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

**Part 4:
Virtual world object characteristics**

*Technologies de l'information — Contrôle et contexte de supports —
Partie 4: Caractéristiques d'objet du monde virtuel*





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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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

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

ISO/IEC 23005-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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

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

Introduction

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

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

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

Each virtual world, however, has a different culture and audience making use of these specific worlds for a variety of reasons. These differences permit users to have unique experiences.

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 includes 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.

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 E.

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 E. ISO and the IEC shall not be held responsible for identifying any or all such patent rights.

Information technology — Media context and control —

Part 4: Virtual world object characteristics

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of description schemes and descriptors used to characterize a virtual world object related metadata, making it possible to migrate a virtual world object (or only its characteristics) from one virtual world to another and/or to control a virtual world object in a virtual world by real world devices.

The system architecture is depicted in Figure 1 and the scope of this part of ISO/IEC 23005 is highlighted. That is, only the information representation that acts as an input to the possible Adaptation VV and Adaptation RV/VR, as defined in ISO/IEC 23005-1, is specified in this part of ISO/IEC 23005.

NOTE The actual Adaptation VV and Adaptation RV/VR are deliberately informative and left open for industry competition.

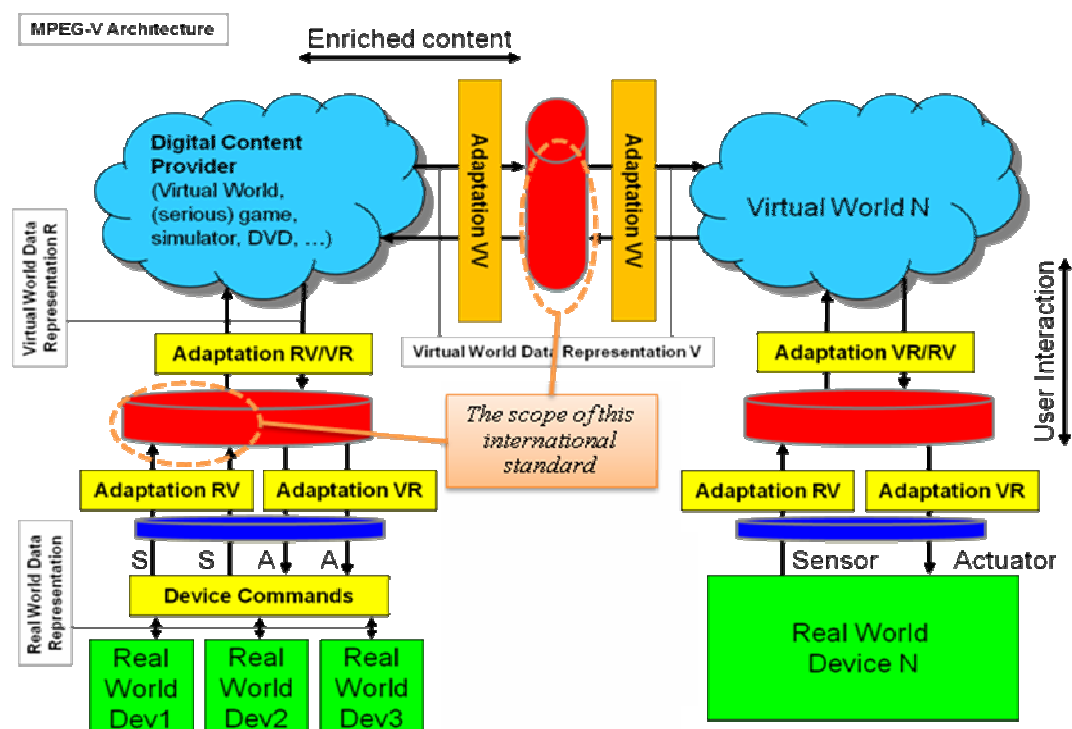


Figure 1 – System Architecture

2 Normative references

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

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

ISO/IEC 21000-5, *Information technology — Multimedia framework (MPEG-21) — Part 5: Rights Expression Language*

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

3 Terms, definitions, symbols, and abbreviated terms

3.1 Terms and definitions

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

3.1.1

avatar

entity that can be used as a (visual) representation of the user inside the virtual environments

EXAMPLE A player's representation in the video game and human or fantastic representations of a person's self in non-gaming online worlds.

3.1.2

avatar metadata

defines the description schemes and descriptors to represent **avatars** (3.1.1)

3.1.3

Extensible Markup Language

set of rules for encoding documents in machine-readable form

3.1.4

Rights expression language

machine-readable language that declares rights and permissions

3.1.5

Uniform Resource Identifier

compact string of characters for identifying an abstract or physical resource

3.1.6

Uniform Resource Locator

compact string representation for a resource available via the Internet

3.1.7

virtual object

entity that is any (visual) object except for avatars in the virtual environment

3.1.8

virtual object metadata

defines the description schemes and descriptors to represent **virtual objects** (3.1.7)

3.1.9**virtual world object**

entity that includes avatars and virtual objects in the virtual world

3.1.10**virtual world object metadata**

defines the description schemes and descriptors to represent **virtual world objects** (3.1.9)

3.2 Symbols and abbreviated terms

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

MPEG-21:	multimedia framework (ISO/IEC 21000-5)
MPEG-7:	multimedia content description interface (ISO/IEC 15938)
REL:	rights expression language
URI:	Uniform Resource Identifier
URL:	Uniform Resource Locator
XML:	Extensible Markup Language

4 Virtual world object metadata**4.1 Introduction**

A specificity of Virtual Environments (VEs) with respect to other multimedia applications consists in the representation of virtual world objects inside the environment. The "virtual world object" can be classified into two types: avatars and virtual objects. An avatar can be used as a (visual) representation of the user inside the environment. These virtual world objects serve different purposes:

- characterize various kinds of objects within the VE,
- provide an interaction with the VE.

In general, creating an object is a time consuming task. Even though some components of the object may be related to the virtual environment (e.g. the avatar wearing a medieval suite in a contemporary style VE may be inappropriate), there is a real need of being able to create the object once and import/use it in different VEs. In addition, it should be possible to control the object from external applications (e.g. the emotions one avatar exposes in the VE can be obtained by processing the associated user's physiological sensors).

The current standard proposes an XML Schema, called Virtual World Object Characteristics XSD, for describing an object by considering three main requirements:

- it should be possible to easily create importers/exporters from various VEs implementations,
- it should be easy to control an object within an VE,
- it should be possible to modify a proprietary template (specific to the virtual world) of the object by using data contained in Virtual World Object Characteristics file.

The proposed schema deals only with metadata and does not include representation of the geometry, sound, scent, animation or texture. To represent the latter, references to media resources are used.

There is a base type of attributes and characteristics of the virtual world objects which is shared by both avatars and the virtual objects.

The base type of the virtual world object characteristics is composed of following type of data:

- **Identity**: contains an identification descriptors,
- **Sound**: contains sound resources and the related properties,
- **Scent**: contains scent resources and the related properties,
- **Control**: contains a set of descriptors for controlling motion features of an object such as translation, orientation and scaling.
- **Event**: contains a set of descriptors providing input events from a mouse, keyboard and etc.,
- **Behaviour Model**: contains a set of descriptors defining the behavior information of the object according to input events.
- **id**: contains a unique identifier for identifying individual virtual world object information.,

The virtual world object base type is inherited to both avatar metadata and virtual object metadata to extend the specific aspects of each of metadata.

4.2 Root element and top-level tools

4.2.1 Introduction

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

4.2.2 Syntax

```
<!-- ##### -->
<!-- Declaration of Root Element -->
<!-- ##### -->
<element name="VWOCInfo" type="vwoc:VWOCInfoType"/>

<complexType name="VWOCInfoType">
  <sequence>
    <element name="AvatarList" type="vwoc:AvatarListType" minOccurs="0"/>
    <element name="VirtualObjectList" type="vwoc:VirtualObjectListType"
minOccurs="0"/>
  </sequence>
</complexType>

<complexType name="AvatarListType">
  <sequence>
    <element name="Avatar" type="vwoc:AvatarBaseType" maxOccurs="unbounded"/>
  </sequence>
</complexType>

<complexType name="VirtualObjectListType">
  <sequence>
    <element name="VirtualObject" type="vwoc:VirtualObjectBaseType"
maxOccurs="unbounded"/>
  </sequence>
</complexType>
```

4.2.3 Semantics

Name	Description
VWOCInfo	The root element that serves as the topmost element in the virtual world object characteristics description.
VWOCInfoType	The root type provides basic structure that the virtual world object characteristics information description should follow through the root element.
AvatarList	Optional wrapper element that serves as the placeholder for the list of avatar characteristics information.
VirtualObjectList	Optional wrapper element that serves as the placeholder for the list of virtual object characteristics information.
AvatarListType	Wrapper element type which allows multiple occurrences of avatar characteristics information.
Avatar	Specifies the description of avatar characteristics information.
AvatarBaseType	AvatarBaseType is a type providing a characteristic description of an individual avatar.
VirtualObjectListType	Wrapper element type which allows multiple occurrences of virtual object characteristics information.
VirtualObject	Specifies the description of virtual object characteristics information.
VirtualObjectBaseType	VirtualObjectBaseType is a type providing a characteristic description of an individual virtual object.

