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Information technology — Biometric data interchange formats —

Part 7:
Signature/sign time series data

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

Partie 7: Données de série chronologique de signature/signe

Reference number
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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

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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 19794-7 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*

— *Part 7: Signature/sign time series 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 11: Signature/sign processed dynamic data*

Information technology — Biometric data interchange formats —

Part 7: Signature/sign time series data

1 Scope

For the purposes of biometric verification and/or identification, this part of ISO/IEC 19794 specifies a concept and data interchange formats for dynamic signature/sign behavioural data captured in the form of a time series using devices such as digitizing tablets or advanced pen systems. The data interchange formats are generic in that they may be applied and used in a wide range of application areas where handwritten signs or signatures are involved. No application-specific requirements or features are addressed in this part of ISO/IEC 19794. This part of ISO/IEC 19794 contains definitions of relevant terms, a description of what data is captured, two data formats for containing the data — one for general use and one compact format for use with smart cards and other tokens — alongside examples of data block contents and best practice in capture.

Specifying which of the format types and which options defined in this part of ISO/IEC 19794 are to be applied in a particular application is out of the scope of this part of ISO/IEC 19794; this needs to be defined in application-specific requirements specifications or application profiles. It is advisable that stored and transmitted biometric data be time-stamped and that cryptographic techniques be used to protect their authenticity, integrity and confidentiality; however such provisions are beyond the scope of this part of ISO/IEC 19794.

2 Conformance

A biometric data block conforms to this part of ISO/IEC 19794 if it satisfies the format requirements with respect to its structure, with respect to relations among its fields, and with respect to relations between its fields and the underlying input that are specified within the normative clauses of this part of ISO/IEC 19794.

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

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

ISO/IEC 19785-3, *Information technology — Common Biometric Exchange Formats Framework — Part 3: Patron format specifications* [1)]

ISO/IEC 19794-1, *Information technology — Biometric data interchange formats — Part 1: Framework*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19794-1 and the following apply.

4.1
signature/sign
handwritten signature or handwritten personal sign

4.2
time series
sequence of values sampled at successive points in time

4.3
biometric data block
BDB
block of data with a defined format that contains one or more biometric samples or biometric templates

4.4
channel
data item (acquired, intermediate or processed) recorded in the form of a time series

NOTE Examples include pen position, pen tip force and tilt.

4.5
pen azimuth
angle measured clockwise from the positive y axis to the perpendicular projection of the pen onto the writing plane

NOTE For an illustration, see Figure 1 (upper left and lower left).

4.6
pen elevation
angle measured counter-clockwise from the perpendicular projection of the pen onto the writing plane to the pen

NOTE For an illustration, see Figure 1 (upper left and lower left).

4.7
pen tilt along the x axis
angle measured clockwise from the positive z axis to the perpendicular projection of the pen onto the x,z plane

NOTE For an illustration, see Figure 1 (upper right and lower left).

4.8
pen tilt along the y axis
angle measured clockwise from the positive z axis to the perpendicular projection of the pen onto the y,z plane

NOTE For an illustration, see Figure 1 (upper right and lower left).

1) To be published.

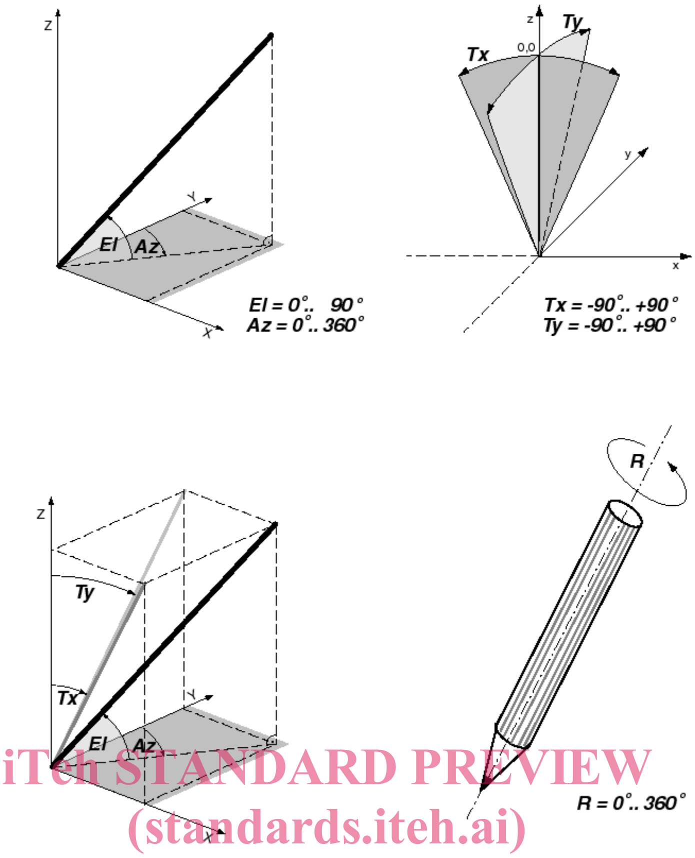

Figure 1 — Azimuth and elevation angles (upper left), tilt angles (upper right), pen orientation decomposition (lower left), and pen rotation (lower right)

4.9
pen rotation
angle of rotation of the pen about its longitudinal axis measured counter-clockwise from a device-specific reference rotational position

NOTE For an illustration, see Figure 1 (lower right).

