SLOVENSKI STANDARD
SIST ISO 24617-7:2018

01-september-2018

Upravljanje z jezikovnimi viri - Ogrodje za semantično označevanje (SemAF) - 7. del: Prostorske informacije (ISOspace)

Language resource management -- Semantic annotation framework -- Part 7: Spatial information (ISOspace)

Gestion des ressources linguistiques -- Cadre d'annotation sémantique -- Partie 7: Information spatiale (ISOspace)

Ta slovenski standard je istoveten z: **ISO 24617-7:2014**

ICS:

01.020	Terminologija (načela in koordinacija)	Terminology (principles and coordination)
35.240.30	Uporabniške rešitve IT v informatiki, dokumentiranju in založništvu	IT applications in information, documentation and publishing

SIST ISO 24617-7:2018 **en,fr,de**

INTERNATIONAL STANDARD

ISO 24617-7

First edition
2014-12-15

Language resource management — Semantic annotation framework —

Part 7: Spatial information (ISOspace)

Gestion des ressources linguistiques — Cadre d'annotation sémantique —

Partie 7: Information spatiale (ISOspace)

Reference number
ISO 24617-7:2014(E)

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

Published in Switzerland

Contents

Page

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO 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 WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 37, *Terminology and other language and content resources*, Subcommittee SC 4, *Language resource management*.

ISO 24617 consists of the following parts, under the general title *Language resource management — Semantic annotation framework (semAF)*:

— *Part 1: Time and events (SemAF-Time, ISO-TimeML)*

— *Part 2: Dialogue acts*

— *Part 4: Semantic roles (SemAF-SR)*

— *Part 5: Discourse structures (SemAF-DS)*

— *Part 6: Principles of semantic annotation (SemAF-Basics)*

— *Part 7: Spatial information (ISOspace)*

— *Part 8: Semantic relations in discourse (SemAF-DRel)*

Introduction

The automatic recognition of spatial information in natural language is currently attracting considerable attention in the fields of computational linguistics and artificial intelligence. The development of algorithms that exhibit "spatial awareness" promises to add needed functionality to NLP systems, from named entity recognition to question-answering and text-based inference. However, in order for such systems to reason spatially, they require the enrichment of textual data with the annotation of spatial information in language. This involves a large range of linguistic constructions, including spatially anchoring events, descriptions of objects in motion, viewer-relative descriptions of scenes, absolute spatial descriptions of locations, and many other constructions.

This part of ISO 24617 was developed in collaboration with the ISOspace working group at Brandeis University with the aim to provide an International Standard for the representation of spatial information relating to locations, motions and non-motion events in language.

NOTE The ISOspace Working Group is headed by James Pustejovsky, jampesp@cs.brandeis.edu, Brandeis University, Waltham, MA, U.S.A.

This part of ISO 24617 provides normative specifications and guidelines not only for spatial information, but also for information content in motion and various other types of event in language.

The main parts of this part of ISO 24617 consist of the following:

a) Scope;

b) Normative references;

c) Terms and definitions;

d) List of tags or names of elements;

e) Overview;

f) Motivation and requirements;

g) Specification of the ISOspace annotation structure;

h) Representation of ISOspace-conformant annotations.

Clause 8 introduces an XML-based concrete syntax for representing spatial-related or motion-related annotations based on the annotation structure of ISOspace that is presented in Clause 7 with a UML-based metamodel.

A formal semantics for ISOspace will be provided as part of a future new work item within the semantic annotation framework. This will be coordinated with the temporal semantics and specification of ISO 24617-1 (SemAF-Time, ISO-TimeML), thereby producing a rich semantics that will be directly useable by practitioners in computational linguistics and other communities (see Clause 6). The multilingual extension of ISOspace will also be treated in a separate part of the ISO 24617- series in the near future.

NOTE Although the schema and DTD are not part of the present document as normative annexes, they will both be found in a webpage relating to the ISOspace specification.

Normative Annex A is an integral part of ISO 24617 and provides core annotation guidelines.

Language resource management — Semantic annotation framework —

Part 7: Spatial information (ISOspace)

1 Scope

This part of ISO 24617 provides a framework for encoding a broad range not only of spatial information, but also of spatiotemporal information relating to motion as expressed in natural language texts. This part of ISO 24617 includes references to locations, general spatial entities, spatial relations (involving topological, orientational, and metric values), dimensional information, motion events, and paths.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 24617-1, *Language resource management — Semantic annotation framework (SemAF) — Part 1: Time and events (SemAF-Time, ISO-TimeML)*

ISO/IEC 14977, *Information technology — Syntactic metalanguage — Extended BNF*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 24617-1 and the following apply.

