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Information technology — Coding of audio-visual objects

Part 16: Animation Framework eXtension (AFX)

AMENDMENT 3: 3D Multiresolution profile

Technologies de l'information — Codage des objets audiovisuels

Partie 16: Extension du cadre d'animation (AFX)

AMENDEMENT 3: Profil multirésolution en 3D

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Foreword

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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.

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Amendment 3 to ISO/IEC 14496-16:2006 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

Information technology — Coding of audio-visual objects

Part 16:
Animation Framework eXtension (AFX)

AMENDMENT 3: 3D Multiresolution profile

After 7.2.1, add the following new subclause:

7.2.2 MPEG-4 Basic AFX Graphics Profiles and Levels

7.2.2.1 List of tools/functionalities

The Basic AFX Graphics Profile represents a collection of nodes to allow progressive and adaptive transmission over networks of large 3D environments and /or complexe 3D shapes. It includes the following nodes : Appearance, Background, Color, Coordinate, DirectionalLight, ElevationGrid, IndexedFaceSet, IndexedLineSet, Material, PointLight, Shape, SpotLight, TextureCoordinate, TextureTransform, ProceduralTexture (V.5), SBVCAnimation, SBVCSkinnedModel, SBBone, SBSegment, SubdivisionSurfaces, WaveletSubdivisionSurfaces and FootPrint.

7.2.2.2 Comparison with existing profiles

The Basic AFX Scene Graph profile represents a collection of nodes to allow progressive and adaptive transmission over networks of large 3D environments and / or complexe 3D shapes

The existing 'X3D' profile does not provide compression tools.

7.2.2.3 Basic AFX Graphics Profile @ Level 1 and 2 Definition

In Table AMD3.1, definitions for level 1 of the 3D Multiresolution Graphics profile are given.

Table AMD3.1 – Level 1 & 2 of Basic AFX Graphics profile

Node	Maximum values for content related parameters	
	Level 1	**Level 2**
Appearance	Ignore *TextureTransform.*	Full features supported.
Color	2^{16} colors*	2^{32} colors*
Coordinate	2^{16} points*	2^{32} points*
DirectionalLight	Not scoped by parent *Group* or *Transform*.	Scoped by parent *Group* or *Transform*.
IndexedFaceSet	Only triangle face supported. A given *coordIndex* is not repeated in a face. Ignore *set_colorIndex.* Ignore *set_normalIndex.*	Full features supported.
IndexedLineSet	Ignore *set_colorIndex.* Ignore *set_coordIndex.*	Full features supported.
Material	Ignore *AmbientIntensity.* Ignore *Shininess*. Ignore *SpecularColor.*	Full features supported.
PointLight	Ignore *radius.* Ignore Linear attenuation.	Full features supported.
Shape	Full features support.	Full features supported.
SpotLight	Ignore *beamWidth.* Ignore *radius.* Ignore Linear attenuation.	Full features supported.
TextureCoordinate	2^{16} coordinates*	2^{32} coordinates*
WaveletSubdivision Surfaces	12 bitplanes per coordinate 4 levels of subdivision	24 bitplanes per coordinates 10 levels of subdivision
FootPrint	Full features supported.	Full features supported.

* indicates maximum vector size.

Table AMD3.2 specifies further restriction to the fields of the nodes listed in Table AMD3.1. These Tables can be used for both the Profile and the Level definitions.

Table AMD3.2 – Functionality limitation and minimum system requirement

Node	Restrictions (Maximum values)
All lights	8 simultaneous lights.
Names for DEF/field	50 utf8 octets.
All *url* fields	10 URLs. URN's ignored. Support relative URLs where relevant.
SFBool	Full support.
SFColor	Full support.
SFFloat	Full support.
SFImage	256 width. 256 height.
SFInt32	Full support.
SFNode	Full support.
SFRotation	Full support.
SFString	30,000 utf8 octets.
SFTime	Full support.
SFVec2f	15,000 values.
SFVec3d	15,000 values.
SFVec3f	15,000 values.
MFColor	15,000 values.
MFFloat	1,000 values.
MFInt32	20,000 values.
MFNode	500 values.
MFRotation	1,000 values.
MFString	30,000 utf8 octets per string, 10 strings.
MFVec2f	15,000 values.
MFVec3d	15,000 values.
MFVec3f	15,000 values.

Add the following new subclause after 7.3.1:

7.3.2 MPEG-4 Basic AFX Scene Graph Profile and Levels

7.3.2.1 List of tools/functionalities

The Basic AFX Scene Graph profile represents a collection of nodes to allow progressive and adaptive transmission over networks of large 3D environments and / or complexe 3D shapes. It contains the same set of nodes as the X3D Scene Graph Profile, plus the Bitwrapper node.

7.3.2.2 Comparison with existing profiles

The Basic AFX Scene Graph profile represents a collection of nodes to allow progressive and adaptive transmission over networks of large 3D environments and / or complexe 3D shapes

The existing 'X3D' profile does not provide compression tools.

7.3.2.3 Basic AFX Scene Graph Profile @ Level 1 Definition

In Table AMD3.3, definitions for level 1 of the Basic AFX Scene Graph profile are given.

Table AMD3.3 – Level 1 of Basic AFX Scene Graph profile

Node	Maximum values for content related parameters	
	Level 1	**Level 2**
CoordinateInterpolator	Full features supported.	Full features supported.
Group	Ignore *AddChildren*, Ignore *removeChildren*	Full features supported.
NavigationInfo	Ignore *AvatarSize,* Ignore *speed,* Ignore *type,* Ignore *visibilityLimit*	Full features supported.
OrientationInterpolator	Full features supported.	Full features supported.
PositionInterpolator	Full features supported.	Full features supported.
ScalarInterpolator	Full features supported.	Full features supported.
TouchSensor	Full features supported.	Full features supported.
Transform	Ignore *AddChildren*, Ignore *removeChildren*	Full features supported.

