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Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794 —

Part 4:
Finger image data

Technologies de l'information — Méthodologie d'essai de conformité pour les formats d'interéchange de données biométriques définis dans l'ISO/CEI 19794 —

Partie 4: Données d'image du doigt

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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.

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 29109 consists of the following parts, under the general title *Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794:*

— *Part 1: Generalized conformance testing methodology*

— *Part 2: Finger minutiae data*

— *Part 4: Finger image data*

— *Part 5: Face image data*

— *Part 6: Iris image data*

— *Part 8: Finger pattern skeletal data*

— *Part 9: Vascular image data*

— *Part 10: Hand geometry silhouette data*

The following part is under preparation:

— *Part 7: Signature/sign time series data*

Introduction

ISO/IEC 19794-4:2005 specifies a data record interchange format for recording, storing, and transmitting one or more finger images within a common biometric exchange formats framework (CBEFF) data structure. Each image is accompanied by image-specific metadata contained in a header record. This part of ISO/IEC 29109 establishes tests for checking the correctness of the binary record.

The objective of ISO/IEC 19794-4:2005 cannot be completely achieved until biometric products can be tested to determine whether they conform to those specifications. Conforming implementations are a necessary prerequisite for achieving interoperability among implementations; therefore there is a need for a standardized conformance testing methodology, test assertions, and test procedures as applicable to specific modalities addressed by each part of ISO/IEC 19794. The test assertions will cover, as far as practical, the ISO/IEC 19794 requirements (covering the most critical features), so that the conformity results produced by the test suites will reflect the real degree of conformity of the implementations to ISO/IEC 19794 data interchange format records. This is the motivation for the development of this conformance testing methodology.

This part of ISO/IEC 29109 supports those applications that require use of finger image data according to ISO/IEC 19794-4:2005. It defines a testing methodology to ensure conformance of a vendor's application or service to ISO/IEC 19794-4:2005. Thus this part of ISO/IEC 29109 is intended to

— establish elements of the conformance testing methodology framework that are specific to the finger and palm image-based data record requirements of ISO/IEC 19794-4:2005 conformance testing,

— define requirements and guidelines for specifying conformance test suites and related test methods for measuring conformity of products and services to the finger image data record requirements of ISO/IEC 19794-4:2005, and

— define testing and reporting procedures to be followed before, during, and after conformance testing.

This part of ISO/IEC 29109 is applicable to the development and use of conformity test method specifications, conformity test suites for ISO/IEC 19794-4:2005 records, and conformance testing programs for ISO/IEC 19794-4:2005 conformant products. It is intended primarily for use by testing organizations, but may be applied by developers and users of test method specifications and test method implementations. The table of test assertions (Clause 6.2, Table 2) specifies test assertions for the conformance requirements of ISO/IEC 19794-4:2005.

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Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794 —

Part 4: Finger image data

1 Scope

This part of ISO/IEC 29109 specifies elements of conformance testing methodology, test assertions, and test procedures as applicable to ISO/IEC 19794-4.

It establishes

— test assertions of the structure of the finger image data format as specified in ISO/IEC 19794-4:2005 (Type A Level 1 as defined in ISO/IEC 29109-1:2009),

— test asssertions of internal consistency by checking the types of values that may be contained within each field (Type A Level 2 as defined in ISO/IEC 29109-1:2009),

— tests of semantic assertions (Type A Level 3 as defined in ISO/IEC 29109-1:2009).

It does not establish

— tests of conformance of CBEFF structures required by ISO/IEC 19794-4:2005,

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

— tests of conformance of systems that do not produce ISO/IEC 19794-4:2005 records.

2 Conformance

Biometric data interchange format conformance tests conform to this part of ISO/IEC 29109 if they satisfy all of the normative requirements related to Clause 6. Specifically, they shall use the test methodology specified in Clauses 6, 7 and 8 of ISO/IEC 29109-1:2009, and all Level 1 and Level 2 tests shall use the assertions defined in Table 2 of this part of ISO/IEC 29109.

Implementations of ISO/IEC19794-4:2005 tested according to the methodology specified shall be able to claim conformance only to those biometric data record (BDB) requirements specified in ISO/IEC 19794-4:2005 that are tested by the test methods established by this methodology.

Implementations of ISO/IEC 19794-4:2005 do not necessarily need to conform to all possible aspects of ISO/IEC 19794-4:2005, but only to those ISO/IEC 19794-4:2005 requirements that are claimed to be supported by the implementation in an implementation conformance statement (ICS), filled out in accordance with Clause 8 of ISO/IEC 29109-1:2009 and Table 1 of this part of ISO/IEC 29109.