3.1
document creation location
dcl
unique place or set of places associated with a document that represents the *location* (3.7) in which the document was created

Note 1 to entry: Some collaboratively written documents, such as GoogleDoc[1)] documents and chat logs, might refer not only to a single location but also to a set of locations spread out across the world. Besides, for example, the creation place of the Hebrew bible or the creation place of each of the books in it is uncertain. The attribute @ dcl will, therefore, have the value "false" which is to be understood to mean "unspecified", while the value "true" is to be understood to mean "specified".

3.2
event
eventuality
something that can be said to obtain or hold true, to happen or to occur

Note 1 to entry: This is a very broad notion of event, also known in the literature as "eventuality" and includes all kinds of actions, states, processes, etc. It is not to be confused with the narrower notion of event (as opposed to the notion of "state") as something that happens at a certain point in time (e.g. the clock striking two or waking up) or during a short period of time (e.g. laughing). In ISO-TimeML, the term *event* is used in a broader sense and is equivalent to the term *eventuality*.

1) GoogleDoc is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these products.

[SOURCE: ISO 24617-1:2012]

3.3
event-path
path (3.13) or trajectory followed by a *spatial entity* (3.17) coincident with a *motion-event* (3.9)

3.4
extent
textual segment which is string of character segments in text to be annotated

EXAMPLE Tokens, words, and non-contiguous phrases (e.g. a complex verb like “look ... up”) are extents.

3.5
figure
spatial entity (3.17) that is considered to be the focal object, which is related to some reference object

3.6
ground
spatial entity (3.17) that acts as reference for a *figure* (3.5)

3.7
location
point or finite area that is positioned within a *space* (3.16)

3.8
measure
magnitude of a spatial dimension or relation

EXAMPLE Distance is a spatial relation.

3.9
motion
motion-event
action or process involving the translocation of a spatial object, transformation of some spatial property of an object, or change in the conformation of an object

Note 1 to entry: A *motion* (3.9) in ISOspace is a particular kind of *event* (3.2).

3.10
motion-signal
adjunct
motion-adjunct
path (3.13) of motion and/or manner of motion information contributed by a particle or by a prepositional, adverbial phrase, in conjunction with a *motion* (3.9)-related text

Note 1 to entry: This terminology is specific to ISOspace and is different from the general term “adjunct” which is used to describe optional syntactic elements.

3.11
non-cosuming tag
tag (3.19) that has no associated *extent* (3.4)

Note 1 to entry: The *extent* (3.4) of a non-consuming tag is a “null” string.

EXAMPLE In *John ate an apple but Mary a pear*, there are at least two ways of marking up the non-consuming <event> tag:

a) John ate_{e1} an apple, but Mary $\emptyset_{e2}$ a pear;

b) 1) <event xml:id=”e1” markable=”ate”/>

2) <event xml:id=”e2” markable=” “/> (non-consuming <event> tag)

3.12
orientation
orientation(al) relation
relation between a *figure* (3.5) and a *ground* (3.6) that expresses the spatial disposition or direction of a spatial object within a frame of reference

3.13
path
location (3.7) that consists of a series of *locations* (3.7)

Note 1 to entry: A spatial object *path* is a location where the focus is on the potential for traversal or which functions as a boundary. This includes common nouns like *road*, *coastline,* and *river* and proper names like *Route 66* and *Kangamangus Highway*. Some nouns, such as *valley*, can be ambiguous. It can be understood as a path in *we walked down the valley* or as a *place* (3.14) in *we live in the valley*.

Note 2 to entry: A path might be represented as an undirected graph whose vertices are *locations* (3.7) and whose edges signify continuity; that is to say, a path has no inherent directionality.

3.14
place
geographic or administrative entity that is situated at a *location* (3.7)

3.15
region
connected, non-empty point-set defined by a domain and its boundary points

Note 1 to entry: The term "region" as defined here does not refer to a political or administrative region such as "the Canary Islands" or "Hong Kong, SAR", where SAR is the acronym of "Special Administrative Region".

