabilities.

4.6.4 Sensory device capability base attributes

4.6.4.1 XML representation syntax

```
<!-- ##### -->
<!-- Sensory Device Capability Attributes -->
<!-- ##### -->
<attributeGroup name="sensoryDeviceCapabilityAttributes">
  <attribute name="zerothOrderDelayTime" type="nonNegativeInteger"
    use="optional"/>
  <attribute name="firstOrderDelayTime" type="nonNegativeInteger"
    use="optional"/>
  <attribute name="locator" type="mpeg7:termReferenceType" use="optional"/>
</attributeGroup>
```

4.6.4.2 Binary representation syntax

sensoryDeviceCapabilityAttributes {	(Number of bits)	(Mnemonic)
zerothOrderDelayTimeFlag	1	bslbf
firstOrderDelayTimeFlag	1	bslbf
locatorFlag	1	bslbf
if(zerothOrderDelayTimeFlag){		
zerothOrderDelayTime	16	uimsbf
}		
if(firstOrderDelayTimeFlag){		
firstOrderDelayTime	16	uimsbf
}		
if(locatorFlag){		
locator	8	blsbf
}		
}		

4.6.4.3 Semantics

Semantics of the `sensoryDeviceCapabilityAttributes` type:

Name	Definition
<code>sensoryDeviceCapabilityAttributes</code>	Describes a group of attributes for the sensory device capabilities.
<code>zerothOrderDelayTimeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>firstOrderDelayTimeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>locatorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>zerothOrderDelayTime</code>	Describes required preparation time of a sensory device to be activated since it receives a command in the unit of millisecond (ms).
<code>firstOrderDelayTime</code>	Describes the delay time for a device to reach the target intensity since it receives a command and is activated in the unit of millisecond (ms).

Name	Definition
locator	Describes the position of the device from the user's perspective according to the x-, y-, and z-axis as a reference to the LocationCS as defined in Annex 2.3 of ISO/IEC 23005-6.

In the binary description, the following mapping table is used,

locationTypeCS	Term ID of location
00000000	left
00000001	centerleft
00000010	center
00000011	centerright
00000100	right
00000101	bottom
00000110	middle
00000111	top
00001000	back
00001001	midway
00001010	front
00001011-11111111	Reserved

4.6.4.4 Examples

The following example shows a use of `sensoryDeviceCapabilityAttributes`, which describes that a sensory device, specified by the identifier value of `ldc1`, of "`specific_sensory_device_capability_type`" requires preparation time of 0 ms to start, and 1 ms to reach target intensity, and is located at the left side according to the position model defined in Annex 2.3 of ISO/IEC 23005-6.

```
<cidl:SensoryDeviceCapability
xsi:type="dcdv:specific_sensory_device_capability_type"    firstOrderDelayTime="0"
zerothOrderDelayTime="1"    id="ldc1"    locator="urn:mpeg:mpeg-v:01-SI-LocationCS -
NS:left"/>
```

4.7 Sensor capability description

4.7.1 Introduction

This Subclause specifies tools for describing Sensor capability of individual sensors. The following Subclause defines the global coordinate for sensors which depends on the real world environment of user to determine

the location of the sensors. An abstract complex type of `SensorCapabilityBaseType`, which the sensor capability description of individual device should inherit, is defined in the following Subclause.

4.7.2 Global coordinate for sensors

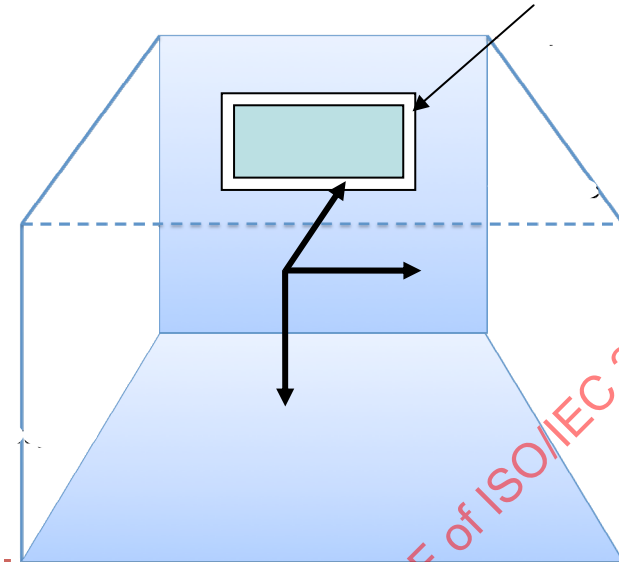


Figure 3 — Global coordinate for sensors

The origin of the global coordinate for sensors is located at the position of the user adapting the right handed coordinate system. Each axis is defined as follows. Y-axis is in the direction of gravity. X-axis is in the direction of the top right corner of the screen. Z-axis is in the opposite direction of the user's position. The x-, y-, and z-axis are depicted in Figure 3.

4.7.3 Sensor capability base type

4.7.3.1 XML representation syntax

```
<!-- ##### -->
<!-- Sensor Capability base type -->
<!-- ##### -->
<complexType name="SensorCapabilityBaseType" abstract="true">
  <complexContent>
    <extension base="dia:TerminalCapabilityBaseType">
      <sequence>
        <element name="Accuracy" type="cidl:AccuracyType" minOccurs="0"/>
      </sequence>
      <attributeGroup ref="cidl:sensorCapabilityBaseAttributes"/>
    </extension>
  </complexContent>
</complexType>

<complexType name="AccuracyType" abstract="true"/>

<complexType name="PercentAccuracy">
  <complexContent>
```

```

    <extension base="cidl:AccuracyType">
      <attribute name="value" type="mpeg7:zeroToOneType"/>
    </extension>
  </complexContent>
</complexType>

<complexType name="ValueAccuracy">
  <complexContent>
    <extension base="cidl:AccuracyType">
      <attribute name="value" type="float"/>
    </extension>
  </complexContent>
</complexType>

```

4.7.3.2 Binary representation syntax

SensorCapabilityBaseType {	(Number of bits)	(Mnemonic)
AccuracyFlag	1	bslbf
TerminalCapabilityBase		TerminalCapabilityBaseType
if(AccuracyFlag){		
Accuracy		AccuracyType
}		
SensorCapabilityBaseAttributes		SensorCapabilityBaseAttributesType
}		
AccuracyType {		
AccuracySelect	2	bslbf
if(AccuracySelect==00){		
PercentAccuracy	32	fsbf
} else if (AccuracySelect==01) {		
ValueAccuracy	32	fsbf
}		
}		

4.7.3.3 Semantics

Semantics of the `SensorCapabilityBaseType`:

Name	Definition
<code>SensorCapabilityBaseType</code>	<code>SensorCapabilityBaseType</code> shall extend <code>dia:TeminalCapabilityBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor device capability metadata types.
<code>AccuracyFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>Accuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in <code>AccuracyType</code> .
<code>sensorCapabilityBaseAttributes</code>	Describes a group of attributes for the sensor capabilities.

Semantics of the `AccuracyType`:

Name	Definition
<code>AccuracyType</code>	Becomes a parent type providing a choice of describing the accuracy in either relative value or absolute value.
<code>AccuracySelect</code>	This field, which is only present in the binary representation, describes which accuracy scheme shall be used. "0" means that the <code>PercentAccuracy</code> type shall be used, and "1" means that the <code>ValueAccuracy</code> type shall be used.
<code>PercentAccuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in a relative way using a value ranging from 0 to 1.0.
<code>value</code>	Provides an actual value in a relative way for accuracy where value 0 means 0 % accuracy and value 1.0 means 100 % accuracy. It shall be a <code>zeroToOneType</code> type as defined in ISO/IEC 15938-5:2003.
<code>ValueAccuracy</code>	Describes the degree of closeness of a measured quantity to its actual value in an absolute value of given unit.
<code>value</code>	Provides an actual value in an absolute way, where the value means the possible range of error as (-value, +value) of given unit.

4.7.3.4 Examples

For examples of using `SensorCapabilityBaseType` please see the examples provided by the individual sensor device capability types.

4.7.4 Sensor capability base attributes

4.7.4.1 XML representation syntax

```

<!-- ##### -->
<!-- Sensor Capability Base Attributes -->
<!-- ##### -->
<attributeGroup name="sensorCapabilityBaseAttributes">
  <attribute name="unit" type="mpegvct:unitType" use="optional"/>
  <attribute name="maxValue" type="float" use="optional"/>
  <attribute name="minValue" type="float" use="optional"/>
  <attribute name="offset" type="float" use="optional"/>
  <attribute name="numOfLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="sensitivity" type="float" use="optional"/>
  <attribute name="SNR" type="float" use="optional"/>
</attributeGroup>

```

4.7.4.2 Binary representation syntax

SensorCapabilityBaseAttributesType {	(Number of bits)	(Mnemonic)
unitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
offsetFlag	1	bslbf
numOfLevelsFlag	1	bslbf
sensitivityFlag	1	bslbf
SNRFlag	1	bslbf
if(unitFlag){		
unit	8	bslbf
}		
if(maxValueFlag){		
maxValue	32	fsbf
}		
if(minValueFlag){		
minValue	32	fsbf
}		
if(offsetFlag){		

SensorCapabilityBaseAttributesType {	(Number of bits)	(Mnemonic)
offset	32	fsbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
if(sensitivityFlag){		
sensitivity	32	fsbf
}		
if(SNRFlag){		
SNR	32	fsbf
}		
}		

4.7.4.3 Semantics

Semantics of the SensorCapabilityBaseAttributes:

Name	Definition
sensorCapabilityBaseAttributes	Describes a group of attributes for the sensor capabilities.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
offsetFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
sensitivityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
SNRFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unit	Describes the unit of the sensor's measuring value. Specifies the unit of the sensor's measuring value as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxValue</code> and <code>minValue</code> is used for the values of <code>maxValue</code> and <code>minValue</code> are used.
maxValue	Describes the maximum value that the sensor can perceive. The terms will be different according to the individual sensor type.
minValue	Describes the minimum value that the sensor can perceive. The terms will be different according to the individual sensor type.
offset	Describes the number of value locations added to a base value in order to get to a specific absolute value.
numOfLevels	Describes the number of value levels that the sensor can perceive in between maximum and minimum value. EXAMPLE The value 5 means the sensor can perceive 5 steps from <code>minValue</code> to <code>maxValue</code> .
sensitivity	Describes the minimum magnitude of input signal required to produce a specified output signal in given unit.
SNR	Describes the ratio of a signal power to the noise power corrupting the signal.

4.7.4.4 Examples

The following example shows a use of `SensorCapabilityBaseAttributes`. It shows that an arbitrary sensor device of type `any_specific_sensor_device_capability_type` has an id of "ans01" with `maxValue` of 100, `minValue` of 10, 20 levels, offset of -3, sensitivity of 0.8, and SNR of 99 dB. It also shows that the measuring unit of the specified sensor device is dB.

```
<cidl:SensorDeviceCapability
xsi:type="scdv:any_specific_sensor_device_capability_type" id="ans01"
maxValue="100" minValue="10" numOfLevels="20" offset="-3" sensitivity="0.8"
SNR="99" unit="dB"/>
```

4.8 User's sensory preference description

4.8.1 Introduction

This Subclause specifies tools for describing preferences of individual users regarding the sensory experience. The following Subclauses define an abstract complex type of `UserSensoryPreferenceBaseType`, which the user preferences on each individual type of sensory experience should inherit.

4.8.2 User sensory preference base type

4.8.2.1 XML representation syntax

```
<!-- ##### -->
<!-- User Sensory Preference base type -->
<!-- ##### -->
<complexType name="UserSensoryPreferenceBaseType" abstract="true">
  <complexContent>
    <extension base="dia:UserCharacteristicBaseType">
      <attributeGroup ref="cidl:userSensoryPrefBaseAttributes"/>
    </extension>
  </complexContent>
</complexType>
```

4.8.2.2 Binary representation syntax

UserSensoryPreferenceBaseType {	(Number of bits)	(Mnemonic)
UserCharacteristicBase		UserCharacteristicBaseType
userSensoryPrefBaseAttributes		userSensoryPrefBaseAttributesType
}		

4.8.2.3 Semantics

Semantics of the `UserSensoryPreferenceBaseType` type:

Name	Definition
UserSensoryPreferenceBaseType	UserSensoryPreferenceBaseType shall extend <code>dia:UserCharacteristicBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensory device capability metadata types.
userSensoryPrefBaseAttributes	Describes a group of common attributes for the describing user preferences on sensory experience.

4.8.2.4 Examples

For the examples of `UserSensoryPreferenceBaseType`, please see the examples of preferences on individual sensory effect type.

4.8.3 User sensory preference base attributes

4.8.3.1 XML representation syntax

```

<!-- ##### -->
<!-- User Sensory Preference Base Attributes -->
<!-- ##### -->
<attributeGroup name="userSensoryPrefBaseAttributes">
  <attribute name="adaptationMode" type="cidl:adaptationModeType"
    use="optional"/>
  <attribute name="activate" type="boolean" use="optional"/>
</attributeGroup>

<!-- User Preference of Adaptation Mode Types -->
<simpleType name="adaptationModeType">
  <restriction base="string">
    <enumeration value="strict"/>
    <enumeration value="scalable"/>
  </restriction>
</simpleType>

```

4.8.3.2 Binary representation syntax

userSensoryPrefBaseAttributesType {	(Number of bits)	(Mnemonic)
adaptationModeFlag	1	bslbf
activateFlag	1	bslbf
if(adaptationModeFlag){		
adaptationMode		adaptationModeType
}		
if(activateFlag){		
activate	1	bslbf
}		
}		
adaptationModeType {		
adaptationMode	2	bslbf
}		

4.8.3.3 Semantics

Semantics of the userSensoryPrefBaseAttributes type:

Name	Definition								
userSensoryPrefBaseAttributes	Describes a group of common attributes for the describing user preferences on sensory experience.								
adaptationModeFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.								
activateFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.								
adaptationMode	Describes the user's preference on the adaptation method for the sensory effect. EXAMPLE The value "strict" means the user prefer to render sensory effect exactly as described. Otherwise the value "scalable" means to render sensory effect with scaled intensity according to the device capacity.								
activate	Describes whether the effect shall be activated. A value of <code>true</code> means the effect shall be activated and <code>false</code> means the effect shall be deactivated.								
adaptationModeType	Tool for describing the adaptation mode with enumeration set. When its value is <code>strict</code> , it means that when the input value is out of range, the output should be equal to the maximum value that the device is able to operate. When its value is <code>scalable</code> , it means that the output shall be linearly scaled into the range that the device can operate. In the binary description, the following mapping table is used,								
<table border="1"> <thead> <tr> <th>adaptationModeType</th><th>adaptationMode</th></tr> </thead> <tbody> <tr> <td>00</td><td>strict</td></tr> <tr> <td>01</td><td>scalable</td></tr> <tr> <td>10-11</td><td>Reserved</td></tr> </tbody> </table>		adaptationModeType	adaptationMode	00	strict	01	scalable	10-11	Reserved
adaptationModeType	adaptationMode								
00	strict								
01	scalable								
10-11	Reserved								

4.8.3.4 Examples

For the examples of `userSensoryPrefBaseAttributes`, please see the examples of preferences on individual sensory effect type.

4.9 Sensor adaptation preference description

4.9.1 Introduction

This Subclause specifies tools for describing preferences of individual users regarding the sensed information. The following Subclauses define an abstract complex type of `SensorAdaptationPreferenceBaseType`, which the user preferences on each individual type of sensed information should inherit.

4.9.2 Sensor adaptation preference base type

4.9.2.1 XML representation syntax

```

<!-- ##### -->
<!-- Sensor Adaptation Preference base type -->
<!-- ##### -->
<complexType name="SensorAdaptationPreferenceBaseType" abstract="true">
  <complexContent>
    <extension base="dia:UserCharacteristicBaseType">
      <attributeGroup ref="cidl:sensorAdaptationPrefBaseAttributes"/>
    </extension>
  </complexContent>
</complexType>

```

4.9.2.2 Binary representation syntax

SensorAdaptationPreferenceBaseType {	(Number of bits)	(Mnemonic)
UserCharacteristicBase		UserCharacteristicBaseType
sensorAdaptationPrefBaseAttributes		sensorAdaptationPrefBaseAttributesType
}		

4.9.2.3 Semantics

Semantics of the `SensorAdaptationPreferenceBaseType` type:

Name	Definition
<code>SensorAdaptationPreferenceBaseType</code>	<code>SensorAdaptationPreferenceBaseType</code> shall extend <code>dia:UserCharacteristicBaseType</code> as defined in ISO/IEC 21000-7 and provides a base abstract type for a subset of types defined as part of the sensor capability metadata types.
<code>SensorAdaptationPrefBaseAttributes</code>	Describes a group of common attributes for describing the adaptation preferences on sensed information.

4.9.2.4 Examples

For the examples of `SensorAdaptationPreferenceBaseType`, please see the examples of preferences on individual sensor adaptation preference type.

4.9.3 Sensor adaptation preference base attributes

4.9.3.1 XML representation syntax

```

<!-- ##### -->
<!-- Sensor Adaptation Preference Base Attributes -->
<!-- ##### -->
<attributeGroup name="sensorAdaptationPrefBaseAttributes">

```

```

<attribute name="sensorIdRef" type="anyURI" use="optional"/>
<attribute name="sensorAdaptationMode" type="cidl:sensorAdaptationModeType"
use="optional"/>
<attribute name="activate" type="boolean" use="optional"/>
<attribute name="unit" type="mpegvct:unitType" use="optional"/>
<attribute name="maxValue" type="float" use="optional"/>
<attribute name="minValue" type="float" use="optional"/>
<attribute name="numOfLevels" type="nonNegativeInteger" use="optional"/>
</attributeGroup>
<!-- Adaptation Preference of Sensor Adaptation Mode Types -->
<simpleType name="sensorAdaptationModeType">
  <restriction base="string">
    <enumeration value="strict"/>
    <enumeration value="scalable"/>
  </restriction>
</simpleType>

```

4.9.3.2 Binary representation syntax

sensorAdaptationPrefBaseAttributesType {	(Number of bits)	(Mnemonic)
sensorIdRefFlag	1	bslbf
sensorAdaptationModeFlag	1	bslbf
activateFlag	1	bslbf
unitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
numOfLevelsFlag	1	bslbf
If(sensorIdRefFlag) {		
sensorIdRef	See ISO 10646	UTF-8
}		
If(sensorAdaptationModeFlag) {		
sensorAdaptationMode		sensorAdaptationModeType
}		
If(activateFlag) {		
activate	1	bslbf
}		
If(unitFlag) {		

sensorAdaptationPrefBaseAttributesType {	(Number of bits)	(Mnemonic)
unit	8	bslbf
}		
If(maxValueFlag) {		
maxValue	32	fsbf
}		
If(minValueFlag) {		
minValue	32	fsbf
}		
If(numOfLevelsFlag) {		
numOfLevels		vluimsbf5
}		
}		
sensorAdaptationModeType {		
value	2	bslbf
}		

4.9.3.3 Semantics

Semantics of the `SensorAdaptationPrefBaseAttributes` type:

Name	Definition
<code>SensorAdaptationPrefBaseAttributes</code>	Describes a group of common attributes for the describing adaptation preferences on sensed information.
<code>sensorIdRefFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>sensorAdaptationModeFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>activateFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
sensorIdRef	Refers the Id of an individual sensor that has generated the specific sensor adaptation preferences.
sensorAdaptationMode	Describes the user's preference on the adaptation method for the sensed information. EXAMPLE The value "strict" means the user prefer to transmit sensed information to the virtual world exactly as described. Otherwise the value "scalable" means to let the virtual world may adjust sensed information with scaled value according to user's intention.
activate	Describes whether the user allows the sensed information to be used or not. A value of "true" means the sensed information is allowed to use and "false" means the sensed information is not allowed to use.
unit	Describes the unit of value which the user prefers to adapt.
maxValue	Describes the maximum desirable value of the sensed information according to the maximum scale defined within the semantics definition of the individual sensor.
minValue	Describes the minimum desirable value of the sensed information according to the minimum scale defined within the semantics definition of the individual sensor.
numOfLevels	Describes the desirable number of value levels in between maximum and minimum value.
sensorAdaptationModeType	Tool for describing the adaptation mode with enumeration set. When its value is <code>strict</code> , it means that when the input value is out of range, the output should be equal to the maximum value that the device is able to operate. When its value is <code>scalable</code> , it means that the output shall be linearly scaled into the range that the device can operate.

4.9.3.4 Examples

For the examples of `sensorAdaptationPrefBaseAttributes`, please see the examples of preferences on individual sensor adaptation preference type.

