International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

X.1081
Amendment 2
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SERIES X: DATA NETWORKS, OPEN SYSTEM COMMUNICATIONS AND SECURITY

Information and network security – Telebiometrics

The telebiometric multimodal model – A framework for the specification of security and safety aspects of telebiometrics

Amendment 2: Enhancement to support the ISO/IEC 80000-series

Recommendation ITU-T X.1081 (2004) – Amendment 2

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Recommendation ITU-T X.1081

The telebiometric multimodal model – A framework for the specification of security and safety aspects of telebiometrics

Amendment 2

Enhancement to support the ISO/IEC 80000-series

Summary

Amendment 2 to Recommendation ITU-T X.1081 changes references to ISO 31 and IEC 60027 with references to the ISO/IEC 80000-series, which supersedes these two previous standards.

This amendment also replaces the term "biosphere" with "1-m radius biosphere", as "biosphere" is classically a bigger object, around planet Earth (Sol-3).

This amendment also adds a sixth modality: "CALOR".

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T X.1081	2004-04-29	17
1.1	ITU-T X.1081 (2004) Cor. 1	2007-02-13	17
1.2	ITU-T X.1081 (2004) Amend.1	2009-10-29	17
1.3	ITU-T X.1081 (2004) Amend.2	2010-05-29	17

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

CONTENT

Recommendation ITU-T X.1081

The telebiometric multimodal model – A framework for the specification of security and safety aspects of telebiometrics

Amendment 2

Enhancement to support the ISO/IEC 80000-series

1) Summary

Replace the Summary with:

The telebiometric multimodal model has been developed from two main sources that provide the solid foundation for the model. The first is a considerable body of theoretical work on systems, scale propinquity, hierarchies and modalities of interaction between a human being and the environment. This work is referenced in an extensive bibliography. The second is the specification in the [ISO/IEC 80000]-series of quantities and units for all known forms of measurement of the magnitude of physical interactions between a person and its environment.

The telebiometric multimodal model is not limited to consideration of purely physical interactions, but also recognizes behavioural interactions. Such interactions are currently not quantified by standard units. It also recognizes the importance of examining all possible interactions using the insights provided by a number of different fields of academic study.

The model itself consists of a specification of a number of dimensions related to interactions in a set of specified modalities, in both directions, at various intensities, using the complete range of quantities and units specified in the [ISO/IEC 80000]-series. This provides a taxonomy of all possible interactions, which contains more than 1600 combinations of measurement units, modalities and fields of study.

2) Introduction

a)   Replace the fourth paragraph of the Introduction with:

This Recommendation provides a structure for categorizing the interaction of human beings with telecommunication terminals based on scale propinquity, using the International System of Units as it appears in the [ISO/IEC 80000]-series, with standardized descriptors for units of physical phenomena (such as the bel, candela, and becquerel units for sound, light, and the intensity of radio-activity).

b)   Replace the paragraph related to Appendix I in the Introduction with:

Appendix I, "ISO/IEC 80000-series specification of SI units", contains a copy of a table from the [ISO/IEC 80000]-series for convenience, as it is fundamental to the use of the telebiometric multimodal model.

c)   Add at the end of the Introduction:

Appendix V, "Hierarchy theory principles", summarizes the hierarchy theory and is supplemented by the extensive Bibliography that references most of the major papers in this area.

3)   Clause 1.2

Replace clause 1.2 with:

1.2   This telebiometric multimodal model covers all the possibilities for safe and secure multimodal man-machine interactions, and is derived in part from the [ISO/IEC 80000]-series. The cognitive, perceptual and behavioural modalities of a human being are also relevant in the field of telecommunication, and are likely to be used by a biometric sensor or effector in the future, for authentication purposes. These are also covered by this telebiometric multimodal model.

4)   Clause 2

In clause 2, replace [2], [3] and the Note with:

> [ISO/IEC 80000]-series (in force), Quantities and units.
>
> ISO 80000-1 – *Part 1: General.*
>
> ISO 80000-2 – *Part 2: Mathematical signs and symbols to be used in the natural sciences and technology.*
>
> ISO 80000-3 – *Part 3: Space and time.*
>
> ISO 80000-4 – *Part 4: Mechanics.*
>
> ISO 80000-5 – *Part 5: Thermodynamics.*
>
> IEC 80000-6 – *Part 6: Electromagnetism.*
>
> ISO 80000-7 – *Part 7: Light.*
>
> ISO 80000-8 – *Part 8: Acoustics.*
>
> ISO 80000-9 – *Part 9: Physical chemistry and molecular physics.*
>
> ISO 80000-10 – *Part 10: Atomic and nuclear physics.*
>
> ISO 80000-11 – *Part 11: Characteristic numbers.*
>
> ISO 80000-12 – *Part 12: Solid state physics.*
>
> IEC 80000-13 – *Part 13: Information science and technology.*
>
> IEC 80000-14 – *Part 14: Telebiometrics related to human physiology.*

5)   Clause 3.1

Modify the title of clause 3.1 as follows:

3.1   This Recommendation uses the following terms defined in the [ISO/IEC 80000]-series:

6)   Clause 3.2

Replace the following subclauses of clause 3.2 as follows:

3.2.1   base unit: A unit that cannot be expressed in terms of any other base unit, and that is used in the specification of derived units.

