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Information technology — Extensible biometric data interchange formats —

Part 17: Gait image sequence data

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Abbreviated terms **3**
5 Conformance **4**
6 Modality specific information **5**
6.1 Purpose 5
6.2 Practices 5
6.3 Data models for gait recognition 5
6.3.1 General 5
6.3.2 Model-based methods 6
6.3.3 Appearance-based methods 6
6.4 Data flow of gait recognition 7
6.5 Body tree concept for gait 7
6.6 Camera image sequence requirements 8
6.7 Gait recognition recordings 9
6.7.1 General 9
6.7.2 Gait and upper body movement image encoding 9
6.7.3 Gait and upper body camera image resolutions 9
6.8 Gait modality 10
6.8.1 General 10
6.8.2 Gait silhouette 10
6.8.3 Surveillance systems 12
6.9 Upper body movement modality 12
6.9.1 General 12
6.9.2 Face Features Motion (FFM) 13
6.9.3 Head movement recognition 13
6.9.4 Head Movements Static Body (HMS) 13
6.9.5 Head Movements Dynamic Body (HMD) 13
6.9.6 Hands movement 14
7 Profile-specific information **14**
7.1 Purpose 14
7.1.1 General 14
7.1.2 Gait representations 14
7.1.3 Scene requirements 14
7.2 2D gait image sequence profile 15
7.2.1 General 15
7.2.2 Gait image sequence representation profile requirements 15
7.2.3 Post-acquisition processing 15
7.2.4 Neural network training and testing 16
7.3 UBM 2D upper body movement profile 17
8 Encoding **17**
8.1 Tagged binary encoding 17
8.2 XML encoding 17
9 Registered BDB format identifiers **18**
Annex A (informative) **Conditions for capturing** **19**
Annex B (informative) **Encoding examples** **30**

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Annex C (informative) **Image sequence acquisition measurements** **42**
Bibliography **54**

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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 or www.iec.ch/members_experts/refdocs).

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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. In the IEC, see www.iec.ch/understanding-standards.

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 and www.iec.ch/national-committees.

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Introduction

Most countries around the world use biometric recognition systems for law enforcement and border control. Many of these systems are not limited to face recognition purposes. To be consistent in such deployments and processes, technical documents, guidelines and best practice recommendations are being developed by different groups. However, these documents are primarily focused on travel documents and related border control systems and the technical and operational issues to be considered when planning and deploying them. Gait recognition is the biometric mode used as a secondary mode in addition to biometric full body recognition or for forensic purposes. Face recognition is the biometric mode best suited to the practicalities of travel documents and automated border processing.

There is little guidance covering the gait imaging for cross-border interoperability or law enforcement services. There is a need for guidance for the use of high-quality digital cameras and video surveillance devices to record gait image sequence data. This document is not restricted to full body gait image sequence data. For example, it can be possible to extract only head movement data for recognition. Gait recognition in this document therefore also covers recognition based on different body parts, e.g. head or limb.

To enable applications on a wide variety of devices, including devices that have limited data storage, and to improve biometric recognition accuracy, this document addresses not only 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.).

A specific biometric profile for cross-border interoperability is required for gait video and still images. Gait image sequence data standardization is required to achieve the threshold quality gait image database records required for automated gait biometric verification and identification. At the moment, border guards record gait video using local practices for gait biometric enrolment, verification and identification.

In order to fully understand the requirements implied in this document it is recommended that the user become acquainted with the following documents: ISO/IEC 39794-16, specifying full body image file formats; ISO 22311, giving information on a common output file format that can be extracted from the video-surveillance contents collection systems to perform necessary processing; the ISO/IEC 30137 series, giving information on the use of biometrics in video surveillance systems; and EN 62676[7] defining video surveillance systems for use in security applications.

This document is intended to provide advice on the use of body image data for gait and upper body movement recognition applications requiring exchange of gait image sequence data and upper body movement data. Typical applications are:

— automated body biometric verification and identification (one-to-one as well as one-to-many comparison),

— support for human biometric verification by comparison of persons based on video and still gait images, and

— support for human examination of video and still gait images with sufficient resolution to allow a human examiner to perform biometric verification.