Viewpoint	Ignore *FieldOfView,* Ignore *description*	Full features supported.
WorldInfo	Full features supported.	Full features supported.
QuantizationParameter	Full features supported.	Full features supported.
Scene Updates	Full features supported.	Full features supported.
ROUTE	Full features supported.	Full features supported.

Table AMD3.4 specifies other aspects of functionality that are supported by this profile. Note that general items refer only to those specific nodes listed in Table AMD3.3.

Table AMD3.4 – Functionality Limitations and Minimum System Requirements

Node	Minimum System Support
All groups	500 children. Ignore *bboxCenter* and *bboxSize*.
All interpolators	1000 key-value pairs.
Names for DEF/field	50 utf8 octets.
All *url* fields	10 URLs. URN's ignored. Support relative URLs where relevant.
SFBool	Full support.
SFFloat	Full support.
SFImage	256 width. 256 height.
SFInt32	Full support.
SFNode	Full support.
SFRotation	Full support.
SFString	30,000 utf8 octets.
SFTime	Full support.
SFVec2f	15,000 values.
SFVec3d	15,000 values.
SFVec3f	15,000 values.
MFFloat	1,000 values.
MFInt32	20,000 values.
MFNode	500 values.

MFRotation	1,000 values.
MFString	30,000 utf8 octets per string, 10 strings.
MFVec2f	15,000 values.
MFVec3d	15,000 values.
MFVec3f	15,000 values.

In 7.4 replace:

Table 33 — 3DCompressionProfileLevelIndication Values.

Value	Profile	Level
0x00	Reserved for ISO use	-
0x01	Core	L1
0x02	Core	L2
0x0A-0x7F	reserved for ISO use	-
0x80-0xFD	user private	-
0xFE	no 3D Compression profile specified	-
0xFF	no 3D Compression capability required	-
Note: Usage of the value 0xFE may indicate that the content described by this descriptor does not comply with any conformance point specified in this international standard.		

with:

Table 33 — 3DCompressionProfileLevelIndication Values.

Value	Profile	Level
0x00	Reserved for ISO use	-
0x01	Core	L1
0x02	Core	L2
0X03	3D Multiresolution	L1
0X04	3D Multiresolution	L2
0x0A-0x7F	reserved for ISO use	-
0x80-0xFD	user private	-
0xFE	no 3D Compression profile specified	-
0xFF	no 3D Compression capability required	-
Note: Usage of the value 0xFE may indicate that the content described by this descriptor does not comply to any conformance point specified in this international standard.		

Add the following new subclause after 7.4.1:

7.4.2 3D Multiresolution Compression Profile and Levels

7.4.2.1 List of Tools/Functionalities

The 3D Multiresolution Compression profile combines the 3D Mesh Compression, Interpolation Compression, Wavelet Subdivision Surface, and Bone Based Animation tools for efficient 3D resource transmission and storage.

7.4.2.2 List of Tools/Functionalities

The "3D Multiresolution Compression" profile represents a collection of compression tools to allow implementation of minimum functionalities for compact transmission and storage of 3D object under a constrained environment (e.g. mobile), where the processing power and memory size can be very limited.

The "Multiresolution Compression" profile contains the following 3D Compression object types:

- The **Simple 3DMC** object type provides high compression and error resilience for static triangle 3D models.
- The **Simple CI** object type compresses the Coordinate Interpolator animation.
- The **Simple PI** object type compresses the Position Interpolator animation. It can support both Key-Preserving and Path-Preserving mode.
- The **Simple OI** object type compresses the Orientation Interpolator animation. It can support both Key-Preserving and Path-Preserving mode.
- The **Main WSS** object type represents, in a compressed form, the details for subdivision of 3D mesh. This tool is used for level of detail management and animation.
- The **Simple FootPrint** object type represents in a compressed form the multiresolution of 2D and a half data.
- The **Simple BBA** object type compresses the skeleton animation based on bone transforms and connected to a skin mesh model. This object type does not support Muscle.

Table AMD3.5 – 3D Compression Object Types

AFX Tools	3D Compression Object Types						
	Simple 3DMC	Simple CI	Simple PI	Simple OI	Main WSS	Simple BBA	Simple Footprint
3D Mesh Compression (3DMC) • Basic	X						
CoordinateInterpolator (CI)		X					
PositionInterpolator (PI) • Key Preserving • Path Preserving			X				
OrientationInterpolator (OI) • Key Preserving • Path Preserving				X			

Wavelet Subdivision Surface (WSS) • IndexedFace Set or 3DMC for base mesh • Backchannel enabled					X		
BBA • Only Bones						X	
Footprint-based Coding • Bckchannel enabled							X

The "3D Multiresolution Compression" includes the object types as illustrated in Table AMD3.6.

Table AMD3.6 – "3D Multiresolution Compression" Profile

	"3D Compression" Object Types						
	Simple 3DMC	Simple CI	Simple PI	Simple OI	Main WSS	Simple BBA	Simple Footprint
3D Multiresolution Compression Profile	X	X	X	X	X	X	X

7.4.2.3 Comparison with Existing Profiles and object types

The existing 'Core 3D Profile' is targeted for mobile applications and contains much simpler tools.

7.4.2.4 Profile Level Definition

According to target device and applications, two levels are defined as listed in Tables AMD3.7, AMD3.8, and AMD3.9. Level 1 is for mobile devices, while the level 2 is targeted at workstations or dedicated hardware.