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Part 16:
Full body image data

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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.

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).

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

For an explanation on 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 the following URL www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/IEC JTC 1, Information technology, SC 37, Biometrics

A list of all parts in the ISO/IEC 39794 series, published under the general title Information technology — Extensible biometric data interchange formats, can be found on the ISO website and on the IEC website.

NOTE

This standard is originally based on CEN/TS 17051.

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 the issuance and use of identity documents and related border control systems, and the technical and operational issues to be considered when planning and deploying them. Face is the biometric mode most suited to the practicalities of travel documents and automated border processing. Full body is a biometric mode that could be used in addition to face (for example: in border crossing watchlist scenarios, crime surveillance, and others). It may also be used in forensic scenarios.

There is-very little guidance covering full body imaging for cross-border or law enforcement biometric recognition purposes. There is a need for guidance for the use of high-quality digital cameras and video surveillance devices, and guidance on full body data interchange structure semantics, syntax and format for the collection and use of full body image data in biometric recognition scenarios. A specific extensible biometric data interchange format for cross-border interoperability is required for full body images. Full body image data standardization is required to ensure threshold quality database images for identification and verification using video surveillance and other similar system generated images. Border personnel, immigration officials and police take full body images using local practices where no international standards are available that describe practices that enable cross-border interoperability. For identification purposes in disaster victim and law enforcement scenarios (e.g. victims identification, unknown bodies and missing individuals) the description of the full body biometric characteristics and associated non-biometric information, should follow this standard.

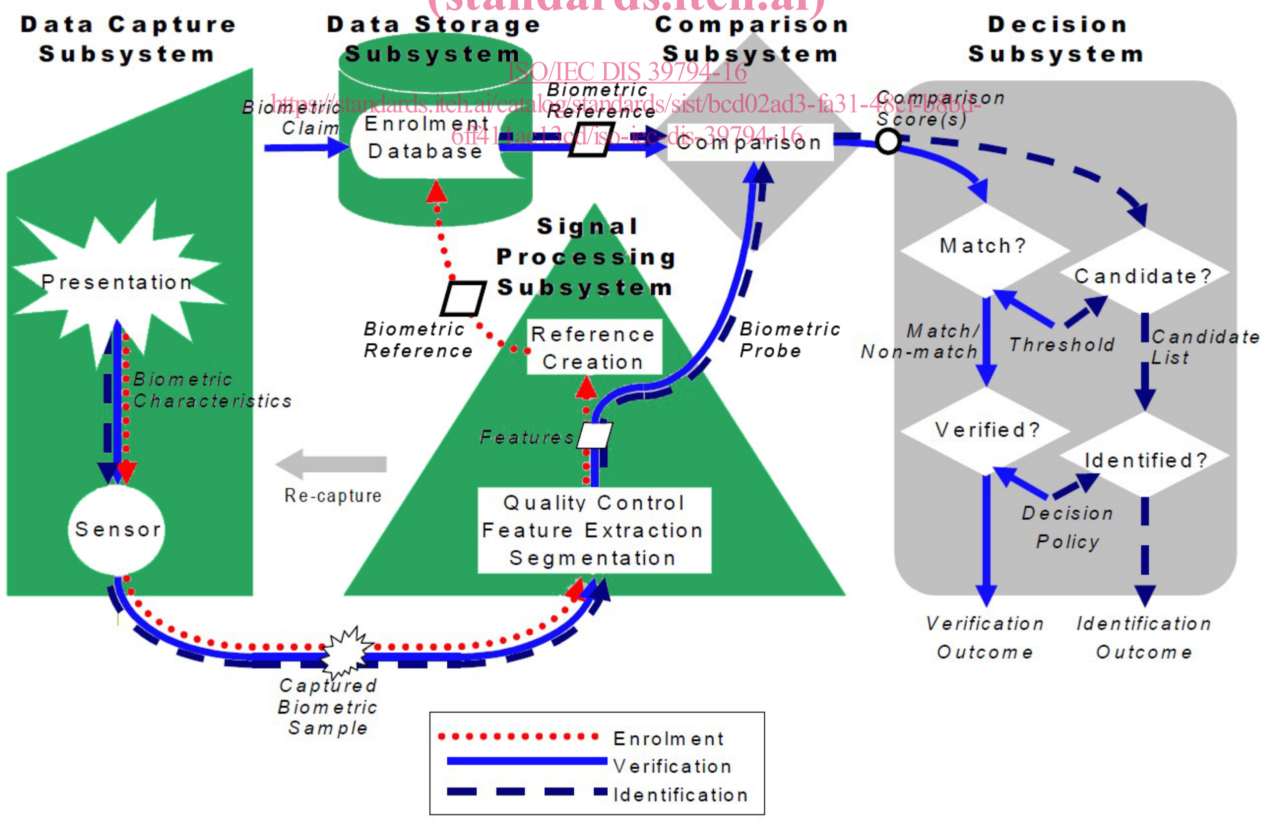

Figure 1 - Components of a full body image biometric system are shown on a dark green background.

To enable applications on a wide variety of devices, including devices that have limited data storage, and to improve biometric recognition accuracy, other parts of the ISO/IEC 39794 series of standards are followed regarding 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.).

In order to fully understand the requirements implied in this standard it is recommended to get acquainted with the following standards. ISO 22311:2012 [12] specifies a common output file format that can be extracted from the video-surveillance contents collection systems to perform necessary processing. ISO/IEC 30137 series of standards [8] specifies the use of biometrics in video surveillance systems. EN 62676 [13] defines video surveillance systems for use in security applications.