5 Device capability description vocabulary

5.1 Introduction

This Clause describes syntax and semantics of the device capability description vocabulary to implement description of capability 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:mpegvct="urn:mpeg:mpeg-v:2012:01-
CT-NS" xmlns:cidl="urn:mpeg:mpeg-v:2012:01-CIDL-NS" xmlns:dcdv="urn:mpeg:mpeg-
v:2012:01-DCDV-NS" targetNamespace="urn:mpeg:mpeg-v:2012:01-DCDV-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-2" id="MPEG-V-DCDV.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:2012:01-CIDL-NS"
schemaLocation="CIDL.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-CT-NS" schemaLocation="MPEG-V-
CT.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 capability type

5.3.1 XML representation syntax

```
<!-- ##### -->
<!-- Light capability type -->
<!-- ##### -->
<complexType name="LightCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="Color" type="mpegvct:colorType" minOccurs="0"
maxOccurs="unbounded"/>
      </sequence>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="maxIntensity" type="nonNegativeInteger"
use="optional"/>
      <attribute name="numOfLightLevels" type="nonNegativeInteger"
use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.3.2 Binary representation syntax

LightCapabilityType {	(Number of bits)	(Mnemonic)
ColorFlag	1	bslbf
unitFlag	1	bslbf
maxIntensityFlag	1	bslbf
numOfLightLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(ColorFlag){		
LoopColor		vluimbsf5
for(k=0;k<LoopColor;k++){		
Color[k]		ColorType
}		
}		
if(unitFlag){		
unit	8	bslbf
}		
if(maxIntensityFlag){		
maxIntensity	32	uimbsf
}		
if(numOfLightLevelsFlag){		
numOfLightLevels	16	uimbsf
}		
}		

5.3.3 Semantics

Semantics of the `LightCapabilityType` type:

Name	Definition
<code>LightCapabilityType</code>	Tool for describing a light capability.
<code>ColorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. value of "1" means the attribute shall be

Name	Definition
	used and "0" means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLightLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unit	Specifies the unit of the maxIntensity, if a unit other than the default unit is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6.
maxIntensity	Describes the maximum intensity that the lighting device can provide in terms of LUX.
numOfLightLevels	Describes the number of intensity levels that the device can provide in between maximum and minimum intensity of light.
LoopColor	This field, which is only present in the binary representation, specifies the number of Color contained in the description.
Color	Describes the list of colors which the lighting device can provide as a reference to a classification scheme term or as RGB value. A CS that may be used for this purpose is the ColorCS defined in A.2.2 of ISO/IEC 23005-6. EXAMPLE urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue would describe the color Alice blue.

5.3.4 Examples

This example shows the description of a light capability with the following semantics. The light identifier is "light1". The maximum intensity of the light is 300 lux. There are 10 light levels between maximum and minimum intensity. The location of the light is the right side according to the position model described in Figure 3 of ISO/IEC 23005-3. The colors that can be displayed by the light are "white", "red", "blue", and "green" from the classification scheme described in A.2.2 of ISO/IEC 23005-6.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:LightCapabilityType"
id="light1" unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux"
maxIntensity="300" numOfLightLevels="10" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:right">
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:white
  </dcdv:Color>
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red
  </dcdv:Color>
  <dcdv:Color>
    urn:mpeg:mpeg-v:01-SI-ColorCS-NS:blue
  </dcdv:Color>
```

```

<dcdv:Color>
  urn:mpeg:mpeg-v:01-SI-ColorCS-NS:green
</dcdv:Color>
</cidl:SensoryDeviceCapability>

```

5.4 Flash capability type

5.4.1 XML representation syntax

```

<!-- ##### -->
<!-- Flash capability type -->
<!-- ##### -->
<complexType name="FlashCapabilityType">
  <complexContent>
    <extension base="dcdv:LightCapabilityType">
      <attribute name="maxFrequency" type="positiveInteger" use="optional"/>
      <attribute name="numOfFreqLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.4.2 Binary representation syntax

FlashCapabilityType {	(Number of bits)	(Mnemonic)
maxFrequencyFlag	1	bslbf
numOfFreqLevelsFlag	1	bslbf
LightCapability		LightCapabilityType
if(maxFrequencyFlag){		
maxFrequency	8	uimsbf
}		
if(numOfFreqLevelsFlag){		
numOfFreqLevels	8	uimsbf
}		
}		

5.4.3 Semantics

Semantics of the `FlashCapabilityType` type:

Name	Definition
------	------------

Name	Definition
FlashCapabilityType	Tool for describing a flash capability. It is extended from the light capability type.
maxFrequencyFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfFreqLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
LightCapability	Describes a light capability.
maxFrequency	Describes the maximum number of flickering in times per second. EXAMPLE The value 10 means the device can flicker 10 times for each second.
maxIntensity	Describes the maximum intensity that the flash device can provide in terms of LUX.
unit	Specifies the unit of the maxIntensity, if a unit other than the default unit is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6.
numOfFreqLevels	Describes the number of frequency levels that the device can provide in between maximum and minimum frequency.
numOfLightLevels	Describes the number of intensity levels that the device can provide in between maximum and minimum intensity of light.

5.4.4 Examples

This example shows the description of a flash light capability with the following semantics. The flash light identifier is "flash1". The maximum frequency of the flash light is 50 times per second. There are 10 levels between maximum and minimum frequency of the flash light. The location of the flash light is the left side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:FlashCapabilityType" id="flash1"
maxFrequency="50" numOfFreqLevels="10"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux" maxIntensity="300"
numOfLightLevels="10" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:left"/>
```

5.5 Heating capability type

5.5.1 XML representation syntax

```
<!-- ##### -->
<!-- Heating capability type -->
<!-- ##### -->
<complexType name="HeatingCapabilityType">
  <complexContent>
```

```

<extension base="cidl:SensoryDeviceCapabilityBaseType">
  <attribute name="maxIntensity" type="nonNegativeInteger"
    use="optional"/>
  <attribute name="minIntensity" type="integer" use="optional"/>
  <attribute name="unit" type="mpegvct:unitType" use="optional"/>
  <attribute name="numOfLevels" type="nonNegativeInteger"
    use="optional"/>
</extension>
</complexContent>
</complexType>

```

5.5.2 Binary representation syntax

HeatingCapabilityType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	bslbf
minIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.5.3 Semantics

Semantics of the HeatingCapabilityType type:

Name	Definition
HeatingCapabilityType	Tool for describing the capability of a device which can increase the room temperature.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the highest temperature that the heating device can provide in terms of Celsius (or Fahrenheit).
minIntensity	Describes the lowest temperature that the heating device can provide in terms of Celsius (or Fahrenheit).
unit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6 (it shall be a reference to either Celsius or Fahrenheit.) If the unit is not specified, the default unit is Celsius.
numOfLevels	Describes the number of temperature levels that the device can provide in between maximum and minimum temperature.

5.5.4 Examples

This example shows the description of a heating capability with the following semantics. The heating device identifier is "heater1". The maximum intensity of the heating device is 40 degrees Celsius, and the minimum intensity is 20 degrees Celsius. This specified device can support 40 levels in controlling the intensity. This device takes 10 milliseconds to start and 20 milliseconds to reach the target intensity. The location of the heating device is the left side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:HeatingCapabilityType"
id="heater1" zerothOrderDelayTime="10" firstOrderDelayTime="20"
maxIntensity="40" minIntensity="20" numOfLevels="40"
locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:left"/>
```

5.6 Cooling capability type

5.6.1 XML representation syntax

```
<!-- ##### -->
<!-- Cooling capability type -->
<!-- ##### -->
```

```

<complexType name="CoolingCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="minIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.6.2 Binary representation syntax

CoolingCapabilityType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	bslbf
minIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.6.3 Semantics

Semantics of the CoolingCapabilityType type:

Name	Definition

Name	Definition
CoolingCapabilityType	Tool for describing the capability of a device which can decrease the room temperature.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the lowest temperature that the cooling device can provide in terms of Celsius.
minIntensity	Describes the highest temperature that the cooling device can provide in terms of Celsius.
unit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6 (it shall be a reference to either Celsius or Fahrenheit.) If the unit is not specified, the default unit is Celsius.
numOfLevels	Describes the number of temperature levels that the device can provide in between maximum and minimum temperature.

5.6.4 Examples

This example shows the description of a heating capability with the following semantics. The heating device identifier is "cooler1". The maximum intensity of the cooling device is 15 degrees Celsius, and the minimum intensity is 30 degrees Celsius. This specified device can support 30 levels in controlling the intensity. This device takes 10 milliseconds to start and 30 milliseconds to reach the target intensity. The location of the heating device is the right side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:CoolingCapabilityType"
id="cooler1" zerothOrderDelayTime="10" firstOrderDelayTime="30"
maxIntensity="15" minIntensity="30" numOfLevels="30"
locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:right"/>
```

5.7 Wind capability type

5.7.1 XML representation syntax

```
<!-- ##### -->
<!-- Wind capability type -->
<!-- ##### -->
```

```

<complexType name="WindCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="maxWindSpeed" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.7.2 Binary representation syntax

WindCapabilityType {	(Number of bits)	(Mnemonic)
maxWindSpeedFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxWindSpeedFlag){		
maxWindSpeed	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.7.3 Semantics

Semantics of the WindCapabilityType type:

Name	Definition
WindCapabilityType	Tool for describing a wind capability.

Name	Definition
maxWindSpeedFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxWindSpeed	Describes the maximum wind speed that the fan can provide in terms of Meter per second.
unit	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxWindSpeed is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6.
numOfLevels	Describes the number of wind speed levels that the device can provide in between maximum and minimum speed.

5.7.4 Examples

This example shows the description of a wind device capability with the following semantics. The wind device identifier is "fan01". The maximum wind speed of the wind device (possibly a fan) is 30 meter per second. This specified device can support 5 levels in controlling the wind speed. This device takes 10 milliseconds to start and 10 milliseconds to reach the target intensity. The location of the heating device is the center according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:WindCapabilityType"
id="fan01" zerothOrderDelayTime="10" firstOrderDelayTime="10"
maxWindSpeed="30" numOfLevels="5" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:center"/>
```

5.8 Vibration capability type

5.8.1 XML representation syntax

```
<!-- ##### -->
<!-- Vibration capability type -->
<!-- ##### -->
<complexType name="VibrationCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
```

```

    <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
    <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
</complexContent>
</complexType>

```

5.8.2 Binary representation syntax

VibrationCapabilityType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	Bslbf
unitFlag	1	Bslbf
numOfLevelsFlag	1	Bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.8.3 Semantics

Semantics of the `VibrationCapabilityType` type:

Name	Definition
<code>VibrationCapabilityType</code>	Tool for describing a vibration capability.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the maximum intensity that the vibrator device can provide in terms of Hertz.
unit	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxIntensity is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6.
numOfLevels	Describes the number of intensity levels that the device can provide in between zero and maximum intensity.

5.8.4 Examples

This example shows the description of a vibration device capability with the following semantics. The vibration device identifier is "vib001". The maximum intensity of the vibration device is 600 Hz. This specified device can support 4 levels in controlling the intensity. This device takes 0 milliseconds to start and 10 milliseconds to reach the target intensity. The location of the heating device is the center side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:VibrationCapabilityType"
id="vib001" zerothOrderDelayTime="0" firstOrderDelayTime="10"
maxIntensity="600" numOfLevels="4" locator="urn:mpeg:mpeg-v:01-SI-
LocationCS-NS:center"/>
```

5.9 Scent capability type

5.9.1 XML representation syntax

```
<!-- ##### -->
<!-- Scent capability type -->
<!-- ##### -->
<complexType name="ScentCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="Scent" type="mpeg7:termReferenceType" minOccurs="0"
          maxOccurs="unbounded"/>
      </sequence>
      <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

```

    </extension>
  </complexContent>
</complexType>

```

5.9.2 Binary representation syntax

ScentCapabilityType {	(Number of bits)	(Mnemonic)
ScentFlag	1	Bslbf
maxIntensityFlag	1	Bslbf
unitFlag	1	Bslbf
numOfLevelsFlag	1	Bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(ScentFlag){		
LoopScent		vluimsbf5
for(k=0;k<LoopScent;k++){		
Scent[k]	8	bslbf
}		
}		
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.9.3 Semantics

Semantics of the ScentCapabilityType type:

Name	Definition
ScentCapabilityType	Tool for describing a scent capability.
ScentFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
LoopScent	This field, which is only present in the binary representation, specifies the number of Scent contained in the description.
Scent	Describes the list of scent that the perfumer can provide. The type of the scent shall be described using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the <code>ScentCS</code> defined in A.2.4 of ISO/IEC 23005-6.

In the binary description, the following mapping table is used,

ScentTypeCS	Term ID of scent
00000000	Rose
00000001	Acacia
00000010	Chrysanthemum
00000011	Lilac
00000100	Mint
00000101	Jasmine
00000110	pine_tree
00000111	Orange
00001000	Grape
00001001- 11111111	Reserved

maxIntensity	Describes the maximum intensity that the perfumer can provide in terms of ml/h.
unit	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxIntensity is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. The

Name	Definition
	reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
<code>numOfLevels</code>	Describes the number of intensity levels of the scent that the device can provide in between zero and maximum intensity.

5.9.4 Examples

This example shows the description of a scent device capability with the following semantics. The scent device identifier is "scent01". The maximum intensity of the scent amount is 5 millilitres per hour with two levels of control. As this device takes 0 milliseconds to start and 0 milliseconds to reach the target intensity, it is not specified explicitly. The location of the scent device is the center side according to the position model described in Figure 3 of ISO/IEC 23005-3. The type of scent is rose according to the ScentCS specified in A2.4 of ISO/IEC 23005-6.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:ScentCapabilityType"
id="scent01" maxIntensity="5" numOfLevels="2" locator="urn:mpeg:mpeg-v:01-
SI-LocationCS-NS:center">
  <dcdv:Scent>urn:mpeg:mpeg-v:01-SI-ScentCS-NS:rose</dcdv:Scent>
</cidl:SensoryDeviceCapability>
```

5.10 Fog capability type

5.10.1 XML representation syntax

```
<!-- ##### -->
<!-- Fog capability type -->
<!-- ##### -->
<complexType name="FogCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.10.2 Binary representation syntax

FogCapabilityType {	(Number of bits)	(Mnemonic)
<code>maxIntensityFlag</code>	1	Bslbf
<code>unitFlag</code>	1	Bslbf
<code>numOfLevelsFlag</code>	1	Bslbf

FogCapabilityType {	(Number of bits)	(Mnemonic)
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.10.3 Semantics

Semantics of the `FogCapabilityType` type:

Name	Definition
<code>FogCapabilityType</code>	Tool for describing a fog capability.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>numOfLevelsFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensity</code>	Describes the maximum intensity that the fog device can provide in terms of ml/h.
<code>unit</code>	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used, as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
<code>numOfLevels</code>	Describes the number of intensity levels of the fog that the device can provide in between zero and maximum intensity.

5.10.4 Examples

This example shows the description of a fog device capability with the following semantics. The fog device identifier is "fog11". The maximum intensity of the fog amount is 100 millilitres per hour with five levels of control. This device takes 30 milliseconds to start and 100 milliseconds to reach the target intensity. The location of the scent device is the back side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:FogCapabilityType" id="fog11"
zerothOrderDelayTime="30" firstOrderDelayTime="100" maxIntensity="100"
numOfLevels="5" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:back"/>
```

5.11 Sprayer capability type

5.11.1 XML representation syntax

```
<!-- ##### -->
<!-- Sprayer capability type -->
<!-- ##### -->
<complexType name="SprayerCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="sprayingType" type="mpeg7:termReferenceType"/>
      <attribute name="maxIntensity" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.11.2 Binary representation syntax

SprayerCapabilityType {	(Number of bits)	(Mnemonic)
sprayingFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
numOfLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(sprayingFlag) {		
spraying	8	blsbf
}		
if(maxIntensityFlag){		

SprayerCapabilityType {	(Number of bits)	(Mnemonic)
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.11.3 Semantics

Semantics of the `SprayerCapabilityType` type:

Name	Definition
<code>SprayerCapabilityType</code>	Tool for describing a water sprayer capability.
<code>sprayingFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>numOfLevelsFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

spraying	Describes the type of the material that the sprayer can spray as a reference to a classification scheme term. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the <code>SprayingTypeCS</code> defined in A.2.7 of ISO/IEC 23005-6.
----------	--

In the binary description, the following mapping table is used,

SprayingTypeCS	Term ID of Spraying
00000000	water
00000001-11111111	Reserved

maxIntensity	Describes the maximum intensity that the water sprayer can provide in terms of ml/h.
--------------	--

unit	Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used, as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
------	---

numOfLevels	Describes the number of intensity levels of the fog that the device can provide in between zero and maximum intensity.
-------------	--

5.11.4 Examples

This example shows the description of a sprayer device capability with the following semantics. The sprayer device identifier is "spryr00". The maximum intensity of the spraying amount is 10 millilitres per hour with three levels of control. This device takes 5 milliseconds to start and 5 milliseconds to reach the target intensity. The location of the sprayer device is the midway side according to the position model described in Figure 3 of ISO/IEC 23005-3.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:SprayerCapabilityType"
id="spryr00" sprayingType="urn:mpeg:mpeg-v:01-SI-SprayingTypeCS-NS:water"
zerothOrderDelayTime="5" firstOrderDelayTime="5" maxIntensity="10"
numOfLevels="3" locator="urn:mpeg:mpeg-v:01-SI-LocationCS-NS:midway"/>
```

5.12 Color correction capability type

5.12.1 XML representation syntax

```
<!-- ##### -->
<!-- Color Correction capability type -->
<!-- ##### -->
<complexType name="ColorCorrectionCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="flag" type="boolean" use="optional" default="false"/>
    </extension>
  </complexContent>
</complexType>
```

```
</complexContent>
</complexType>
```

5.12.2 Binary representation syntax

ColorCorrectionCapabilityType {	(Number of bits)	(Mnemonic)
flagFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(flagFlag) {		
flag	1	bslbf
}		
}		

5.12.3 Semantics

Semantics of the ColorCorrectionCapabilityType type:

Name	Definition
ColorCorrectionCapabilityType	Tool for describing if the given device has a color correction capability.
flagFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
flag	Describes the existence of the color correction capability of the given device in terms of "true" and "false".

5.12.4 Examples

This example shows the description of a color correction capability with the following semantics. Since the Flag is "true", the device "tv1" is equipped with a capability of color correction.

```
<cidl:SensoryDeviceCapability      xsi:type="dcdv:ColorCorrectionCapabilityType"
flag="true" id="tv1"/>
```

5.13 Tactile capability type

5.13.1 XML representation syntax

```
<!-- ##### -->
```

```

<!-- Tactile capability type -->
<!-- ##### -->
<complexType name="TactileCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <attribute name="intensityUnit" type="mpegvct:unitType"
        use="optional"/>
      <attribute name="maxValue" type="nonNegativeInteger" use="optional"/>
      <attribute name="minValue" type="nonNegativeInteger" use="optional"/>
      <attribute name="arraysizeX" type="nonNegativeInteger"/>
      <attribute name="arraysizeY" type="nonNegativeInteger"/>
      <attribute name="gapX" type="float" use="optional"/>
      <attribute name="gapY" type="float" use="optional"/>
      <attribute name="gapUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="maxUpdateRate" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="updateRateUnit" type="mpegvct:unitType"
        use="optional"/>
      <attribute name="actuatorType" type="mpeg7:termReferenceType"
        use="optional"/>
      <attribute name="numOfLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.13.2 Binary representation syntax

TactileCapabilityType {	(Number of bits)	(Mnemonic)
intensityUnitFlag	1	bslbf
maxValueFlag	1	bslbf
minValueFlag	1	bslbf
arraysizeXFlag	1	bslbf
arraysizeYFlag	1	bslbf
gapXFlag	1	bslbf
gapYFlag	1	bslbf
gapUnitFlag	1	bslbf
maxUpdateRateFlag	1	bslbf
updateRateUnitFlag	1	bslbf
actuatorTypeFlag	1	bslbf
numOfLevelsFlag	1	bslbf
extendArraySizeFlag	1	bslbf

TactileCapabilityType {	(Number of bits)	(Mnemonic)
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(intensityUnitFlag) {		
intensityUnit	8	bslbf
}		
if(maxValueFlag){		
maxValue	16	uimsbf
}		
if(minValueFlag){		
minValue	16	uimsbf
}		
if(arraySizeXFlag){		
if(extendArraySizeFlag){		
arraySizeX	16	uimsbf
}		
else {		
arraySizeX	8	uimsbf
}		
}		
if(arraySizeYFlag){		
if(extendArraySizeFlag){		
arraySizeY	16	uimsbf
}		
else {		
arraySizeY	8	uimsbf
}		
}		
if(gapXFlag){		

TactileCapabilityType {	(Number of bits)	(Mnemonic)
gapX	32	fsbf
}		
if(gapYFlag){		
gapY	32	fsbf
}		
if(gapUnitFlag){		
gapUnit	8	bslbf
}		
if(maxUpdateRateFlag){		
maxUpdateRate	16	uimsbf
}		
if(updateRateUnitFlag){		
updateRateUnit	8	bslbf
}		
if(actuatorTypeFlag){		
actuatorType	4	blsbf
}		
if(numOfLevelsFlag){		
numOfLevels	16	uimsbf
}		
}		

5.13.3 Semantics

Semantics of the TactileCapabilityType:

Name	Definition
TactileCapabilityType	Tool for describing a tactile device capability.
intensityUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall

Name	Definition
	be used and "0" means the attribute shall not be used.
maxValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minValueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
arraysizeXFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
arraysizeYFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
gapXFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
gapYFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
gapUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxUpdateRateFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
updateRateUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
actuatorTypeFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
extendArraySizeFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
intensityUnit	Specifies the unit of the intensity for maxValu and minValu, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. There is no default unit specified as the intensityUnit may vary depending on the type of the actuator used for the Tactile device. For example, when an electrotactile device is selected the unit can be mA. For a pneumatic tactile device, the unit may be either psi or Pa; for a vibrotactile device, the unit may be hz (frequency), or mm (amplitude); for a thermal

Name	Definition
	display, the unit may be either Celsius or Fahrenheit.
maxValue	Describes the maximum intensity that a tactile device can drive in the unit specified by the intensityUnit attribute.
minValue	Describes the minimum intensity that a tactile device can drive in the unit specified by the intensityUnit attribute.
arraysizeX	Describes a number of actuators in X (horizontal) direction since a tactile device is formed as m-by-n array types. (integer)
arraysizeY	Describes a number of actuators in Y (vertical) direction since a tactile device is formed as m-by-n array types. (integer)
gapX	Describes the X directional gap space between actuators in a tactile device.(mm)
gapY	Describes the Y directional gap space between actuators in a tactile device.(mm)
gapUnit	Specifies the unit of the description of gapX and gapY attributes as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than the default unit of mm is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
maxUpdateRate	Describes a maximum update rate that a tactile device can drive.
updateRateUnit	Specifies the unit of the description of maxUpdateRate as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than the default unit of Hz is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
actuatorType	Describes a type of tactile device (e.g. vibrating motor, electrotactile device, pneumatic device, piezoelectric device, thermal device, etc) as a reference to a classification scheme. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the TactileDisplayCS defined in A.2.11 of ISO/IEC 23005-6.

In the binary description, the following mapping table is used,

TactileDisplayCS	Term ID of TactileDisplay
0000	vibrotactile
0001	electrotactile
0010	pneumatiactile
0011	piezoelectrictactile
0100	thermal

Name	Definition	
	0101-1111	Reserved
numOfLevels	Describes the number of intensity levels that a tactile device can drive.	

5.13.4 Examples

The following is an example of the `TactileCapabilityType` to indicate that the specified device can display tactile information. This example shows the description of tactile device capabilities and its features. Among several tactile devices, a thermal device with 10-by-4 array is selected. In the array, each thermal element locates with a 5 mm gap and maximum temperature the thermal display can generate is 34 degree in Celsius and the minimum is 16 degree. Each thermal element drives 8 different levels and the temperature new temperature presented can be updated up to 10 times per second.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:TactileCapabilityType"
intensityUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius" maxValue="34"
minValue="16" arraysizeX="10" arraysizeY="4" gapX="5" gapY="5"
maxUpdateRate="10" actuatorType="urn:mpeg:mpeg-v:01-CI-TactileDisplayCS-
NS:thermal" numOfLevels="8"/>
```