4.2.4 Examples

The following shows two use cases of VWOCInfo element, which are for listing avatar characteristics information and for listing virtual object characteristics information.

The first example shows the case when the VWOCInfo is used for AvatarList.

```
<vwoc:VWOCInfo>
  <vwoc:AvatarList>
    <vwoc:Avatar xsi:type="vwoc:AvatarType" id="ID_1" gender="male">
      . . .
    </vwoc:Avatar>
  </vwoc:AvatarList>
</vwoc:VWOCInfo>
```

The second example shows the case when the VWOCInfo is used for VirtualObjectList.

```
<vwoc:VWOCInfo>
  <vwoc:VirtualObjectList>
    <vwoc:VirtualObject xsi:type="vwoc:VirtualObjectType" id="ID_80">
      . . .
    </vwoc:VirtualObject>
  </vwoc:VirtualObjectList>
</vwoc:VWOCInfo>
```

Note that these examples are only showing a part of the complete XML description to show the use of the root element, VWOCInfo, with the AvatarList and the VirtualObjectList.

4.3 Virtual world object base type

4.3.1 Introduction

This Subclause defines a complex type of `VWOBaseType`, which the avatar characteristics information and virtual object characteristics information should inherit.

4.3.2 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Base Type --> <!-- ##### --> <complexType name="VWOBaseType" abstract="true"> <complexContent> <restriction base="anyType"> <sequence> <element name="Identification" type="vwoc:IdentificationType" minOccurs="0"/> <element name="Description" type="string" minOccurs="0"/> <element name="VWOC" minOccurs="0"> <complexType> <sequence> <element name="SoundList" type="vwoc:VWOSoundListType" minOccurs="0"/> <element name="ScentList" type="vwoc:VWOScentListType" minOccurs="0"/> <element name="ControlList" type="vwoc:VWOControlListType" minOccurs="0"/> <element name="EventList" type="vwoc:VWOEventListType" minOccurs="0"/> </sequence> </complexType> </element> <element name="BehaviorModelList" type="vwoc:VWOBehaviorModelListType" minOccurs="0"/> </sequence> <attribute name="id" type="ID" use="optional"/> </restriction> </complexContent> </complexType> </pre>

```

</complexType>

<!-- ##### ->
<!-- Avatar BaseType ->
<!-- ##### ->
<complexType name="AvatarBaseType" abstract="true">
  <complexContent>
    <extension base="vwoc:VWOBaseType"/>
  </complexContent>
</complexType>

<!-- ##### ->
<!-- Virtual Object BaseType ->
<!-- ##### ->
<complexType name="VirtualObjectBaseType" abstract="true">
  <complexContent>
    <extension base="vwoc:VWOBaseType"/>
  </complexContent>
</complexType>

```

4.3.3 Semantics

Name	Description
VWOBaseType	The base type that describes common attributes and elements in both avatars and virtual objects.
Identification	Describes the identification of the virtual world object.
Description	Contains the description of the virtual world object.
VWOC	Describes a set of characteristics of the virtual world objects.
SoundList	Describes a list of the sound effects associated to the virtual world object.
ScentList	Describes a list of the scent effects associated to the virtual world object.
ControlList	Describes a list of the controls associated to the virtual world object.
EventList	Describes a list of the input events associated to the virtual world object.
BehaviorModelList	Describes a list of the behaviour models associated to the virtual world object.
id	Unique identifier for identifying individual virtual world object information.
AvatarBaseType	AvatarBaseType is a type providing a characteristic description of an individual avatar.
VirtualObjectBaseType	VirtualObjectBaseType is a type providing a characteristic description of an individual virtual object.

4.3.4 Examples

```

<vwoc:VWOCInfo>
  <vwoc:AvatarList>
    <vwoc:Avatar xsi:type="vwoc:AvatarType" id="AVATARID_1" gender="male">
      <vwoc:VWOC>
        <vwoc:SoundList>
          <vwoc:Sound loop="1" soundID="SOUNDID_10" duration="10"
intensity="3" name="BurpSound">
            <vwoc:ResourcesURL>http://www.BurpSound.info</vwoc:ResourcesURL>
          </vwoc:Sound>
        </vwoc:SoundList>
        <vwoc:ScentList>
          <vwoc:Scent loop="2" duration="1" intensity="3"
name="BurpingScent" scentID="SCENTID_11">
            <vwoc:ResourcesURL>http://www.Burp.info</vwoc:ResourcesURL>
          </vwoc:Scent>
        </vwoc:ScentList>
        <vwoc:ControlList>
          <vwoc:Control controlID="CTRLID_12">
            <vwoc:MotionFeatureControl>
              <vwoc:Position>

```

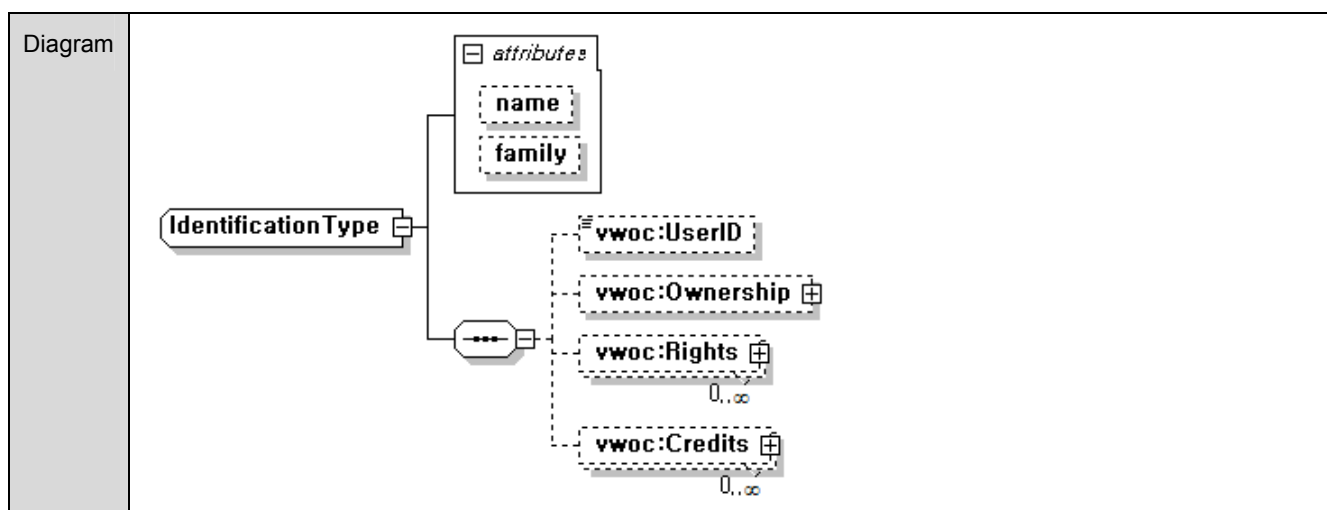
```

        <mpegvct:X>1</mpegvct:X>
        <mpegvct:Y>1</mpegvct:Y>
        <mpegvct:Z>10</mpegvct:Z>
    </vwoc:Position>
    <vwoc:Orientation>
        <mpegvct:X>0</mpegvct:X>
        <mpegvct:Y>0</mpegvct:Y>
        <mpegvct:Z>0</mpegvct:Z>
    </vwoc:Orientation>
    <vwoc:ScaleFactor>
        <mpegvct:X>1</mpegvct:X>
        <mpegvct:Y>1</mpegvct:Y>
        <mpegvct:Z>3</mpegvct:Z>
    </vwoc:ScaleFactor>
    </vwoc:MotionFeatureControl>
</vwoc:Control>
</vwoc:ControlList>
<vwoc:EventList>
    <vwoc:Event eventID="ID_13">
        <vwoc:Mouse>Click</vwoc:Mouse>
    </vwoc:Event>
</vwoc:EventList>
</vwoc:VWOC>
<vwoc:BehaviorModelList>
    <vwoc:BehaviorModel>
        <vwoc:BehaviorInput eventIDRef="ID_13"/>
        <vwoc:BehaviorOutput controlIDRefs="CTRLID_12"
scentIDRefs="SCENTID_11" soundIDRefs="SOUNDID_10"/>
    </vwoc:BehaviorModel>
</vwoc:BehaviorModelList>
</vwoc:Avatar>
</vwoc:AvatarList>
</vwoc:VWOCInfo>

