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Zdravstvena informatika - Časovni standardi za vprašanja, specifična za zdravstveno varstvo (ISO/DIS 12381:2017)

Health informatics - Time standards for healthcare specific problems (ISO/DIS 12381:2017)

Informatique de santé - Représentation du temps dans le domaine de la santé (ISO/DIS 12381:2017)

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35.240.80	Uporabniške rešitve IT v zdravstveni tehniki	IT applications in health care technology
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Health informatics — Time standards for healthcare specific problems

Informatique de santé — Représentation du temps dans le domaine de la santé

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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).

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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 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 the following URL: www.iso.org/iso/foreword.html.

"This document was prepared by the European Committee for Standardization (CEN) (as EN 12381:2005) and was adopted, without modification other than those given below by Technical Committee ISO/TC 215 Health Informatics.

Introduction

Time is an important variable in healthcare, and standards are needed about how to represent information with explicit references to time. This document is a first contribution to this harmonization process, focusing on “representation” and “explicit reference”.

Indeed, a system for Time-Standards must have as a minimum requirement the capacity to order temporal facts (*situations, events, episodes*) in three major ways, independent of any specific ontology of time itself:

- by relating situations to a calendar;
- by relating situations to “reference” situations;
- by relating events together in “before- and after-” chains.

The main reason for this threefold organization is that our everyday temporal discourse contains a variety of expressions that only with a certain artificiality can be regimented into a uniform style of analysis.

The purpose of this document is to enhance, in a perspective of machine-machine and man-machine communication, the generation of statements that are guaranteed to be understood unambiguously with respect to the time-related expressions that are embedded within them.

The purpose of this document is not to develop a full-blown temporal logic, but a standardized way of representing time-related expressions, such that all kinds of questions about the temporal organization of *situations* can be answered on the basis of the information available. Nor is it the intention of the framework presented here to provide a means to interpret the information in its original format. Interpretation of the source information is the task of the provider of information itself. The framework presented in this document allows information providers to express their time-related information in such a way that the intended meaning can be unambiguously understood by a receiver. 9c/sist-en-iso-12381-2019

This of course requires the use of a “restricted”, regimented model or language, allowing the disambiguation of many time-related expressions uttered in natural language. The model (language) presented in this document is restricted enough to allow such disambiguation for time-related expressions in “traditional” medical language, but is not expressive enough to account for all time-related linguistic phenomena that can be encountered in natural language.

This document provides representational tools for “explicit” time-related information. It does not allow (nor encourage) the ad hoc interpretation of implicit temporal information. In an expression such as “diabetes since childhood”, “since childhood” is an explicit temporal reference for the diabetes, but the implicit information what “childhood” might mean (e.g. starting at the age of 2 years ?), is not addressed. However, the framework presented in this document has enough expressive power to allow a specific provider of information to state explicitly what his understanding is of “childhood”.

This document describes some conformance characteristics by means of which developers of health care information systems can label specific modules of their systems as to the degree they are compliant with the document. Although the framework itself does not deal with temporal reasoning, the conformance characteristics can be used to evaluate to what level temporal reasoning is possible with the information collected in a given system.

Health informatics — Time standards for healthcare specific problems

1 Scope

This document specifies a set of representational primitives and semantic relations required for an unambiguous representation of explicit time-related expressions in health informatics. This document does not introduce or force a specific ontology of time, nor does it force the use of a fixed representation scheme for such an ontology. Rather this document provides a set of principles for syntactic and semantic representation that allow the comparability of specific ontologies on time, and the exchange of time-related information that is expressed explicitly.

This document is applicable to:

- 1) developers of medical information systems in which the need is felt to have explicit time-related concepts for internal organization (e.g. temporal data bases, temporal reasoning systems);
- 2) information modellers or knowledge engineers building models for the systems mentioned in (1);
- 3) experts involved in the development of semantic standards on precise subdomains in health care where time-related information need to be covered, (e.g. in the study of Pathochronology, i.e. the discipline dealing with the time course of specific diseases);
- 4) developers of interchange formats for messages in which time-related information is embedded.

This document is not intended to be used directly for:

- 1) representing what is true in time;
- 2) reasoning about time;
- 3) representation of metrological time (which is covered in other standards).