3 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 19794-4:2005, *Information technology — Biometric data interchange formats — Part 4: Finger image data*

ISO/IEC 29109-1:2009, *Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794 — Part 1: Generalized conformance testing methodology*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 29109-1 apply.

5 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO/IEC 29109-1 apply.

6 Conformance testing methodology

The testing methodology specified in Clauses 6, 7 and 8 of ISO/IEC 29109-1:2009 shall apply. The content of the tables below is based on the conformance testing methodology outlined in ISO/IEC 29109-1:2009 and shall only be used in the context of that testing methodology.

6.1 Table of requirements in the base standard

The normative requirements of ISO/IEC 19794-4:2005 are listed in Table 1. The supplier of the IUT can explain which optional components of the standard are supported and the testing laboratory can note the results of the test.

Table 1 — Requirements of the base standard (ISO/IEC 19794-4:2005)

Require- ment identifier	Reference in base standard	Requirement summary	Level	Status	IUT support	Supported range	Test result
R-1	4.15	Information contained in a transaction shall be applicable to a single subject.	3C	O-1		N/A	N/A
R-2	6.1	Each item of information, field, or logical record shall contain one or more bytes of data.	3C	O-1		N/A	N/A
R-3	6.1	The order for transmission shall also be the most significant byte first and least significant byte last.	3C	O-1		N/A	N/A
R-4	6.1	Within a byte, the order of transmission shall be the most significant bit first and the least significant bit last.	3C	O-1		N/A	N/A
R-5	6.2	Each image as presented in accordance with this format standard shall appear to have been captured in an upright position and approximately centered horizontally in the field of view.	3C	O-1		N/A	N/A

Table 1 (*continued*)

Require-ment identifier	Reference in base standard	Requirement summary	Level	Status	IUT support	Supported range	Test result
R-6	6.2	The recorded image data shall appear to be the result of a scanning of a conventional inked impression of a fingerprint.	3C	O-1		N/A	N/A
R-7	6.2	The scanning sequence (and recorded data) shall appear to have been from left-to-right, progressing from top-to-bottom of the fingerprint or palm print.	3C	O-1		N/A	N/A
R-8	6.2	For the purpose of describing the position of each pixel within an image to be exchanged, a pair of reference axes shall be used.	3C	O-1		N/A	N/A
R-9	6.2	The origin of the axes, pixel location (0,0), shall be located at the upper left-hand corner of each image.	3C	O-1		N/A	N/A
R-10	6.2	The x-coordinate (horizontal) position shall increase positively from the origin to the right side of the image.	3C	O-1		N/A	N/A
R-11	6.2	The y-coordinate (vertical) position shall increase positively from the origin to the bottom of the image.	3C	O-1		N/A	N/A
R-12	7.2	For all quality levels, the finger image shall be represented using square pixels, in which the horizontal and vertical dimensions of the pixels are equal.	3C	O-1		N/A	N/A
R-13	7.3	The grayscale precision of the pixel data shall be specified in terms of the pixel depth or the number of bits used to represent the grayscale value of a pixel.	3C	O-1		N/A	N/A
R-14	7.3	For grayscale data, the minimum value that can be assigned to a "black" pixel shall be zero.	3C	O-1		N/A	N/A
R-15	7.3	The maximum value that can be assigned to a "white" pixel shall be the grayscale value with all of its bits of precision set to "1".	3C	O-1		N/A	N/A
R-16	7.4	The image data portion of a record for an uncompressed grayscale image shall contain a set of raw pixel information.	3C	O-1		N/A	N/A
R-17	7.4	Using a pixel depth of 8 bits (256 grayscale levels) each pixel shall be contained in a single byte.	2	M			
R-18	7.4	Increased precision for pixel values greater than 255 shall use two unsigned bytes to hold up to sixteen-bit pixels with values in the range of 0-65635.	3C	O-1		N/A	N/A
R-19	7.4, Tables 2 and 3	The encoding of a compressed grayscale image shall be the output of the appropriate grayscale compression algorithm specified.	2	M		N/A	

Table 1 (*continued*)

