This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

American National Standard

INCITS/ISO/IEC 19794-5:2011 [2013]
ISO/IEC 19794-5:2011

Information technology — Biometric data interchange formats — Part 5: Face image data

Developed by

incits SM

Where IT all begins

Approved American National Standard
ANSI

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

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.

Adopted by INCITS (InterNational Committee for Information Technology Standards) as an American National Standard.

Date of ANSI Approval: 6/26/2013

Published by American National Standards Institute,
25 West 43rd Street, New York, New York 10036

Copyright 2013 by Information Technology Industry Council
(ITI). All rights reserved.

These materials are subject to copyright claims of International Standardization Organization (ISO), International Electrotechnical Commission (IEC), American National Standards Institute (ANSI), and Information Technology Industry Council (ITI). Not for resale. No part of this publication may be reproduced in any form, including an electronic retrieval system, without the prior written permission of ITI. All requests pertaining to this standard should be submitted to ITI, 1250 Eye Street NW, Washington, DC 20005.
Printed in the United States of America

© ITIC 2013 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

INTERNATIONAL **ISO/IEC**

Second edition
2011-11-01

Information technology — Biometric data interchange formats —

Part 5:
Face image data

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

Partie 5: Données d'image de la face

Reference number
ISO/IEC 19794-5:2011(E)

© ISO/IEC 2011

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

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

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Conformance 1

3 Normative references 2

4 Terms and definitions 2

5 The Face Image Data Record Format 4
5.1 Overview 4
5.2 Data Conventions 7
5.3 The General Header 8
5.4 The Representation Header 9
5.5 The Facial Information Block 11
5.6 The Landmark Point Block 16
5.7 The Image Information Block 22
5.8 The Representation Data block 25
5.9 The Image Data Block 25
5.10 The 3D Information Block 25
5.11 The 3D Data Block 32

6 The Basic Face Image Type 35
6.1 Inheritance requirements for the Basic Face Image Type 35
6.2 Image data encoding requirements for the Basic Face Image Type 35
6.3 Image data compression requirements for the Basic Face Image Type 35
6.4 Format requirements for the Basic Face Image Type 35

7 The Frontal Face Image Type 35
7.1 Inheritance requirements for the Frontal Face Image Type 35
7.2 Scene requirements for the Frontal Image Type 36
7.3 Photographic Requirements for the Frontal Image Type 37
7.4 Digital requirements for the Frontal Image Type 38
7.5 Format requirements for the Frontal Image Type 39

8 The Full Frontal Image Type 39
8.1 Inheritance requirements for the Full Frontal Face Image Type 39
8.2 Scene requirements for the Full Frontal Face Image Type 39
8.3 Photographic requirements for the Full Frontal Face Image Type 40
8.4 Digital requirements for the Full Frontal Face Image Type 42
8.5 Format requirements for the Full Frontal Image Type 42

9 The Token Face Image Type 42
9.1 Inheritance requirements for Token Face Image Type 42
9.2 Digital requirements for the Token Face Image Type 42
9.3 Format requirements for the Token Face Image Type 44

10 The Post-processed Frontal Face Image Type 44
10.1 Introduction 44
10.2 Inheritance requirements for the Post-processed Frontal Face Image Type 44
10.3 Format requirements for the Post-processed Frontal Face Image Type 44

11 The Basic 3D Image Type 45
11.1 Inheritance Requirements for the Basic 3D Image Type 45
11.2 The Basic 3D Image Type using the 3D Point Map representation 45

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

11.3 The Basic 3D Image Type using the 3D Vertex representation 45

12 The Full Frontal 3D Image Type 45
12.1 Inheritance requirements 45
12.2 Coordinate System Type 46
12.3 Pose of the 3D representation 46
12.4 Calibration Texture Projection Accuracy 46
12.5 Requirements on Full Frontal 3D Image Types using the Range Image Representation 46
12.6 Requirements on Full Frontal 3D Image Types using the 3D Point Map Representation 47
12.7 Requirements on Full Frontal 3D Image Types using the 3D Vertex Representation 47

13 The Token Frontal 3D Image Type 47
13.1 Inheritance requirements 47
13.2 Requirements on Token Frontal 3D Image Types using the Range Image Representation 48
13.3 Requirements on Token Frontal 3D Image Types using the 3D Point Map Representation 48
13.4 Requirements on Token Frontal 3D Image Types using the Vertex Representation 48

14 Registered Format Type Identifier 48

Annex A (normative) **Conformance test methodology** 49

Annex B (informative) **Best practices for Face Images** 50

Annex C (informative) **Conditions for Taking Photographs** 70

Annex D (informative) **Experimental studies** 100

Annex E (informative) **The Frankfurt Horizon** 110

Bibliography 111

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

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 shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 19794-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

This second edition constitutes a technical revision of the first edition (ISO/IEC 19794-5:2005), which is provisionally retained. It also incorporates the Amendments ISO/IEC 19794-5:2005/Amd.1:2007 and ISO/IEC 19794-5:2005/Amd.2:2009, and the Technical Corrigenda ISO/IEC 19794-5:2005/Cor.1:2008 and ISO/IEC 19794-5:2005/Cor.2:2008. This edition reflects the harmonization across the second generation of ISO/IEC 19794. Clause 5 contains descriptions of the harmonized general and representation headers; and Clauses 5 to 13 have been technically revised. Annexes C, D, and E have been added.