4.10
X jitter
standard deviation of 100 x-coordinate samples from a stationary pen

4.11
Y jitter
standard deviation of 100 y-coordinate samples from a stationary pen

4.12
X resolution
number of dots per centimetre that the capture device resolves in the X (horizontal) direction

4.13
Y resolution
number of dots per centimetre that the capture device resolves in the Y (vertical) direction

4.14
Z resolution
number of dots per centimetre that the capture device resolves in the Z direction

4.15
sampling rate
rate in samples per second at which channel values are recorded

4.16
F resolution
number of units per millinewton that the capture device resolves in the downwards force of the pen tip on the writing plane

5 Conventions

5.1 Coordinate system

The coordinate system used to express the pen position shall be a three-dimensional Cartesian coordinate system. The x axis shall be the horizontal axis of the writing plane, with x coordinates increasing to the right. The y axis shall be the vertical axis of the writing plane, with y coordinates increasing upwards. The z axis shall be the axis perpendicular to the writing plane, with z coordinates increasing upwards out of the writing plane starting from 0.

5.2 Octet order

The more significant octets of any multi-octet quantity are stored at lower addresses in memory than (and are transmitted before) less significant octets.

Within an octet, the bits are numbered from 8 to 1, where bit 8 is the ‘most significant bit’ (MSB) and bit 1 the ‘least significant bit’ (LSB).

5.3 Registered format type identifiers

The biometric data block (BDB) specified in this part of ISO/IEC 19794 shall be embedded in a CBEFF-compliant structure. The structure of a signature/sign time series biometric information record (BIR) is depicted in Figure 2.

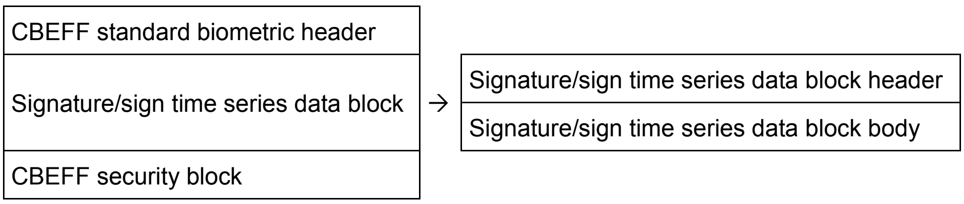

Figure 2 — Overview of a signature/sign time series BIR

NOTE The CBEFF security block holds data that enables the integrity and/or the originator of the signature/ sign time series BIR to be verified [(electronic signature or message authentication code (MAC)].

A CBEFF standard biometric header includes the data elements format owner and format type. Format owner and format type shall be encoded according to ISO/IEC 19785 (CBEFF). The format owner is ISO/IEC JTC 1/SC 37 with the IBIA registered format owner identifier 257 (0101_{Hex}).

The registrations listed in Table 1 have been made with the CBEFF Registration Authority (see ISO/IEC 19785-2) to identify the signature/sign time series full format and the signature/sign time series compact format.

Table 1 — Format type identifiers

CBEFF BDB format type identifier	Short name	Full object identifier
14 (000e$_{Hex}$)	signature-sign-time-series-full	{iso(1) registration-authority(1) cbeff(19785) organizations(0) 257 bdbs(0) signature-sign-time-series-full(14)}
15 (000f$_{Hex}$)	signature-sign-time-series-compact	{iso(1) registration-authority(1) cbeff(19785) organizations(0) 257 bdbs(0) signature-sign-time-series-compact(16)}

6 Channels

6.1 General

Table 2 lists the channel names and their meanings. Signature/sign behavioural data captured with different capture devices or used in different applications may contain data from different channels. Inclusion of the X and Y channels is mandatory. Either the T channel or the DT channel must be present, or uniform sampling (constant time difference between adjacent sample points) must be indicated. Inclusion of the other channels is optional.

Table 2 — Channels

Channel name	Interpretation
X	x coordinate (horizontal pen position)
Y	y coordinate (vertical pen position)
Z	z coordinate (height of pen above the writing plane)
VX	velocity in x direction
VY	velocity in y direction
AX	acceleration in x direction
AY	acceleration in y direction
T	time
DT	time difference
F	pen tip force (pressure)
S	tip switch state (touching/not touching the writing plane)
TX	tilt along the x axis
TY	tilt along the y axis
Az	azimuth angle of the pen (yaw)
El	elevation angle of the pen (pitch)
R	rotation (rotation about the pen axis)

6.2 Pen position channels: X, Y, Z

There are 3 channels defined for recording pen position data in the three-dimensional space. The horizontal and vertical pen position in the writing plane is recorded in the X and Y channels, respectively. The height of the pen above the writing plane is recorded in the Z channel.