```

4.3.5 IdentificationType

4.3.5.1 Syntax



Source	<pre> <!-- ##### --> <!-- Identification Type --> <!-- ##### --> <complexType name="IdentificationType"> <sequence> <element name="UserID" type="anyURI" minOccurs="0"/> <element name="Ownership" type="mpeg7:AgentType" minOccurs="0"/> <element name="Rights" type="r:License" minOccurs="0" maxOccurs="unbounded"/> <element name="Credits" type="mpeg7:AgentType" minOccurs="0" maxOccurs="unbounded"/> </sequence> <attribute name="name" type="string" use="optional"/> <attribute name="family" type="string" use="optional"/> </complexType> </pre>
--------	--

4.3.5.2 Semantics

Name	Definition
IdentificationType	Describes the identification of a virtual world object.
UserID	Contains the user identification associated to the virtual world object
Ownership	Describes the ownership of the virtual world object which shall be based on the type "AgentType" defined in subclause 7.4.2 of ISO/IEC 15938-5:2003.
Rights	Describes the rights of the virtual world object which shall be based on the type "License" defined in ISO/IEC 21000-5:2004.
Credits	Describes the contributors of the virtual object in chronological order which shall be based on the type "AgentType" defined in subclause 7.4.2 of ISO/IEC 15938-5:2003. Note: The 1 st listed credit describes an original author of a virtual world object. The subsequent credits represent the list of the contributors of the virtual world object chronologically.
name	Describes the name of the virtual world object.
family	Describes the relationship with other virtual world objects.

4.3.6 VWOSoundListType

4.3.6.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Sound List Type --> <!-- ##### --> <complexType name="VWOSoundListType"> <sequence> <element name="Sound" type="vwoc:VWOSoundType" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.3.6.2 Semantics

Name	Definition
VWOSoundListType	Wrapper element type which allows multiple occurrences of sound effects associated to the virtual world object.
Sound	Describes a sound effect associated to the virtual world object.

4.3.7 VWOScentListType

4.3.7.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Scent List Type --> <!-- ##### --> <complexType name="VWOScentListType"> <sequence> <element name="Scent" type="vwoc:VWOScentType" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.3.7.2 Semantics

Name	Definition
VWOScentListType	Wrapper element type which allows multiple occurrences of sound effects associated to the virtual world object.
Scent	Describes a scent effect associated to the virtual world object.

4.3.8 VWOControlListType

4.3.8.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Control List Type --> <!-- ##### --> <complexType name="VWOControlListType"> <sequence> <element name="Control" type="vwoc:VWOControlType" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.3.8.2 Semantics

Name	Definition
VWOControlListType	Wrapper element type which allows multiple occurrences of the controls associated to the virtual world object.
Control	Describes a control associated to the virtual world object.

4.3.9 VWOEventListType

4.3.9.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Event List Type --> <!-- ##### --> <complexType name="VWOEventListType"> <sequence> <element name="Event" type="vwoc:VWOEventType" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.3.9.2 Semantics

Name	Definition
VWOEventListType	Wrapper element type which allows multiple occurrences of the input events associated to the virtual world object.
Event	Describes an input event associated to the virtual world object.

4.3.10 VWOBehaviorModelListType

4.3.10.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Behavior Model List Type --> <!-- ##### --> <complexType name="VWOBehaviorModelListType"> <sequence> <element name="BehaviorModel" type="vwoc:VWOBehaviorModelType" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.3.10.2 Semantics

Name	Definition
VWOBehaviorModelListType	Wrapper element type which allows multiple occurrences of the behavior models associated to the virtual world object.
BehaviorModel	Describes a behavior model associated to the virtual world object.

4.3.11 VWO SoundType

4.3.11.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- VWO Sound Type --> <!-- ##### --> <complexType name="VWO SoundType"> <sequence> <element name="ResourcesURL" type="anyURI"/> </sequence> <attribute name="soundID" type="ID" use="optional"/> <attribute name="intensity" type="float" use="optional"/> <attribute name="duration" type="unsignedInt" use="optional"/> <attribute name="loop" type="unsignedInt" use="optional"/> <attribute name="name" type="string" use="optional"/> </complexType> </pre>

4.3.11.2 Semantics

Name	Definition
VWO SoundType	A type that contains the descriptions of a sound effect associated to the virtual world object.
SoundResources URL	Element that contains a link to sound file, usually MP4 file..
soundID	A unique identifier of the object sound.
intensity	The strength(volume) of the sound
duration	The length of time that the sound lasts.
loop	A playing option to describe the number of repetition (default value: 1, 0: indefinite repetition, 1:once, 2: twice, ..., n: n times)
name	The name of the sound.

4.3.11.3 Examples

This example shows the description of the sound information associated to an object with the following semantics. The sound resource whose name is "BigAlarm" is saved at http://sounddb.com/alarmsound_0001.wav and the value of soundID, its identifier is "SoundID3". The length of the sound is 30 seconds. The sound shall be played with the volume of intensity = "50 %" repeatedly.

```

<vwoc:Sound loop="0" soundID="SoundID3" duration="30" intensity="0.5"
name="BigAlarm">
  <vwoc:ResourcesURL>http://sounddb.com/alarmsound\_0001.wav</vwoc:ResourcesURL>
</vwoc:Sound>

```

4.3.12 VWOscentType

4.3.12.1 Syntax

Diagram	
source	<pre> <!-- ##### --> <!-- VWO Scent Type --> <!-- ##### --> <complexType name="VWOscentType"> <sequence> <element name="ResourcesURL" type="anyURI"/> </sequence> <attribute name="scentID" type="ID" use="optional"/> <attribute name="intensity" type="float" use="optional"/> <attribute name="duration" type="unsignedInt" use="optional"/> <attribute name="loop" type="unsignedInt" use="optional"/> <attribute name="name" type="string" use="optional"/> </complexType> </pre>

4.3.12.2 Semantics

Name	Definition
VWOscentType	A type that contains the descriptions of a scent effect associated to the virtual world object.
ScentResources URL	Element that contains a link to a scent file.
scentID	A unique identifier of the object scent.
intensity	The strength of the scent
duration	The length of time that the scent lasts.
loop	A playing option to describe the number of repetition (default value: 1, 0: indefinite repetition, 1:once, 2: twice, ..., n: n times)
name	The name of the scent.

4.3.12.3 Examples

This example shows the description of the scent information associated to the object. The scent resource whose name is "rose" is saved at "http://scentdb.com/flower_0001.sct" and the value of scentID, its identifier is "ScentID5" The intensity shall be 20 % with duration of 20 seconds.

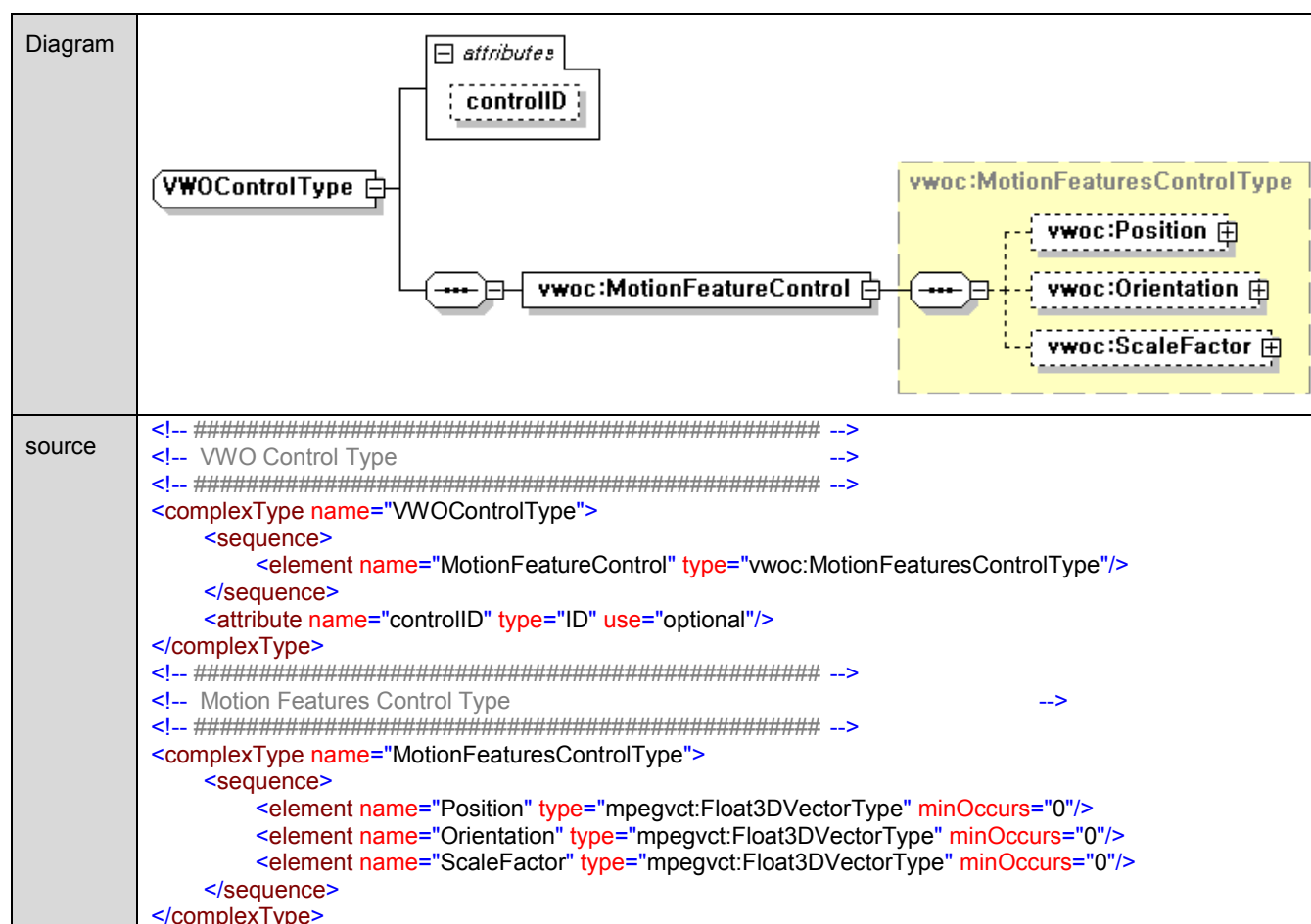
```

<vwoc:Scent duration="20" intensity="0.2" name="rose" scentID="ScentID5">
  <vwoc:ResourcesURL>http://scentdb.com/flower_0001.sct</vwoc:ResourcesURL>
</vwoc:Scent>