NOTE – Examples of base units are metre, kilogram, second, candela, etc. (see the [ISO/IEC 80000]-series).

3.2.4   1-m radius biosphere: A 1-metre radius sphere surrounding a person. When associated with multimodal security and safety measures, it is called the personal privacy sphere, and may have human means to protect its privacy and ensure its safety.

3.2.6   derived unit: A unit that can be defined in terms of one or more base units.

NOTE – Examples of derived units are coulombs, hertz, watts, etc. (see the [ISO/IEC 80000]-series).

3.2.7   interaction modality: A distinct form of interaction across a 1-m radius biosphere, each of which may have sub-categories.

NOTE – Examples of interaction modality across the 1-m radius biosphere are chemo-in (smell), audio-in, audio-out, etc. Music and speech are sub-categories of audio. Gesture and facial expression are sub-categories of video-out.

3.2.10   personal privacy sphere: The 1-m radius biosphere and the individual means to protect its privacy and ensure its safety.

7)   Clause 5

Replace the following subclauses of clause 5 as follows (Figure 1 remains unchanged):

5.1   In the telebiometric multimodal model, a human being is considered in terms of the possible interactions between that human being and its environment across the 1-m radius biosphere (see clause 6). The internal processes of the human being that produce or react to such interactions are not modelled. Thus the 1-m radius biosphere is essentially a black box representing a human being.

NOTE – The term 1-m radius biosphere derives from a drawing by Leonardo da Vinci (see Figure 1) in which he considered the region reachable by outstretched arms and legs as the important privacy area for a human being. The Leonardo drawing is often used in discussions and presentations on the 1-m radius biosphere and the personal privacy sphere.

5.2   When constraints act upon the interactions that can take place across the 1-m radius biosphere, we refer instead to the personal privacy sphere. It is beyond the scope of this Recommendation to categorize these constraints, but it provides a framework within which they can be expressed in a quantitative manner.

5.3   Interactions across the 1-m radius biosphere are classified into 12 modalities (see clause 7), representing interactions arising from the five human senses (seeing, hearing, touching, tasting and smelling), but generalized to all known categories of interactions. The six become 12, because effects of the environment on the human being (e.g., VIDEO-IN – bright lights, or flashing lights) are modelled as distinct modalities from the effect of a human being on the environment or a sensor (e.g., VIDEO-OUT – gestures or facial expressions).

5.5   For the model to be useful, especially for safety discussions, it is important to be able to quantify the interactions in the different modalities. The system of units specified in the [ISO/IEC 80000]-series is incorporated into the telebiometric multimodal model (by reference) in clause 9, for this purpose.

5.6   In almost all cases, the intensity of an interaction, and hence its safety aspects or its usefulness for sensing and identifying the human being, will depend on propinquity – the nearness of the source of an interaction or a sensing device to the 1-m radius biosphere.

8)   Clause 6

a)   Modify the title of clause 6 as follows:

6   The 1-m radius biosphere and the personal privacy sphere

b)   Replace the following subclauses of clause 6 as follows:

6.3   The "Leonardo" diagram shows the concentric spheres of propinquity from the 1-m radius biosphere of a telecommunication systems' user. These concentric spheres are given a code name derived from the names for the power-of-ten multiples listed in the [ISO/IEC 80000]-series (see clause 9) and are considered as sectors to be specified by attributes giving upper and lower thresholds for innocuous (safe) interactions with terminals, as well as in the present ongoing large

security standardization process. The diagram may be fine-tuned for complete satisfaction of security issues, including division into further scalar sectors within the natural electronic system that we currently name the person.

6.4   This self-organizing 1-m radius biosphere is a self-mobile topological sphere (1-m radius), but is subject to scaling (see clause 10), in which dwells a world citizen with a will to use telecommunication services and devices.

6.5   At whatever scale level and in whatever field an observer may focus, a clear and measurable set of upper and lower thresholds can be defined to guarantee the integrity and sustainability of the personal privacy sphere. Twelve subdivisions of the modalities of the personal privacy sphere provide a generic multimodal model (see clause 7) to be used in the lowermost level of the bio field interacting with open telecommunication systems, securely and safely.

