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Part 14: DNA data

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

Partie 14: Données ADN

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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).

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) or the IEC list of patent declarations received (see https://patents.iec.ch).

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

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*.

This second edition cancels and replaces the first edition (ISO/IEC 19794-14:2013), which has been technically revised. It also incorporates the Amendment ISO/IEC 19794-14:2013/Amd. 1:2016.

The main changes are as follows:

— Clause 6 and Annex A have been technically revised to enable the standardized interchange of DNA profile search results;

— Annex B has been technically revised to reflect the revised data interchange format;

— New Annexes E, F and G have been added.

A list of all parts in the ISO/IEC 19794 series can be found on the ISO and IEC websites.

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

Forensic molecular genetics has evolved from a rapidly developing field with changing technologies into a highly recognized and generally accepted forensic science. Forensic genetics using deoxyribonucleic acid (DNA) profiling comprises a number of important applications. Examples are the investigation of biological stains to obtain evidence for the presence of an alleged perpetrator at a crime scene by comparing the genetic profiles from crime scene samples of human origin, to those available at DNA databases administered by law enforcement agencies. These also include the identification of unknown corpses in the context of both natural death and crime, immigration, paternity testing and disaster victim identification (DVI).

This document is based on DNA data from forensic DNA typing techniques that are commonly used, namely short tandem repeat (STR) profiling and other DNA typing techniques that are standardized by scientific bodies for the purpose of discriminating between individuals.

The purpose of this data interchange format is to enable the exchange of DNA data from different systems, not to impose any constraints on the specific DNA typing system/technique to be used. Where existing DNA data exchange formats have been referenced in the preparation of this document, these formats are listed as references.

Standard profiling systems exploit the non-coding parts of DNA that are referred to as "junk DNA". The coding regions, which are richer in information pertaining to specific genetic traits of an individual, are deliberately avoided in order to maintain the privacy and civil rights of the donor. In addition, national data protection and privacy legislation can impose special security safeguards, such as (but not limited to) encryption of data transfers and/or storage.

This document supports XML (Extensible Markup Language) encoding, to support a spectrum of user requirements. Annex A specifies the schema against which XML-encoded DNA data XML documents are required to validate. It also contains a sample DNA data XML document. Annex B addresses the conformance testing methodology. Annex C lists some examples of DNA analysis kits. Annex D lists the names of DNA loci. Annex E lists interoperability test data for kinship searching in the form of pedigrees. In Annex F, there is a description of interoperability tests at Level 3 (semantics). By means of the sample inclusion and comparison rules listed in Annex G, a target can be identified among a number of candidates.

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Information technology — Biometric data interchange formats —

Part 14: DNA data

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1 Scope

This document specifies a data interchange format for the exchange of deoxyribonucleic acid (DNA) data for person identification or verification technologies that utilize human DNA. Consideration of laboratory procedures is out of scope of this document.

This document provides the ability for DNA profile data to be exchanged and used for comparison (subject to privacy regulations) with DNA profile data produced by any other system that is based on a compatible DNA profiling technique and where the data format conforms to this document.

This document is intended to cover current forensic DNA profiling or typing techniques that are based on short tandem repeats (STRs), including STRs on the X chromosome (X-STRs) the Y chromosome (Y-STRs), as well as mitochondrial DNA. A single DNA profile for a subject can contain data resulting from more than one of these different DNA techniques. This document enables data from multiple DNA techniques to be presented in a single DNA profile for a given subject.

This document has been prepared in light of ongoing efforts to reduce human involvement in the processing (enrolment and comparison) of DNA. In anticipation of the data format requirements for automated DNA techniques, this document describes a format for both processed and raw (electrophoretic) DNA data. A normative XML schema definition (XSD) is provided in Clause A.1 for the syntax of DNA data XML documents. In Clause A.2, there is a sample DNA data XML document.

This document is not intended for any other purposes than exchange of DNA for biometric verification and identification of individuals. In particular, it is not intended for the exchange of medical and other health-related information.

This document also specifies elements of conformance testing methodology, test assertions and test procedures as applicable to this document. It establishes test assertions pertaining to the structure of the DNA data format (Type A Level 1 as defined in ISO/IEC 19794-1:2011/Amd. 1:2013) and test assertions pertaining to internal consistency of the values contained within each field (Type A,ind Level 2 as defined in ISO/IEC 19794-1:2011/Amd. 1:2013). This document also specifies test assertions pertaining to the content of DNA data XML documents (Level 3 as defined in ISO/IEC 19794-1:2011/Amd. 1:2013). The successful completion of Level 1 and Level 2 is a prerequisite for carrying out the tests at Level 3.

The conformance testing methodology specified in this document does not establish:

— tests of other characteristics of biometric products or other types of testing of biometric products (e.g. acceptance, performance, robustness, security);

— tests of systems not claimed to conform to the requirements of this document.

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.

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

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO 3166-2, *Codes for the representation of names of countries and their subdivisions — Part 2: Country subdivision code*

ISO/IEC 19794-1:2011, *Information technology — Biometric data interchange formats — Part 1: Framework*

ISO/IEC 19794-1:2011/Amd. 1:2013, *Information technology — Biometric data interchange formats — Part 1: Framework — Amendment 1: Conformance testing methodology*

ISO/IEC 19794-1:2011/Amd. 2:2015, *Information technology — Biometric data interchange formats — Part 1: Framework — Amendment 2: Framework for XML encoding*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37 and ISO/IEC 19794-1 and the following apply.

ISO and IEC maintain terminology 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 Terms related to basic DNA concepts

3.1.1
deoxyribonucleic acid
DNA
complex molecule found in virtually every cell in the body that carries the genetic information from one generation to another

3.1.2
chromosome
structure within the cell that bears the genetic material as a linear strand of DNA

Note 1 to entry: In humans, each cell normally contains 23 pairs of chromosomes, for a total of 46. 22 of these pairs, called autosomes, look the same in both males and females. The 23rd pair, the sex chromosomes, differs between males and females. Sex chromosomes in males are different in size and are called X and Y. Sex chromosones in females are identical in size and both are called X.

3.1.3
Y chromosome
organized structure of the DNA molecule containing male-specific DNA only

3.1.4
non-coding part of DNA
chromosome regions not genetically expressed, i.e. not known to provide for any functional properties of an organism

3.1.5
locus
unique physical location on the DNA molecule

Note 1 to entry: The plural of locus is loci.

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