INTERNATIONAL STANDARD

ISO/IEC 23000-13

Second edition
2017-11

Information technology - Multimedia application format (MPEG-A) —

Part 13: Augmented reality application format

Technologies de l'information - Format des applications multimedias —

Partie 13: Format pour les Applications de Realité Augmentée

Reference number
ISO/IEC 23000-13:2017(E)

© ISO/IEC 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms, definitions, and abbreviated terms ... **1**
3.1 Terms and definitions ... 1
3.2 Abbreviated terms ... 3

4 ARAF principle and context ... **3**

5 ARAF scene description ... **5**
5.1 General ... 5
5.1.1 Elementary media ... 7
5.1.2 Programming information ... 34
5.1.3 User interactivity ... 35
5.1.4 Scene related information (spatial and temporal relationships) ... 43
5.1.5 Dynamic and animated scene ... 98
5.1.6 Communication and compression ... 102
5.1.7 Terminal ... 112

6 ARAF for sensors and actuators ... **113**
6.1 General ... 113
6.1.1 Usage of InputSensor and script nodes ... 113
6.2 Access to local camera sensor ... 116
6.3 Usage of outputactuator and script nodes ... 117
6.3.1 General ... 117

7 ARAF compression ... **120**

8 Reference software ... **121**
8.1 General ... 121
8.2 Implementation details ... 121
8.3 Utility software ... 122

9 Conformance ... **122**

Annex A (informative) **Map related prototypes implementation** ... **125**

Annex B (informative) **ARAF support for proprietary formats** ... **143**

Annex C (informative) **ARAF interactive applications description** ... **144**

Bibliography ... **146**

© ISO/IEC 2017 – All rights reserved

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document 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 23000-13:2014), which has been technically revised.

It also incorporates the Amendment ISO/IEC 23000-13:2014/Amd. 1:2015.

A list of all parts in the ISO/IEC 23000 series can be found on the ISO website.

© ISO/IEC 2017 – All rights reserved

Introduction

Augmented Reality (AR) applications refer to a view of a real-world environment (RWE), whose elements are augmented by content, such as graphics or sound, in a computer driven process. Augmented Reality Application Format (ARAF) is a collection of a subset of the ISO/IEC 14496-11 Scene Description and Application Engine standard, combined with other relevant MPEG standards (e.g. ISO/IEC 23005, MPEG-V), designed to enable the consumption of 2D/3D multimedia content. Consequently, this document focuses not on client or server procedures, but on the data formats used to provide an augmented reality presentation.

© ISO/IEC 2017 – All rights reserved

Information technology - Multimedia application format (MPEG-A) —

Part 13:
Augmented reality application format

1 Scope

This document specifies the following:

— scene description elements for representing AR content;

— mechanisms to connect to local and remote sensors and actuators;

— mechanisms to integrated compressed media (image, audio, video, graphics);

— mechanisms to connect to remote resources such as maps and compressed media.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10646-1:2012, *Information technology — Universal multiple-octet coded character set (UCS) — Part 1: Architecture and basic multilingual plane*

ISO/IEC 14496-1:2010 + Amd. 2:2014, *Information technology — Coding of audio-visual objects — Part 1: Systems*

ISO/IEC 14496-3:2009, *Information technology — Coding of audio-visual objects — Part 3: Audio*

ISO/IEC 14496-11:2015, *Information technology — Coding of audio-visual objects — Part 11: Scene description and application engine*

ISO/IEC 14496-16:2011, *Information technology — Coding of audio-visual objects — Part 16: Animation Framework eXtension (AFX)*

ISO/IEC 14772-1:1997, *Information technology — Computer graphics and image processing — The Virtual Reality Modeling Language — Part 1: Functional specification and UTF-8 encoding*

ISO/IEC 23005-5, *Information technology — Media context and control — Part 5: Data formats for interaction devices*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23000-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

© ISO/IEC 2017 – All rights reserved

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
ARAF browser
augmented reality application format compliant browser

3.1.2
MAR scene
textual result of the MAREC creation, played by an *ARAF browser* (3.1.1)

Note 1 to entry: The result is a MAR experience.

3.1.3
MAR experience
act of playing the ARAF scene using an *ARAF browser* (3.1.1)

Note 1 to entry: The ARAF browser interprets the ARAF scene and presents the result on the end-user's device.

3.1.4
content creator
creator of the media files that are being used within the *MAR experience* (3.1.3)

Note 1 to entry: The media files can be 2D and/or 3D graphics, images, videos and/or sounds.

3.1.5
end-user device
smartphone or mobile device used by an end-user to play a *MAR scene* (3.1.2)

Note 1 to entry: The device shall have an ARAF browser installed.

3.1.6
processing server
server that offers at least one required processing functionality for a *MAR experience* (3.1.3) and it is capable of communicating with an *ARAF browser* (3.1.1)

3.1.7
target resource
target image or target image descriptor

Note 1 to entry: The target image represents the image that shall be detected and recognized by a recognition library. The target image descriptor is represented by the visual descriptors extracted from a target image. The target resources may be specified by the MAREC or they can be already stored in databases on remote servers.

3.1.8
prerecorded video
prerecorded 2D video whose location is specified by MAREC

Note 1 to entry: The video file can be stored locally (on the device where the MAR experience is played) or remotely (anywhere else on the web). The recognition process shall be performed on the frames (still images) composing the video.

3.1.9
live video camera (stream)
live 2D video camera feed

Note 1 to entry: The URL of the camera providing the real time capture is specified by the MAREC. The URL can point to one of the cameras of the device where the MAR experience is played or to any other camera that can provide a live video stream and the ARAF browser can connect to.

© ISO/IEC 2017 – All rights reserved

3.1.10
image recognition library
library that is able to recognize *target resources* (3.1.7) in a video

Note 1 to entry: The library can run locally (implemented in the ARAF browser) or remotely (on a processing server). The result of an image recognition library is an array of indexes of the recognized target resources.

3.1.11
image recognition and tracking library
library that is able to recognize and track *target resources* (3.1.7) in a video

Note 1 to entry: The library can run locally (implemented in the ARAF browser) or remotely (on a processing server). The result of a recognition and tracking library is an array of indexes of the recognized target resources and their pose matrixes. Each recognized target resource shall have a pose matrix associated or a default value if the corresponding pose matrix could not be computed.

3.1.12
augmentation resource
media objects that are used in the augmentation of the *MAR experience* (3.1.3)

Note 1 to entry: A valid augmentation resource can be a 2D/3D grapic element, an image, a video, a sound or a BIFS scene. The augmentation resources can be stored locally in the MAR Scene or remotely anywhere on the Web, as long as the ARAF browser is capable of accesing their locations. In this case, a URL pointing to the augmentation resource is stored in the MAR scene.

3.2 Abbreviated terms

AR	Augmented Reality
ARAF	Augmented Reality Application Format
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
MAR	Mixed and Augmented Reality
MARE	Mixed and Augmented Reality Experience
MAREC	Mixed and Augmented Reality Experience Creator
PROTO	A PROTOtype is a mechanism used to group together scene graph elements in order to implement one or several specific functionalities.
RTR	Recognized Target Resource

4 ARAF principle and context

Augmented Reality (AR) applications refer to a view of a real-world environment whose elements are augmented by content, such as graphics or sound, in a computer driven process. Figure 1 illustrates two real and virtual cameras and the composition of a real image and graphics objects. Annex C describes several application scenarios for augmented reality.

© ISO/IEC 2017 – All rights reserved