6.6   The personal privacy sphere uses the SI unit categorizations (see clause 9) to provide a scale for the model of the PPS. Signals enter and leave the 1-m radius biosphere: the guiding principle is harmlessness in the set of signals going inward from telecommunication devices and full accessibility and ability to be authenticated in the set of signals going outward from the personal privacy sphere. Multimodality (see clause 7) is modelled within a scale hierarchy framework constructed with the relevant units and prefixes of the [ISO/IEC 80000]-series.

9)   **Clause 7**

Replace the following subclauses of clause 7 as follows:

7.1   The interactions that take place across the personal privacy sphere can be categorized into six broad categories based on the human senses and on ionizing radiation that can both be produced by the human body and can damage it (but cannot be directly sensed). These broad categories are called the basic interaction modalities.

7.2   These six basic interaction modalities occur in one of two interaction modality ideal-types:
–   the behavioural modality ideal-type represents interactions from the human being to the environment (six outgoing interaction modalities). The six behavioural modality ideal-types can be used to classify what kind of biometric signals and what type of measurements are going to be opted for by users, according to their cultural and personal preferences;
–   the perceptual modality ideal-type represents interactions from the environment to the human being (six incoming interaction modalities).

7.3   A third interaction modality ideal-type, the conceptual modality ideal-type represents interactions from the human being that presents things that it knows to the environment (see clause 7.8). This information can be transmitted using any of the six basic interaction modalities of the behavioural modality ideal-type.

7.4   The twelve (two-way) perceptual and behavioural modalities are:
–   Video in (I see it);
–   Video out (it sees me);
–   Audio in (I hear it);
–   Audio out (it hears me);
–   Tango in (I touch it);
–   Tango out (it touches me);
–   Chemo in (I smell it or I taste it);
–   Chemo out (it smells me or it tastes me);
–   Radio in (I am irradiated);

–   Radio out (I emit radiation);

–   Calor in (I feel heat);

–   Calor out (I emit heat).

7.5   Voluntarily emitted, biometrically unique signs are thus of six basic interaction modalities in the behavioural modality ideal-types, and are the "out" bullets of clause 7.4. They are multimodal generic descriptors of what we are and what we manifest towards sensing devices such as a charge-coupled device, a microphone, a keyboard, or a Geiger-counter.

7.6   Voluntarily received, biometrically unique signs are of six modalities in the perceptual modality ideal-types, and are the "in" bullets of clause 7.4. They are multimodal generic descriptors of what we are and what we manifest towards emitting devices that simulate these human senses.

7.10.1 The first classification is into the basic interaction modalities of:

–   Video basic interaction modality;

–   Audio basic interaction modality;

–   Tango basic interaction modality;

–   Chemo basic interaction modality;

–   Radio basic interaction modality;

–   Calor basic interaction modality.

10)   Clause 9

Replace the following subclauses of clause 9 as follows:

9.1.2   In the [ISO/IEC 80000]-series, quantities and units (SI units) are specified (see Appendix I), thus providing a top-level taxonomy of measures that can be used in biometrics or in determining safety and security. This is fundamental to the telebiometric multimodal model defined in this Recommendation.

9.1.3   In the [ISO/IEC 80000]-series, a table of names (to be used for various power-of-ten multiples and sub-multiples of the SI units) is also specified. Some of these names are widely known and in widespread use (e.g., micro, kilo, mega). Others are less well known (e.g., zetta and yocto).

NOTE – This table is not included in this Recommendation, but see [ISO 80000-1].

11)   Clause 11

Replace the following subclauses of clause 11 as follows:

11.5   The metric layer specifies the quantities used in measurement, and references the seven SI base units given in the [ISO/IEC 80000]-series, listed in the table in Appendix I.

11.6   This Recommendation makes use of proposals given in [18] to assign a numerical labelling for all elements of the model, recognizing all possible combinations of the six disciplines, of the 12 in/out modalities, and of the seven SI base units.

11.8   The sensory layer (combinations of basic in-out modalities) is represented by an eight dimensional (the radio interaction modality and the calor interaction modality are not present in the model described in [45]) binary vector (eight values that are all either zero or one, one representing the presence of an interaction of that in or out modality).

12) Appendix I

Replace the title and the first paragraph of Appendix I with:

ISO/IEC 80000-series specification of SI units

This table is fundamental to the approach taken by the telebiometric multimodal model, and is copied from the [ISO/IEC 80000]-series for the convenience of users of this Recommendation. The normative specification is in the [ISO/IEC 80000]-series.

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