```

4.3.13 VWOControlType

4.3.13.1 Syntax



4.3.13.2 Semantics

Name	Definition	
VWOControlType	A type that contains the descriptions of a control associated to the virtual world object.	
MotionFeatureControl	Set of elements that control position, orientation and scale of the virtual object.	
	Element	Information
	MotionFeatureControlType	A type that provides three types of controls such as position control, orientation control, and scaling control.
	Position	The position of the object in the scene with 3D floating point vector (x, y, z).
	Orientation	The orientation of the object in the scene with 3D floating point vector as an Euler angle (yaw, pitch, roll).
	ScaleFactor	The scale of the object in the scene expressed as 3D floating point vector (Sx, Sy, Sz).
controlID	A unique identifier of the control.	

NOTE 1 If two controllers are associated to the same object but on different parts of the object and if these parts exist hierarchical structures (parent and children relationship) then the controllers does perform the relative motion of the children. If the controllers are associated with the same part, the controller does the scaling or similar effects for the entire object.

NOTE 2 The reference coordinate system of this part is the right handed coordinate system.

4.3.13.3 Examples

This example shows the description of object control information with the following semantics. The motion feature control of changing a position is given and its value of controlId, its identifier is "CtrlID7" The object shall be positioned at X="122.0", Y="150.0" and Z="40.0".

```
<vwoc:Control controlId="CtrlID7">
  <vwoc:MotionFeatureControl>
    <vwoc:Position>
      <mpegvct:X>122.0</mpegvct:X>
      <mpegvct:Y>150.0</mpegvct:Y>
      <mpegvct:Z>40.0</mpegvct:Z>
    </vwoc:Position>
  </vwoc:MotionFeatureControl>
</vwoc:Control>
```

4.3.14 VWOEventType

4.3.14.1 Syntax

Diagram	
Source	<!-- ##### --> <!-- VWO Event Type --> <!-- ##### --> <complexType name="VWOEventType"> <sequence> <element name="Mouse" type="mpeg7:termReferenceType" minOccurs="0" maxOccurs="unbounded"/> <element name="Keyboard" minOccurs="0" maxOccurs="unbounded"> <complexType> <attribute name="keyCode" type="mpeg7:unsigned8" use="optional"/> <attribute name="event" use="required"> <simpleType> <restriction base="string"> <enumeration value="pressed"/> <enumeration value="clicked"/> <enumeration value="released"/> </restriction> </simpleType> </attribute> </complexType> </element> <element name="UserDefinedInput" minOccurs="0" maxOccurs="unbounded"/> </sequence> </complexType>

```

        </restriction>
      </simpleType>
    </attribute>
  </complexType>
</element>
<element name="UserDefinedInput" type="string" minOccurs="0" maxOccurs="unbounded"/>
</sequence>
<attribute name="eventID" type="ID" use="required"/>
</complexType>

```

4.3.14.2 Semantics

Name	Definition
VWOEventType	A type that contains the descriptions of an input event associated to the virtual world object.
Mouse	Describes a mouse event as a reference to a classification scheme (CS) term. A CS that may be used for this purpose is the <code>MouseEventCS</code> defined in A.2.1.1 in this part.
Keyboard	Describes a keyboard event defined by a key code and its related event.
keyCode	Describes the corresponding key code (0-255) of each key.
event	Describes the keyboard event (pressed, clicked, or released).
UserDefinedInput	Describes an input event defined by user.
eventID	A unique identifier of the event.

4.3.14.3 Examples

EXAMPLE 1 This example shows the description of an input event with the following semantics. The mouse as an input device produces new input value, "click." For identifying this input, the value of eventID is "EventID1."

```

<vwoc:EventList>
  <vwoc:Event eventID="EventID1">
    <vwoc:Mouse>urn:mpeg:mpeg-v:01-VWOC-MouseEventCS-NS:Click</vwoc:Mouse>
  </vwoc:Event>
</vwoc:EventList>

```

EXAMPLE 2 This example shows the description of an input event with the following semantics. The Keyboard as an input device produces a new input value which is pressing the key code of "65". For identifying this input, the value of eventID is "EventID2."

```

<vwoc:EventList>
  <vwoc:Event eventID="EventID2">
    <vwoc:Keyboard keyCode="65" event="pressed" />
  </vwoc:Event>
</vwoc:EventList>

```

EXAMPLE 3 This example shows the description of an input event with the following semantics. The Keyboard produces a new input event of pressing the two keys "shift" + "a". One of the keyboard events is the pressing event, "pressed", of the "shift" key whose code is "16", and the other one is the pressing event, "pressed", of the "a" key whose code is "65". For identifying this input, the value of eventID is "EventID3."

```

<vwoc:EventList>
  <vwoc:Event eventID="EventID3">
    <vwoc:Keyboard keyCode="16" event="pressed" />
    <vwoc:Keyboard keyCode="65" event="pressed" />
  </vwoc:Event>
</vwoc:EventList>

```

4.3.15 VWOBehaviourModelType

4.3.15.1 Syntax

Diagram	<pre> sequenceDiagram participant VWOBehaviourModelType participant vwoc:BehaviorInput participant vwoc:BehaviorOutput VWOBehaviourModelType --> vwoc:BehaviorInput VWOBehaviourModelType --> vwoc:BehaviorOutput vwoc:BehaviorInput --> eventIDRef[eventIDRef] vwoc:BehaviorOutput --> soundIDRefs[soundIDRefs] vwoc:BehaviorOutput --> scentIDRefs[scentIDRefs] vwoc:BehaviorOutput --> animationIDRefs[animationIDRefs] vwoc:BehaviorOutput --> controlIDRefs[controlIDRefs] </pre>
Source	<pre> <!-- ##### --> <!-- VWO Behavior Model Type --> <!-- ##### --> <complexType name="VWOBehaviourModelType"> <sequence> <element name="BehaviorInput" type="vwoc:BehaviorInputType"/> <element name="BehaviorOutput" type="vwoc:BehaviorOutputType"/> </sequence> </complexType> <!-- ##### --> <!-- Behavior Input Type --> <!-- ##### --> <complexType name="BehaviorInputType"> <attribute name="eventIDRef" type="IDREF"/> </complexType> <!-- ##### --> <!-- Behavior Output Type --> <!-- ##### --> <complexType name="BehaviorOutputType"> <attribute name="soundIDRefs" type="IDREFS" use="optional"/> <attribute name="scentIDRefs" type="IDREFS" use="optional"/> <attribute name="animationIDRefs" type="IDREFS" use="optional"/> <attribute name="controlIDRefs" type="IDREFS" use="optional"/> </complexType> </pre>

4.3.15.2 Semantics

Name	Description				
VWOBehaviourModelType	A type that describes a container of an input event and the associated output object behaviors.				
BehaviorInput	An input event to make an object behavior.				
BehaviorInputType	Refers to an input event ID				
	<table border="1"> <tr> <th>Element</th><th>Information</th></tr> <tr> <td>eventIDRef</td><td>Input event ID</td></tr> </table>	Element	Information	eventIDRef	Input event ID
Element	Information				
eventIDRef	Input event ID				
BehaviorOutput	Object behavior output according to an input event				

BehaviorOutputType	Refers to a list of object behavioral outputs.	
	Element	Information
	soundIDRefs	It refers soundIDs to provide sound effects of the object.
	scentIDRefs	It refers scentIDs to provide scent effects of the object.
	animationIDRefs	It refers animationIDs to provide animation clips of the object.
	controlIDRefs	It refers controlIDs to provide controls of the object.

