
**Information technology — Biometric data
interchange formats —**

**Part 2:
Finger minutiae data**

*Technologies de l'information — Formats d'échange de données
biométriques —*

Partie 2: Données du point caractéristique du doigt

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO/IEC 2005

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
Introduction	vi
1 Scope	1
2 Conformance	1
3 Normative references	1
4 Terms and definitions	1
5 Symbols and abbreviated terms	5
6 Minutiae Extraction	5
6.1 Principle	5
6.2 Minutia Type	5
6.3 Minutia Location	6
6.3.1 Coordinate System	6
6.3.2 Minutia Placement on a Ridge Ending (encoded as Valley Skeleton Bifurcation Point)	7
6.3.3 Minutia Placement on a Ridge Bifurcation (encoded as a Ridge Skeleton Bifurcation Point)	7
6.3.4 Minutia Placement on a Ridge Skeleton Endpoint	7
6.3.5 Minutia Placement on Other Minutia Types	8
6.4 Minutia Direction	8
6.4.1 Angle Conventions	8
6.4.2 Minutia Direction of a Ridge Ending (encoded as Valley Skeleton Bifurcation Point)	9
6.4.3 Minutia Direction of a Ridge Bifurcation (encoded as Ridge Skeleton Bifurcation Point)	9
6.4.4 Minutia Direction of a Ridge Skeleton End Point	9
6.5 Core and Delta Placement and Direction	9
6.6 Minutia Type Matching	10
6.7 Encoding of multibyte quantities	10
7 Finger Minutiae Record Format	11
7.1 Introduction	11
7.2 Record Organization	11
7.3 Record Header	11
7.3.1 Format Identifier	11
7.3.2 Version Number	11
7.3.3 Length of Record	11
7.3.4 Capture Equipment Certifications	11
7.3.5 Capture Device Type ID	12
7.3.6 Size of Scanned Image in X direction	12
7.3.7 Size of Scanned Image in Y direction	12
7.3.8 X (horizontal) resolution	12
7.3.9 Y (vertical) resolution	12
7.3.10 Number Of Finger Views	12
7.3.11 Reserved Byte	12
7.4 Single Finger Record Format	12
7.4.1 Finger Header	12
7.4.2 Finger Minutiae Data	14
7.5 Extended Data	14
7.5.1 Common Extended Data Fields	15
7.5.2 Ridge Count Data Format	15
7.5.3 Core and Delta Data Format	17
7.5.4 Zonal Quality Data	19
7.6 Minutia Record Format Summary	21

8	Finger Minutiae Card Format	22
8.1	Normal Size Finger Minutiae Format	22
8.2	Compact Size Finger Minutiae Format	22
8.3	Number of Minutiae, Minutiae Ordering Sequence and Truncation	23
8.3.1	General Aspects	23
8.3.2	Biometric matching algorithm parameters	23
8.3.3	Number of Minutiae	23
8.3.4	Minutiae Order	24
8.4	Usage of additional features for the card format	26
8.4.1	Data objects for additional features	26
8.4.2	Indication of card capabilities	26
9	CBEFF Format Owner and Format Types	27
Annex A	(normative) Record Format Diagrams	28
A.1	Overall Record Format	28
A.2	Record Header	28
A.3	Single Finger View Minutiae Record	28
A.4	Finger Minutiae Data	29
A.5	Extended Data	29
Annex B	(normative) Fingerprint Image Quality Specifications.	30
B.1	SCOPE AND PURPOSE	30
B.2	FINGERPRINT SCANNERS	30
B.2.1	Geometric Image Accuracy	30
B.2.2	Modulation Transfer Function	30
B.2.3	Signal-to-Noise Ratio	31
B.2.4	Gray-Scale Range of Image Data	31
B.2.5	Gray-scale Linearity	32
B.2.6	Output Gray Level Uniformity	32
B.3	LATENT PRINT SCANNERS	32
B.3.1	Geometric Image Accuracy	33
B.3.2	Modulation Transfer Function	33
Annex C	(informative) Example Data Record	34
C.1	Data	34
C.2	Example Data Format Diagrams	35
C.3	Raw Data for the Resulting Minutiae Record	36
Annex D	(informative) Handling of Finger Minutiae Card Formats.	37
D.1	Enrollment	37
D.1.1	Number of minutiae	37
D.1.2	Number of required finger presentations	37
D.2	Matching	37
D.2.1	Matching conditions	38
D.2.2	Threshold Value	38
D.2.3	Retry Counter	39
D.3	Security Aspects of Finger Minutiae Presentation to the Card	39
Bibliography		40