5.14 Kinesthetic capability type

5.14.1 XML representation syntax

```
<!-- ##### -->
<!-- Kinesthetic capability type -->
<!-- ##### -->
<complexType name="KinestheticCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="MaximumForce" type="mpegvct:Float3DVectorType"/>
        <element name="MaximumTorque" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
        <element name="MaximumStiffness" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
        <element name="DOF" type="dcdv:DOFType"/>
        <element name="WorkSpace" type="dcdv:WorkSpaceType"/>
      </sequence>
      <attribute name="forceUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="torqueUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="stiffnessUnit" type="mpegvct:unitType"
        use="optional"/>
      <attribute name="numOfForceLevels" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="numOfTorqueLevels" type="nonNegativeInteger"
        use="optional"/>
      <attribute name="numOfStiffnessLevels" type="nonNegativeInteger"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

```

    </extension>
  </complexContent>
</complexType>

<complexType name="DOFType">
  <sequence>
    <element name="Tx" type="boolean"/>
    <element name="Ty" type="boolean"/>
    <element name="Tz" type="boolean"/>
    <element name="Rx" type="boolean"/>
    <element name="Ry" type="boolean"/>
    <element name="Rz" type="boolean"/>
  </sequence>
</complexType>

<complexType name="WorkSpaceType">
  <sequence>
    <element name="Width" type="float"/>
    <element name="Height" type="float"/>
    <element name="Depth" type="float"/>
    <element name="RotationX" type="float"/>
    <element name="RotationY" type="float"/>
    <element name="RotationZ" type="float"/>
  </sequence>
</complexType>

```

5.14.2 Binary representation syntax

KinestheticCapabilityType {	(Number of bits)	(Mnemonic)
MaximumTorqueFlag	1	bslbf
MaximumStiffnessFlag	1	bslbf
forceUnitFlag	1	bslbf
torqueUnitFlag	1	bslbf
stiffnessUnitFlag	1	bslbf
numOfForceLevelsFlag	1	bslbf
numOfTorqueLevelsFlag	1	bslbf
numOfStiffnessLevelsFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
MaximumForce		Float3DVectorType
if(MaximumTorqueFlag){		
MaximumTorque		Float3DVectorType
}		

KinestheticCapabilityType {	(Number of bits)	(Mnemonic)
if(MaximumStiffnessFlag){		
MaximumStiffness		Float3DVectorType
}		
DOF		DOFType
workspace		workspaceType
if(forceUnitFlag) {		
forceUnit	8	bslbf
}		
if(torqueUnitFlag) {		
torqueUnit	8	bslbf
}		
if(stiffnessUnitFlag) {		
stiffnessUnit	8	bslbf
}		
if(numOfForceLevelsFlag) {		
numOfForceLevels	16	uimsbf
}		
if(numOfTorqueLevelsFlag) {		
numOfTorqueLevels	16	uimsbf
}		
if(numOfStiffnessLevelsFlag) {		
numOfStiffnessLevels	16	uimsbf
}		
}		
Float3DVectorType {		
X	32	fsbf
Y	32	fsbf

KinestheticCapabilityType {	(Number of bits)	(Mnemonic)
Z	32	fsbf
}		
DOFType {		
Tx	1	bslbf
Ty	1	bslbf
Tz	1	bslbf
Rx	1	bslbf
Ry	1	bslbf
Rz	1	bslbf
}		
workspaceType{		
Width	32	fsbf
Height	32	fsbf
Depth	32	fsbf
RotationX	32	fsbf
RotationY	32	fsbf
RotationZ	32	fsbf
}		

5.14.3 Semantics

Semantics of the KinestheticCapabilityType:

Name	Definition
KinestheticCapabilityType	Tool for describing a kinesthetic device capability.
MaximumTorqueFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaximumStiffnessFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
forceUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
torqueUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
stiffnessUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfForceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfTorqueLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfStiffnessLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaximumForce	Describes the maximum force that the device can provide stably for each axis (N).
MaximumTorque	Describes the maximum torque referring maximum rotational force that the device can generate stably for each axis.(Nmm)
MaximumStiffness	Describes the maximum stiffness (rigidity) that the device can generate stably for each axis.(N/mm)
DOF	Describes the DOF (degree of freedom) of the device.
WorkSpace	Describes the workspace of the device. (e.g. Width x Height x Depth(mm), 3 angles(degree))
forceUnit	Specifies the unit of the description of maximumForce attribute as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than N(Newton) is used. 1N refers a force that produces an acceleration of 1 m/s ² for 1 kg mass. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
torqueUnit	Specifies the unit of the description of maximumTorque attribute as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than Nmm (Newton-millimeter) is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
stiffnessUnit	Specifies the unit of the description of maximumTorque attribute as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than N/mm (Newton per millimeter) is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.

<i>Name</i>	<i>Definition</i>
numOfForceLevels	Describes the number of intensity levels of force that the kinesthetic device can drive.
numOfTorqueLevels	Describes the number of intensity levels of torque that the kinesthetic device can drive.
numOfStiffnessLevels	Describes the number of intensity levels of stiffness that the kinesthetic device can drive.

Semantics of the DOFType:

<i>Name</i>	<i>Definition</i>
DOFType	Defines a degree of freedom that shows a kinesthetic device provides several single (independent) movements.
Tx	A Boolean values whether a kinesthetic device allows x directional independent translation or not.
Ty	A Boolean values whether a kinesthetic device allows y directional independent translation or not.
Tz	A Boolean values whether a kinesthetic device allows z directional independent translation or not.
Rx	A Boolean values whether a kinesthetic device allows x directional independent rotation or not.
Ry	A Boolean values whether a kinesthetic device allows y directional independent rotation or not.
Rz	A Boolean values whether a kinesthetic device allows z directional independent rotation or not.

Semantics of the workspaceType:

<i>Name</i>	<i>Definition</i>
WorkspaceType	Defines ranges where a kinesthetic device can translate and rotate. According to DOF (degree of freedom), three translational values(width, height, and depth) in mm(millimeter) and three rotational values(roll, pitch and yaw) in degree are defined.
Width	Defines a maximum range in the unit of mm (millimeter) that a kinesthetic device can translate in x-axis.
Height	Defines a maximum range in the unit of mm (millimeter) that a kinesthetic device can translate in y-axis.
Depth	Defines a maximum range in the unit of mm (millimeter) that a kinesthetic device can translate in z-axis.

Name	Definition
RotationX	Defines a maximum range that a kinesthetic device can rotate in x-axis, Θ (pitch).
RotationY	Defines a maximum range that a kinesthetic device can rotate in y-axis, Ψ (yaw).
RotationZ	Defines a maximum range that a kinesthetic device can rotate in z-axis, ϕ (roll).

5.14.4 Examples

The following is an example of the `KinestheticCapabilityType` to indicate that the specified kinesthetic device can display. This example shows the description of kinesthetic device capabilities. This 3DOF kinesthetic device can support maximum force $F(3.3\text{N}, 2.1\text{N}, 2.7\text{N})$ and maximum stiffness $K(1.45\text{N/mm}, 2.5\text{N/mm}, 1.07\text{N/mm})$ and it's workspace is $180\text{mm}(\text{width}), 130\text{mm}(\text{height}),$ and $80\text{mm}(\text{depth})$.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:KinestheticCapabilityType"
forceUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Newton"
torqueUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Nmm"
stiffnessUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Nmm"
numOfForceLevels="100" numOfTorqueLevels="100" numOfStiffnessLevels="100">
  <dcdv:MaximumForce>
    <mpegvct:X>3.3</mpegvct:X>
    <mpegvct:Y>2.1</mpegvct:Y>
    <mpegvct:Z>2.7</mpegvct:Z>
  </dcdv:MaximumForce>
  <dcdv:MaximumTorque>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </dcdv:MaximumTorque>
  <dcdv:MaximumStiffness>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </dcdv:MaximumStiffness>
  <dcdv:DOF>
    <dcdv:Tx>true</dcdv:Tx>
    <dcdv:Ty>true</dcdv:Ty>
    <dcdv:Tz>true</dcdv:Tz>
    <dcdv:Rx>false</dcdv:Rx>
    <dcdv:Ry>false</dcdv:Ry>
    <dcdv:Rz>false</dcdv:Rz>
  </dcdv:DOF>
  <dcdv:WorkSpace>
    <dcdv:Width>180</dcdv:Width>
    <dcdv:Height>130</dcdv:Height>
    <dcdv:Depth>80</dcdv:Depth>
    <dcdv:RotationX>0</dcdv:RotationX>
    <dcdv:RotationY>0</dcdv:RotationY>
    <dcdv:RotationZ>0</dcdv:RotationZ>
  </dcdv:WorkSpace>
</cidl:SensoryDeviceCapability>
```

5.15 RigidBodyMotion capability type

5.15.1 XML representation syntax

```

<!-- ##### -->
<!-- Rigid Body Motion capability type -->
<!-- ##### -->
<complexType name="RigidBodyMotionCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="MoveTowardCapability"
          type="dcdv:MoveTowardCapabilityType" minOccurs="0"/>
        <element name="InclineCapability" type="dcdv:InclineCapabilityType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

<!-- ##### -->
<!-- MoveToward Capability type -->
<!-- ##### -->
<complexType name="MoveTowardCapabilityType">
  <attribute name="maxXDistance" type="float" use="optional"/>
  <attribute name="maxYDistance" type="float" use="optional"/>
  <attribute name="maxZDistance" type="float" use="optional"/>
  <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
  <attribute name="maxXSpeed" type="float" use="optional"/>
  <attribute name="maxYSpeed" type="float" use="optional"/>
  <attribute name="maxZSpeed" type="float" use="optional"/>
  <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
  <attribute name="maxXAccel" type="float" use="optional"/>
  <attribute name="maxYAccel" type="float" use="optional"/>
  <attribute name="maxZAccel" type="float" use="optional"/>
  <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
  <attribute name="xDistanceLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="yDistanceLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="zDistanceLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="xSpeedLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="ySpeedLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="zSpeedLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="xAccelLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="yAccelLevels" type="nonNegativeInteger" use="optional"/>
  <attribute name="zAccelLevels" type="nonNegativeInteger" use="optional"/>
</complexType>

<!-- ##### -->
<!-- Incline Capability type -->
<!-- ##### -->
<complexType name="InclineCapabilityType">
  <attribute name="maxPitchAngle" type="mpegvct:InclineAngleType"
    use="optional"/>
  <attribute name="maxYawAngle" type="mpegvct:InclineAngleType"
    use="optional"/>
  <attribute name="maxRollAngle" type="mpegvct:InclineAngleType"
    use="optional"/>
  <attribute name="maxPitchSpeed" type="float" use="optional"/>
  <attribute name="maxYawSpeed" type="float" use="optional"/>

```

```

<attribute name="maxRollSpeed" type="float" use="optional"/>
<attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
<attribute name="maxPitchAccel" type="float" use="optional"/>
<attribute name="maxYawAccel" type="float" use="optional"/>
<attribute name="maxRollAccel" type="float" use="optional"/>
<attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
<attribute name="pitchAngleLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="yawAngleLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="rollAngleLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="pitchSpeedLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="yawSpeedLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="rollSpeedLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="pitchAccelLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="yawAccelLevels" type="nonNegativeInteger" use="optional"/>
<attribute name="rollAccelLevels" type="nonNegativeInteger" use="optional"/>
</complexType>

```

5.15.2 Binary representation syntax

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
MoveTowardCapabilityFlag	1	bslbf
InclineCapabilityFlag	1	bslbf
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
if(MoveTowardCapabilityFlag){		
MoveTowardCapability		MoveTowardCapabilityType
}		
if(InclineCapabilityFlag){		
InclineCapability		InclineCapabilityType
}		
}		
MoveTowardCapabilityType {		
MaxXDistanceFlag	1	bslbf
MaxYDistanceFlag	1	bslbf
MaxZDistanceFlag	1	bslbf
distanceUnitFlag	1	bslbf
MaxXSpeedFlag	1	bslbf
MaxYSpeedFlag	1	bslbf

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
MaxZSpeedFlag	1	bslbf
speedUnitFlag	1	bslbf
MaxXAccelFlag	1	bslbf
MaxYAccelFlag	1	bslbf
MaxZAccelFlag	1	bslbf
accelUnitFlag	1	bslbf
XDistanceLevelsFlag	1	bslbf
YDistanceLevelsFlag	1	bslbf
ZDistanceLevelsFlag	1	bslbf
XSpeedLevelsFlag	1	bslbf
YSpeedLevelsFlag	1	bslbf
ZSpeedLevelsFlag	1	bslbf
XAccelLevelsFlag	1	bslbf
YAccelLevelsFlag	1	bslbf
ZAccelLevelsFlag	1	bslbf
if(MaxXDistanceFlag){		
MaxXDistance	32	fsbf
}		
if(MaxYDistanceFlag){		
MaxYDistance	32	fsbf
}		
if(MaxZDistanceFlag){		
MaxZDistance	32	fsbf
}		
if(distanceUnitFlag){		
distanceUnit	8	bslbf
}		

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
if(MaxXSpeedFlag){		
MaxXSpeed	32	fsbf
}		
if(MaxYSpeedFlag){		
MaxYSpeed	32	fsbf
}		
if(MaxZSpeedFlag){		
MaxZSpeed	32	fsbf
}		
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(MaxXAccelFlag){		
MaxXAccel	32	fsbf
}		
if(MaxYAccelFlag){		
MaxYAccel	32	fsbf
}		
if(MaxZAccelFlag){		
MaxZAccel	32	fsbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf
}		
if(XDistanceLevelsFlag){		
XDistanceLevels	16	uimsbf
}		

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
if(YDistanceLevelsFlag){		
YDistanceLevels	16	uimsbf
}		
if(ZDistanceLevelsFlag){		
ZDistanceLevels	16	uimsbf
}		
if(XSpeedLevelsFlag){		
XSpeedLevels	16	uimsbf
}		
if(YSpeedLevelsFlag){		
YSpeedLevels	16	uimsbf
}		
if(ZSpeedLevelsFlag){		
ZSpeedLevels	16	uimsbf
}		
if(XAccelLevelsFlag){		
XAccelLevels	16	uimsbf
}		
if(YAccelLevelsFlag){		
YAccelLevels	16	uimsbf
}		
if(ZAccelLevelsFlag){		
ZAccelLevels	16	uimsbf
}		
}		
InclineCapabilityType {		
MaxPitchAngleFlag	1	bslbf

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
MaxYawAngleFlag	1	bslbf
MaxRollAngleFlag	1	bslbf
MaxPitchSpeedFlag	1	bslbf
MaxYawSpeedFlag	1	bslbf
MaxRollSpeedFlag	1	bslbf
speedUnitFlag	1	bslbf
MaxPitchAccelFlag	1	bslbf
MaxYawAccelFlag	1	bslbf
MaxRollAccelFlag	1	bslbf
accelUnitFlag	1	bslbf
PitchAngleLevelsFlag	1	bslbf
YawAngleLevelsFlag	1	bslbf
RollAngleLevelsFlag	1	bslbf
PitchSpeedLevelsFlag	1	bslbf
YawSpeedLevelsFlag	1	bslbf
RollSpeedLevelsFlag	1	bslbf
PitchAccelLevelsFlag	1	bslbf
YawAccelLevelsFlag	1	bslbf
RollAccelLevelsFlag	1	bslbf
if(MaxPitchAngleFlag){		
MaxPitchAngle		InclineAngleType
}		
if(MaxYawAngleFlag){		
MaxYawAngle		InclineAngleType
}		
if(MaxRollAngleFlag){		
MaxRollAngle		InclineAngleType

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
}		
if(MaxPitchSpeedFlag){		
MaxPitchSpeed	32	fsbf
}		
if(MaxYawSpeedFlag){		
MaxYawSpeed	32	fsbf
}		
if(MaxRollSpeedFlag){		
MaxRollSpeed	32	fsbf
}		
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(MaxPitchAccelFlag){		
MaxPitchAccel	32	fsbf
}		
if(MaxYawAccelFlag){		
MaxYawAccel	32	fsbf
}		
if(MaxRollAccelFlag){		
MaxRollAccel	32	fsbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf
}		
if(PitchAngleLevelsFlag){		
PitchAngleLevels	16	uimsbf

RigidBodyMotionCapabilityType {	(Number of bits)	(Mnemonic)
}		
if(YawAngleLevelsFlag){		
YawAngleLevels	16	uimsbf
}		
if(RollAngleLevelsFlag){		
RollAngleLevels	16	uimsbf
}		
if(PitchSpeedLevelsFlag){		
PitchSpeedLevels	16	uimsbf
}		
if(YawSpeedLevelsFlag){		
YawSpeedLevels	16	uimsbf
}		
if(RollSpeedLevelsFlag){		
RollSpeedLevels	16	uimsbf
}		
if(PitchAccelLevelsFlag){		
PitchAccelLevels	16	uimsbf
}		
if(YawAccelLevelsFlag){		
YawAccelLevels	16	uimsbf
}		
if(RollAccelLevelsFlag){		
RollAccelLevels	16	uimsbf
}		
}		

5.15.3 Semantics

Semantics of the `RigidBodyMotionCapabilityType` type:

Name	Definition
<code>RigidBodyMotionCapabilityType</code>	Tool for describing the capability of Rigid body motion effect.
<code>MoveTowardCapabilityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>InclineCapabilityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MoveTowardCapability</code>	Describes the capability for move toward motion effect.
<code>InclineCapability</code>	Describes the capability for Incline motion effect.

Semantics of the `MoveTowardCapabilityType` type:

Name	Definition
<code>MoveTowardCapabilityType</code>	Tool for describing a capability on move toward motion effect.
<code>MaxXDistanceFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxYDistanceFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxZDistanceFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>distanceUnitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxXSpeedFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxYSpeedFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxZSpeedFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
speedUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxXAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxYAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxZAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
accelUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
XDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
YDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
ZDistanceLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
XSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
YSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
ZSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
XAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
YAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
ZAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
maxXDistance	Describes the maximum distance on x-axis that the device can provide in terms of centimeter. EXAMPLE The value '10' means the device can move maximum 10cm on x-axis. NOTE The value 0 means the device can't provide x-axis movement.
maxYDistance	Describes the maximum distance on y-axis that the device can provide in terms of centimeter.
maxZDistance	Describes the maximum distance on z-axis that the device can provide in terms of centimeter.
distanceUnit	Specifies the unit of the description of <code>MaxXDistance</code> , <code>MaxYDistance</code> , and <code>MaxZDistance</code> attributes as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if any unit other than cm (centimeter) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
maxXSpeed	Describes the maximum speed on x-axis that the device can provide in terms of centimeter per second.
maxYSpeed	Describes the maximum speed on y-axis that the device can provide in terms of centimeter per second.
maxZSpeed	Describes the maximum speed on z-axis that the device can provide in terms of centimeter per second.
speedUnit	Specifies the unit of the description of <code>MaxXSpeed</code> , <code>MaxYSpeed</code> , and <code>MaxZSpeed</code> attributes as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if any unit other than cm/sec (centimeter per second) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
maxXAccel	Describes the maximum acceleration on x-axis that the device can provide in terms of centimeter per square second.
maxYAccel	Describes the maximum acceleration on y-axis that the device can provide in terms of centimeter per square second.
maxZAccel	Describes the maximum acceleration on z-axis that the device can provide in terms of centimeter per second square.
accelUnit	Specifies the unit of the description of <code>MaxXAccel</code> , <code>MaxYAccel</code> , and <code>MaxZAccel</code> attributes as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if any unit other than cm/sec ² (centimeter per second square) is used. These three attributes shall have the same unit. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

Name	Definition
xDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on x-axis. EXAMPLE The value 5 means the device can provide 5 steps from minimum to maximum distance in x-axis.
yDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on y-axis.
zDistancelevels	Describes the number of distance levels that the device can provide in between maximum and minimum distance on z-axis.
xSpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on x-axis.
ySpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on y-axis.
zSpeedLevels	Describes the number of speed levels that the device can provide in between maximum and minimum speed on z-axis.
xAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on x-axis.
yAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on y-axis.
zAccelLevels	Describes the number of acceleration that the device can provide in between maximum and minimum acceleration on z-axis.