3.16
space
dimensional extent in which objects and *events* (3.2) have a relative position and direction

3.17
spatial entity
object that is situated at a unique *location* (3.7) for some period of time, and typically has the potential to undergo translocation

Note 1 to entry: A spatial entity can also be understood as an object that participates in a spatial relation. In *John is sitting in a car*, both *John* and *car* could be understood as *spatial entities* or as being the *figure* (3.5) and the *ground* (3.6), respectively, of the sitting-in situation.

3.18
spatial signal
segment or series of segments of a text that rebounds to *orientational* (3.12) or *topological relations* (3.20)

3.19
tag
element name
name associated with textual segments for annotation or for a relation between these segments

Note 1 to entry: The following are two kinds of tag for annotation:

a) extent tag, which is associated with textual segments referring to basic entities or signals;

b) link tag, for representing spatial relations.

3.20
topological relation
relation that expresses the connectedness or continuity of *spaces* (3.16)

4 List of tags

4.1 General

The tag in angled brackets stands for the name of an XML element. See 8.2.

4.2 Extent tags: Basic entities and signals

4.2.1

measure
<measure>

extent tag representing some *measure* (3.8)

4.2.2

motion
<motion>

extent tag representing a *motion* (3.9)

4.2.3

motionSignal
<motionSignal>

extent tag representing a *motion-signal* (3.10)

4.2.4

non-motion event
<event>

extent tag representing a *non-motion event* (3.9)

4.2.5

path
<path>

extent tag that represents a *path* (3.13)

4.2.6

place
<place>

extent tag that represents a *place* (3.14)

4.2.7

spatialEntity
<spatialEntity>

extent tag that represents a *spatial entity* (3.17)

4.2.8

spatialSignal
<spatialSignal>

extent tag that represents a *spatial signal* (3.18)

4.3 Link tags

4.3.1

mLink
<mLink>

linking tag that represents some *measure* (3.8)

4.3.2

moveLink
<moveLink>

linking tag that represents a relation between a *motion* (3.9) and participant *spatial entities* (3.17)

4.3.3

oLink
<oLink>

linking tag that represents an *orientation relation* (3.12) between a *figure* (3.5) and a *ground* (3.6)

4.3.4

qsLink
<qsLink>

linking tag that represents a *topological relation* (3.20)

NOTE The tag qsLink or <qsLink> stands for a qualitative spatial link.

4.4 Root element

4.4.1

isoSpace
<isoSpace>

root element in which all ISOspace tags are embedded

NOTE In ISOspace annotations, all of the extent and link tags listed above are embedded in the tag <isoSpace>.

5 Overview

Human languages impose diverse linguistic constructions for expressing concepts of space, of spatially-anchored events, and of spatial configurations that relate in complex ways to the situations in which they are used. One area that deserves further development regarding the connection between natural language and formal representations of space is the automatic enrichment of textual data with spatial annotations. There is a growing demand for such annotated data, particularly in the context of the semantic web. Moreover, textual data routinely make reference to objects moving through space over time. Integrating such information derived from textual sources into a geosensor data system can enhance the overall spatiotemporal representation in changing and evolving situations, such as when tracking objects through space with limited image data. It follows that verbal subjective descriptions of spatial relations need to be translated into metrically meaningful positional information. A central research question currently hindering progress in interpreting textual data is the lack of a clear separation of the information that can be derived directly from linguistic interpretation and further information that requires contextual interpretation. In order to avoid building incorrect deductions into the annotations themselves, mark-up schemes should avoid over-annotating the text. Solutions to the language-space mapping problem and its grounding in geospatial data are urgently required for this purpose.

There are many applications and tasks that would benefit from a robust spatial mark-up language, such as ISOspace. These applications and tasks include the following:

a) creating a visualization of objects from a verbal description of a scene;

b) identifying the spatial relations associated with a sequence of processes and events from a news article;

c) determining an object location or tracking a moving object from a verbal description;

d) translating viewer-centric verbal descriptions into other relative descriptions or absolute coordinate descriptions;

e) constructing a route given a route description;

f) constructing a spatial model of an interior or exterior space given a verbal description;

g) integrating spatial descriptions with information from other media.

The goal of ISOspace is not to provide a formalism that fully represents the complexity of spatial language but rather to capture these complex constructions in text in order to provide an inventory of how spatial information is presented in natural language. For example, many texts have no explicit frame of spatio-temporal reference, thus, making it impossible to annotate such an unspecified frame of reference. The interpretation of spatial prepositions, such as *on* in *a book on the desk* vs *a picture on the wall* requires a handbook of its own dealing with different senses or uses of spatial prepositions beyond a set of annotation guidelines. Any detailed classification of motion verbs in English alone is again beyond the scope of this International Standard.