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*

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

— *Part 8: Finger pattern skeletal data*

— *Part 9: Vascular image data*

— *Part 10: Hand geometry silhouette data*

— *Part 11: Signature/sign processed dynamic data*

— *Part 13: Voice data*

— *Part 14: DNA data*

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

Introduction

Face images, also commonly referred to as displayed portraits, have been used for many decades to verify the identity of persons. In recent years, digital face images are used in many applications including human examination as well as computer automated face recognition. Although photographic formats have been standardized in some cases such as for passports and driver licenses, there is a need to define a standard data format of digital face images to allow interoperability among vendors.

This part of ISO/IEC 19794 is intended to provide a face image format for face recognition applications requiring exchange of face image data. The typical applications are

1) human examination of facial images with sufficient resolution to allow a human examiner to ascertain small features such as moles and scars that might be used to verify identity,

2) human verification of identity by comparison of persons against facial images,

3) computer automated face biometric identification (one-to-many searching), and

4) computer automated face biometric verification (one-to-one comparison).

To enable many applications on a variety of devices, including devices that have limited resources available for data storage, and to improve face recognition accuracy, this part of ISO/IEC 19794 specifies not only a data format, but also scene constraints (lighting, pose, expression, etc.), photographic properties (positioning, camera focus, etc.) and digital image attributes (image resolution, image size, etc.).

Several face image types are introduced to define categories that satisfy requirements of some applications:

- **Basic:** This is the fundamental Face Image Type that specifies a record format including header and representation data. All Face Image Types adhere to the properties of this type. No mandatory scene, photographic and digital requirements are specified for this image type.
- **Frontal:** A Basic Face Image Type that adheres to additional requirements appropriate for frontal face recognition and/or human examination. Two types of Frontal Face Image Types are defined in this part of ISO/IEC 19794, Full Frontal and Token Frontal (or simply Token).
- **Full Frontal:** A Face Image Type that specifies frontal images with sufficient resolution for human examination as well as reliable computer face recognition. This type of Face Image Type includes the full head with all hair in most cases, as well as neck and shoulders. This image type is suitable for permanent storage of the face information, and it is applicable to portraits for passport, driver license, and “mugshot” images.
- **Token Frontal:** A Face Image Type that specifies frontal images with a specific geometric size and eye positioning based on the width and height of the image. This image type is suitable for minimizing the storage requirements for computer face recognition tasks such as verification while still offering vendor independence and human verification (versus human examination which requires more detail) capabilities.
- **Post-processed Frontal:** Applying digital post-processing to a captured image can modify this image in a way that it is more suitable for automatic face recognition. The Post-processed Frontal Face Image Type is thought of as the interchange format for these kinds of facial images.
- **Basic 3D:** The Basic 3D Image Type is the base Image Type of all 3D Face Image Types. All 3D Face Image Types obey normative requirements of this image type.
- **Full Frontal 3D:** The Full Frontal 3D Image Type combines a Full Frontal 2D image with additional 3D information.
- **Token Frontal 3D:** The Token Frontal 3D Image Type combines a Token Frontal 2D image with additional 3D information.

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

Table 1 shows the relationships between Face Image Types using the notion of inheritance. For example, Frontal inherits properties from Basic, which means that all normative clauses that apply to Basic also apply to Frontal.

Table 1 — Inheritance of Face Image Types

Face Image Type	Inherits from	Normative clauses	Informative annexes
Basic	None	1, 2, 3, 4, 5, 6	B.1
Frontal	Basic	7	B.2
Full Frontal	Frontal	8	B.3
Token Frontal	Frontal	9	B.4
Post-processed Frontal	Frontal	10	

Figure 1 gives a general overview of the scene, photographic, digitization, and format requirements for the face image types specified in this part of ISO/IEC 19794.

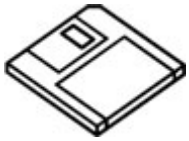
Requirements			
Scene	**Photographic**	**Digital**	**Format**
Lighting Image and Subject	Positioning Camera Attributes	Digital Camera Analogue to Digital Image Scanning	 Digital Specifications Record Format and Organization
Clauses: Basic Face None Frontal Face 7.2 Full Frontal Face 8.2	*Clauses:* Basic Face None Frontal Face 7.3 Full Frontal Face 8.3	*Clauses:* Basic Face None Frontal Face 7.4 Full Frontal Face 8.4 Token Face 9.2	*Clauses:* Basic Face 5 6.2 6.3 6.4 Frontal Face 7.5 Full Frontal Face 8.5 Token Face 9.3 Post-processed Frontal Face 10.3

Figure 1 — The types of imaging requirements specified in this part of ISO/IEC 19794. The Basic Face Image Type has no scene, photographic, or digital requirements

© ISO/IEC 2011 – All rights reserved

This is a preview of "INCITS/ISO/IEC 19794...". Click here to purchase the full version from the ANSI store.

This is a revision of ISO/IEC 19794-5:2005. The structure of the data format is not compatible with the previous version.

NOTE This part of ISO/IEC 19794 relies on other ISO International Standards.

© ISO/IEC 2011 – All rights reserved