4.3.15.3 Examples

This example shows the description of a VWO behavior model with the following semantics. If eventID = "EventID1" is given as BehaviorInput, then BehaviorOutput shall be executed related to soundID="SoID5" and animationID="AniID4"

```
<vwoc:BehaviorModel>
  <vwoc:BehaviorInput eventIDRef="EventID1" />
  <vwoc:BehaviorOutput animationIDRefs="AniID4" soundIDRefs="SoID5" />
</vwoc:BehaviorModel>
```

4.4 Virtual world object common data types

This Subclause specifies syntax and semantics of the common datatypes for avatar and virtual object metadata. To be specific, basic data types which are used as basic building blocks, such as haptic properties, animation description, and other simple data types.

4.4.1 VWOHapticPropertyType

4.4.1.1 Syntax

Diagram	<pre> classDiagram class VWOHapticPropertyType { +vwoc:MaterialProperty +vwoc:DynamicForceEffect +vwoc:TactileProperty +hapticID } </pre>
Source	<pre> <!-- ##### --> <!-- VWO Haptic Property Type --> <!-- ##### --> <complexType name="VWOHapticPropertyType"> <sequence> <element name="MaterialProperty" type="vwoc:MaterialPropertyType" minOccurs="0"/> <element name="DynamicForceEffect" type="vwoc:DynamicForceEffectType" minOccurs="0"/> <element name="TactileProperty" type="vwoc:TactileType" minOccurs="0"/> </sequence> <attribute name="hapticID" type="ID" use="required"/> </complexType> </pre>

4.4.1.2 Semantics

Name	Description
VWOHapticPropertyType	A type that contains the descriptions of a haptic property associated to the virtual world object.
MaterialProperty	This type contains parameters characterizing material properties.
DynamicForceEffect	This type contains parameters characterizing force effects.
TactileProperty	This type contains parameters characterizing tactile properties.
hapticID	A unique identifier of the haptic property.

4.4.1.3 MaterialPropertyType

4.4.1.3.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- Material Property Type --> <!-- ##### --> <complexType name="MaterialPropertyType"> <attribute name="stiffness" type="float" use="optional"/> <attribute name="staticFriction" type="float" use="optional"/> <attribute name="dynamicFriction" type="float" use="optional"/> <attribute name="damping" type="float" use="optional"/> <attribute name="texture" type="anyURI" use="optional"/> <attribute name="mass" type="float" use="optional"/> </complexType> </pre>

4.4.1.3.2 Semantics

Name	Description
MaterialPropertyType	A type that contains the descriptions of a material property associated to the virtual world object.
stiffness	The stiffness of the virtual world object (in N/mm).
staticFriction	The static friction of the virtual world object.
dynamicFriction	The dynamic friction of the virtual world object.
damping	The damping of the virtual world object.
texture	Contains a link to haptic texture file (e.g. bump image)
mass	The mass of the virtual world object.

4.4.1.3.3 Examples

This example shows the material properties of a virtual world object which has 0.5 N/mm of stiffness, 0.3 of static coefficient of friction, 0.02 of kinetic coefficient of friction, 0.001 damping coefficient, 0.7 of mass and it's surface haptic texture is loaded from the given URL with the id of MID30.

```
<vwoc:HapticProperty hapticID="MID30">
  <vwoc:MaterialProperty stiffness="0.5" staticFriction="0.3"
dynamicFriction="0.02"
damping="0.001" texture="http://haptic.kr/tactile/texture1.bmp" mass="0.7"/>
</vwoc:HapticProperty>
```

4.4.1.4 DynamicForceEffectType

4.4.1.4.1 Syntax

Diagram	<pre> classDiagram class DynamicForceEffectType { forceField? movementTrajectory? } </pre>
Source	<pre> <!-- ##### --> <!-- Dynamic Force Effect Type --> <!-- ##### --> <complexType name="DynamicForceEffectType"> <attribute name="forceField" type="anyURI" use="optional"/> <attribute name="movementTrajectory" type="anyURI" use="optional"/> </complexType> </pre>

4.4.1.4.2 Semantics

Name	Description
DynamicForceEffectType	A type that contains the descriptions of a dynamic force effect associated to the virtual world object.
forceField	Contains link to force field vector file (sum of force field vectors).
movementTrajectory	Contains link to force trajectory file (e.g. .dat file including a sequence of motion data).

4.4.1.4.3 Examples

This example shows the dynamic force effect of an avatar. The force field characteristic of the avatar with its id of FFID30 is determined by the designed force field file from the URL.

```
<vwoc:HapticProperty hapticID="FFID30">
  <vwoc:DynamicForceEffect forceField="http://haptic.kr/avatar/forcefield.dat"/>
</vwoc:HapticProperty>
```

4.4.1.5 TactileType

4.4.1.5.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- Tactile Type --> <!-- ##### --> <complexType name="TactileType"> <attribute name="temperature" type="float" use="optional"/> <attribute name="vibration" type="float" use="optional"/> <attribute name="current" type="float" use="optional"/> <attribute name="tactilePatterns" type="anyURI" use="optional"/> </complexType> </pre>

4.4.1.5.2 Semantics

Name	Description
TactileType	A type that contains the descriptions of a tactile property associated to the virtual world object.
temperature	The temperature of the virtual world object (in degree celcius).
vibration	The vibration of the virtual world object.
current	The electric current of the virtual world object (in mA).
tactilePatterns	Contains link to tactile pattern file (e.g. grayscale video (.avi, h.264, or .dat file.)

4.4.1.5.3 Examples

This example shows the tactile properties, with its id of DFEID30, which has 15 degree of temperature and a tactile effect based on the tactile information from the following URL (<http://www.haptic.kr/avatar/tactile1.avi>).

```

<vwoc:HapticProperty hapticID="DFEID30">
  <vwoc:TactileProperty temperature="15"
  tactilePatterns="http://www.haptic.kr/avatar/tactile1.avi"/>
</vwoc:HapticProperty>

```

4.4.2 AnimationDescriptionType

4.4.2.1 Syntax

Diagram	<pre> classDiagram class AnimationDescriptionType { animationID duration loop Name vwoc:Name Uri vwoc:Uri Extra vwoc:Extra } </pre>
Source	<pre> <!-- ##### --> <!-- Animation Description Type --> <!-- ##### --> <complexType name="AnimationDescriptionType"> <choice> <sequence> <element name="Name" type="mpeg7:termReferenceType" minOccurs="0"/> <element name="Uri" type="anyURI" minOccurs="0"/> </sequence> <element name="Extra" type="vwoc:Extra Type"/> </choice> <attribute name="animationID" type="ID" use="optional"/> <attribute name="duration" type="unsignedInt" use="optional"/> <attribute name="loop" type="unsignedInt" use="optional"/> </complexType> </pre>

4.4.2.2 Semantics

Name	description
AnimationDescription Type	A type that contains descriptions and a link to the animation file.
Name	Describes a type of the animation as a reference to classification schemes (CSs) term. The CSs that may be used for this purpose is defined in A.2.3 and A.2.4 in this part.
Uri	Contains a link to an animation file, usually MP4 file.
Extra	Describes an animation in the form of any proprietary but well-formed XML metadata.
animationID	A unique identifier of the animation.
duration	The length of time that the animation lasts.
loop	A playing option to describe the number of repetition. (default value: 1, 0:indefinite repetition, 1:once, 2: twice, ..., n: n times)

4.4.3 AnimationResourcesDescriptionType

4.4.3.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- Animation Resources Description Type --> <!-- ##### --> <complexType name="AnimationResourcesDescriptionType"> <sequence> <element name="Description" type="string" minOccurs="0"/> <element name="Uri" type="anyURI" minOccurs="0"/> </sequence> <attribute name="animationID" type="ID" use="optional"/> <attribute name="duration" type="unsignedInt" use="optional"/> <attribute name="loop" type="unsignedInt" use="optional"/> </complexType> </pre>

4.4.3.2 Semantics

Name	Description
AnimationResourcesDescriptionType	A type that contains a link to an animation file and its description.
Description	Contains the description of the animation resource.
Uri	Contains a link to an animation file, usually MP4 file.
animationID	A unique identifier of the animation.
duration	The length of time that the animation lasts.
loop	A playing option to describe the number of repetition. (default value: 1, 0: indefinite repetition, 1: once, 2: twice, ..., n: n times)