Semantics of the InclineCapabilityType:

Name	Definition
InclineCapabilityType	Tool for describing a capability on motion chair incline effect.
MaxPitchAngleFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxYawAngleFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxRollAngleFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxPitchSpeedFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
MaxYawSpeedFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxRollSpeedFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
speedUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxPitchAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxYawAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxRollAccelFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
accelUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
PitchAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
YawAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
RollAngleLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
PitchSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
YawSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
RollSpeedLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
PitchAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
YawAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
RollAccelLevelsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxPitchAngle	Describes the maximum angle of x-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counter-clock wise.
maxYawAngle	Describes the maximum angle of y-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counter-clock wise.
maxRollAngle	Describes the maximum angle of z-axis rotation in degrees that the device can provide. NOTE The rotation angle is increased with counter-clock wise.
maxPitchSpeed	Describes the maximum speed of x-axis rotation that the device can provide in terms of degree per second.
maxYawSpeed	Describes the maximum speed of y-axis rotation that the device can provide in terms of degree per second.
maxRollSpeed	Describes the maximum speed of z-axis rotation that the device can provide in terms of degree per second.
speedUnit	Specifies the common unit of the description of maxPitchSpeed, maxYawSpeed, and maxRollSpeed attributes as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than degree per second is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
maxPitchAccel	Describes the maximum acceleration of x-axis rotation that the device can provide in terms of degree per second square.
maxYawAccel	Describes the maximum acceleration of y-axis rotation that the device can provide in terms of degree per second square.
maxRollAccel	Describes the maximum acceleration of z-axis rotation that the device can provide in terms of degree per second square.
accelUnit	Specifies the common unit of the description of maxPitchAccel, maxYawAccel, and maxRollAccel attributes as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if any unit other than degree per second square is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.

Name	Definition
pitchAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of x-axis rotation. EXAMPLE The value 5 means the device can provide 5 steps from minimum to maximum rotation angle on x-axis.
yawAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of y-axis rotation.
rollAngleLevels	Describes the number of rotation angle levels that the device can provide in between maximum and minimum angle of z-axis rotation.
pitchSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of x-axis rotation. EXAMPLE The value 5 means the device can provide 5 steps from minimum to maximum rotation angle on x-axis.
yawSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of y-axis rotation.
rollSpeedLevels	Describes the number of rotation speed levels that the device can provide in between maximum and minimum speed of z-axis rotation.
pitchAccelLevels	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of x-axis rotation.
yawAccelLevels	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of y-axis rotation.
rollAccelLevels	Describes the number of rotation acceleration levels that the device can provide in between maximum and minimum acceleration of z-axis rotation.

5.15.4 Examples

This example shows the description of a MoveToward capability. This device can move maximum 20cm on x and y-axis. The maximum speed of example device on x-axis, y-axis is 10cm/sec and z-axis is 0. Also the maximum acceleration on x-axis, y-axis is 1cm/sec² and z-axis is 0. That is, example device can not move on z-axis. x speed level and acceleration level is '10' and '5', y speed level and acceleration level is '5' respectively.

```
<dcdv:MoveTowardCapability    maxXAccel="1"    maxXSpeed="10"    maxXDistance="20"
maxYAccel="1"    maxYSpeed="10"    maxYDistance="20"    maxZAccel="0"    maxZSpeed="0"
maxZDistance="0"    xAccelLevels="5"    xDistanceLevels="20"    xSpeedLevels="10"
yAccelLevels="5"    yDistanceLevels="20"    ySpeedLevels="20"    zAccelLevels="0"
zDistanceLevels="0"    zSpeedLevels="0"/>
```

This example shows the description of an Incline capability. This device can rotate 180 and 90 degree on x and y-axis. The maximum speed of example device on x-axis, y-axis is 10degree/sec and z-axis is 0. Also the maximum acceleration on x-axis, y-axis is 2degree/sec² and z-axis is 0. That is, example device can not move on z-axis. x speed level and acceleration level is '1', y speed level and acceleration level is '1' respectively.

```
<dcdv:InclineCapability maxPitchAccel="2" maxPitchAngle="180" maxPitchSpeed="10"
maxYawAccel="2" maxYawAngle="90" maxYawSpeed="10" maxRollAccel="0"
maxRollAngle="0" maxRollSpeed="0" pitchAccelLevels="1" pitchAngleLevels="1"
pitchSpeedLevels="1" yawAccelLevels="1" yawAngleLevels="1" yawSpeedLevels="1"
rollAccelLevels="0" rollAngleLevels="0" rollSpeedLevels="0"/>
```

5.16 Mobile device position capability type

5.16.1 XML representation syntax

```
<!-- ##### -->
<!-- Mobile Device Position CapabilityType type -->
<!-- ##### -->
<complexType name="MobileDevicePositionCapabilityType">
  <complexContent>
    <extension base="cidl:SensoryDeviceCapabilityBaseType">
      <sequence>
        <element name="Boundary" type="dcdv:PhysicalSpaceBoundingBoxType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

<!-- Precision -->
  <attribute name="numOfLongitudeLevels" type="nonNegativeInteger"
use="optional"/>
  <attribute name="numOfLatitudeLevels" type="nonNegativeInteger"
use="optional"/>
  <attribute name="numOfAltitudeLevels" type="nonNegativeInteger"
use="optional"/>
</extension>
</complexContent>
</complexType>

<complexType name="PhysicalSpaceBoundingBoxType">
  <sequence>
    <element name="Longitude">
      <complexType>
        <attribute name="lowerBound" use="optional" default="-180.0">
          <simpleType>
            <restriction base="double">
              <minInclusive value="-180.0"/>
              <maxInclusive value="180.0"/>
            </restriction>
          </simpleType>
        </attribute>
        <attribute name="upperBound" use="optional" default="180.0">
          <simpleType>
            <restriction base="double">
              <minInclusive value="-180.0"/>
              <maxInclusive value="180.0"/>
            </restriction>
          </simpleType>
        </attribute>
      </complexType>
    </element>
    <element name="Latitude">
      <complexType>
        <attribute name="lowerBound" use="optional" default="-90.0">
          <simpleType>
```

```

        <restriction base="double">
            <minInclusive value="-90.0"/>
            <maxInclusive value="90.0"/>
        </restriction>
    </simpleType>
</attribute>
<attribute name="upperBound" use="optional" default="90.0">
    <simpleType>
        <restriction base="double">
            <minInclusive value="-90.0"/>
            <maxInclusive value="90.0"/>
        </restriction>
    </simpleType>
</attribute>
</complexType>
</element>
<element name="Altitude">
    <complexType>
        <attribute name="lowerBound" type="double" use="optional"
default="0.0"/>
        <attribute name="upperBound" type="double" use="optional"/>
        <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </complexType>
</element>
</sequence>
</complexType>

```

5.16.2 Binary representation syntax

MobileDevicePositionCapabilityType {	(Number of bits)	(Mnemonic)
Boundary		PhysicalSpaceBoundingBoxType
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
}		
PhysicalSpaceBoundingBoxType {		
longitudeUpperBoundFlag	1	bsblf
longitudeLowerBoundFlag	1	bsblf
latitudeUpperBoundFlag	1	bsblf
latitudeLowerBoundFlag	1	bsblf
altitudeUpperBoundFlag	1	bsblf
altitudeLowerBoundFlag	1	bsblf
altitudeUnitFlag	1	bsblf
If(longitudeUpperBoundFlag) {		
longitudeUpperBound	32	fsfb

MobileDevicePositionCapabilityType {	(Number of bits)	(Mnemonic)
}		
If(longitudeLowerBoundFlag) {		
longitudeLowerBound	32	fsfb
}		
If(latitudeUpperBoundFlag) {		
latitudeUpperBound	32	fsfb
}		
If(latitudeLowerBoundFlag) {		
latitudeLowerBound	32	fsfb
}		
If(altitudeUpperBoundFlag) {		
altitudeUpperBound	32	fsfb
}		
If(altitudeLowerBoundFlag) {		
altitudeLowerBound	32	fsfb
}		
If(altitudeUnitFlag) {		
altitudeUnit	10	bslbf
}		
}		

5.16.3 Semantics

Semantics of the MobileDevicePositionCapabilityType:

Names	Description
MobileDevicePositionCapabilityType	Tool for describing capabilities of a mobile device which can move to a destination given as a position in the global positioning system, i.e. in Longitude, Latitude, and Altitude above sea level.
zerothOrderDelayTime	Describes required preparation time of the mobile device to be activated since it receives a command in the unit of millisecond (ms).

<i>Names</i>	<i>Description</i>
firstOrderDelayTime	Describes the delay time for a mobile device to reach the cruising speed since it receives a command and is activated in the unit of millisecond (ms).
location	Does not have any specific semantics in this description.
Boundary	Describes the destination position where the mobile device can reach in forms of three-dimensional bounding box, specified by using PhysicalSpaceBoundingBoxType.
numOfLongitudeLevels	Describes the number of longitude levels that the device can provide in between upper bound and lower bound longitude positions.
numOfLatitudeLevels	Describes the number of latitude levels that the device can provide in between upper bound and lower bound latitude positions.
numOfAltitudeLevels	Describes the number of altitude levels that the device can provide in between upper bound and lower bound altitude positions.
unit	Does not have any specific semantics in this description.
longitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Longitude element is present in this instance of the description.
longitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Longitude element is present in this instance of the description.
latitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Latitude element is present in this instance of the description.
latitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Latitude element is present in this instance of the description.
altitudeUpperBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of upperBound of Altitude element is present in this instance of the description.
altitudeLowerBoundFlag	This field, which is only present in the binary representation, indicates if the optional attribute of lowerBound of Altitude element is present in this instance of the description.
altitudeUnitFlag	This field, which is only present in the binary representation, indicates if the optional attribute of unit of Altitude element is present in this instance of the description.
PhysicalSpaceBoundingBoxType	Describes a bounding box in a physical space using longitude, latitude, and altitude.
Longitude	Describes lower bound and upper bound of longitude for the bounding box that the mobile device can reach.

<i>Names</i>	<i>Description</i>
lowerBound	Lower bound of longitude given in degrees. Positive number represents eastern longitude and the negative number represents western longitude.
upperBound	Upper bound of longitude given in degrees. Positive number represents eastern longitude and the negative number represents western longitude.
Latitude	Describes lower bound and upper bound of latitude for the bounding box that the mobile device can reach.
lowerBound	Lower bound of latitude given in degrees. Positive number represents northern latitude and the negative number represents southern latitude.
upperBound	Upper bound of latitude given in degrees. Positive number represents northern latitude and the negative number represents southern latitude.
Altitude	Describes lower bound and upper bound of altitude for the bounding box that the mobile device can reach.
lowerBound	Lower bound of altitude above sea level given in meters. The default is zero.
upperBound	Upper bound of altitude above sea level given in meters.
unit	Specifies the unit of the lowerBound and upperBound of Altitude, if a unit other than the meter is used, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6.

5.16.4 Examples

The following example shows the capability description of a mobile device with id "mobile1", which can move from 127 degrees East to 132 degrees East in longitude, from 32 degrees North to 45 degrees North in latitude, and from 10 meters to 1200 meters above sea level.

```
<cidl:SensoryDeviceCapability xsi:type="dcdv:MobileDevicePositionCapabilityType"
id="mobile1">
  <dcdv:Boundary>
    <dcdv:Longitude upperBound="132" lowerBound="127"/>
    <dcdv:Latitude upperBound="45" lowerBound="32"/>
    <dcdv:Altitude upperBound="1200" lowerBound="10" unit="urn:mpeg:mpeg-v:01-
CI-UnitTypeCS-NS:meter"/>
  </dcdv:Boundary>
</cidl:SensoryDeviceCapability>
```

6 Sensor capability description vocabulary

6.1 Introduction

This Clause describes syntax and semantics of the sensor capability description vocabulary to implement description of capability of individual sensor devices.

6.2 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:dia="urn:mpeg:mpeg21:2003:01-DIA-
NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-CT-NS" xmlns:cidl="urn:mpeg:mpeg-
v:2012:01-CIDL-NS" xmlns:scdv="urn:mpeg:mpeg-v:2012:01-SCDV-NS"
targetNamespace="urn:mpeg:mpeg-v:2012:01-SCDV-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-2" id="MPEG-V-
SCDV.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:mpeg21:2003:01-DIA-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
21_schema_files/dia-2nd/UED-2nd.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-CIDL-NS"
schemaLocation="CIDL.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-CT-NS" schemaLocation="MPEG-V-
CT.xsd"/>
```

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

```
</schema>
```

6.3 Light sensor capability type

6.3.1 XML representation syntax

```
<!-- ##### -->
<!-- Light Sensor capability type -->
<!-- ##### -->
<complexType name="LightSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Color" type="mpegvct:colorType" minOccurs="0"
maxOccurs="unbounded"/>
        <element name="Location" type="mpegvct:Float3DVectorType"
minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

6.3.2 Binary representation syntax

LightSensorCapabilityType {	(Number of bits)	(Mnemonic)
colorFlag	1	bslbf
locationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(colorFlag){		
Loopcolor		vlui-msbf5
for(k=0;k<Loopcolor;k++){		
color[k]		ColorType
}		
}		
if(locationFlag){		
location		Float3DVectorType
}		
}		
Float3DVectorType {		
X	32	fsbf
Y	32	fsbf
Z	32	fsbf
}		

6.3.3 Semantics

Semantics of the `LightSensorCapabilityType` type:

Name	Definition
<code>LightSensorCapabilityType</code>	Tool for describing a light sensor capability.
<code>colorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>locationFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
maxValue	Describes the maximum value that the light sensor can perceive in terms of LUX.
minValue	Describes the minimum value that the light sensor can perceive in terms of LUX.
Color	Describes the list of colors which the lighting device can provide either as a reference to a classification scheme term or as RGB value. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. 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.
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of meter (m).

6.3.4 Examples

This example shows the description of a light sensing capability with the following semantics. The sensor has an ID of "LS001" and the maximum value shall be 400 (LUX) and the minimum value shall be 0 (LUX) with the resolution of 50 levels. The accuracy of the sensor is 10.0 (LUX). The offset of sensor is 1.5 (LUX). The sensor shall detect the color #FF000. The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability xsi:type="scdv:LightSensorCapabilityType" id="LS001"
maxValue="400" minValue="0" numOfLevels="50" offset="1.5">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="10.0"/>
  <scdv:Color>#FF000</scdv:Color>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.4 Ambient noise sensor capability type

6.4.1 XML representation syntax

```
<!-- ##### -->
<!-- Ambient Noise Sensor capability type -->
<!-- ##### -->
<complexType name="AmbientNoiseSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Location" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

</complexContent>
</complexType>

```

6.4.2 Binary representation syntax

AmbientNoiseSensorCapabilityType {	(Number of bits)	(Mnemonic)
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.4.3 Semantics

Semantics of the AmbientNoiseSensorCapabilityType type:

Name	Definition
AmbientNoiseSensorCapabilityType	Tool for describing an ambient noise sensor capability.
LocationFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValue	Describes the maximum value that the ambient noise sensor can perceive in terms of decibel (dB).
minValue	Describes the minimum value that the ambient noise sensor can perceive in terms of decibel (dB).
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of meter (m).

6.4.4 Examples

This example shows the description of an ambient noise sensing capability with the following semantics. The sensor has an ID of "ANS001" and the maximum value shall be 200 (dB) and the minimum value shall be -100 (dB) with the resolution of 600 levels. The accuracy of the sensor is 0.5 (dB), the offset of sensor is 0.1 (dB). The sensed information is received at the location of (1.00, 1.00, -1.00).

```

<cidl:SensorDeviceCapability      xsi:type="scdv:AmbientNoiseSensorCapabilityType"
id="ANS001" maxValue="200" minValue="-100" numOfLevels="600" offset="0.1">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>

```

6.5 Temperature sensor capability type

6.5.1 XML representation syntax

```

<!-- ##### -->
<!-- Temperature Sensor capability type -->
<!-- ##### -->
<complexType name="TemperatureSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Location" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.5.2 Binary representation syntax

TemperatureSensorCapabilityType {	(Number of bits)	(Mnemonic)
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.5.3 Semantics

Semantics of the TemperatureSensorCapabilityType type:

Name	Definition
TemperatureSensor CapabilityType	Tool for describing a temperature sensor capability.

Name	Definition
LocationFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValue	Describes the maximum value that the temperature sensor can perceive in the unit of Celsius (or Fahrenheit).
minValue	Describes the minimum value that the temperature sensor can perceive in the unit of Celsius (or Fahrenheit).
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of meter (m).

6.5.4 Examples

This example shows the description of a temperature sensing capability with the following semantics. The sensor has an ID of "TS001" and the maximum value shall be 120 (°C) and the minimum value shall be -20 (°C) with the resolution of 1400 levels. The accuracy of the sensor is 0.1 (°C). The offset of sensor is 1.0 (°C). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability      xsi:type="scdv:TemperatureSensorCapabilityType"
id="TS001"    maxValue="120"    minValue="-20"    numOfLevels="1400"    offset="1.0"
unit="celsius">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.6 Humidity sensor capability type

6.6.1 XML representation syntax

```
<!-- ##### -->
<!-- Humidity Sensor capability type -->
<!-- ##### -->
<complexType name="HumiditySensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Location" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

6.6.2 Binary representation syntax

HumiditySensorCapabilityType {	(Number of bits)	(Mnemonic)
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.6.3 Semantics

Semantics of the HumiditySensorCapabilityType type:

Name	Definition
HumiditySensorCapabilityType	Tool for describing a humidity sensor capability.
LocationFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValue	Describes the maximum value that the humidity sensor can perceive in the unit of percentage.
minValue	Describes the minimum value that the humidity sensor can perceive in the unit of percentage.
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of meter (m).

6.6.4 Examples

This example shows the description of a humidity sensing capability with the following semantics. The sensor has an ID of "HS001" and the maximum value shall be 100 (%) and the minimum value shall be 0 (%) with the resolution of 1000 levels. The accuracy of the sensor is 0.1 (%). The offset of sensor is 1.0 (%). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability      xsi:type="scdv:HumiditySensorCapabilityType"
id="HS001" maxValue="100" minValue="0" numOfLevels="1000" offset="1.0">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.7 Distance sensor capability type

6.7.1 XML representation syntax

```

<!-- ##### -->
<!-- Distance Sensor capability type -->
<!-- ##### -->
<complexType name="DistanceSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Location" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.7.2 Binary representation syntax

DistanceSensorCapabilityType {	(Number of bits)	(Mnemonic)
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.7.3 Semantics

Semantics of the DistanceSensorCapabilityType type:

Name	Definition
DistanceSensorCapabilityType	Tool for describing a distance sensor capability.
LocationFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxValue	Describes the maximum value that the distance sensor can perceive in the unit of meter.
minValue	Describes the minimum value that the distance sensor can perceive in the unit of meter.
Location	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis in the unit of meter (m).

6.7.4 Examples

This example shows the description of a distance sensing capability with the following semantics. The sensor has an ID of "DS001" and the maximum value shall be 10 (m) and the minimum value shall be 0 (m) with the resolution of 1000 levels. The accuracy of the sensor is 0.01 (m). The offset of sensor is 0.1 (m). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability          xsi:type="scdv:DistanceSensorCapabilityType"
id="DS001" maxValue="10" minValue="0" numOfLevels="1000" offset="0.1">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.8 Atmospheric pressure sensor capability type

6.8.1 XML representation syntax

```
<!-- ##### -->
<!-- Atmospheric Pressure Sensor capability type -->
<!-- ##### -->
<complexType name="AtmosphericPressureSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Location" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

6.8.2 Binary representation syntax

AtmosphericPressureSensorCapabilityType {	(Number of bits)	(Mnemonic)
LocationFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(LocationFlag){		
Location		Float3DVectorType
}		
}		

6.8.3 Semantics

Semantics of the `AtmosphericPressureSensorCapabilityType` type:

Name	Definition
<code>AtmosphericPressureSensorCapabilityType</code>	Tool for describing an atmospheric pressure sensor capability.
<code>LocationFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxValue</code>	Describes the maximum value that the atmospheric pressure sensor can perceive in the unit of hectopascal (hPa).
<code>minValue</code>	Describes the minimum value that the atmospheric pressure sensor can perceive in the unit of hectopascal (hPa).
<code>Location</code>	Describes the location of the device from the global coordinate system according to the x-, y-, and z-axis.