This part of ISO/IEC 39794 is intended to provide a generic extensible full body image data format for biometric recognition applications requiring exchange of human full body image data. Typical applications are

— automated body biometric verification and identification of an unknown individual or cadaver (one-to-one as well as one-to-many comparison),

— support for human verification of identity by comparison of individuals against full body images, and

— support for human examination of full body images with sufficient resolution to allow a human examiner to verify identity or identify a living individual or a cadaver.

The structure of the data format is compatible with the ISO/IEC 39794-5 standard. In addition to the data format, this part of ISO/IEC 39794 specifies application specific profiles including scene constraints, photographic properties and digital image attributes like image spatial sampling rate, image size, etc. These application profiles are contained in a series of Annexes.

The 3D encoding types *3D point map* and *range image* are not supported by this document.

NOTE: This part of ISO/IEC 39794 relies on other ISO/IEC International Standards.

1 Scope

This document specifies a full body image data format for biometric recognition applications requiring exchange of human full body image data:

a) support for human examination of high resolution full body images;

b) support for human biometric verification based on full body images;

c) automated full body biometric verification and identification.

This specification ensures that full human body images and image sequence data generated by video surveillance and other similar systems are suitable for identification and verification.

2 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 10918-1, Information Technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines

ISO/IEC 10918-5:2013 - Information technology - Digital compression and coding of continuous-tone still images: JPEG File Interchange Format (JFIF)

ISO/IEC 14496-2:2004, Information technology — Coding of audio-visual objects — Part 2: Visual

ISO/IEC 15444 (all parts), Information technology — JPEG 2000 image coding system

ISO/IEC 15948:2004, Information technology – Computer graphics and image processing - Portable Network Graphics (PNG): Functional specification

ISO 12052:2017 Health informatics -- Digital imaging and communication in medicine (DICOM) including workflow and data management

ISO/IEC 2382-37, Information technology — Vocabulary — Part 37: Biometrics

ISO/IEC 29794-1:2016, Information technology -- Biometric sample quality -- Part 1: Framework

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

ITU-T Rec. T.81, Information technology – Digital compression and coding of continuous-tone still images Requirements and guidelines

ITU-T Rec. T.800, Information technology — JPEG 2000 image coding system: Core coding system

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

ISO 12233:2014, Photography - Electronic still picture imaging - Resolution and spatial frequency responses

XML Schema Part 0: Primer. W3C Recommendation, second edition, October 2004

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, definitions and abbreviated terms given in ISO/IEC 39794-1, and ISO/IEC 2382-37, the following apply.

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

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

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

3.1
1:1 application case
biometric verification
Note 1 to entry: Biometric verification is defined in ISO/IEC 2382-37 as process of confirming a biometric claim through biometric comparison.

3.2
1:N application case
biometric identification
Note 1 to entry: Biometric identification is defined in ISO/IEC 2382-37 as process of searching against a biometric enrolment database to find and return the biometric reference identifier(s) attributable to a single individual.

3.3
2D image
two-dimensional biometric capture subject body representation that encodes the luminance and/or colour variations of a biometric capture subject in a given lighting environment or a set of images recorded using required radiation bandwidths

3.4
3D shape
DEPRECATED **3D image**
three-dimensional biometric capture subject body representation that encodes a surface or a volumetric shape in a 3D space

3.5
3D point map
3D point cloud representing a biometric capture subject, where each surface point is encoded with a triplet, representing the point as coordinate values in a 3D Cartesian coordinate system respectively

3.6
3D vertex representation
representation using 3D vertices and triangles between these points for coding of a 3D surface

3.7
4K
UHDTV resolution of 3840 px × 2160 px to achieve a 16 × 9 aspect ratio

3.8
ante-mortem
AM

before death
Note 1 to entry: Latin ante mortem

3.9
anthropometric landmark
landmark point on the biometric capture subject representation used for identification and classification of humans

3.10
anthropometric landmark code
two-part code that defines an Anthropometric Landmark uniquely

3.11
anthropometry
the scientific study of the measurements and proportions of the human body

3.12
artificial intelligence
AI
A discipline concerned with the building of computer systems that perform tasks requiring intelligence when done by humans

3.13
artificial neural network
ANN
formal name for neural network

3.14
biometric data block
BDB
DEPRECATED biometric data interchange record (BDIR)
data package containing biometric data that claims to be in the form prescribed by a base standard

3.15
biometric feature tensor
an arbitrarily complex geometric object that maps in a (multi-)linear manner biometric feature processing related geometric vectors, scalars, and other tensors to a resulting tensor
Note 1 to entry: When neural network transforms the subject's 2D or 3D representation to a neural network geometric representation space then the resulting biometric feature vector or more generally biometric feature tensor represents the subject in this neural network geometric space.
Note 2 to entry: Feature tensor is a multi-dimensional array of numbers taken from the output of a neural network layer or other process output, where an array is any ordered n-dimensional collection.
Note 3 to entry: Neural network weight matrices can be treated as tensors, both in convolutional layers and in fully connected layers.
Note 4 to entry: Using tensor decompositions it is possible to compress data. A tensor decomposition is any scheme for expressing a tensor as a sequence of elementary operations acting on other, often simpler tensors.

3.16
biometric feature vector
one dimensional matrix representation of biometric features
Note 1 to entry: Feature vector is a list of numbers taken from the output of a neural network layer or other biometric process capable of creating a one dimensional matrix representation of biometric features.