4.4.3.3 PointType

4.4.3.3.1 Syntax

Diagram	-
Source	<pre> <!-- ##### --> <!-- Point Type --> <!-- ##### --> <complexType name="PointType" abstract="true"/> <!-- ##### --> <!-- Logical Point Type --> <!-- ##### --> <complexType name="LogicalPointType"> <complexContent> <extension base="vwoc:PointType"> </pre>

```

        <attribute name="name" type="string" use="optional"/>
        <attribute name="sensorID" type="anyURI" use="optional"/>
    </extension>
</complexContent>
</complexType>
<!-- ##### -->
<!-- Physical 3D Point Type -->
<!-- ##### -->
<complexType name="Physical3DPointType">
    <complexContent>
        <extension base="vwoc:PointType">
            <attribute name="x" type="float" use="required"/>
            <attribute name="y" type="float" use="required"/>
            <attribute name="z" type="float" use="required"/>
        </extension>
    </complexContent>
</complexType>

```

4.4.3.3.2 Semantics

Name	Description
PointType	An abstract type providing root for two different point types, which are LogicalPointType and Physical3DPointType for specifying a feature point for face feature control.
LogicalPointType	A type providing the name of the feature point
name	The name of the feature point
sensorID	The sensor ID corresponding to the feature point
Physical3DPointType	A type providing a three dimensional point vector value.
x	The point value on x-axis in 3 dimensional space
y	The point value on y-axis in 3 dimensional space
z	The point value on z-axis in 3 dimensional space

4.4.3.4 ExtraType

4.4.3.4.1 Syntax

Diagram	
Source	<pre> <!-- ##### --> <!-- Extra Type --> <!-- ##### --> <complexType name="ExtraType"> <annotation> <appinfo>enable-xmlns</appinfo> </annotation> <sequence> <any namespace="##any" processContents="lax" minOccurs="0" maxOccurs="unbounded"/> </sequence> </complexType> </pre>

4.4.3.4.2 Semantics

Name	Description
ExtraType	A type that can contain any well-formed XML data

Note: Element defined as type <ExtraType> allows extending the MPEG-V schema with proprietary but well defined or at least well formatted data.

4.4.4 Common simple data types

4.4.4.1 IndicateOfLHType

4.4.4.1.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of LH Type --> <!-- ##### --> <simpleType name="indicateOfLHType"> <restriction base="string"> <enumeration value="low"/> <enumeration value="high"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.1.2 Semantics

Name	Description
indicateOfLHType	A type of which the value is either low or high.

4.4.4.2 IndicateOfLMHType

4.4.4.2.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of LMH Type --> <!-- ##### --> <simpleType name="indicateOfLMHType"> <restriction base="string"> <enumeration value="low"/> <enumeration value="medium"/> <enumeration value="high"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.2.2 Semantics

Name	Description
indicateOfLMHType	A type of which the value is among low, medium or high.

4.4.4.3 IndicateOfSMBType

4.4.4.3.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of SMB Type --> <!-- ##### --> <simpleType name="indicateOfSMBType"> <restriction base="string"> <enumeration value="small"/> <enumeration value="medium"/> <enumeration value="big"/> </restriction> </simpleType> </pre>
--------	---

4.4.4.3.2 Semantics

Name	Description
indicateOfSMBType	A type of which the value is among small, medium or big.

4.4.4.4 IndicateOfSMLType

4.4.4.4.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of SML Type --> <!-- ##### --> <simpleType name="indicateOfSMLType"> <restriction base="string"> <enumeration value="short"/> <enumeration value="medium"/> <enumeration value="long"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.4.2 Semantics

Name	Description
indicateOfSMLType	A type of which the value is among short, medium or long.

4.4.4.5 IndicateOfDMUType

4.4.4.5.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of DMU Type --> <!-- ##### --> <simpleType name="indicateOfDMUType"> <restriction base="string"> <enumeration value="down"/> <enumeration value="medium"/> <enumeration value="up"/> </restriction> </simpleType> </pre>
--------	---

4.4.4.5.2 Semantics

Name	Description
indicateOfDMUType	A type of which the value is among down, medium or up.

4.4.4.6 IndicateOfDUType

4.4.4.6.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of DMU Type --> <!-- ##### --> <simpleType name="indicateOfDUType"> <restriction base="string"> <enumeration value="down"/> <enumeration value="up"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.6.2 Semantics

Name	Description
indicateOfDUType	A type of which the value is either down or up.

4.4.4.7 IndicateOfPMNType

4.4.4.7.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of PMN Type --> <!-- ##### --> <simpleType name="indicateOfPMNType"> <restriction base="string"> <enumeration value="pointed"/> <enumeration value="middle"/> <enumeration value="notpointed"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.7.2 Semantics

Name	Description
indicateOfPMNType	A type of which the value is among pointed, middle or not pointed.

4.4.4.8 IndicateOfRCType

4.4.4.8.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of RC Type --> <!-- ##### --> <simpleType name="indicateOfRCType"> <restriction base="string"> <enumeration value="round"/> <enumeration value="cleft"/> </restriction> </simpleType> </pre>
--------	---

4.4.4.8.2 Semantics

Name	Description
indicateOfRCType	A type of which the value is either round or cleft.

4.4.4.9 IndicateOfLRType

4.4.4.9.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of LR Type --> <!-- ##### --> <simpleType name="indicateOfLRType"> <restriction base="string"> <enumeration value="left"/> <enumeration value="right"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.9.2 Semantics

Name	Description
indicateOfLRType	A type of which the value is either left or right.

4.4.4.10 IndicateOfLMRTType

4.4.4.10.1 Syntax

Source	<pre> <!-- ##### --> <!-- indicate Of LMR Type --> <!-- ##### --> <simpleType name="indicateOfLMRTType"> <restriction base="string"> <enumeration value="left"/> <enumeration value="middle"/> <enumeration value="right"/> </restriction> </simpleType> </pre>
--------	---

4.4.4.10.2 Semantics

Name	Description
indicateOfLMRTType	A type of which the value is among left, middle or right.

4.4.4.11 measureUnitLMHType

4.4.4.11.1 Syntax

Source	<pre> <!-- ##### --> <!-- measure Unit LMH Type --> <!-- ##### --> <simpleType name="measureUnitLMHType"> <union memberTypes="vwoc:indicateOfLMHType float"/> </simpleType> </pre>
--------	--

4.4.4.11.2 Semantics

Name	Description
measureUnitLMHType	A type which may be either indicateOfLMHType or float.

4.4.4.12 measureUnitSMBType**4.4.4.12.1 Syntax**

Source	<pre> <!-- ##### --> <!-- measure Unit SMB Type --> <!-- ##### --> <simpleType name="measureUnitSMBType"> <union memberTypes="vwoc:indicateOfSMBType float"/> </simpleType> </pre>
--------	--

4.4.4.12.2 Semantics

Name	Description
measureUnitSMBType	A type which may be either indicateOfSMBType or float.

4.4.4.13 levelOf5Type**4.4.4.13.1 Syntax**

Source	<pre> <!-- ##### --> <!-- level Of 5 Type --> <!-- ##### --> <simpleType name="levelOf5Type"> <restriction base="integer"> <minInclusive value="1"/> <maxInclusive value="5"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.13.2 Semantics

Name	Description
levelOf5Type	A type of which the integer value is from one to five.

4.4.4.14 angleType**4.4.4.14.1 Syntax**

Source	<pre> <!-- ##### --> <!-- angle Type --> <!-- ##### --> <simpleType name="angleType"> <restriction base="float"> <minInclusive value="0"/> <maxInclusive value="360"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.14.2 Semantics

Name	Description
angleType	A type of which the floating point value is from 0 degree to 360 degree.

4.4.4.15 percentageType

4.4.4.15.1 Syntax

Source	<pre> <!-- ##### --> <!-- percentage Type --> <!-- ##### --> <simpleType name="percentageType"> <restriction base="float"> <minInclusive value="0"/> <maxInclusive value="100"/> </restriction> </simpleType> </pre>
--------	--

4.4.4.15.2 Semantics

Name	Description
percentageType	A type of which the floating point value is from 0 percent to 100 percent.

4.4.4.16 unlimitedPercentageType

4.4.4.16.1 Syntax

Source	<pre> <!-- ##### --> <!-- unlimited percentage Type --> <!-- ##### --> <simpleType name="unlimitedPercentageType"> <restriction base="float"> <minInclusive value="0"/> </restriction> </simpleType> </pre>
--------	---

4.4.4.16.2 Semantics

Name	Description
unlimitedPercentageType	A type of which the floating point value is from 0 percent.