Require-ment identifier	Reference in base standard	Requirement summary	Level	Status	IUT support	Supported range	Test result
R-20	7.4	Upon decompression the grayscale value for each pixel shall be represented in the same manner as pixels in an uncompressed image.	3C	O-1		N/A	N/A
R-21	7.5	The image grayscale shall be encoded using the agreed precision necessary to meet the dynamic range requirement for a specific application.	3C	O-1		N/A	N/A
R-22	7.6	Grayscale fingerprint image areas to be captured shall be acquired by an image capture device operating at a specific scanning resolution.	3C	O-1		N/A	N/A
R-23	8.1	Each record shall pertain to a single subject.	3C	O-1		N/A	N/A
R-24	8.1	Each record shall contain an image record (consisting of one or more views) for each of one or more fingers, multiple fingers (single image records), or palms.	3C	O-1		N/A	N/A
R-25	8.1	The biometric data record specified in this standard shall be embedded in a CBEFF-compliant structure in the CBEFF biometric data block (BDB).	N/A	N/A		N/A	N/A
R-26	8.1	The CBEFF BDB_biometric organization shall be assigned by the International Biometric Industry Association (IBIA) to JTC 1 SC 37 shall be used.	N/A	N/A		N/A	N/A
R-27	8.1	This code shall be included in the CBEFF Header.	N/A	N/A		N/A	N/A
R-28	8.1	The associated sixteen-bit CBEFF BDB_format code shall have a value of 0x0007. The BDB_PID recorded shall be defined by CBEFF.	N/A	N/A		N/A	N/A
R-28	8.1	The BDB_PID recorded shall be defined by CBEFF.	N/A	N/A		N/A	N/A
R-30	8.2.2, Table 2	The Format identifier for the finger image standard record shall consist of the three ASCII characters "FIR" followed by the null character (0x0).	1	M		N/A	
R-31	8.2.3, Table 2	The number for the version of this standard used for constructing the image record shall be placed in four bytes.	1	M		N/A	
R-32	8.2.3, Table 2	This version number shall consist of three ASCII numerals followed by a zero byte as a null string terminator.	1	M		N/A	
R-33	8.2.3, Table 2	Upon approval of this specification, the version number shall be "010" –. Version 1 revision 0.	1	M		N/A	
R-34	8.2.4, Table 2	The combined length in bytes for the entire record shall be recorded in these six bytes.	1	M			

Table 1 (*continued*)

Require-ment identifier	Reference in base standard	Requirement summary	Level	Status	IUT support	Supported range	Test result
R-35	8.2.4, Table 2	This count [the value of the record length] shall be the sum of the lengths of all finger records (including all finger headers), the views for each finger, multiple finger record, and palms.	2	M			
R-36	8.2.5, Table 2	Capture device ID.	1, 3B	M			
R-37	8.2.6, Tables 1 and 2	This two-byte field shall specify the image acquisition setting level chosen from Table 1.	1,2	M			
R-38	8.2.6	The value used shall indicate the level at which all of the minimum acquisition parameters were satisfied during the image.	3C	O-1		N/A	N/A
R-39	8.2.7, Table 2	The number of finger or palm images included in the record shall be recorded in one byte.	1,2	M			
R-40	8.2.8, Table 2	This field shall specify the units used to describe the scanning and image resolutions of the image.	1,2 3C	M O-1			
R-41	8.2.9, Tables 1 and 2	This 2-byte field shall specify the rounded scanning resolution used in the horizontal direction.	2 3C	M O-1			
R-42	8.2.10, Tables 1 and 2	This 2-byte field shall specify the rounded scanning resolution used in the vertical direction.	2 3C	M O-1			
R-43	8.2.11, Table 2	This 2-byte field shall specify the rounded image resolution used in the horizontal direction.	2	M			
R-44	8.2.12, Table 2	This 2-byte field shall specify the rounded image resolution used in the vertical direction.	2	M			
R-45	8.2.13, Tables 1 and 2	This 1-byte field shall contain the number of bits used to represent a pixel.	2	M			
R-46	8.2.13, Tables 1 and 2	This field (pixel depth) shall contain an entry of '0x1' to '0x10'.	1	M			
R-47	8.2.14, Tables 2 and 3	This 1-byte field shall specify the method used to record the uncompressed or compressed grayscale images.	1,2	M			
R-48	8.2.14	When using the unpacked option for grayscale pixels greater than eight bits, each pixel shall be recorded in a pair of bytes right justified.	3C	O-1		N/A	N/A
R-49	8.2.14, Tables 2 and 3	Compression ratio for lossy compression of 8-bit, 19.69 ppmm (500 ppi) grayscale images shall be limited to a 15:1.	2	M			