All of the examples in the current version of part of ISO 24617 are from English datasets. The specification language proposed in this International Standard can be seen as a version of ISOspace for English only and its applicability to other languages is still pending. A multilingual extension of ISOspace is necessary if the document is to be verified, but this is expected to immediately follow preliminary rigorous work on establishing the first edition of this part of ISO 24617 as an International Standard for spatial and motion-related annotation.

6 Motivation and requirements

This International Standard aims to formulate the requirements for spatiotemporal annotation standards and to develop the ISOspace standard to meet these requirements. It assumes ISO 24612 and builds on previous work, including ISO 24617-1 and other spatial representations and calculi.

Natural language abounds with descriptions of motion. Our experience of our own motion, together with our perception of motion in the world, have given human languages substantial means to verbally express many different aspects of movement, including its temporal circumstances, spatial trajectory and manner. In every language on earth, verbalizations of motion can specify changes in the spatial position of an object over time. In addition to when and where the motion takes place, languages additionally characterize how the motion takes place (e.g., its path, its manner, and how it was caused). In particular, the path of motion involves conceptualizations of the various spatial relationships that an object can have to other objects in the space in which it moves. An understanding of such spatial information in natural language is necessary for many computational linguistics and artificial intelligence applications.

Any specification language for spatial information in language will need to support the following computational tasks:

— identification of the appropriate topological configuration between two regions or objects (e.g. containment, identity, disjointedness, connectedness, overlap, and closure over these relations, when possible);

— identification of directional and orientational relations between objects and regions, including the distinction between frames of reference;

— identification of metric properties of objects and metric values between regions and objects, when possible (e.g. distance, height and width);

— identification of the motion of objects through time and a characterization of the nature of this movement;

— the provision of clear interoperable interfaces to existing representations and geo-databases (e.g. GeoNames, ArcGIS, and Google Earth[2)]).

NOTE 1 Texts are often completely unspecified for frames of reference (texts are, so to speak, “not situated”) and it, therefore, appears that the annotation of a frame of reference cannot be provided for many texts.

2) GeoNames, ArcGIS, and Google Earth are examples of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these products.

NOTE 2 Measure expressions, such as *20 miles*, have two attributes, numeric @value "20" and @unit "miles", but expressions like *near* and *far* have no unit specified. The annotation scheme proposed in this International Standard can only state that they are measure-related expressions only with its attribute @value specified, say with "near" or "far". As will be seen, many of the annotation cases are left underspecified.

7 Specification of ISOspace for spatial annotation

7.1 Overview: annotation vs. representation

As with other areas of work on semantic annotation carried by the ISO Working Group (ISO/TC 37/SC 4/WG 2), ISOspace draws a fundamental distinction between the concepts of annotation and representation; ISO 24612 does likewise. The term "annotation" is used to refer to the process of adding information to segments of language data or to refer to that information itself. This notion is independent of the format in which this information is represented. The term "representation" is used to refer to the format in which an annotation is rendered (for instance, in XML) independent of its content. According to ISO 24612, annotations are the proper level of standardization, not representations. This part of ISO 24617 therefore, defines a specification language for annotating documents with information about spatial entities and spatial relations at the level of annotations and then for representing these annotations in a specific way, either with XML or with a predicate-logic-like format, as used in Annex A. This language is called "ISOspace".

However, the current version of ISOspace does not offer a formal specification of its annotation structure with an abstract syntax and a formal semantics. This task will be taken up in a proposed work item, ISO PWI 24617-9, aims to achieve a full development of spatial semantics. Instead, ISOspace will simply specify a concrete XML-based syntax in 8.2 and a set of core annotation guidelines in Annex A.

7.2 Abstract syntax for the ISOspace annotation structure

An abstract syntax provides a theoretical basis for deriving various versions of a concrete syntax. In this part of ISO 24617, the abstract syntax of ISOspace is schematically represented by the UML-based metamodel (Figure 1), which specifies an annotation structure for spatial information consisting of two substructures: an entity structure and a link structure. The entity structure of ISOspace consists of basic spatial entities that are anchored to textual fragments called "markables" or "extents"; the link structure relates these spatial entities and assigns a specific relation-type to each relation.