6.8.4 Examples

This example shows the description of an atmospheric pressure sensing capability with the following semantics. The sensor has an ID of "APS001" and the maximum value shall be 1075 (hPa) and the minimum value shall be 910 (hPa) with the resolution of 1650 levels. The accuracy of the sensor is 0.1 (hPa). The offset of sensor is 1.0 (hPa). The sensed information is received at the location of (1.00, 1.00, -1.00).

```
<cidl:SensorDeviceCapability
xsi:type="scdv:AtmosphericPressureSensorCapabilityType" id="APS001"
maxValue="1075.0" minValue="910.0" numOfLevels="1650" offset="1.0">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
  <scdv:Location>
    <mpegvct:X>1.0</mpegvct:X>
    <mpegvct:Y>1.0</mpegvct:Y>
    <mpegvct:Z>-1.0</mpegvct:Z>
  </scdv:Location>
</cidl:SensorDeviceCapability>
```

6.9 Position sensor capability type

6.9.1 XML representation syntax

```
<!-- ##### -->
<!-- Position Sensor capability type -->
<!-- ##### -->
<complexType name="PositionSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Range" type="scdv:RangeType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

    </extension>
  </complexContent>
</complexType>

<complexType name="RangeType">
  <sequence>
    <element name="XminValue" type="float"/>
    <element name="XmaxValue" type="float"/>
    <element name="YminValue" type="float"/>
    <element name="YmaxValue" type="float"/>
    <element name="ZminValue" type="float"/>
    <element name="ZmaxValue" type="float"/>
  </sequence>
</complexType>

```

6.9.2 Binary representation syntax

PositionSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
range		RangeType
}		
RangeType {		
XminValue	32	fsbf
XmaxValue	32	fsbf
YminValue	32	fsbf
YmaxValue	32	fsbf
ZminValue	32	fsbf
ZmaxValue	32	fsbf
}		

6.9.3 Semantics

Semantics of the PositionSensorCapabilityType type:

Name	Definition
PositionSensorCapabilityType	Tool for describing a position sensor capability.
unit	Describes the unit of the sensor's measuring value. Specifies the unit of the sensor's measuring value as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of

Name	Definition
	ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the XmaxValue/YmaxValue/ZmaxValue and XminValue/YminValue/ZminValue is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.
Range	Describes the range that the position sensor can perceive in terms of RangeType in its global coordinate system. NOTE The minValue and the maxValue in the SensorCapabilityBaseType are not used for this sensor.
RangeType	Defines the range in a local coordinate system relative to the position of the sensor in idle state according to the x-, y-, and z-axis.
XminValue	Describes the minimum value that the position sensor can perceive along the x-axis in the unit of meter.
XmaxValue	Describes the maximum value that the position sensor can perceive along the x-axis in the unit of meter.
YminValue	Describes the minimum value that the position sensor can perceive along the y-axis in the unit of meter.
YmaxValue	Describes the maximum value that the position sensor can perceive along the y-axis in the unit of meter.
ZminValue	Describes the minimum value that the position sensor can perceive along the z-axis in the unit of meter.
ZmaxValue	Describes the maximum value that the position sensor can perceive along the z-axis in the unit of meter.

6.9.4 Examples

This example shows the description of a position sensing capability with the following semantics. The sensor has an ID of "PS001" and the maximum value shall be XmaxValue="10.0", YmaxValue="10.0" and ZmaxValue="10.0" (m), and the minimum value shall be XminValue="-10.0", YminValue="-10.0" and ZminValue="-10.0" (m) with the resolution of 2000 levels. The accuracy of the sensor is 0.01 (m). The SNR of the sensor is 0.1 (dB). The offset of sensor is 1.0 (m).

```
<cidl:SensorDeviceCapability xsi:type="scdv:PositionSensorCapabilityType"
id="PS001" numOfLevels="2000" SNR="0.1" offset="1.0">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
  <scdv:Range xsi:type="scdv:RangeType">
    <scdv:XminValue>-10.0</scdv:XminValue>
    <scdv:XmaxValue>10.0</scdv:XmaxValue>
    <scdv:YminValue>-10.0</scdv:YminValue>
    <scdv:YmaxValue>10.0</scdv:YmaxValue>
    <scdv:ZminValue>-10.0</scdv:ZminValue>
    <scdv:ZmaxValue>10.0</scdv:ZmaxValue>
  </scdv:Range>
</cidl:SensorDeviceCapability>
```

6.10 Velocity sensor capability type

6.10.1 XML representation syntax

```
<!-- ##### -->
<!-- Velocity Sensor capability type -->
<!-- ##### -->
<complexType name="VelocitySensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.10.2 Binary representation syntax

VelocitySensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.10.3 Semantics

Semantics of the VelocitySensorCapabilityType type:

Name	Definition
VelocitySensorCapabilityType	Tool for describing a velocity sensor capability.
maxValue	Describes the maximum value that the velocity sensor can perceive in terms of meter/second for the given axis.
minValue	Describes the minimum value that the velocity sensor can perceive in terms of meter/second for the given axis.

6.10.4 Examples

This example shows the description of a velocity sensing capability with the following semantics. The sensor has an ID of "VS001" and the maximum value shall be 50 (m/s) and the minimum value shall be 0.1 (m/s) with the resolution of 5000 levels. The accuracy of the sensor is 0.01 (m/s). The offset of sensor is 0.5 (m/s).

```
<cidl:SensorDeviceCapability xsi:type="scdv:VelocitySensorCapabilityType"
id="VS001" maxValue="50.0" minValue="0.1" numOfLevels="5000" offset="0.5">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.11 Acceleration sensor capability type

6.11.1 XML representation syntax

```
<!-- ##### -->
<!-- Acceleration Sensor capability type -->
<!-- ##### -->
<complexType name="AccelerationSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.11.2 Binary representation syntax

AccelerationSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.11.3 Semantics

Semantics of the AccelerationSensorCapabilityType type:

Name	Definition
AccelerationSensorCapabilityType	Tool for describing an acceleration sensor capability.
maxValue	Describes the maximum value that the acceleration sensor can perceive in terms of meter/second ² for the given axis.
minValue	Describes the minimum value that the acceleration sensor can perceive in terms of meter/second ² for the given axis.

6.11.4 Examples

This example shows the description of an acceleration sensing capability with the following semantics. The sensor has an ID of "AS001" and the maximum value shall be 9.8 (m/s²) and the minimum value shall be -9.8 (m/s²) with the resolution of 1000 levels. The accuracy of the sensor is 0.01 (m/s²). The offset of sensor is 0.5 (m/s²).

```
<cidl:SensorDeviceCapability xsi:type="scdv:AccelerationSensorCapabilityType"
id="AS001" maxValue="9.8" minValue="-9.8" numOfLevels="1000" offset="0.5">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.12 Orientation sensor capability type

6.12.1 XML representation syntax

```

<!-- ##### -->
<!-- Orientation Sensor capability type -->
<!-- ##### -->
<complexType name="OrientationSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="OrientationRange" type="scdv:OrientationRangeType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

<complexType name="OrientationRangeType">
  <sequence>
    <element name="YawMin" type="float"/>
    <element name="YawMax" type="float"/>
    <element name="PitchMin" type="float"/>
    <element name="PitchMax" type="float"/>
    <element name="RollMin" type="float"/>
    <element name="RollMax" type="float"/>
  </sequence>
</complexType>

```

6.12.2 Binary representation syntax

OrientationSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
OrientationRange		OrientationRangeType
}		
OrientationRangeType {		
YawMin	32	fsbf
YawMax	32	fsbf
PitchMin	32	fsbf
PitchMax	32	fsbf
RollMin	32	fsbf
RollMax	32	fsbf
}		

6.12.3 Semantics

Semantics of the `OrientationSensorCapabilityType` type:

Name	Definition
<code>OrientationSensorCapabilityType</code>	Tool for describing an orientation sensor capability.
<code>OrientationRange</code>	Describes the range that the orientation sensor can perceive in terms of <code>OrientationRangeType</code> .
<code>OrientationRangeType</code>	Defines the range from the local coordinate system according to the Yaw, Pitch and Roll.
<code>YawMin</code>	Describes the minimum value that the orientation sensor can perceive for Yaw in the unit of degree.
<code>YawMax</code>	Describes the maximum value that the orientation sensor can perceive for Yaw in the unit of degree.
<code>PitchMin</code>	Describes the minimum value that the orientation sensor can perceive for Pitch in the unit of degree.
<code>PitchMax</code>	Describes the maximum value that the orientation sensor can perceive for Pitch in the unit of degree.
<code>RollMin</code>	Describes the minimum value that the orientation sensor can perceive for Roll in the unit of degree.
<code>RollMax</code>	Describes the maximum value that the orientation sensor can perceive for Roll in the unit of degree.

NOTE 1 The local coordinate system is defined as right-handed coordinate system.

NOTE 2 Since the sensor has multidimensional information, the `OrientationRangeType` defined in this Subclause shall be used to describe the range of the possible value instead of the `minValue` and the `maxValue` in the `SensorCapabilityBaseType` for this sensor.

6.12.4 Examples

This example shows the description of an orientation sensing capability with the following semantics. The sensor has an ID of "OS001" and the maximum value shall be `YawMax = "10.0"`, `PitchMax = "10.0"` and `RollMax = "10.0"` (rad), and the minimum value shall be `YawMin = "-10.0"`, `PitchMin = "-10.0"` and `RollMin = "-10.0"` (rad) with the resolution of 1000 levels. The accuracy of the sensor is 0.01 (rad). The SNR of the sensor is 0.1 (dB). The offset of sensor is 1.0 (rad).

```
<cidl:SensorDeviceCapability xsi:type="scdv:OrientationSensorCapabilityType"
id="OS001" unit="radian" numOfLevels="1000" SNR="0.1" offset="1.0">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
  <scdv:OrientationRange xsi:type="scdv:OrientationRangeType">
    <scdv:YawMin>-10.0</scdv:YawMin>
    <scdv:YawMax>10.0</scdv:YawMax>
    <scdv:PitchMin>-10.0</scdv:PitchMin>
    <scdv:PitchMax>10.0</scdv:PitchMax>
    <scdv:RollMin>-10.0</scdv:RollMin>
    <scdv:RollMax>10.0</scdv:RollMax>
```

```

</scdv:OrientationRange>
</cidl:SensorDeviceCapability>

```

6.13 Angular velocity sensor capability type

6.13.1 XML representation syntax

```

<!-- ##### -->
<!-- Angular Velocity Sensor capability type -->
<!-- ##### -->
<complexType name="AngularVelocitySensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>

```

6.13.2 Binary representation syntax

AngularVelocitySensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.13.3 Semantics

Semantics of the AngularVelocitySensorCapabilityType type:

Name	Definition
AngularVelocitySensorCapabilityType	Tool for describing an angular velocity sensor capability.
maxValue	Describes the maximum value that the angular velocity sensor can perceive in terms of radian/second for each axis.
minValue	Describes the minimum value that the angular velocity sensor can perceive in terms of radian/second for each axis.

6.13.4 Examples

This example shows the description of an angular velocity sensing capability with the following semantics. The sensor has an ID of "AVS001" and the maximum value shall be 5.0 (rad/s) and the minimum value shall be -5.0 (rad/s) with the resolution of 1000 levels. The accuracy of the sensor is 0.01 (rad/s). The offset of sensor is 0.01 (rad/s).

```

<cidl:SensorDeviceCapability xsi:type="scdv:AngularVelocitySensorCapabilityType"
id="AVS001" unit="radpersec" maxValue="5.0" minValue="-5.0" numOfLevels="1000"
offset="0.01">

```

```
<cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.14 Angular acceleration sensor capability type

6.14.1 XML representation syntax

```
<!-- ##### -->
<!-- Angular Acceleration Sensor capability type -->
<!-- ##### -->
<complexType name="AngularAccelerationSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.14.2 Binary representation syntax

AngularAccelerationSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.14.3 Semantics

Semantics of the AngularAccelerationSensorCapabilityType type:

Name	Definition
AngularAccelerationSensorCapabilityType	Tool for describing an angular acceleration sensor capability.
maxValue	Describes the maximum value that the angular acceleration sensor can perceive in terms of radian/second ² for each axis.
minValue	Describes the minimum value that the angular acceleration sensor can perceive in terms of radian/second ² for each axis.

6.14.4 Examples

This example shows the description of an angular acceleration sensing capability with the following semantics. The sensor has an ID of "AAS001" and the maximum value shall be 200.0 (rad/s²) and the minimum value shall be -200.0 (rad/s²) with the resolution of 1000 levels. The accuracy of the sensor is 0.1 (rad/s²). The offset of sensor is 0.5 (rad/s²).

```
<cidl:SensorDeviceCapability
xsi:type="scdv:AngularAccelerationSensorCapabilityType" id="AAS001"
```

```

unit="radpersecsquared"  maxValue="200.0"  minValue="-200.0"  numOfLevels="1000"
offset="0.5">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
</cidl:SensorDeviceCapability>

```

6.15 Force sensor capability type

6.15.1 XML representation syntax

```

<!-- ##### -->
<!-- Force Sensor capability type -->
<!-- ##### -->
<complexType name="ForceSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>

```

6.15.2 Binary representation syntax

ForceSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.15.3 Semantics

Semantics of the ForceSensorCapabilityType:

Name	Definition
ForceSensorCapabilityType	Tool for describing a force sensor capability.
maxValue	Describes the maximum value that the force sensor can perceive in terms of N (Newton) for each axis.
minValue	Describes the minimum value that the force sensor can perceive in terms of N (Newton) for each axis.

6.15.4 Examples

This example shows the description of a force sensing capability with the following semantics. The sensor has an ID of "FS001" and the maximum value shall be 5.0 (N) and the minimum value shall be 0.0 (N) with the resolution of 500 levels. The accuracy of the sensor is 0.01 (N). The offset of sensor is 0.05 (N).

```

<cidl:SensorDeviceCapability xsi:type="scdv:ForceSensorCapabilityType" id="FS001"
maxValue="5.0" minValue="0.0" numOfLevels="500" offset="0.05">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>

```

```
</cidl:SensorDeviceCapability>
```

6.16 Torque sensor capability type

6.16.1 XML representation syntax

```
<!-- ##### -->
<!-- Torque Sensor capability type -->
<!-- ##### -->
<complexType name="TorqueSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.16.2 Binary representation syntax

TorqueSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.16.3 Semantics

Semantics of the TorqueSensorCapabilityType:

Name	Definition
TorqueSensorCapabilityType	Tool for describing a torque sensor capability.
maxValue	Describes the maximum value that the torque sensor can perceive in terms of N-mm (Newton millimeter) for each axis.
minValue	Describes the minimum value that the torque sensor can perceive in terms of N-mm (Newton millimeter) for each axis.

6.16.4 Examples

This example shows the description of a torque sensing capability with the following semantics. The sensor has an ID of "TS001" and the maximum value shall be 200.0 (Nmm) and the minimum value shall be 0.0 (Nmm) with the resolution of 20000 levels. The accuracy of the sensor is 0.01 (Nmm). The offset of sensor is 0.05 (Nmm).

```
<cidl:SensorDeviceCapability xsi:type="scdv:TorqueSensorCapabilityType"
id="TS001" maxValue="200.0" minValue="0.0" numOfLevels="20000" offset="0.05">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.01"/>
</cidl:SensorDeviceCapability>
```

6.17 Pressure sensor capability type

6.17.1 XML representation syntax

```
<!-- ##### -->
<!-- Pressure Sensor capability type -->
<!-- ##### -->
<complexType name="PressureSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.17.2 Binary representation syntax

PressureSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.17.3 Semantics

Semantics of the PressureSensorCapabilityType:

Name	Definition
PressureSensorCapabilityType	Tool for describing a pressure sensor capability.
maxValue	Describes the maximum value that the pressure sensor can perceive in terms of N/mm ² (Newton/millimeter square) for each axis.
minValue	Describes the minimum value that the pressure sensor can perceive in terms of N/mm ² (Newton/millimeter square) for each axis.

6.17.4 Examples

This example shows the description of a pressure sensing capability with the following semantics. The sensor has an ID of "PRS001" and the maximum value shall be 2.5 (N/mm²) and the minimum value shall be 0.0 (N/mm²) with the resolution of 2500 levels. The accuracy of the sensor is 0.001 (N/mm²). The offset of sensor is 0.05 (N/mm²).

```
<cidl:SensorDeviceCapability xsi:type="scdv:PressureSensorCapabilityType"
id="PRS001" maxValue="2.5" minValue="0.0" numOfLevels="2500" offset="0.05">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.001"/>
</cidl:SensorDeviceCapability>
```

6.18 Motion sensor capability type

6.18.1 XML representation syntax

```

<!-- ##### -->
<!-- Motion Sensor capability type -->
<!-- ##### -->
<complexType name="MotionSensorCapabilityType">
  <complexContent>
    <extension base="cid1:SensorCapabilityBaseType">
      <sequence>
        <element name="PositionCapability"
          type="scdv:PositionSensorCapabilityType" minOccurs="0"/>
        <element name="OrientationCapability"
          type="scdv:OrientationSensorCapabilityType" minOccurs="0"/>
        <element name="VelocityCapability"
          type="scdv:VelocitySensorCapabilityType" minOccurs="0"/>
        <element name="AngularVelocityCapability"
          type="scdv:AngularVelocitySensorCapabilityType" minOccurs="0"/>
        <element name="AccelerationCapability"
          type="scdv:AccelerationSensorCapabilityType" minOccurs="0"/>
        <element name="AngularAccelerationCapability"
          type="scdv:AngularAccelerationSensorCapabilityType"
            minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.18.2 Binary representation syntax

MotionSensorCapabilityType {	(Number of bits)	(Mnemonic)
PositionCapabilityFlag	1	bslbf
OrientationCapabilityFlag	1	bslbf
VelocityCapabilityFlag	1	bslbf
AngularVelocityCapabilityFlag	1	bslbf
AccelerationCapabilityFlag	1	bslbf
AngularAccelerationCapabilityFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(PositionCapabilityFlag){		
PositionCapability		PositionSensorCapabilityType
}		
if(OrientationCapabilityFlag){		

MotionSensorCapabilityType {	(Number of bits)	(Mnemonic)
OrientationCapability		OrientationSensorCapabilityType
}		
if(VelocityCapabilityFlag){		
VelocityCapability		VelocitySensorCapabilityType
}		
if(AngularVelocityCapabilityFlag){		
AngularVelocityCapability		AngularVelocitySensorCapabilityType
}		
if(AccelerationCapabilityFlag){		
AccelerationCapability		AccelerationSensorCapabilityType
}		
if(AngularAccelerationCapabilityFlag){		
AngularAccelerationCapability		AngularAccelerationSensorCapabilityType
}		
}		

6.18.3 Semantics

Semantics of the MotionSensorCapabilityType type:

Name	Definition
MotionSensorCapabilityType	Tool for describing a motion sensor capability.
PositionCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
OrientationCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
VelocityCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
AngularVelocityCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
	be used and "0" means the attribute shall not be used.
AccelerationCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
AngularAccelerationCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
PositionCapability	Describes the capability with respect to the position as defined in PositionSensorCapabilityType.
OrientationCapability	Describes the capability with respect to the orientation as defined in OrientationSensorCapabilityType.
VelocityCapability	Describes the capability with respect to the velocity as defined in VelocitySensorCapabilityType.
AngularVelocityCapability	Describes the capability with respect to the angular as defined in AngularVelocitySensorCapabilityType.
AccelerationCapability	Describes the capability with respect to the acceleration as defined in AccelerationSensorCapabilityType.
AngularAccelerationCapability	Describes the capability with respect to the angular acceleration as defined in AngularAccelerationSensorCapabilityType.

6.18.4 Examples

This example shows the description of a motion sensing capability with the following semantics. The motion sensor is with id of "MS001". It is composed of position sensor with id "MSPC001", orientation sensor with id "MSOC001", velocity sensor with id "MSVC0001", angular velocity sensor with id "MSAVC0001", acceleration sensor with id "MSAC0001", and angular acceleration sensor with id "MSAAC0001".