1 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 8601-1, Data elements and interchange formats -- Information interchange -- Representation of dates and times -- Part 1: Basic rules (DIS finished and soon to be published)

ISO 8601-2, Data elements and interchange formats -- Information interchange -- Representation of dates and times -- Part 2: Extensions

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ISO 80000-3:2006, *Quantities and units -- Part 3: Space and time*

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

situation

phenomenon occurring (or having the potential to occur) at or over a time in a given world context

NOTE 1 situations cover phenomena which may occur in past, present or future time

NOTE 2 This document applies both to the representation of actual phenomena occurring in the real world (e.g. registrations in medical records), as to the description of concepts (eg medical knowledge bases).

EXAMPLE “The patient suffered from pain which occurred over night”, “pain occurring over night”,

3.2

time interval

portion of time of which the duration in a given context is considered to be significant and relevant

3.3

time point

portion of time of which the duration in a given context is considered to be insignificant or irrelevant

NOTE This document does not specify any regulations on what entities should occupy time points, and what entities should occupy time intervals. Decisions of this kind are explicitly to be made by the user of this document (Chapter 5). As a consequence, temporal references such as “Friday the 13th” may refer to a time point or a time interval, depending on the context.

3.4

episode

situation considered to occupy a time interval

NOTE 1 Whether a situation is to be considered an episode or an event, is a decision taken by the provider of the information, based on its perception of the phenomenon in a given context.

NOTE 2 It is possible to further subcategorize episodes into “states”, “culminations”, “processes”, “actions”, or other conceptual entities that can be defined using additional conceptual aspects describing particular properties of each of the various episodes. However there is no need to do so within the scope of this document.

EXAMPLE a patient’s stay in the hospital, the “episode of care” related to a medical problem

3.5

event

situation considered to occur at a time point

3.6

predication

representation of a situation in a language

EXAMPLE “The removal of Mr Jones’ appendix on 21 July 1994, at 9 o’clock in the morning.”

3.7

temporal reference

component of a predication representing information related to time

EXAMPLE “on 1994-07-21”, “at 9 o’clock”, “on 1994-07-21 at 9 o’clock”

3.8

propositional clause

component of a predication to which temporal references implicitly or explicitly refer

EXAMPLE in the expression “taking syrup three times a day for 2 weeks”, the propositional clause is “taking syrup”. To it are attached the temporal references “three times a day” and “for 2 weeks”.

NOTE 1 The term propositional clause is used here in a broader sense than in formal logic where a proposition denotes a statement on what is true in a given world. In the context of this document, propositional clauses do not impose a truth-value on the phenomena that are represented.

NOTE 2 This document allows for a recursive representation of information related to time (see Informative Annex A for a formal description). In expressions such as “severe headache lasting for half an hour after each meal”, both “severe headache” and “severe headache lasting for half an hour” are propositional clauses, each at a different level in the recursion. A propositional clause that is at the deepest level of recursion, i.e. to which no temporal references are attached, is called propositional clause zero. In this example: “severe headache” is propositional clause zero.

3.9

ambiguous temporal reference

temporal reference whose temporal link with the propositional clause of the predication is ambiguous, or which does not unambiguously refer to a unique, identifiable time point or time interval on a calendar.

NOTE 1 In the predication “He died on Monday”, “on Monday” is a time point expression. A person can only die once. In the predication “He operates on Monday”, “on Monday” may be considered a frequency expression. However, in the context of this document, the meaning of a propositional clause is not known, and as a consequence, “on Monday” cannot unambiguously be identified as a time point expression or a frequency expression, unless the provider of the information is explicit about this. Hence, it is an ambiguous temporal reference.

NOTE 2 Ambiguity is in this context related to “lacking knowledge” on the exact interpretation of a predication, i.e. the intended meaning by the provider of the information is not known. Phenomena that are “planned” for the future do not necessarily introduce ambiguity. In an expression such as “He will probably operate next Monday”, the temporal reference “next Monday” is not ambiguous.

NOTE 3 From the definition it follows that it is specifically the nature of the temporal link that makes a temporal reference ambiguous or not, and not the fact whether the temporal reference is explicitly categorised as being a time point or a time interval. In the expression “He will probably operate next Monday”, “Monday” might indeed as well be a time point as a time interval.

3.10

temporal link

component of a temporal reference capturing the semantic relation in a predication between the propositional clause and the temporal expression

NOTE In natural language, the temporal link may be grammaticalized with prepositions or other constructs, such as in “on Monday”. Often, the link is not expressed explicitly, as in “tomorrow”. In formal representations compliant to this document, the temporal link needs to be represented explicitly, or should be unambiguously derivable from a data model.