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Part 6: Iris image data

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Partie 6: Données d'image de l'iris

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Contents

Page

Foreword ..... **iv**

Introduction ..... **v**

1 Scope **1**

2 Normative references **2**

3 Terms and definitions **2**

4 Symbols and abbreviated terms **3**

5 Conformance **4**

6 Iris image content specification **4**
6.1 General 4
6.2 Uncropped iris image 5
6.3 VGA iris image 6
6.4 Cropped iris image 6
6.5 Cropped and masked iris image 7
6.5.1 General 7
6.5.2 Masking of the sclera 7
6.5.3 Masking of the eyelids 7
6.5.4 Mask transition blurring 8

7 Abstract data elements **9**
7.1 Purpose and overall structure 9
7.2 Version block 11
7.3 Representation block 11
7.3.1 General 11
7.3.2 Eye label 11
7.3.3 Iris image kind 11
7.3.4 Bit depth 11
7.3.5 Image data format 12
7.3.6 Horizontal orientation 13
7.3.7 Vertical orientation 13
7.3.8 Compression history 13
7.3.9 Capture date/time block 14
7.3.10 Iris image data 14
7.3.11 Range 14
7.3.12 Capture device block 14
7.3.13 Quality blocks 15
7.3.14 Roll angle block 15
7.3.15 Localization block 16
7.3.16 PAD data block 17

8 Encoding **17**
8.1 Tagged binary encoding 17
8.2 XML encoding 17

9 Registered BDB format identifiers **17**

Annex A (normative) **Formal specifications** **19**

Annex B (informative) **Encoding examples** **26**

Annex C (normative) **Conformance testing methodology** **27**

Annex D (informative) **Iris image capture** **33**

Bibliography **37**

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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.

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 document 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 and IEC 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) or the IEC list of patent declarations received (see patents.iec.ch).

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

For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

A list of all parts in the ISO/IEC 39794 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The purpose of this document is to define an International Standard for the exchange of iris image extensible information. This document contains a specific definition of iris image record attribute data elements, record's tagged binary and XML encoding extensible formats for storing and transmitting the iris image and certain attribute data elements, and conformance criteria.

Currently, the exchange of iris information between equipment from different vendors can be achieved using images of the eye. While some applications can successfully operate with full size uncompressed rectilinear images, there are others for which this is expensive in terms of storage and bandwidth. This document therefore also defines compact representations.

Biometric data interchange formats enable the interoperability of different biometric systems. The first generation of biometric data interchange formats was published between 2005 and 2007 in the first edition of the ISO/IEC 19794 series. From 2011 onwards, the second generation of biometric data interchange formats has been published in the second edition of the established parts and the first edition of some new parts of ISO/IEC 19794. In the second generation of biometric data interchange formats, new useful data elements such as those related to biometric sample quality have been added, the header data structures have been harmonized across all parts of the ISO/IEC 19794 series, and an XML encoding has been added in addition to the binary encoding.

In anticipation of the future need for additional data elements and in order to avoid future compatibility issues, ISO/IEC JTC 1/SC 37 has developed the ISO/IEC 39794 series as a third generation of biometric data interchange formats, defining extensible biometric data interchange formats capable of including future extensions in a defined way. Extensible specifications in ASN.1 (Abstract Syntax Notation One) and the Distinguished Encoding Rules of ASN.1 form the basis for encoding biometric data in binary tag-length-value formats. XML schema definitions form the basis for encoding biometric data in XML (Extensible Markup Language).

Annex A specifies the ASN.1 schema and XML schema of the formal structure description to which tagged binary encoded and XML encoded iris image extensible records are to conform (respectively).

Annex B provides sample iris image extensible record encodings. Annex C includes normative assertions for testing conformance of iris image extensible records. Finally, Annex D gives recommendations on iris image capture.

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Information technology — Extensible biometric data interchange formats —

Part 6: Iris image data

1 Scope

This document specifies:

— generic extensible data interchange formats for the representation of iris image data: a tagged binary data format based on an extensible specification in ASN.1 and a textual data format based on an XML schema definition that are both capable of holding the same information,

— examples of data record contents,

— application specific requirements, recommendations, and best practices in data acquisition, and

— conformance test assertions and conformance test procedures applicable to this document.