5 Avatar metadata

5.1 Introduction

Avatar metadata as a (visual) representation of the user inside the environment serves the following purposes:

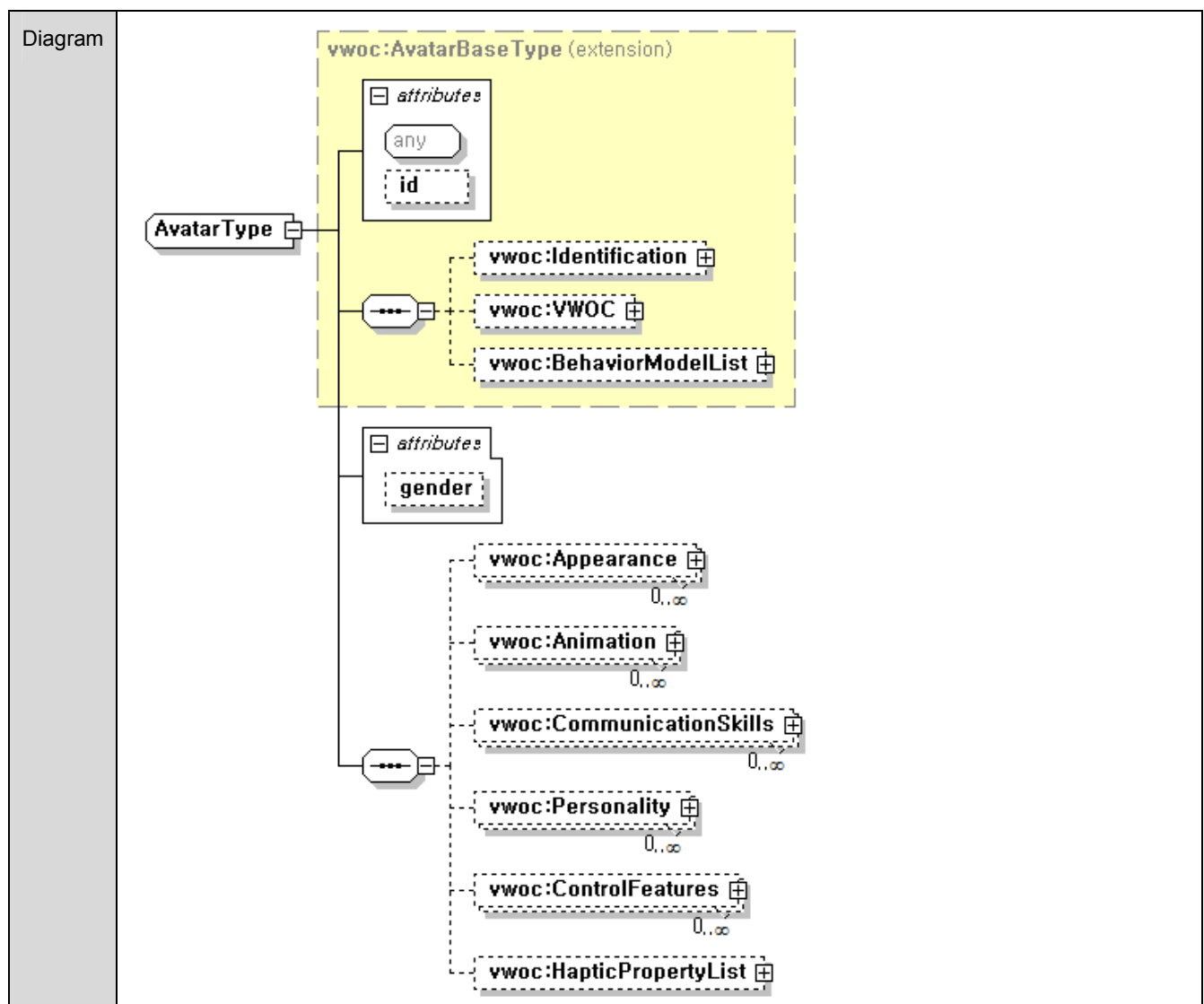
- make visible the presence of a real user into the VE,
- characterize the user within the VE,
- interact with the VE.

The "Avatar" element is composed of following type of data with the extension of the base type of avatar.

- **Appearance**: contains the high level description of the appearance and may refer a media containing the exact geometry and texture,
- **Animation**: contains the description of a set of animation sequences that the avatar is able to perform and may refer to several medias containing the exact (geometric transformations) animation parameters,
- **CommunicationSkills**: contains a set of descriptors providing information on the different modalities an avatar is able to communicate,
- **Personality**: contains a set of descriptors defining the personality of the avatar,
- **ControlFeatures**: contains a set of descriptors defining possible place-holders for sensors on body skeleton and face feature points.
- **HapticPropertyList**: contains a list of high level descriptors of the haptic properties.
- **gender**: describes the gender of the avatar.

5.2 AvatarType

5.2.1 Syntax



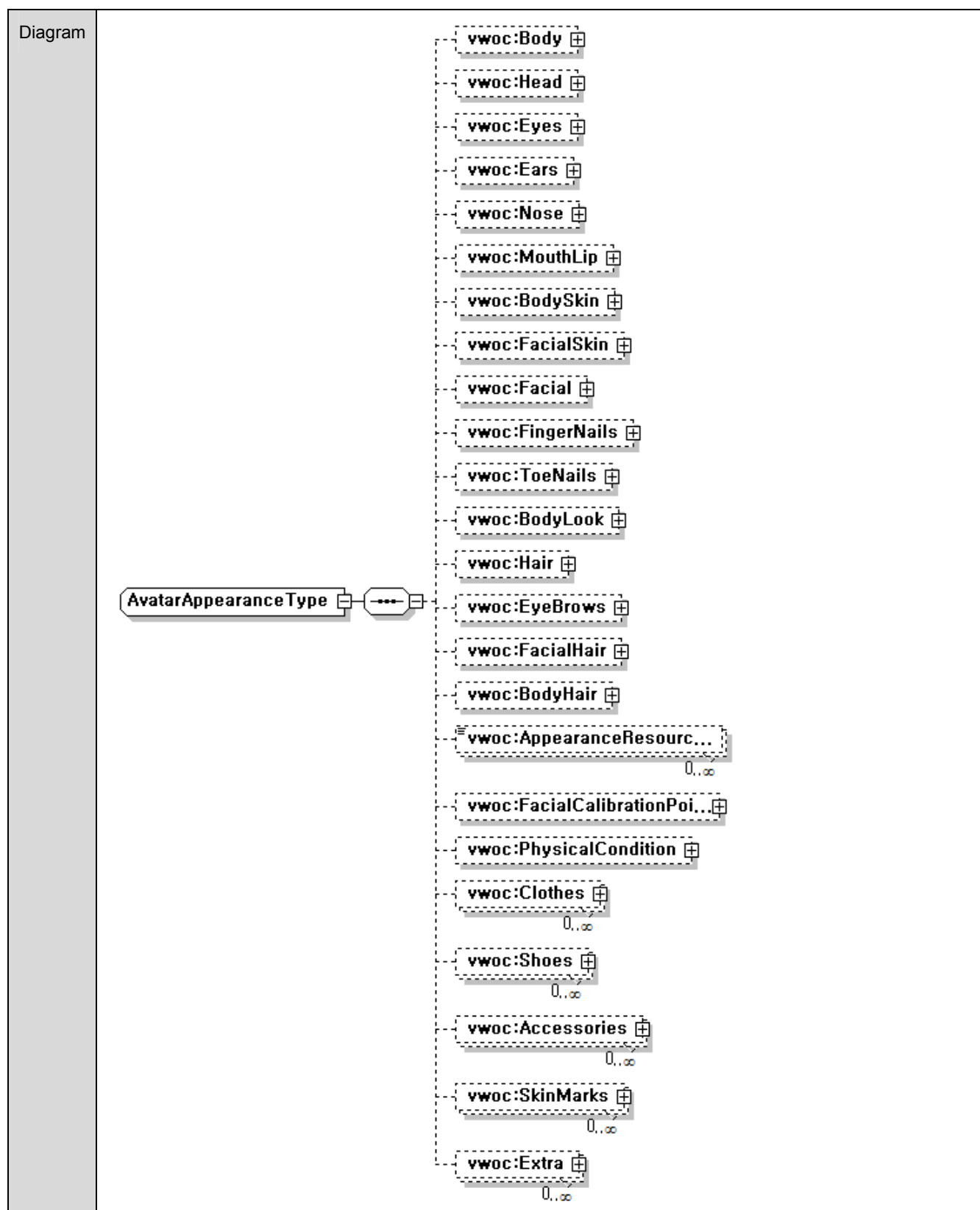
Source	<pre> <!-- ##### --> <!-- Avatar Type --> <!-- ##### --> <complexType name="AvatarType"> <complexContent> <extension base="vwoc:AvatarBaseType"> <sequence> <element name="Appearance" type="vwoc:AvatarAppearanceType" minOccurs="0" maxOccurs="unbounded"/> <element name="Animation" type="vwoc:AvatarAnimationType" minOccurs="0" maxOccurs="unbounded"/> <element name="CommunicationSkills" type="vwoc:AvatarCommunicationSkillsType" minOccurs="0" maxOccurs="unbounded"/> <element name="Personality" type="vwoc:AvatarPersonalityType" minOccurs="0" maxOccurs="unbounded"/> <element name="ControlFeatures" type="vwoc:AvatarControlFeaturesType" minOccurs="0" maxOccurs="unbounded"/> <element name="HapticPropertyList" type="vwoc:VWOHapticPropertyListType" minOccurs="0"/> </sequence> <attribute name="gender" type="string" use="optional"/> </extension> </complexContent> </complexType> </pre>
--------	---

5.2.2 Semantics

Name	Description
AvatarType	A type that represents the user inside the virtual world environment.
Appearance	Contains the high level description of the appearance of an avatar,
Animation	Contains the description of a set of animation sequences that the avatar is able to perform.
CommunicationSkills	Contains a set of descriptors providing information on the different modalities an avatar is able to communicate.
Personality	Contains a set of descriptors defining the personality of the avatar.
ControlFeatures	Contains a set of descriptors defining possible place-holders for sensors on body skeleton and face feature points.
HapticPropertyList	Contains a list of high level descriptors of the haptic properties.
gender	Describes the gender of the avatar.