The unit of measurement is metres (m). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.3 Pen velocity channels: VX, VY

The horizontal and vertical pen velocity in the writing plane is recorded in the VX and VY channels, respectively.

The unit of measurement is metres per second (m/s). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.4 Pen acceleration channels: AX, AY

The horizontal and vertical pen acceleration in the writing plane is recorded in the AX and AY channels, respectively.

The unit of measurement is metres per square second (m/s^2). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.5 Time channel: T

The T channel is defined for recording time data relative to the first sample.

The unit of measurement is seconds (s). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.6 Time difference channel: DT

The DT channel is defined for recording time data relative to the previous sample.

The unit of measurement is seconds (s). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.7 Pen tip force channel: F

The F channel is defined for recording pen forces (pressure) data.

The unit of measurement is Newton (N). To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

6.8 Tip switch state channel: S

The S channel is defined for recording whether the pen touches the writing plane or not. The data values shall be 0 in case of non-touching and 1 in case of touching.

6.9 Pen orientation channels: TX, TY, Az, El, R

There are 5 channels defined for recording pen orientation data. Implementers may choose to use either azimuth and elevation or tilt angles. The third degree of freedom in orientation is defined as the rotation of the pen about its axis. All 5 pen orientation channels are optional.

The unit of measurement is degree (°).To restore the actual values, the integer values given in the BDB body are to be divided by a scaling value given in the BDB header. By choosing appropriate scaling values, different resolutions can be expressed for several applications.

7 Full format

7.1 Introduction

The signature/sign time series data full format shall be used to achieve interoperability between capture devices used for the purposes of capturing signature/sign data for biometric verification or identification as well as some form of interoperability between biometric systems. A signature/sign time series data block in this format contains descriptive information about the structure and contents of the data block.

7.2 BDB organisation

The organisation of the BDB shall be as follows:

a) mandatory variable-length BDB header containing information about the overall BDB,

b) mandatory BDB body.

Figure 3 depicts a signature/sign time series data block in full format. The solid boxes indicate fields that must be present. The dashed boxes indicate optional fields. The length of each field in bytes is indicated in parentheses at the bottom of the corresponding box. The ellipses indicate that more fields of the same format may follow.

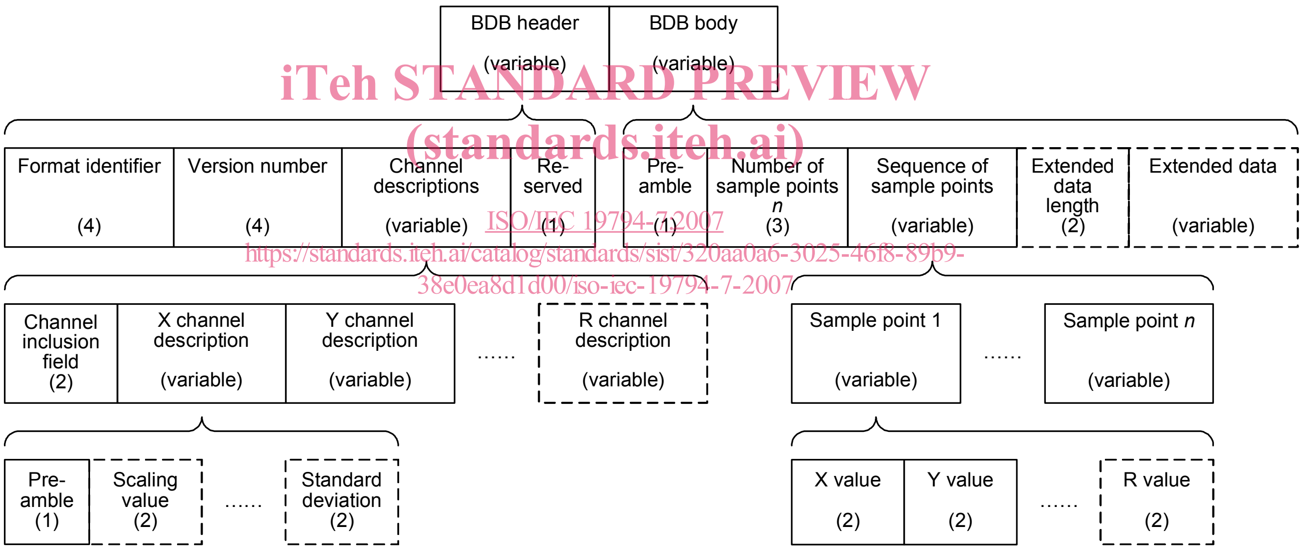

Figure 3 — Signature/sign time series data block in full format

7.3 BDB header

7.3.1 General

The BDB header shall contain information about the overall signature/sign time series data block. The structure of the header shall be as defined in Table 3 and in the following subclauses.