```
<cidl:SensorDeviceCapability          xsi:type="scdv:MotionSensorCapabilityType"
id="MS001">
  <scdv:PositionCapability id="MSPC001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:PositionSensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:PositionCapability>
  <scdv:OrientationCapability id="MSOC001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:OrientationSensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:OrientationCapability>
  <scdv:VelocityCapability id="MSVC0001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:VelocitySensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:VelocityCapability>
  <scdv:AngularVelocityCapability id="MSAVC0001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:AngularVelocitySensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:AngularVelocityCapability>
  <scdv:AccelerationCapability id="MSAC0001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:AccelerationSensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:AccelerationCapability>
  <scdv:AngularAccelerationCapability id="MSAAC0001" SNR="0.1" numOfLevels="10000"
xsi:type="scdv:AngularAccelerationSensorCapabilityType">
    <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
    <scdv:Range xsi:type="scdv:RangeType">
      <scdv:XminValue>0.0</scdv:XminValue>
      <scdv:XmaxValue>3.0</scdv:XmaxValue>
      <scdv:YminValue>0.0</scdv:YminValue>
      <scdv:YmaxValue>3.0</scdv:YmaxValue>
      <scdv:ZminValue>0.0</scdv:ZminValue>
      <scdv:ZmaxValue>3.0</scdv:ZmaxValue>
    </scdv:Range>
  </scdv:AngularAccelerationCapability>
</cidl:SensorDeviceCapability>
```

```

</scdv:PositionCapability>
<scdv:OrientationCapability id="MSOC001" SNR="0.1" unit="radian"
numOfLevels="10000" xsi:type="scdv:OrientationSensorCapabilityType">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
  <scdv:OrientationRange>
    <scdv:YawMin>-3.14</scdv:YawMin>
    <scdv:YawMax>3.14</scdv:YawMax>
    <scdv:PitchMin>-3.14</scdv:PitchMin>
    <scdv:PitchMax>3.14</scdv:PitchMax>
    <scdv:RollMin>-1.57</scdv:RollMin>
    <scdv:RollMax>1.57</scdv:RollMax>
  </scdv:OrientationRange>
</scdv:OrientationCapability>
<scdv:VelocityCapability id="MSVC0001"
xsi:type="scdv:VelocitySensorCapabilityType" maxValue="50.0" minValue="0.1"
numOfLevels="1000">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
</scdv:VelocityCapability>
<scdv:AngularVelocityCapability id="MSAVC0001"
xsi:type="scdv:AngularVelocitySensorCapabilityType" maxValue="5.0"
minValue="-5.0">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.1"/>
</scdv:AngularVelocityCapability>
<scdv:AccelerationCapability id="MSAC0001" maxValue="9.8" minValue="-9.8"/>
<scdv:AngularAccelerationCapability id="MSAAC0001" maxValue="200.0"
minValue="-200.0"/>
</cidl:SensorDeviceCapability>

```

6.19 Intelligent camera capability type

6.19.1 XML representation syntax

```

<!-- ##### -->
<!-- Intelligent Camera CapabilityType -->
<!-- ##### -->
<complexType name="IntelligentCameraCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="MaxBodyFeaturePoint" type="nonNegativeInteger"
minOccurs="0"/>
        <element name="MaxFaceFeaturePoint" type="nonNegativeInteger"
minOccurs="0"/>
        <element name="TrackedFeature" type="scdv:FeatureType"
minOccurs="0"/>
        <element name="TrackedFacialFeaturePoints"
type="scdv:FacialFeatureMask" minOccurs="0"/>
        <element name="TrackedBodyFeaturePoints"
type="scdv:BodyFeatureMask" minOccurs="0"/>
      </sequence>
      <attribute name="featureTrackingStatus" type="boolean" use="optional"
default="false"/>
      <attribute name="facialExpressionTrackingStatus" type="boolean"
use="optional" default="false"/>
      <attribute name="gestureTrackingStatus" type="boolean" use="optional"
default="false"/>
    </extension>
  </complexContent>
</complexType>

```

```

    </extension>
  </complexContent>
</complexType>

<simpleType name="FeatureType">
  <restriction base="string">
    <enumeration value="face"/>
    <enumeration value="body"/>
    <enumeration value="both"/>
  </restriction>
</simpleType>

<complexType name="FacialFeatureMask">
  <sequence>
    <element name="FaceFeaturePoint" type="boolean" minOccurs="60"
      maxOccurs="200"/>
  </sequence>
</complexType>

<complexType name="BodyFeatureMask">
  <sequence>
    <element name="BodyFeaturePoint" type="boolean" minOccurs="60"
      maxOccurs="200"/>
  </sequence>
</complexType>

```

6.19.2 Binary representation syntax

IntelligentCameraCapabilityType {	(Number of bits)	(Mnemonic)
MaxBodyFeaturePointFlag	1	bslbf
MaxFaceFeaturePointFlag	1	bslbf
TrackedFeatureFlag	1	bslbf
TrackedFacialFeaturePointsFlag	1	bslbf
TrackedBodyFeaturePointsFlag	1	bslbf
featureTrackingStatusFlag		
facialExpressionTrackingStatusFlag	1	bslbf
gestureTrackingStatusFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(MaxBodyFeaturePointFlag){		
MaxBodyFeaturePoint	32	uimbsf
}		
if(MaxFaceFeaturePointFlag){		

IntelligentCameraCapabilityType {	(Number of bits)	(Mnemonic)
MaxFaceFeaturePoint	32	uimsbf
}		
if(TrackedFeatureFlag){		
TrackedFeature	2	bslbf
}		
if(TrackedFacialFeaturePointsFlag){		
TrackedFacialFeaturePoints		FacialFeatureMask
}		
if(TrackedBodyFeaturePointsFlag){		
TrackedBodyFeaturePointsFlag		BodyFeatureMask
}		
if(featureTrackingStatusFlag){		
featureTrackingStatus	1	bslbf
}		
if(facialExpressionTrackingStatusFlag){		
facialExpressionTrackingStatus	1	bslbf
}		
if(gestureTrackingStatusFlag){		
gestureTrackingStatus	1	bslbf
}		
}		
FacialFeatureMask {		
LoopFaceFeaturePoint	8	uimsbf
for(k=0;k< LoopFaceFeaturePoint;k++){		
FaceFeaturePoint[k]	1	bslbf
}		
}		

IntelligentCameraCapabilityType {	(Number of bits)	(Mnemonic)
BodyFeatureMask {		
LoopBodyFeaturePoint	16	uimsbf
for(k=0;k< LoopBodyFeaturePoint;k++){		
BodyFeaturePoint[k]	1	bslbf
}		
}		

6.19.3 Semantics

Semantics of the IntelligentCameraCapabilityType type:

Name	Definition
IntelligentCameraCapabilityType	Tool for describing an intelligent camera capability.
MaxBodyFeaturePointFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
MaxFaceFeaturePointFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
TrackedFeatureFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
TrackedFacialFeaturePointsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
TrackedBodyFeaturePointsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
featureTrackingStatusFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
facialExpressionTrackingStatusFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
gestureTrackingStatusFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition										
MaxBodyFeaturePoint	Describes the maximum number of body feature points that the intelligent camera can track.										
MaxFaceFeaturePoint	Describes the maximum number of facial feature points that the intelligent camera can track.										
TrackedFeature	Describes what kind of feature points can be tracked as given in <i>FeatureType</i> , e.g., body, face or both.										
FeatureType	Describes the types of feature to be tracked. (face, body, or both). In the binary description, the following mapping table is used, <table border="1"> <tr> <th>Term of FeatureType</th><th>Binary representation for feature type (2bits)</th></tr> <tr> <td>Face</td><td>00</td></tr> <tr> <td>Body</td><td>01</td></tr> <tr> <td>Both</td><td>10</td></tr> <tr> <td>Reserved</td><td>11</td></tr> </table>	Term of FeatureType	Binary representation for feature type (2bits)	Face	00	Body	01	Both	10	Reserved	11
Term of FeatureType	Binary representation for feature type (2bits)										
Face	00										
Body	01										
Both	10										
Reserved	11										
TrackedFacialFeature Points	Describes whether each of the facial feature points orderly listed in 5.2.7.4 of ISO/IEC 23005-4 is active or not, based on <i>FacialFeatureMask</i> .										
TrackedBodyFeature Points	Describes whether each of the body feature points orderly listed in 5.2.7.6 of ISO/IEC 23005-4 is active or not, based on <i>BodyFeatureMask</i> .										
featureTracking Status	Describes whether the feature tracking is capable or not.										
facialExpression TrackingStatus	Describes whether the intelligent camera can extract the facial animation or not.										
gestureTracking Status	Describes whether the intelligent camera can extract the body animation or not.										
FacialFeatureMask	Provides a Boolean map of facial feature points in the order listed in 5.2.7.4 of ISO/IEC 23005-4 to identify active feature points.										
BodyFeatureMask	Provides a Boolean map of body feature points in the order listed in 5.2.7.6 of ISO/IEC 23005-4 to identify active feature points.										

6.19.4 Examples

This example shows the description of an intelligent camera sensing capability.

```
<cidl:SensorDeviceCapability      xsi:type="scdv:IntelligentCameraCapabilityType"
id="IC001" featureTrackingStatus="true" gestureTrackingStatus="true">
  <scdv:MaxBodyFeaturePoint>69</scdv:MaxBodyFeaturePoint>
  <scdv:MaxFaceFeaturePoint>60</scdv:MaxFaceFeaturePoint>
```

```

<scdv:TrackedFeature>both</scdv:TrackedFeature>
<scdv:TrackedFacialFeaturePoints>
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
  ...
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
  <scdv:FaceFeaturePoint>true</scdv:FaceFeaturePoint>
</scdv:TrackedFacialFeaturePoints>
<scdv:TrackedBodyFeaturePoints>
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
  ...
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
  <scdv:BodyFeaturePoint>true</scdv:BodyFeaturePoint>
</scdv:TrackedBodyFeaturePoints>
</cidl:SensorDeviceCapability>

```

6.20 Bend sensor capability type

6.20.1 XML representation syntax

```

<!-- ##### -->
<!-- Bend Sensor capability type -->
<!-- ##### -->
<complexType name="BendSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="Channels"
type="scdv:BendSensorChannelCapabilityType" minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute name="numOfChannels" type="nonNegativeInteger"
use="optional" default="1"/>
    </extension>
  </complexContent>
</complexType>

<complexType name="BendSensorChannelCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="NumOfLocations" type="nonNegativeInteger" minOccurs="0"/>
        <element name="DistanceBtwnLocations" type="float" minOccurs="0"/>
        <element name="NumOfAxes" type="nonNegativeInteger" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.20.2 Binary representation syntax

BendSensorCapabilityType{	(Number of bits)	(Mnemonic)
ChannelsFlag	1	bslbf
numOfChannelsFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(ChannelsFlag){		
LoopChannels		Vluimsbf5
for(k=0;k< LoopChannels;k++){		
Channels[k]		BendSensorChannelCapabilityType
}		
}		
if(numOfChannelsFlag){		
numOfChannels	16	uimsbf
}		
}		
BendSensorChannelCapabilityType{		
NumOfLocationsFlag	1	bslbf
DistanceBtwnLocationsFlag	1	bslbf
NumOfAxesFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(NumOfLocationsFlag){		
NumOfLocations	16	uimsbf
}		
if(DistanceBtwnLocationsFlag){		
DistanceBtwnLocations	32	fsbf
}		
if(NumOfAxesFlag){		
NumOfAxes	2	uimsbf
}		
}		

6.20.3 Semantics

Semantics of the `BendSensorType`:

<i>Name</i>	<i>Definition</i>
<code>BendSensorCapabilityType</code>	Tool for describing a bend sensor capability.
<code>NumOfLocationsFlag</code>	This field, which is only present in the binary representation, indicates the presence of the “numOfLocations” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
<code>DistanceBtwnLocationsFlag</code>	This field, which is only present in the binary representation, indicates the presence of the “distanceBtwnLocations” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
<code>NumOfAxesFlag</code>	This field, which is only present in the binary representation, indicates the presence of the “numOfAxes” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
<code>numOfChannelsFlag</code>	This field, which is only present in the binary representation, indicates the presence of the “numOfChannels” attribute. A value of “1” implies that the attribute shall be used and a value of “0” implies that the attribute shall not be used.
<code>maxValue</code>	Describes the maximum value that the bend sensor can perceive in terms of degree.
<code>minValue</code>	Describes the minimum value that the bend sensor can perceive in terms of degree.
<code>NumOfLocations</code>	Describes the number of locations that a bend sensor can sense bend angles.
<code>DistanceBtwnLocations</code>	Describes the distance between the adjacent sensing locations in terms of meter.
<code>NumOfAxes</code>	Describes the dimension that the bend sensor can perceive the bend angles.
<code>numOfChannels</code>	Describes the number of channels that an array of bend sensors can perceive. The default value of the number of channels is 1.

6.20.4 Examples

This example shows the description of a bend sensing capability with the following semantics. The sensor has an ID of “BendID_01” and the number of channels is 1. The channel has its ID of “Ch1”, three sensing locations with a single axis, the distance between the sensing locations of 0.03m, and the maximum and minimum values of 90 and 0 degrees, respectively.

```

<cidl:SensorDeviceCapability                                xsi:type="scdv:BendSensorCapabilityType"
id="BendID_01" numOfChannels="1">
  <scdv:Channels id="Ch1" maxValue="90" minValue="0">
    <scdv:NumOfLocations>
      3
    </scdv:NumOfLocations>
    <scdv:DistanceBtwnLocations>
      0.03
    </scdv:DistanceBtwnLocations>
    <scdv:NumOfAxes>
      1
    </scdv:NumOfAxes>
  </scdv:Channels>
</cidl:SensorDeviceCapability>

```

6.21 Gas sensor capability type

6.21.1 XML representation syntax

```

<!-- ##### -->
<!-- Gas Sensor capability type -->
<!-- ##### -->
<complexType name="GasSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="GasType" type="mpeg7:termReferenceType" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.21.2 Binary representation syntax

GasSensorCapabilityType {	(Number of bits)	(Mnemonic)
GasTypeFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(GasTypeFlag){		
GasType	16	uimsbf
}		
}		

6.21.3 Semantics

Semantics of the GasSensorCapabilityType:

Name	Definition																																		
GasSensorCapabilityType	Tool for describing a gas sensor capability.																																		
e																																			
GasTypeFlag	This field, which is only present in the binary representation, signals the presence of the GasType element. A value of "1" means the element shall be used and "0" means the element shall not be used.																																		
GasType	Describes the sensed type by the gas sensor. Tool for describing a gas type as a reference to a classification scheme term provided by GasTypeCS defined in ISO/IEC 23005-6. The details of the structure and use of classification scheme and termReferencetype description is defined in 7.6 of ISO/IEC 15938-5:2003. EXAMPLE <code>urn:mpeg:mpeg-v:01-CI-GasCS-NS:oxygen</code> would describe Oxygen gas. As for the binary representation, the following table shall be used to identify the gas type in binary representation. <table> <tr> <th>GasTypeCS (16bits)</th><th>Type</th></tr> <tr> <td>0000000000000000</td><td>Reserved</td></tr> <tr> <td>0000000000000001</td><td>carbon monoxide</td></tr> <tr> <td>0000000000000010</td><td>carbon dioxide</td></tr> <tr> <td>0000000000000011</td><td>sulfurous acid</td></tr> <tr> <td>0000000000000100</td><td>nitrogen oxide</td></tr> <tr> <td>0000000000000101</td><td>oxygen</td></tr> <tr> <td>0000000000000110</td><td>ozone</td></tr> <tr> <td>0000000000000111</td><td>hydrogen</td></tr> <tr> <td>0000000000001000</td><td>VOC (Volatile Organic Compounds)</td></tr> <tr> <td>0000000000001001</td><td>ethanol (chemical symbol of ethanol is C₂H₅OH)</td></tr> <tr> <td>0000000000001010</td><td>propane</td></tr> <tr> <td>0000000000001011</td><td>methane</td></tr> <tr> <td>0000000000001100</td><td>butane</td></tr> <tr> <td>0000000000001101</td><td>formaldehyde</td></tr> <tr> <td>0000000000001110</td><td>Radon222</td></tr> <tr> <td>0000000000001111-1111111111111111</td><td>reserved</td></tr> </table>	GasTypeCS (16bits)	Type	0000000000000000	Reserved	0000000000000001	carbon monoxide	0000000000000010	carbon dioxide	0000000000000011	sulfurous acid	0000000000000100	nitrogen oxide	0000000000000101	oxygen	0000000000000110	ozone	0000000000000111	hydrogen	0000000000001000	VOC (Volatile Organic Compounds)	0000000000001001	ethanol (chemical symbol of ethanol is C ₂ H ₅ OH)	0000000000001010	propane	0000000000001011	methane	0000000000001100	butane	0000000000001101	formaldehyde	0000000000001110	Radon222	0000000000001111-1111111111111111	reserved
GasTypeCS (16bits)	Type																																		
0000000000000000	Reserved																																		
0000000000000001	carbon monoxide																																		
0000000000000010	carbon dioxide																																		
0000000000000011	sulfurous acid																																		
0000000000000100	nitrogen oxide																																		
0000000000000101	oxygen																																		
0000000000000110	ozone																																		
0000000000000111	hydrogen																																		
0000000000001000	VOC (Volatile Organic Compounds)																																		
0000000000001001	ethanol (chemical symbol of ethanol is C ₂ H ₅ OH)																																		
0000000000001010	propane																																		
0000000000001011	methane																																		
0000000000001100	butane																																		
0000000000001101	formaldehyde																																		
0000000000001110	Radon222																																		
0000000000001111-1111111111111111	reserved																																		

Name	Definition
maxValue	Describes the maximum value that the gas sensor can perceive in terms of ppm (parts per million).
minValue	Describes the minimum value that the gas sensor can perceive in terms of ppm (parts per million).

6.21.4 Examples

This example shows the description of a gas sensing capability with the following semantics. The sensor has an ID of "GSID_01" and the maximum value shall be 25.0 (ppm) and the minimum value shall be 0.0 (ppm) with the resolution of 100 levels. The accuracy of the sensor is 0.001 (ppm). The offset of sensor is 0.05 (ppm).

```
<cidl:SensorDeviceCapability xsi:type="scdv:GasSensorCapabilityType" id="GSID_01"
minValue="0.0"          maxValue="25.0"          numOfLevels="100"          offset="0.05"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:ppm">
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.001"/>
</cidl:SensorDeviceCapability>
```

6.22 Dust sensor capability type

6.22.1 XML representation syntax

```
<!-- ##### -->
<!-- Dust Sensor capability type -->
<!-- ##### -->
<complexType name="DustSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType"/>
  </complexContent>
</complexType>
```

6.22.2 Binary representation syntax

DustSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensorCapabilityBase		SensorCapabilityBaseType
}		

6.22.3 Semantics

Semantics of the DustSensorCapabilityType:

Name	Definition
DustSensorCapabilityType	Tool for describing a dust sensor capability.

Name	Definition
maxValue	Describes the maximum value that the dust sensor can perceive in terms of $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter).
minValue	Describes the minimum value that the dust sensor can perceive in terms of $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter).

6.22.4 Examples

This example shows the description of a dust sensing capability with the following semantics. The sensor has an ID of "DTID_01" and the maximum value shall be 1000 ($\mu\text{g}/\text{m}^3$) and the minimum value shall be 1 ($\mu\text{g}/\text{m}^3$) with the resolution of 1000 levels. The accuracy of the sensor is 1 ($\mu\text{g}/\text{m}^3$). The offset of sensor is 5 ($\mu\text{g}/\text{m}^3$).

```
<cidl:SensorDeviceCapability xsi:type="scdv:GasSensorCapabilityType" id="GSID_01"
minValue="1" maxValue="1000" numOfLevels="1000" offset="5" >
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="1"/>
</cidl:SensorDeviceCapability>
```

6.23 Multi interaction point sensor capability type

6.23.1 XML representation syntax

```
<!-- ##### -->
<!-- Multi Interaction Point Sensor capability type -->
<!-- ##### -->
<complexType name="MultiInteractionPointSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <attribute name="numOfInteractionPoints" type="nonNegativeInteger"
use="optional" default="1"/>
    </extension>
  </complexContent>
</complexType>
```

6.23.2 Binary representation syntax

MultiInteractionPointSensorCapabilityType {	(Number of bits)	(Mnemonic)
numOfInteractionPointsFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(numOfInteractionPointsFlag){		
numOfInteractionPoints	16	uimbsf
}		
}		

6.23.3 Semantics

Semantics of the MultiInteractionPointSensorCapabilityType:

Name	Definition
MultiInteractionPointSensorCapabilityType	Tool for describing a multi interaction-point sensor capability.
numOfInteractionPointsFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
numOfInteractionPoints	Describes the number of interaction points that a multi interaction point sensor includes.

6.23.4 Examples

The following is an example of the MultiInteractionPointSensorCapability to indicate the capable number of interaction points. This example shows that the given Multi Interaction Point Sensor with id of MIPS_ID1 has 5 interaction points to receive user's selection.

