
**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)

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Language resource management — Semantic annotation framework —

Part 7: Spatial information (ISOspace)

*Gestion des ressources linguistiques — Cadre d'annotation
sémantique —*

Partie 7: Information spatiale (ISOspace)



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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).

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 GoogleDoc¹⁾ 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.

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[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-consuming 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)

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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;