The iris image information is stored as:

— an array of intensity values optionally compressed with ISO/IEC 15948 or ISO/IEC 15444-1, or

— an array of intensity values optionally compressed with ISO/IEC 15948 or ISO/IEC 15444-1 that can be cropped around the iris, with the iris at the centre, and which can incorporate region-of-interest masking of non-iris regions.

This document also specifies elements of conformance testing methodology, test assertions, and test procedures, as applicable to this document.

It establishes:

— test assertions pertaining to the structure of the iris image data format, as specified in Clauses 6, 7, 8 and 9 of this document,

— test assertions pertaining to internal consistency by checking the types of values that may be contained within each field, and

— semantic test assertions.

The conformance testing methodology specified in this document does not establish:

— tests of other characteristics of biometric products or other types of testing of biometric products (e.g. acceptance, performance, robustness, security), or

— tests of conformance of systems that do not produce data records conforming to the requirements of this document.

This document does not establish:

— requirements on the optical specifications of cameras, or

— requirements on photometric properties of iris images, or

— requirements on enrolment processes, workflow and use of iris equipment.

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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 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*

ISO/IEC 8824-1, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO/IEC 8825-1, *Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) — Part 1*

ISO/IEC 15444-1, *Information technology — JPEG 2000 image coding system — Part 1: Core coding system*

ISO/IEC 15948, *Information technology — Computer graphics and image processing — Portable Network Graphics (PNG): Functional specification*

ISO/IEC 39794-1, *Information technology — Extensible biometric data interchange formats — Part 1: Framework*

W3C Recommendation, *XML Schema Part 1: Structures Second Edition*, 28 October 2004, http://www.w3.org/TR/xmlschema-1/

W3C Recommendation, *XML Schema Part 2: Datatypes Second Edition*, 28 October 2004, http://www.w3.org/TR/xmlschema-2/

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37 and ISO/IEC 39794-1 and the following apply.

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

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

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

3.1
defocus
image impairment due to the position of the *iris* (3.4) along the optical axis of the camera away from the plane or surface of best focus, generally resulting in reduced sharpness (blur) and reduced contrast

3.2
depth of field
distance range relative to the entrance aperture of a capture device over which the *iris* (3.4) image has greater than a specified quality with respect to focus

3.3
greyscale
continuous-tone image that has one component, which is pixel intensity

3.4
iris
coloured annular structure in the front portion of the eye comprised of muscular and connective tissue and pigmented layers, that defines the *pupil* (3.9) and controls its size

3.5
iris centre
centre of a circle modelling the boundary between *iris* (3.4) and *sclera* (3.12)

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3.6
iris radius
radius of a circle modelling the boundary between *iris* (3.4) and *sclera* (3.12)

3.7
margin
distance in an image from the iris-sclera border, when modelled as a circle, to the closest image border, expressed in pixels

Note 1 to entry: Throughout this document, margins are defined in terms of the *iris radius*, *R* (3.6). When written as an ordered pair, the order is (horizontal, vertical).

EXAMPLE (0,6*R*, 0,2*R*) indicates that for an iris radius of *R*, there shall be margins of image data 0,6·*R* to the right and left of the *iris* (3.4) and 0,2·*R* above and below the iris.

3.8
Modulation Transfer Function
MTF
ratio of the image modulation to the object modulation as a function of *spatial frequency* (3.14)

3.9
pupil
optical opening in the centre of the eye that serves as a variable light aperture and defines the inner boundary of the *iris* (3.4)

3.10
pupil centre
average of coordinates of all the pixels lying on the boundary of the *pupil* (3.9) and the *iris* (3.4)

3.11
round
mathematical function applied to a number *x* such that round(*x*) is the integer that is closest in value to *x*

3.12
sclera
generally white wall of the eye peripheral to the *iris* (3.4)

3.13
segmentation
process of determining, within an image containing an *iris* (3.4), the boundaries between areas containing visible iris tissue and those that do not

Note 1 to entry: This process is preceded by localization of the iris, and typically followed by cropping or masking regions that are not iris tissue.

3.14
spatial frequency
measure of the spatial period of a sinusoidal intensity pattern in space, in units of cycles/degree or of cycles/mm at a given target range

3.15
spatial sampling rate
number of picture elements (pixels) per unit distance in the object plane or per unit angle in the imaging system

4 Symbols and abbreviated terms

For the purposes of this document, the abbreviations given in ISO/IEC 39794-1 and the following apply.

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