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 19794-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

ISO/IEC 19794 consists of the following parts, under the general title *Information technology — Biometric data interchange formats*:

- *Part 1: Framework*
- *Part 2: Finger minutiae data*
- *Part 3: Finger pattern spectral data*
- *Part 4: Finger image data*
- *Part 5: Face image data*
- *Part 6: Iris image data*

The following parts are under preparation:

- *Part 7: Signature/sign behavioral data*
- *Part 8: Finger pattern skeletal data*

Vascular image data, hand geometry silhouette data, and signature/sign processed dynamic data will form the subjects of future Parts 9, 10 and 11, respectively.

Introduction

In the interest of implementing interoperable biometric recognition systems, this part of ISO/IEC 19794 establishes a data interchange format for minutiae-based fingerprint capture and recognition equipment. Representation of fingerprint data using minutiae is a widely used technique in many application areas.

This part of ISO/IEC 19794 defines specifics of the extraction of key points (called *minutiae*) from fingerprint ridge patterns. Two types of data formats are then defined: one for general storage and transport, one for use in card-based systems; the card format has a standard and a compact expression.

This document is a preview generated by EVS

Information technology — Biometric data interchange formats —

Part 2: Finger minutiae data

1 Scope

This part of ISO/IEC 19794 specifies a concept and data formats for representation of fingerprints using the fundamental notion of minutiae. It is generic, in that it may be applied and used in a wide range of application areas where automated fingerprint recognition is involved. This part of ISO/IEC 19794 contains definitions of relevant terms, a description of how minutiae shall be determined, data formats for containing the data for both general use and for use with cards, and conformance information. Guidelines and values for matching and decision parameters are provided in an informative annex.

2 Conformance

A system conforms to this part of ISO/IEC 19794 if it satisfies the mandatory requirements herein for extraction of minutiae from a fingerprint image as described in Clause 6 and the generation of a minutiae data format as described in Clause 7 (for general data interchange use) or Clause 8 (for use with cards). Since any finger minutiae extraction and matching algorithm supporting the described finger minutiae data interchange formats may be used, interoperability testing is of extreme importance, especially for environments in which components of different manufacturers interact. In ISO/IEC 19795 "Information technology - Biometric performance testing and reporting," test methodologies and performance testing of biometric data interchange formats are outlined. The application specific policies and relevant standards will determine the requirements for conformance testing and evaluation affecting levels of interoperability.

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 7816-11:2004, *Identification cards — Integrated circuit cards — Part 11: Personal verification through biometric methods*

ISO/IEC 19784-1:—¹⁾, *Information technology — Biometric application programme interface — Part 1: BioAPI specification*

ISO/IEC 19785-1:—¹⁾, *Information technology — Common Biometric Exchange Formats Framework — Part 1: Data element specification*

ISO/IEC 19785-2:—¹⁾, *Information technology — Common Biometric Exchange Formats Framework — Part 2: Procedures of the operation of the Biometric Registration Authority*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1

algorithm

a sequence of instructions that tell a biometric system how to solve a particular problem. An algorithm will have a finite number of steps and is typically used by the biometric engine (i.e., the biometric system software) to compute whether a biometric sample and template are a match.

¹⁾ To be published.