
**Information technology — Coding of
audio-visual objects —**

**Part 16:
Animation Framework eXtension (AFX)**

*Technologies de l'information — Codage des objets audiovisuels —
Partie 16: Extension du cadre d'animation (AFX)*

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
1 Scope	1
2 Normative references	1
3 Symbols and abbreviated terms	1
4 3D Graphics Primitives	3
4.1 Introduction	3
4.2 The AFX place within computer animation framework	4
4.3 Geometry tools	6
4.4 Texture tools	48
4.5 Animation tools	60
4.6 Rendering tools	73
5 3D Graphics compression tools	75
5.1 Introduction	75
5.2 Geometry tools	75
5.3 Texture tools	206
5.4 Animation tools	221
5.5 Generic tools	258
6 AFX object codes	273
7 3D Graphics Profiles	274
7.1 Introduction	274
7.2 "Graphics" Dimension	274
7.3 "Scene Graph" Dimension	278
7.4 "3D Compression" Dimension	282
8 XMT representation for AFX tools	288
8.1 AFX nodes	288
8.2 AFX encoding hints	288
8.3 AFX encoding parameters	289
8.4 AFX decoder specific info	292
8.5 XMT for Bone-based Animation	293
Annex A (normative) Wavelet Mesh Decoding Process	298
Annex B (normative) MeshGrid Representation	302
Annex C (informative) MeshGrid representation	312
Annex D (informative) Solid representation	315
Annex E (informative) Face and Body animation: XMT compliant animation and encoding parameter file format	322
Annex F (normative) Local refinements for MultiResolution FootPrint-Based Representation	328
Annex G (informative) Partition Encoding for FAMC	330
Annex H (informative) Animation Weights Encoding for FAMC	331
Annex I (normative) Layered decomposition for FAMC	332
Annex J (normative) Reconstruction of values from decoded prediction errors with LD technique for FAMC	340
Annex K (normative) CABAC definitions, basic functions, and binarizations (as used for FAMC)	343

Annex L (normative) Node coding tables	349
Annex M (Informative) SC3DMC Encoding Process	350
Annex N (informative) QBCR Encoding Process	351
Annex O (informative) SVA Encoding Process	352
Annex P (informative) TFAN Encoding Process	356
Annex Q (informative) Prediction Process	363
Annex R (informative) BPC process	370
Annex S (informative) 4C Process	373
Annex T (informative) AC/EGk Process	377
Annex U (informative) Patent Statements	380
Bibliography	381

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 or all such patent rights.

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

This fourth edition cancels and replaces the third edition (ISO/IEC 14496-16:2009) which has been technically revised.

ISO/IEC 14496 consists of the following parts, under the general title *Information technology — Coding of audio-visual objects*:

- *Part 1: Systems*
- *Part 2: Visual*
- *Part 3: Audio*
- *Part 4: Conformance testing*
- *Part 5: Reference software*
- *Part 6: Delivery Multimedia Integration Framework (DMIF)*
- *Part 7: Optimized reference software for coding of audio-visual objects* [Technical Report]
- *Part 8: Carriage of ISO/IEC 14496 contents over IP networks*
- *Part 9: Reference hardware description*
- *Part 10: Advanced Video Coding*
- *Part 11: Scene description and application engine*
- *Part 12: ISO base media file format*
- *Part 13: Intellectual Property Management and Protection (IPMP) extensions*

- *Part 14: MP4 file format*
- *Part 15: Advanced Video Coding (AVC) file format*
- *Part 16: Animation Framework eXtension (AFX)*
- *Part 17: Streaming text format*
- *Part 18: Font compression and streaming*
- *Part 19: Synthesized texture stream*
- *Part 20: Lightweight Application Scene Representation (LASER) and Simple Aggregation Format (SAF)*
- *Part 21: MPEG-J Graphics Framework eXtensions (GFX)*
- *Part 22: Open Font Format*
- *Part 23: Symbolic Music Representation*
- *Part 24: Audio and systems interaction [Technical Report]*
- *Part 25: 3D Graphics Compression Model*
- *Part 26: Audio conformance*
- *Part 27: 3D Graphics conformance*

Information technology — Coding of audio-visual objects —

Part 16:

Animation Framework eXtension (AFX)

1 Scope

This part of ISO/IEC 14496 specifies MPEG-4 Animation Framework eXtension (AFX) model for representing and encoding 3D graphics assets to be used standalone or integrated in interactive multimedia presentations (the latter when combined with other parts of MPEG-4). Within this model, MPEG-4 is extended with higher-level synthetic objects for geometry, texture, and animation as well as dedicated compressed representations.

AFX also specifies a backchannel for progressive streaming of view-dependent information.

2 Normative references

The following referenced documents are indispensable for the application 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 14496-1, *Information technology — Coding of audio-visual objects — Part 1: Systems*

ISO/IEC 14496-2, *Information technology — Coding of audio-visual objects — Part 2: Visual*

ISO/IEC 14496-11, *Information technology — Coding of audio-visual objects — Part 11: Scene description and application engine*

3 Symbols and abbreviated terms

List of symbols and abbreviated terms.

AFX	Animation Framework eXtension
BIFS	Binary Format for Scene
DIBR	Depth-Image Based Representation
ES	Elementary Stream
IBR	Image-Based Rendering
NDT	Node Data Type
OD	Object Descriptor
VRML	Virtual Reality Modelling Language
4C	4-bits-based Coding
AC	Arithmetic Coding
BPC	Bit Precision Coding