The structure of the data format is compatible with ISO/IEC 39794-5 and ISO/IEC 39794-16.

This document specifies application-specific profiles including scene constraints, imaging properties and digital image attributes, like image spatial and temporal sampling rates, image size, etc. These modality and application profile specifics are contained in Figures 6 and 7 respectively. Data creation and exchange is described in ISO/IEC 39794-16. The body image data blocks used in encoding gait image sequence data are of type *BodyImageDataBlockType*, which is defined in ISO/IEC 39794-16. This document makes normative reference to other ISO/IEC International Standards.

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Information technology — Extensible biometric data interchange formats —

Part 17: Gait image sequence data

1 Scope

This document specifies examples of application-specific requirements, recommendations and best practices in data acquisition applicable to gait image sequence data. Its typical applications include:

a) support for human examination of high-resolution video and still images;

b) support for human biometric verification and identification based on video and still images;

c) automated gait image sequence verification and identification.

This document ensures that image sequences are suitable for human identification and human verification generated by video surveillance and other similar systems.

The following topics are not in scope of this document:

— Definitions for facial and/or full body image related biometric profiles, which are fully covered in ISO/IEC 39794-5 and ISO/IEC 39794-16 respectively.

— Security aspects like digital image sequence electronic signature, Presentation Attack Detection (PAD) and morphing prevention.

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 10918-1, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 10918-5, *Information technology — Digital compression and coding of continuous-tone still images: JPEG File Interchange Format (JFIF) — Part 5:*

ISO/IEC 14496-1, *Information technology — Coding of audio-visual objects — Part 1: Systems*

ISO/IEC 14496-2, *Information technology — Coding of audio-visual objects — Part 2: Visual*

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

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

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ISO/IEC 39794-5, *Information technology — Extensible biometric data interchange formats — Part 5: Face image data*

ISO/IEC 39794-16, *Information technology — Extensible biometric data interchange formats – Part 16: Full body image data*

XML Schema Part 0: Primer Second Edition, W3C Recommendation, October 2004, https://www.w3.org/TR/xmlschema-0/

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

XML Schema Part 2: Datatypes Second Edition, W3C Recommendation, 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 39794-1, ISO/IEC 39794-16, and ISO/IEC 2382-37 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 https://www.electropedia.org/

3.1
3D model
DEPRECATED: 3D image
three-dimensional biometric capture subject body representation that encodes a surface or a volumetric shape in a 3D space

Note 1 to entry: a 3D model can be a heavily processed biometric subject body 3D shape.

3.2
biometric profile
conforming subsets or combinations of base standards used to effect specific biometric functions

Note 1 to entry: Biometric profiles define specific values or conditions from the range of options described in the relevant base standards, with the aim of supporting the interchange of data between applications and the interoperability of systems.

[SOURCE: ISO/IEC 24713-1:2008, 3.9]

3.3
full body recognition
automated recognition of individuals based on their morphology

Note 1 to entry: This can include any or all of the head, torso and limbs.

3.4
gait recognition
automated recognition of individuals based on their manner of walking

3.5
human identification
process of searching through a list of biometric capture subject images to match against an input image(s)

Note 1 to entry: Also known as one-to-many (1: N) searching.

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3.6
vignetting
reduction of image brightness or saturation toward the periphery compared to the image centre

4 Abbreviated terms

AVC	advanced video coding
BAP	body animation parameter
BDB	biometric data block
BER	basic encoding rules
CCTV	closed-circuit television
CEN	European Committee for Standardization
CIE	International Commission on Illumination (Commission Internationale de l'Eclairage)
CNN	convolutional neural network
DCI	Digital Cinema Initiatives consortium
DCNN	deep convolutional neural network
DER	distinguished encoding rules
DL	deep learning
EXIF	exchangeable image file format
FAP	face animation parameter
FFM	face features motion
FOV	field of view
GEI	gait energy image
GHM	gesture hand motion
HD	high definition or horizontal deviation angle
HDR	high dynamic range
HMD	head movements dynamic body
HMS	head movements static body
ICS	implementation conformance statement
INTERPOL	International Criminal Police Organization
ISO	International Organization for Standardization
JFIF	JPEG file interchange format
JPEG	image compression standard specified as ISO/IEC 10918

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