```
<cidl:SensorDeviceCapability
xsi:type="scdv:MultiInteractionPointSensorCapabilityType" id="MIPSID_01"
numOfInteractionPoints="5">
</cidl:SensorDeviceCapability>
```

6.24 Gaze tracking sensor capability type

6.24.1 XML representation syntax

```
<!-- ##### -->
<!-- Gaze Tracking Sensor capability type -->
<!-- ##### -->
<complexType name="GazeTrackingSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="PositionCapability"
type="scdv:PositionSensorCapabilityType" minOccurs="0"/>
        <element name="OrientationCapability"
type="scdv:OrientationSensorCapabilityType" minOccurs="0"/>
      </sequence>
      <attribute name="gazeTrackingOn" type="boolean" use="optional"
default="false"/>
      <attribute name="blinkTrackingOn" type="boolean" use="optional"
default="false"/>
    </extension>
  </complexContent>
</complexType>
```

6.24.2 Binary representation syntax

GazeTrackingSensorCapabilityType {	(Number of bits)	(Mnemonic)
PositionCapabilityFlag	1	bslbf
OrientationCapabilityFlag	1	bslbf
gazeTrackingOnFlag	1	bslbf
blinkTrackingOnFlag	1	bslbf
SensorCapabilityBase		SensorCapabilityBaseType
if(PositionCapabilityFlag){		
PositionCapability		PositionSensorCapabilityType
}		
if(OrientationCapabilityFlag){		
OrientationCapability	1	OrientationSensorCapabilityType
}		
if(gazeTrackingOnFlag){		
gazeTrackingOn	1	bslbf
}		
if(blinkTrackingOnFlag){		
blinkTrackingOn	1	bslbf
}		
}		

6.24.3 Semantics

Semantics of the GazeTrackingSensorCapabilityType:

Name	Definition
GazeTrackingSensorCapabilityType	Tool for describing a Gaze tracking sensor capability.
PositionCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the element shall be used and "0" means the element shall not be used.

Name	Definition						
OrientationCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.						
gazeTrackingOnFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.						
blinkTrackingOnFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.						
PositionCapability	Describes the capability with respect to the position as defined in PositionSensorCapabilityType						
OrientationCapability	Describes the capability with respect to the orientation as defined in OrientationSensorCapabilityType						
gazeTrackingOn	Indicates whether the gaze tracking sensor can track user's gazes or not. „false“ means the gaze tracking sensor does not detect the gaze and „true“ means the sensor does detect. In the binary description, the following mapping table is used, <table border="1"> <tr> <th>Binary value (1 bits)</th><th>whether detecting gaze or not</th></tr> <tr> <td>0</td><td>Not detecting gaze</td></tr> <tr> <td>1</td><td>Detecting gaze</td></tr> </table>	Binary value (1 bits)	whether detecting gaze or not	0	Not detecting gaze	1	Detecting gaze
Binary value (1 bits)	whether detecting gaze or not						
0	Not detecting gaze						
1	Detecting gaze						
blinkTrackingOn	Indicates whether the gaze tracking sensor can detect the user's blinking or not. „false“ means the gaze tracking sensor does not detect eye's blinking and „true“ means the sensor does detect. In the binary description, the following mapping table is used, <table border="1"> <tr> <th>Binary value (1 bits)</th><th>Whether detecting eye's blinking or not</th></tr> <tr> <td>0</td><td>Not detecting eye's blinking</td></tr> <tr> <td>1</td><td>Detecting eye's blinking</td></tr> </table>	Binary value (1 bits)	Whether detecting eye's blinking or not	0	Not detecting eye's blinking	1	Detecting eye's blinking
Binary value (1 bits)	Whether detecting eye's blinking or not						
0	Not detecting eye's blinking						
1	Detecting eye's blinking						

6.24.4 Examples

This example shows the description of a gaze tracking sensor capability with the following semantics. The sensor has an ID of "GTS001" and it can track the position and the orientation of user's gaze while it cannot sense user's blinking.

```
<cidl:SensorDeviceCapability      xsi:type="scdv:GazeTrackingSensorCapabilityType"
id="GTS001" gazeTrackingOn="true" blinkTrackingOn="false">
</cidl:SensorDeviceCapability>
```

6.25 Global position sensor capability type

6.25.1 XML representation syntax

```

<!-- ##### -->
<!-- Global Position Sensor capability type -->
<!-- ##### -->
  <complexType name="GlobalPositionSensorCapabilityType">
    <complexContent>
      <extension base="cidl:SensorCapabilityBaseType">
        <sequence>
          <element name="VariousAccuracy" type="scdv:VariousAccuracyType"
minOccurs="0" maxOccurs="unbounded"/>
        </sequence>
        <attribute name="crs" type="anyURI"
default="urn:ogc:def:crs:EPSG::4326"/>
        <attribute name="latitudeOffset" type="float" use="optional"/>
        <attribute name="longitudeOffset" type="float" use="optional"/>
        <attribute name="maxOperatingTemp" type="float" use="optional"/>
        <attribute name="minOperatingTemp" type="float" use="optional"/>
      </extension>
    </complexContent>
  </complexType>

  <complexType name="VariousAccuracyType">
    <attribute name="accuracyType" type="mpeg7:termReferenceType"/>
    <attribute name="value" type="float" use="required"/>
    <attribute name="accuracyUnit" type="mpeg7:termReferenceType"/>
  </complexType>

```

6.25.2 Binary representation syntax

GlobalPositionSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
latitudeOffsetFlag	1	bslbf
longitudeOffstFlag	1	bslbf
maxOperatingTempFlag	1	bslbf
minOperatingTempFlag	1	bslbf
VariousAccuracyCount	32	uimsbf
For (i=1;i<VariousAccuracyCount;i++) {		
accuracyType	8	AccuracyTypeCS
value	32	flbf
accuracyUnit	8	bslbf
}		

GlobalPositionSensorCapabilityType {	(Number of bits)	(Mnemonic)
crs		UTF-8
if(latitudeOffsetFlag){		
latitudeOffset	32	fsbf
}		
if(longitudeOffsetFlag){		
longitudeOffset	32	Fsbf
}		
if(maxOperatingTempFlag){		
maxOperatingTemp	32	fsbf
}		
if(minOperatingTempFlag){		
minOperatingTemp	32	fsbf
}		
}		

6.25.3 Semantics

Semantics of the GlobalPositionSensorCapabilityType:

Name	Definition
GlobalPositionSensorCapabilityType	Tool for describing a GPS sensor capability.
Accuracy	Describes the degree of closeness of a measured quantity of longitude to its actual value in AccuracyType.
LatitudeAccuracy	Describes the degree of closeness of a measured quantity of latitude to its actual value in AccuracyType.
unit	Does not have any meaningful semantics in this description.
maxValue	Does not have any meaningful semantics in this description.
minValue	Does not have any meaningful semantics in this description.
offset	Describes the value added to a base value of longitude in order to get to a specific absolute value.

Name	Definition
VariousAccuracy	Describes the accuracy in various point of view. Each occurrence of this element defines one type of accuracy. This element defines the accuracy by using three attributes defined. The <code>accuracyType</code> attribute specifies the type of the accuracy by referencing the <code>AccuracyTypeCS</code> . The <code>value</code> attribute specifies the value to denote the accuracy. The <code>unit</code> attribute specifies the unit of the value attribute by referencing the <code>UnitTypeCS</code> .
<code>crs</code>	Specifies the URI of the coordinate reference system based on which the values of longitude, latitude and altitude are given. The default is <code>urn:ogc:def:crs:EPSG::4326</code> specifying the Coordinate Reference System (CRS) with code 4326 specified in the EPSG database available at http://www.epsg.org/ .
<code>longitudeOffset</code>	Describes the value added to a base value of longitude in order to get to a specific absolute value.
<code>latitudeOffset</code>	Describes the value added to a base value of latitude in order to get to a specific absolute value.
<code>numOfLevels</code>	Describes the number of value levels that the sensor can perceive in between maximum and minimum value of longitude. EXAMPLE The value 5 means the sensor can perceive 5 steps from <code>minValue</code> to <code>maxValue</code> .
<code>sensitivity</code>	Describes the minimum magnitude of input signal required to produce a specified output signal in given unit.
<code>SNR</code>	Describes the ratio of a signal power to the noise power corrupting the signal.
<code>maxOperatingTemp</code>	Describes the number of locations that a bend sensor can sense bending angles.
<code>minOperatingTemp</code>	Describes the distance between the adjacent sensing locations.

Semantics of the `VariousAccuracyType`

Name	Definition
VariousAccuracy	Tool for describing accuracy of the sensor in various point of view.
<code>accuracyType</code>	This attribute specifies the accuracy type, e.g., distance accuracy or reacquisition time, by referencing to the <code>AccuracyTypeCS</code> .
<code>value</code>	This attribute specifies the value of the accuracy.
<code>accuracyUnit</code>	This attribute specifies the unit of the accuracy description by referencing to the <code>UnitTypeCS</code> .

6.25.4 Examples

This example shows the description of a global position sensor's sensing capability with the following semantics. The sensor has an ID of "gps01" with the maximum operating temperature of 90 degrees Celsius, minimum operating temperature of -30 degrees Celsius, sensitivity of 0.01 degrees, and the position accuracy of 0.01 degree.

```
<cidl:SensorDeviceCapability    xsi:type="scdv:GlobalPositionSensorCapabilityType"
id="gps01"                      crs="urn:ogc:def:crs:EPSG::4326"                maxOperatingTemp="90"
minOperatingTemp="-30" sensitivity="0.01">
  <scdv:VariousAccuracy          value="0.01"                accuracyType=":mpeg:mpeg-v:01-
AccuracyTypeCS-NS:PositionAccuracy"          accuracyUnit="urn:mpeg:mpeg-v:01-CI-
UnitTypeCS-NS:degree"/>
</cidl:SensorDeviceCapability>
```

6.26 Altitude sensor capability type

6.26.1 XML representation syntax

```
<!-- ##### -->
<!-- Altitude Sensor capability type -->
<!-- ##### -->
<complexType name="AltitudeSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <attribute name="crs" type="anyURI"
default="urn:ogc:def:crs:EPSG::4326"/>
    </extension>
  </complexContent>
</complexType>
```

6.26.2 Binary representation syntax

AltitudeSensorCapabilityType {	(Number of bits)	(Mnemonic)
SensoryDeviceCapabilityBase		SensoryDeviceCapabilityBaseType
crs		UTF-8
}		

6.26.3 Semantics

Semantics of the AltitudeSensorCapabilityType:

Name	Definition
AltitudeSensorCapabilityType	Tool for describing an altitude sensor capability.

Name	Definition
crs	Specifies the URI of the coordinate reference system based on which the values of longitude, latitude and altitude are given. The default is urn:ogc:def:crs:EPSG::4326 specifying the Coordinate Reference System (CRS) with code 4326 specified in the EPSG database available at http://www.epsg.org/ .
Accuracy	Describes the degree of closeness of a measured quantity to its actual value in AccuracyType.
unit	Specifies the unit of the sensor's measuring value as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of Part 6 of ISO/IEC 23005, if a unit other than the default unit specified in the semantics of the max Value and min Value is used for the values of max Value and min Value are used. The default unit is meter.
maxValue	Describes the maximum altitude that the altitude sensor can perceive in meters.
minValue	Describes the minimum altitude that the altitude sensor can perceive in meters.
offset	Describes the value needed to be added to a base value in order to get to a specific absolute value.
numOfLevels	Describes the number of altitude levels that the sensor can perceive in between maximum and minimum value. EXAMPLE The value 5 means the sensor can perceive 5 steps from min Value to max Value .
sensitivity	Describes the minimum magnitude of input signal required to produce a specified output signal in given unit.
SNR	Describes the ratio of a signal power to the noise power corrupting the signal.

6.26.4 Examples

This example shows the description of a altitude sensing capability with the following semantics. The sensor has an ID of "ASID_01" and the maximum value shall be 1000 (meter) and the minimum value shall be 0 (meter) with the resolution of 2000 levels. The accuracy of the sensor is 0.5 (meter). The offset of sensor is 5 (meter).

```
<cidl:SensorDeviceCapability      xsi:type="scdv:AltitudeSensorCapabilityType"
id="ASID_01" minValue="0" maxValue="1000" numOfLevels="2000" offset="5" >
  <cidl:Accuracy xsi:type="cidl:ValueAccuracy" value="0.5"/>
</cidl:SensorDeviceCapability>
```

6.27 Weather sensor capability type

6.27.1 XML representation syntax

```

<!-- ##### -->
<!-- Weather Sensor capability type -->
<!-- ##### -->
<complexType name="WeatherSensorCapabilityType">
  <complexContent>
    <extension base="cidl:SensorCapabilityBaseType">
      <sequence>
        <element name="TemperatureCapability"
type="scdv:TemperatureSensorCapabilityType" minOccurs="0"/>
        <element name="PrecipitationCapability" minOccurs="0">
          <complexType>
            <complexContent>
              <extension base="cidl:SensorCapabilityBaseType"/>
            </complexContent>
          </complexType>
        </element>
        <element name="SnowCapability" minOccurs="0">
          <complexType>
            <complexContent>
              <extension base="cidl:SensorCapabilityBaseType"/>
            </complexContent>
          </complexType>
        </element>
        <element name="WindCapability" minOccurs="0">
          <complexType>
            <complexContent>
              <extension base="cidl:SensorCapabilityBaseType"/>
            </complexContent>
          </complexType>
        </element>
        <element name="HumidityCapability"
type="scdv:HumiditySensorCapabilityType" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

6.27.2 Binary representation syntax

WeatherSensorCapabilityType {	(Number of bits)	(Mnemonic)
TemperatureCapabilityFlag	1	bslbf
PrecipitationCapabilityFlag	1	bslbf
SnowCapabilityFlag	1	bslbf
WindCapabilityFlag	1	bslbf
HumidityCapabilityFlag	1	bslbf
If (TemperatureCapabilityFlag) {		

WeatherSensorCapabilityType {	(Number of bits)	(Mnemonic)
TemperatureCapability		ensorCapabilityBaseType
}		
If (PrecipitationCapabilityFlag) {		
PrecipitationCapability		ensorCapabilityBaseType
}		
If (SnowCapabilityFlag) {		
SnowCapability		ensorCapabilityBaseType
}		
If (WindCapabilityFlag) {		
WindCapability		ensorCapabilityBaseType
}		
If (HumidityCapabilityFlag) {		
HumidityCapability		ensorCapabilityBaseType
}		
}		

6.27.3 Semantics

Semantics of the WeatherSensorCapabilityType:

Name	Definition
WeatherSensorCapabilityType	Tool for describing capabilities of a weather sensor, which may be either a physical sensor or a virtual sensor that can produce weather information or can gather weather information in various means.
TemperatureCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the TemperatureCapability element. A value of "1" means that this element is present and "0" means that this element is not present.
PrecipitationCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the PrecipitationCapability element. A value of "1" means that this element is present and "0" means that this element is not present.
SnowCapabilityFlag	This field, which is only present in the binary representation, signals the presence of the SnowCapability element. A value of "1" means that this element is present and "0" means that this element is not present.
WindCapabilityFlag	This field, which is only present in the binary representation, signals the

Name	Definition
	presence of the <code>WindCapability</code> element. A value of "1" means that this element is present and "0" means that this element is not present.
<code>HumidityCapabilityFlag</code>	This field, which is only present in the binary representation, signals the presence of the <code>HumidityCapability</code> element. A value of "1" means that this element is present and "0" means that this element is not present.
<code>TemperatureCapability</code>	Element to describe the temperature-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide temperature information.
<code>PrecipitationCapability</code>	Element to describe the precipitation-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide precipitation information.
<code>SnowCapability</code>	Element to describe the snow-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide snow information.
<code>WindCapability</code>	Element to describe the wind-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide wind information.
<code>HumidityCapability</code>	Element to describe the humidity-related capability of a weather sensor. If this element is not instantiated, the given Weather sensor is unable to provide humidity information.
<code>sensorCapabilityBaseAttributes</code>	There are <code>sensorCapabilityBaseAttributes</code> inherited from the <code>SensorCapabilityBaseType</code> at the top level of the <code>WeatherSensorCapabilityType</code> as well as at each individual capability description of temperature, precipitation, snow, wind and humidity sensor. In this capability description, the attributes defined in the <code>sensorCapabilityBaseAttributes</code> of the top level are disabled and not used except the <code>id</code> and <code>sensorIdRef</code> attributes.

6.27.4 Examples

The following is an example of the `WeatherSensorCapabilityType` to indicate that the capability of the given sensor. This example shows that the given Weather sensor with id of `WSC_ID1` can sense humidity, temperature, and snow. The humidity information can be provided between 5% and 90% with sensitivity of 1%, the temperature information can be provided between 100 degrees Celsius and -100 degrees Celsius in 200 levels, and the snow information can be provided with maximum of 100 centimeters per minute, in 200 levels.

```
<cidl:SensorDeviceCapability          xsi:type="scdv:WeatherSensorCapabilityType"
id="WSC_ID1">
  <scdv:TemperatureCapability maxValue="100" minValue="-100" numOfLevels="200"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius"/>
  <scdv:SnowCapability maxValue="100" numOfLevels="200" unit="urn:mpeg:mpeg-
v:01-CI-UnitTypeCS-NS:centimeterperhour"/>
  <scdv:HumidityCapability maxValue="90" minValue="5" numOfLevels="90"
sensitivity="1"/>
</cidl:SensorDeviceCapability>
```

7 User's sensory preference vocabulary

7.1 Introduction

This Clause describes syntax and semantics of the user's sensory preference vocabulary to implement description of user's preference on individual sensory effect.

7.2 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:mpegvct="urn:mpeg:mpeg-v:2012:01-
CT-NS" xmlns:cidl="urn:mpeg:mpeg-v:2012:01-CIDL-NS" xmlns:sepv="urn:mpeg:mpeg-
v:2012:01-SEPV-NS" targetNamespace="urn:mpeg:mpeg-v:2012:01-SEPV-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-2" id="MPEG-V-SEPV.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:2012:01-CIDL-NS"
schemaLocation="CIDL.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-CT-NS" schemaLocation="MPEG-V-
CT.xsd"/>
```

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

```
</schema>
```

7.3 Light preference type

7.3.1 XML representation syntax

```
<!-- ##### -->
<!-- Light Preference type -->
<!-- ##### -->
<complexType name="LightPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <sequence>
        <element name="UnfavorableColor" type="mpegvct:colorType"
minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute name="maxIntensity" type="float" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.3.2 Binary representation syntax

LightPrefType {	(Number of bits)	(Mnemonic)
UnfavorableColorFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(UnfavorableColorFlag){		
LoopUnfavorableColor		vluimsbf5
for(k=0;k< LoopUnfavorableColor;k++){		
UnfavorableColor[k]		ColorType
}		
}		
if(maxIntensityFlag){		
maxIntensity	32	fsbf
}		
if(unitFlag){		
Unit	8	bslbf
}		
}		

7.3.3 Semantics

Semantics of the `LightPrefType` type:

Name	Definition
<code>LightPrefType</code>	Tool for describing a user preference on light effect.
<code>UnfavorableColorFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the maximum desirable intensity of the light effect in terms of illumination with respect to $[10^{-5} \text{ lux}, 130 \text{ klux}]$.
unit	Specifies the unit of the <code>maxIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
UnfavorableColor	Describes the list of user's detestable colors either as a reference to a classification scheme term 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. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. EXAMPLE <code>urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue</code> would describe the color Alice blue.

7.3.4 Examples

This example shows the description of a user preference on light effect with the following semantics. The light effect is desired with the maximum intensity of 300 lux. A color, which is refused by user, is "alice_blue" from the classification scheme described in A2.2 of ISO/IEC 23005-6.

```
<cidl:USPreference xsi:type="sepv:LightPrefType" activate="true"
unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:lux" maxIntensity="300">
  <sepv:UnfavorableColor>
    :mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue
  </sepv:UnfavorableColor>
</cidl:USPreference>
```

7.4 Flash preference type

7.4.1 XML representation syntax

```
<!-- ##### -->
<!-- Flash Preference type -->
<!-- ##### -->
<complexType name="FlashPrefType">
  <complexContent>
    <extension base="sepv:LightPrefType">
      <attribute name="maxFrequency" type="float" use="optional"/>
      <attribute name="freqUnit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.4.2 Binary representation syntax

FlashPrefType {	(Number of bits)	(Mnemonic)
maxFrequencyFlag	1	bslbf
freqUnitFlag	1	bslbf
LightPref		LightPrefType
if(maxFrequencyFlag){		
maxFrequency	32	fsbf
}		
if(freqUnitFlag){		
freqUnit	8	bslbf
}		
}		

7.4.3 Semantics

Semantics of the `FlashPrefType` type:

Name	Definition
<code>FlashPrefType</code>	Tool for describing a user preference on flash effect. It is extended from the <code>light</code> type.
<code>maxFrequencyFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>freqUnitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxFrequency</code>	Describes the maximum allowed number of flickering in times per second. EXAMPLE The value 10 means it will flicker 10 times for each second.
<code>freqUnit</code>	Specifies the unit of the <code>maxFrequency</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxFrequency</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.4.4 Examples

This example shows the description of a user preference on flash effect with the following semantics. The flash is desired with the maximum frequency of 50 times per second.