5.2.3 AvatarAppearanceType

5.2.3.1 Syntax



Source

```

<!-- ##### -->
<!-- Avatar Appearance Type -->
<!-- ##### -->
<complexType name="AvatarAppearanceType">
  <sequence>
    <element name="Body" type="vwoc:BodyType" minOccurs="0"/>
    <element name="Head" type="vwoc:HeadType" minOccurs="0"/>
    <element name="Eyes" type="vwoc:EyesType" minOccurs="0"/>
    <element name="Ears" type="vwoc:EarsType" minOccurs="0"/>
    <element name="Nose" type="vwoc:NoseType" minOccurs="0"/>
    <element name="MouthLip" type="vwoc:MouthType" minOccurs="0"/>
    <element name="BodySkin" type="vwoc:SkinType" minOccurs="0"/>
    <element name="FacialSkin" type="vwoc:SkinType" minOccurs="0"/>
    <element name="Facial" type="vwoc:FacialType" minOccurs="0"/>
    <element name="FingerNails" type="vwoc:NailType" minOccurs="0"/>
    <element name="ToeNails" type="vwoc:NailType" minOccurs="0"/>

    <element name="BodyLook" type="vwoc:BodyLookType" minOccurs="0"/>
    <element name="Hair" type="vwoc:HairType" minOccurs="0"/>
    <element name="EyeBrows" type="vwoc:EyeBrowsType" minOccurs="0"/>
    <element name="FacialHair" type="vwoc:FacialHairType" minOccurs="0"/>
    <element name="BodyHair" type="vwoc:BodyHairType" minOccurs="0"/>
    <element name="AppearanceResources" type="anyURI" minOccurs="0" maxOccurs="unbounded"/>
    <element name="FacialCalibrationPoints" type="vwoc:FacialCalibrationPointsType" minOccurs="0"/>
    <element name="PhysicalCondition" type="vwoc:PhysicalConditionType" minOccurs="0"/>
    <element name="Clothes" type="vwoc:VirtualObjectType" minOccurs="0"
maxOccurs="unbounded"/>
    <element name="Shoes" type="vwoc:VirtualObjectType" minOccurs="0" maxOccurs="unbounded"/>
    <element name="Accessories" type="vwoc:VirtualObjectType" minOccurs="0"
maxOccurs="unbounded"/>
    <element name="SkinMarks" type="vwoc:VirtualObjectType" minOccurs="0"
maxOccurs="unbounded"/>
    <element name="Extra" type="vwoc:ExtraType" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</complexType>
<!-- ##### -->
<!-- Body Type -->
<!-- ##### -->
<complexType name="BodyType">
  <sequence>
    <element name="BodyHeight" type="float" minOccurs="0"/>
    <element name="BodyThickness" type="float" minOccurs="0"/>
    <element name="BodyFat" type="vwoc:measureUnitLMHType" minOccurs="0"/>
    <element name="TorsoMuscles" type="vwoc:measureUnitLMHType" minOccurs="0"/>
    <element name="NeckThikness" type="float" minOccurs="0"/>
    <element name="NeckLength" type="float" minOccurs="0"/>
    <element name="Shoulders" type="float" minOccurs="0"/>
    <element name="Pectorials" type="float" minOccurs="0"/>
    <element name="ArmLength" type="float" minOccurs="0"/>
    <element name="HeadSize" type="float" minOccurs="0"/>
    <element name="TorsoLength" type="float" minOccurs="0"/>
    <element name="LoveHandles" type="float" minOccurs="0"/>
    <element name="BellySize" type="float" minOccurs="0"/>
    <element name="LegMuscles" type="float" minOccurs="0"/>
    <element name="LegLength" type="float" minOccurs="0"/>
    <element name="HipWidth" type="float" minOccurs="0"/>
    <element name="HipLength" type="float" minOccurs="0"/>
    <element name="ButtSize" type="float" minOccurs="0"/>
    <element name="Package" type="vwoc:indicateOfSMBType" minOccurs="0"/>
    <element name="SaddleBags" type="vwoc:indicateOfSMBType" minOccurs="0"/>
    <element name="KneeAngle" type="vwoc:angleType" minOccurs="0"/>
    <element name="FootSize" type="float" minOccurs="0"/>
    <element name="Extra" type="vwoc:ExtraType" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
  <attribute name="hapticIDRef" type="IDREF" use="optional"/>
</complexType>
<!-- ##### -->

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<!-- Head Type -->
<!-- ##### -->
<complexType name="HeadType">
  <sequence>
    <element name="HeadSize" type="vwoc:measureUnitSMBType" minOccurs="0"/>
    <element name="HeadStretch" type="vwoc:unlimitedPercentageType" minOccurs="0"/>
    <element name="HeadShape" minOccurs="0">
      <simpleType>
        <restriction base="string">
          <enumeration value="square"/>
          <enumeration value="round"/>
          <enumeration value="oval"/>
          <enumeration value="long"/>
        </restriction>
      </simpleType>
    </element>
    <element name="EggHead" type="boolean" minOccurs="0"/>
    <element name="HeadLength" type="float" minOccurs="0"/>
    <element name="FaceShear" type="float" minOccurs="0"/>
    <element name="ForeheadSize" type="float" minOccurs="0"/>
    <element name="ForeheadAngle" type="vwoc:angleType" minOccurs="0"/>
    <element name="BrowSize" type="float" minOccurs="0"/>
    <element name="FaceSkin" minOccurs="0">
      <simpleType>
        <restriction base="string">
          <enumeration value="dry"/>
          <enumeration value="normal"/>
          <enumeration value="greasy"/>
        </restriction>
      </simpleType>
    </element>
    <element name="Cheeks" type="vwoc:measureUnitSMBType" minOccurs="0"/>
    <element name="CheeksDepth" type="float" minOccurs="0"/>
    <element name="CheeksShape" minOccurs="0">
      <simpleType>
        <restriction base="string">
          <enumeration value="chubby"/>
          <enumeration value="high"/>
          <enumeration value="bone"/>
        </restriction>
      </simpleType>
    </element>
    <element name="UpperCheeks" type="vwoc:measureUnitSMBType" minOccurs="0"/>
    <element name="LowerCheeks" type="vwoc:measureUnitSMBType" minOccurs="0"/>
    <element name="CheekBones" type="vwoc:indicateOfDMUType" minOccurs="0"/>
    <element name="Extra" type="vwoc:ExtraType" minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
  <attribute name="hapticIDRef" type="IDREF" use="optional"/>
</complexType>
<!-- ##### -->
<!-- Eyes Type -->
<!-- ##### -->
<complexType name="EyesType">
  <sequence>
    <element name="EyeSize" type="float" minOccurs="0"/>
    <element name="EyeOpening" type="vwoc:unlimitedPercentageType" minOccurs="0"/>
    <element name="EyeSpacing" type="float" minOccurs="0"/>
    <element name="OuterEyeCorner" type="vwoc:indicateOfDMUType" minOccurs="0"/>
    <element name="InnerEyeCorner" type="vwoc:indicateOfDMUType" minOccurs="0"/>
    <element name="EyeDepth" type="float" minOccurs="0"/>
    <element name="UpperEyelidFold" type="float" minOccurs="0"/>
    <element name="EyeBags" type="float" minOccurs="0"/>
    <element name="PuffyEyeLids" type="vwoc:indicateOfSMBType" minOccurs="0"/>
    <element name="EyelashLength" type="float" minOccurs="0"/>
    <element name="EyePop" type="float" minOccurs="0"/>
    <element name="EyeColor" type="mpegvct:colorType" minOccurs="0"/>
    <element name="EyeLightness" type="vwoc:percentageType" minOccurs="0"/>
  </sequence>

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