```
<cidl:USPreference xsi:type="sepv:FlashPrefType" activate="true"
maxFrequency="50" unit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Hertz"/>
```

7.5 Heating preference type

7.5.1 XML representation syntax

```
<!-- ##### -->
<!-- Heating Preference type -->
<!-- ##### -->
<complexType name="HeatingPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="minIntensity" type="integer" use="optional"/>
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.5.2 Binary representation syntax

HeatingPrefType {	(Number of bits)	(Mnemonic)
minIntensityFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(minIntensityFlag){		
minIntensity	8	uimsbf
}		
if(maxIntensityFlag){		
maxIntensity	16	uimsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.5.3 Semantics

Semantics of the `HeatingPrefType` type:

Name	Definition
<code>HeatingPrefType</code>	Tool for describing a user preference on heating effect.
<code>minIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensity</code>	Describes the highest desirable temperature of the heating effect with respect to the Celsius scale (or Fahrenheit).
<code>minIntensity</code>	Describes the lowest desirable temperature of the heating effect with respect to the Celsius scale (or Fahrenheit).
<code>unit</code>	Specifies the unit of the <code>maxIntensity</code> and <code>minIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.5.4 Examples

This example shows a description of a user preference on heating effect with the following semantics. The identifier for this preference description is "heater001". The heating is desired with the maximum intensity of upto 50 degrees Celsius, and minimum intensity of 20 degrees Celsius. When the given command on the heating effect is not within the range of preference or capability, it should be properly scaled.

```
<cidl:USPreference xsi:type="sepv:HeatingPrefType" id="heater001"
maxIntensity="50" minIntensity="20" adaptationMode="scalable"
activate="true"/>
```

7.6 Cooling preference type

7.6.1 XML representation syntax

```
<!-- ##### -->
<!-- Cooling Preference type -->
<!-- ##### -->
<complexType name="CoolingPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="minIntensity" type="integer" use="optional"/>
      <attribute name="maxIntensity" type="integer" use="optional"/>
    
```

```

        <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
</complexContent>
</complexType>

```

7.6.2 Binary representation syntax

CoolingPrefType {	(Number of bits)	(Mnemonic)
minIntensityFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(minIntensityFlag){		
minIntensity	16	simsbf
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.6.3 Semantics

Semantics of the CoolingPrefType type:

Name	Definition
CoolingPrefType	Tool for describing a user preference on cooling effect.
minIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the lowest desirable temperature of the cooling effect with respect to the Celsius scale (or Fahrenheit).
minIntensity	Describes the highest desirable temperature of the cooling effect with respect to the Celsius scale (or Fahrenheit).
unit	Specifies the unit of the <code>maxIntensity</code> and <code>minIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.6.4 Examples

This example shows a description of a user preference on cooling effect with the following semantics. The identifier for this preference description is "cooling001". The cooling is desired with the maximum intensity of upto 10 degrees Celsius, and minimum intensity of 30 degrees Celsius. When the given command on the cooling effect is not within the range of preference or capability, it should be properly scaled.

```
<cidl:USPreference xsi:type="sepv:CoolingPrefType" id="cooling001"
maxIntensity="10" minIntensity="30" adaptationMode="scalable"
activate="true"/>
```

7.7 Wind preference type

7.7.1 XML representation syntax

```
<!-- ##### -->
<!-- Wind Preference type -->
<!-- ##### -->
<complexType name="WindPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.7.2 Binary representation syntax

WindPrefType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf

WindPrefType {	(Number of bits)	(Mnemonic)
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.7.3 Semantics

Semantics of the `WindPrefType` type:

Name	Definition
<code>WindPrefType</code>	Tool for describing a user preference on a wind effect.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensity</code>	Describes the maximum desirable intensity of the wind effect in terms of strength with respect to the Beaufort scale.
<code>unit</code>	Specifies the unit of the <code>maxIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.7.4 Examples

This example shows a description of a user preference on wind effect with the following semantics. The identifier for this preference description is "wind01". The wind is desired with the maximum intensity of upto 4 Beaufort. When the given command on the wind effect is not within the range of preference or capability, it should be clipped.

```
<cidl:USPreference xsi:type="sepv:WindPrefType" id="wind01" maxIntensity="4" activate="true"
adaptationMode="strict"/>
```

7.8 Vibration preference type

7.8.1 XML representation syntax

```

<!-- ##### -->
<!-- Vibration Preference type -->
<!-- ##### -->
<complexType name="VibrationPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

7.8.2 Binary representation syntax

VibrationPrefType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.8.3 Semantics

Semantics of the `VibrationPrefType` type:

Name	Definition
VibrationPrefType	Tool for describing a user preference on vibration effect.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensity	Describes the maximum desirable intensity of the vibration effect in terms of strength with respect to Hertz.
unit	Specifies the unit of the maxIntensity value as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the maxIntensity is used. The reference to the classification scheme shall be done using the mpeg7:termReferenceType defined in 7.6 of ISO/IEC 15938-5:2003.

7.8.4 Examples

This example shows a description of a user preference on vibration effect with the following semantics. The identifier for this preference description is "vibe02". The vibration is desired with the maximum intensity of upto 600 Hz. When the given command on the vibration effect is not within the range of preference or capability, it should be properly scaled with the maximum of 600 Hz, if the maximum intensity defined in the device capability is greater than 600.

```
<cidl:USPreference xsi:type="sepv:VibrationPrefType" id="vibe02"
maxIntensity="600" activate="true" adaptationMode="scalable"/>
```

7.9 Scent preference type

7.9.1 XML representation syntax

```
<!-- ##### -->
<!-- Scent Preference type -->
<!-- ##### -->
<complexType name="ScentPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <sequence>
        <element name="HedonicScent" type="mpeg7:termReferenceType"
          minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.9.2 Binary representation syntax

ScentPrefType {	(Number of bits)	(Mnemonic)
HedonicScentFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(HedonicScentFlag){		
LoopHedonicScent		vluimsbf5
for(k=0;k< LoopHedonicScent;k++){		
HedonicScent[k]	8	bslbf
}		
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.9.3 Semantics

Semantics of the ScentPrefType type:

Name	Definition
ScentPrefType	Tool for describing a user preference on scent effect.
HedonicScentFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxIntensityFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
unitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
LoopHedonicScent	This field, which is only present in the binary representation, specifies the number of HedonicScent contained in the description.
HedonicScent	Describes the list of user's pleasant or unpleasant scent. A CS that may be used for this purpose is the <code>ScentCS</code> defined in A.2.4 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
maxIntensity	Describes the maximum desirable intensity of the scent effect in terms of milliliter/hour.
unit	Specifies the unit of the <code>maxIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.9.4 Examples

This example shows a description of a user preference on scent effect with the following semantics. The identifier for this preference description is "scent001". The scent effect is desired with the maximum intensity of upto 4 milliliter/hour. When the given command on the scent effect is not within the range of preference or capability, it should be properly scaled with the maximum of 4 milliliter/hour, if the maximum intensity defined in the device capability is greater than 4. Also, it specifies that the scent of rose as defined in `ScentCS` of ISO/IEC 23005-6 is not desired.

```
<cidl:USPreference xsi:type="sepv:ScentPrefType" id="scent001"
maxIntensity="4" adaptationMode="scalable">
  <sepv:HedonicScent>
    :mpeg:mpeg-v:01-SI-ScentCS-NS:rose
  </sepv:HedonicScent>
</cidl:USPreference>
```

7.10 Fog preference type

7.10.1 XML representation syntax

```
<!-- ##### -->
<!-- Fog Preference type -->
<!-- ##### -->
<complexType name="FogPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.10.2 Binary representation syntax

FogPrefType {	(Number of bits)	(Mnemonic)
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		
unit	8	bslbf
}		
}		

7.10.3 Semantics

Semantics of the `FogPrefType` type:

Name	Definition
<code>FogPrefType</code>	Tool for describing a preference on fog effect.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensity</code>	Describes the maximum desirable intensity of the fog effect in terms of milliliter/hour.
<code>unit</code>	Specifies the unit of the <code>maxIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.10.4 Examples

This example shows a description of a user preference on fog effect with the following semantics. The identifier for this preference description is “fogfog”. The fog effect is desired with the maximum intensity of upto 5 milliliter/hour. When the given command on the fog effect is not within the range of preference or capability, it should be properly scaled with the maximum of 5 milliliter/hour, if the maximum intensity defined in the device capability is greater than 5.

```
<cidl:USPreference xsi:type="sepv:FogPrefType" id="fogfog" maxIntensity="5"
adaptationMode="scalable"/>
```

7.11 Spraying preference type

7.11.1 XML representation syntax

```
<!-- ##### -->
<!-- Spraying Preference type -->
<!-- ##### -->
<complexType name="SprayingPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="sprayingType" type="mpeg7:termReferenceType"/>
      <attribute name="maxIntensity" type="integer" use="optional"/>
      <attribute name="unit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

7.11.2 Binary representation syntax

SprayingPrefType{	(Number of bits)	(Mnemonic)
sprayingFlag	1	bslbf
maxIntensityFlag	1	bslbf
unitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(sprayingFlag){		
spraying		SprayingType
}		
if(maxIntensityFlag){		
maxIntensity	16	simsbf
}		
if(unitFlag){		

SprayingPrefType{	(Number of bits)	(Mnemonic)
unit	8	bslbf
}		
}		

7.11.3 Semantics

Semantics of the `SprayingPrefType` type:

Name	Definition
<code>SprayingPrefType</code>	Tool for describing a user preference on spraying effect.
<code>sprayingFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxIntensityFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>unitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>sprayingType</code>	Describes the type of the sprayed material as a reference to a classification scheme term. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the <code>SprayingTypeCS</code> defined in Annex A.2.7 of ISO/IEC 23005-6.
<code>maxIntensity</code>	Describes the maximum desirable intensity of the spraying effect in terms of milliliter/hour.
<code>unit</code>	Specifies the unit of the <code>maxIntensity</code> value as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6, if a unit other than the default unit specified in the semantics of the <code>maxIntensity</code> is used. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.11.4 Examples

This example shows a description of a user preference on spraying effect with the following semantics. The identifier for this preference description is "letspray". The spraying effect is desired with the maximum intensity of upto 4 milliliter/hour. When the given command on the spraying effect is not within the range of preference or capability, it should be properly scaled with the maximum of 4 milliliter/hour, if the maximum intensity defined in the device capability is greater than 4. The desired material to be sprayed is purified water, as defined in the `SprayingTypeCS` defined in Annex A.2.7 of ISO/IEC 23005-6.

```
<cidl:USPreference xsi:type="sepv:SprayingPrefType" id="letspray"
maxIntensity="4" sprayingType="urn:mpeg:mpeg-v:01-SI-SprayingTypeCS-
NS:water"/>
```

7.12 Color correction preference type

7.12.1 XML representation syntax

```
<!-- ##### -->
<!-- Color Correction Preference Type -->
<!-- ##### -->
<complexType name="ColorCorrectionPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType"/>
  </complexContent>
</complexType>
```

7.12.2 Binary representation syntax

ColorCorrectionPrefType {	(Number of bits)	(Mnemonic)
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
}		

7.12.3 Semantics

Semantics of the ColorCorrectionPreferenceType type:

Name	Definition
ColorCorrectionPrefType	Specifies whether the user prefers to use color correction functionality of the device or not by using activate attribute. Any information given by other attributes is ignored.

7.12.4 Examples

This example shows the description of a user preference on color correction effect with the following semantics. The color collection effect is desired by user simply by activating it "true".

```
<cidl:USPreference xsi:type="sepv:ColorCorrectionPrefType" activate="true"/>
```

7.13 Tactile preference type

7.13.1 XML representation syntax

```

<!-- ##### -->
<!-- Tactile Preference type -->
<!-- ##### -->
<complexType name="TactilePrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <attribute name="maxTemperature" type="float" use="optional"/>
      <attribute name="minTemperature" type="float" use="optional"/>
      <attribute name="maxCurrent" type="float" use="optional"/>
      <attribute name="maxVibration" type="float" use="optional"/>
      <attribute name="tempUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="currentUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="vibrationUnit" type="mpegvct:unitType"
        use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

7.13.2 Binary representation syntax

TactilePrefType {	(Number of bits)	(Mnemonic)
maxTemperatureFlag	1	bslbf
minTemperatureFlag	1	bslbf
maxCurrentFlag	1	bslbf
maxVibrationFlag	1	bslbf
tempUnitFlag	1	bslbf
currentUnitFlag	1	bslbf
vibrationUnitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxTemperatureFlag){		
maxTemperature	32	fsbf
}		
if(minTemperatureFlag){		
minTemperature	32	fsbf
}		
if(maxCurrentFlag){		

TactilePrefType {	(Number of bits)	(Mnemonic)
maxCurrent	32	fsbf
}		
if(maxVibrationFlag){		
maxVibration	32	fsbf
}		
if(tempUnitFlag){		
tempUnit	8	bslbf
}		
if(currentUnitFlag){		
currentUnit	8	bslbf
}		
if(vibrationUnitFlag){		
vibrationUnit	8	bslbf
}		
}		

7.13.3 Semantics

Semantics of the TactilePrefType:

Name	Definition
TactilePrefType	Tool for describing a user preference on tactile effect.
maxTemperatureFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
minTemperatureFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxCurrentFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxVibrationFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
tempUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
currentUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
vibrationUnitFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
maxTemperature	Describes the maximum desirable temperature regarding how hot the tactile effect may be achieved. (Celsius)
minTemperature	Describes the minimum desirable temperature regarding how cold the tactile effect may be achieved.(Celsius)
maxCurrent	Describes the maximum desirable electric current. (mA)
maxVibration	Describes the maximum desirable vibration.(mm)
tempUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. If the unit is not specified, the default unit is Celsius. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
currentUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. If the unit is not specified, the default unit is milli-ampere. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.
vibrationUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.13.4 Examples

An example of the `TactilePrefType` to indicate the preference of tactile sensory effect is given. For the case of thermal display maximum temperature is 45 degree in Celsius and minimum temperature is 10 degree in Celsius. Also maximum electric current less than 30mA is preferred and maximum vibration not exceeded 0.1millimeter is preferred.

```
<cidl:USPreference xsi:type="sepv:TactilePrefType" maxTemperature="45"
minTemperature="10" maxCurrent="30" maxVibration="0.1"
tempUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:celsius"
currentUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:milliampere"
vibrationUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:millimeter"/>
```

7.14 Kinesthetic preference type

7.14.1 XML representation syntax

```

<!-- ##### -->
<!-- Kinesthetic Preference type -->
<!-- ##### -->
<complexType name="KinestheticPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <sequence>
        <element name="MaxForce" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
        <element name="MaxTorque" type="mpegvct:Float3DVectorType"
          minOccurs="0"/>
      </sequence>
      <attribute name="forceUnit" type="mpegvct:unitType" use="optional"/>
      <attribute name="torqueUnit" type="mpegvct:unitType" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

7.14.2 Binary representation syntax

KinestheticPrefType {	(Number of bits)	(Mnemonic)
maxForceFlag	1	bslbf
maxTorqueFlag	1	bslbf
forceUnitFlag	1	bslbf
torqueUnitFlag	1	bslbf
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
if(maxForceFlag){		
maxForce		Float3DVectorType
}		
if(maxTorqueFlag){		
maxTorque		Float3DVectorType
}		
if(forceUnitFlag) {		
forceUnit	8	bslbf
}		
if(torqueUnitFlag) {		

KinestheticPrefType {	(Number of bits)	(Mnemonic)
torqueUnit	8	bslbf
}		
}		
Float3DVectorType {		
X	32	fsbf
Y	32	fsbf
Z	32	fsbf
}		

7.14.3 Semantics

Semantics of the `KinestheticPrefType`:

Name	Definition
<code>KinestheticPrefType</code>	Tool for describing a user preference on Kinesthetic effect (forcefeedback effect).
<code>maxForceFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>maxTorqueFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>forceUnitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>torqueUnitFlag</code>	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>MaxForce</code>	Describes the maximum desirable force for each direction of 3 dimensional axis (x, y and z). (N)
<code>MaxTorque</code>	Describes the maximum desirable torque for each direction of 3 dimensional axis (x, y and z). (Nmm)
<code>forceUnit</code>	Specifies the unit of the intensity, as a reference to a classification scheme term provided by <code>UnitTypeCS</code> defined in A.2.1 of ISO/IEC 23005-6. If the unit is not specified, the default unit is Newton(N). The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

Name	Definition
torqueUnit	Specifies the unit of the intensity, as a reference to a classification scheme term provided by UnitTypeCS defined in A.2.1 of ISO/IEC 23005-6. If the unit is not specified, the default unit is Newton millimeter (Nmm). The reference to the classification scheme shall be done using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003.

7.14.4 Examples

This example of the `KinestheticPrefType` indicates the preference of kinesthetic sensory effect. In this example, a maximum force is considered with values of forces on each axis ($F_x=5.0N$, $F_y=3.0N$, $F_z=3.5N$).

```
<cidl:USPreference xsi:type="sepv:KinestheticPrefType"
forceUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Newton"
torqueUnit="urn:mpeg:mpeg-v:01-CI-UnitTypeCS-NS:Nmm">
  <sepv:MaxForce>
    <mpegvct:X>5.0</mpegvct:X>
    <mpegvct:Y>3.0</mpegvct:Y>
    <mpegvct:Z>3.5</mpegvct:Z>
  </sepv:MaxForce>
</cidl:USPreference>
```

7.15 RigidBodyMotion preference type

7.15.1 XML representation syntax

```
<!-- ##### -->
<!-- RigidBodyMotion Preference type -->
<!-- ##### -->
<complexType name="RigidBodyMotionPrefType">
  <complexContent>
    <extension base="cidl:UserSensoryPreferenceBaseType">
      <sequence maxOccurs="unbounded">
        <element name="MotionPreference"
          type="sepv:MotionPreferenceBaseType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

<!-- ##### -->
<!-- Motion Preference base type -->
<!-- ##### -->
<complexType name="MotionPreferenceBaseType" abstract="true">
  <attribute name="unfavor" type="boolean" use="optional" default="0"/>
</complexType>

<!-- ##### -->
<!-- Move Toward Preference type -->
<!-- ##### -->
<complexType name="MoveTowardPreferenceType">
  <complexContent>
    <extension base="sepv:MotionPreferenceBaseType">
```

```

        <attribute name="maxMoveDistance" type="unsignedInt" use="optional"/>
        <attribute name="maxMoveSpeed" type="float" use="optional"/>
        <attribute name="maxMoveAccel" type="float" use="optional"/>
        <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
        <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
    </extension>
</complexContent>
</complexType>

<!-- ##### -->
<!-- Incline Preference type -->
<!-- ##### -->
<complexType name="InclinePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxRotationAngle" type="float" use="optional"/>
            <attribute name="maxRotationSpeed" type="float" use="optional"/>
            <attribute name="maxRotationAccel" type="float" use="optional"/>
            <attribute name="angleUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="accelUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<!-- ##### -->
<!-- Wave Preference type -->
<!-- ##### -->
<complexType name="WavePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxWaveDistance" type="float" use="optional"/>
            <attribute name="maxWaveSpeed" type="float" use="optional"/>
            <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<!-- ##### -->
<!-- Collide Preference type -->
<!-- ##### -->
<complexType name="CollidePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxCollideSpeed" type="float" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<!-- ##### -->
<!-- Turn Preference type -->
<!-- ##### -->
<complexType name="TurnPreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxTurnSpeed" type="float" use="optional"/>

```

```

        <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
    </extension>
</complexContent>
</complexType>

<!-- ##### -->
<!-- Shake Preference type -->
<!-- ##### -->
<complexType name="ShakePreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxShakeDistance" type="float" use="optional"/>
            <attribute name="maxShakeSpeed" type="float" use="optional"/>
            <attribute name="distanceUnit" type="mpegvct:unitType" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

<!-- ##### -->
<!-- Spin Preference type -->
<!-- ##### -->
<complexType name="SpinPreferenceType">
    <complexContent>
        <extension base="sepv:MotionPreferenceBaseType">
            <attribute name="maxSpinSpeed" type="float" use="optional"/>
            <attribute name="speedUnit" type="mpegvct:unitType" use="optional"/>
        </extension>
    </complexContent>
</complexType>

```

7.15.2 Binary representation syntax

RigidBodyMotionPrefType {	(Number of bits)	(Mnemonic)
UserSensoryPreferenceBase		UserSensoryPreferenceBaseType
LoopMotionPreference	4	uimsbf
for(k=0;k< LoopMotionPreference;k++){		
MotionPreferenceType[k]	4	bslbf
MotionPreference[k]		MotionPreferenceBaseType
}		
}		
MotionPreferenceBaseType {		
unfavorFlag	1	bslbf
if(unfavorFlag){		
unfavor	1	bslbf

RigidBodyMotionPrefType {	(Number of bits)	(Mnemonic)
}		
}		
MoveTowardPreferenceType {		
MaxMoveDistanceFlag	1	bslbf
MaxMoveSpeedFlag	1	bslbf
MaxMoveAccelFlag	1	bslbf
distanceUnitFlag	1	bslbf
speedUnitFlag	1	bslbf
accelUnitFlag	1	bslbf
MotionPreferenceBase		MotionPreferenceBaseType
if(MaxMoveDistanceFlag){		
MaxMoveDistance	8	uimsbf
}		
if(MaxMoveSpeedFlag){		
MaxMoveSpeed	32	fsbf
}		
if(MaxMoveAccelFlag){		
MaxMoveAccel	32	fsbf
}		
if(distanceUnitFlag){		
distanceUnit	8	bslbf
}		
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf

RigidBodyMotionPrefType {	(Number of bits)	(Mnemonic)
}		
}		
InclinePreferenceType {		
MaxRotationAngleFlag	1	bslbf
MaxRotationSpeedFlag	1	bslbf
MaxRotationAccelFlag	1	bslbf
angleUnitFlag	1	bslbf
speedUnitFlag	1	bslbf
accelUnitFlag	1	bslbf
MotionPreferenceBase		MotionPreferenceBaseType
if(MaxRotationAngleFlag){		
MaxRotationAngle	32	fsbf
}		
if(MaxRotationSpeedFlag){		
MaxRotationSpeed	32	fsbf
}		
if(MaxRotationAccelFlag){		
MaxRotationAccel	32	fsbf
}		
if(angleUnitFlag){		
angleUnit	8	bslbf
}		
if(speedUnitFlag){		
speedUnit	8	bslbf
}		
if(accelUnitFlag){		
accelUnit	8	bslbf