INTERNATIONAL STANDARD

ISO 19146

First edition
2010-11-01

Geographic information — Cross-domain vocabularies

Information géographique — Vocabulaires interdomaines

Reference number
ISO 19146:2010(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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 19146 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Introduction

A common language is an essential prerequisite to effective communication. However, a simple knowledge of a language's vocabulary is insufficient to ensure communication integrity. A word can have several meanings depending on the context in which it is used. Similarly, a concept can be referenced by several words, each communicating a different connotation or level of emphasis.

The issues associated with the correct use of language extend far beyond day-to-day communication. Every field of endeavour, from engineering to cookery, has its own technical language and vocabulary. In order to participate in discussions on a subject, it is necessary to understand both the subject's terminology and the context in which it is to be used. The imprecise use of technical or professional language (for example, by using two terms interchangeably when, in fact, they have distinctly different connotations) gives rise to the same traps and dangers associated with the inappropriate use of a spoken language.

This International Standard establishes a methodology for cross-mapping technical vocabularies that have been adopted by industry-focussed geospatial communities (for example, geospatial communities supporting the transport or utilities industries). The processes relate to the unique identification of concepts and ensuring the existence of monosemic relations between concepts and designations. The methodology aims to ensure the consistent use of cross-mapping processes when associating disparate geospatial vocabularies and identifying synonyms.

It is not the objective of this International Standard to define an ontology or taxonomy for geographic information and geomatics. Its purpose is to provide rules for ensuring consistency when implementing cross-mapping processes. The rules, however, have been developed with regard to taxonomic and ontological concepts and with a view to enabling semantic interoperability. Their application to vocabulary cross-mapping, therefore, can be expected to provide input to any future ontology/taxonomy initiatives.

This International Standard applies the provisions of ISO 19135 to the registration of geospatial concepts. An online register of cross-mapped terminology entries, conforming to the requirements of ISO 19135, is associated with this International Standard. Administrative arrangements for the population and maintenance of the online register are beyond the scope of this International Standard. However, the provisions of ISO 19135 relating to the maintenance of registers apply.

This International Standard adopts terms and concepts that are taken from UML and terminology theory and practice. A cross-mapping between the two terminologies can be found in ISO/TR 24156:2008.

Geographic information — Cross-domain vocabularies

1 Scope

This International Standard defines a methodology for cross-mapping technical vocabularies that have been adopted by industry-specific geospatial communities. It also specifies an implementation of ISO 19135 for the registration of geographic information concepts for the purpose of integrating multiple domain-based vocabularies.

Methodologies for the development of ontologies and taxonomies that relate to geographic information and geomatics are not within the scope of this International Standard.

2 Conformance

Any vocabulary cross-mapping that claims conformance to this International Standard shall satisfy all of the conditions specified in the following abstract test suites:

a) Annex A of this International Standard, and

b) ISO 19135:2005, A.1 and A.2 for conformance to ISO 19135.

A vocabulary cross-mapping register established by ISO/TC 211 shall, in addition, satisfy all of the conditions specified in the ISO 19135 abstract test suite for registers established by ISO/TC 211 as specified in ISO 19135:2005, A.3.

3 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/TS 19103:2005, *Geographic information — Conceptual schema language*

ISO/TS 19104:2008, *Geographic information — Terminology*

ISO 19115:2003, *Geographic information — Metadata*

ISO 19135:2005, *Geographic information — Procedures for item registration*

4 Terms and definitions

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

4.1
associative concept system
concept system based on associative, i.e. thematic or pragmatic, relations

NOTE 1 Adapted from ISO 12620:1999.

NOTE 2 An associative relation exists between the concepts “education” and “teaching”, “baking” and “oven”.

4.2
characteristic
abstraction of a property of an object or of a set of objects

[ISO 1087-1:2000, definition 3.2.4]

NOTE Characteristics are used for describing **concepts**.

4.3
concept
unit of knowledge created by a unique combination of **characteristics**

[ISO 1087-1:2000, definition 3.2.1]

NOTE Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.

4.4
concept system
system of concepts
set of **concepts** structured according to the relations among them

[ISO 1087-1:2000, definition 3.2.11]

4.5
cross-mapping
comparison of **terminology entries** from different **domains** to determine their semantic equivalence

4.6
definition
representation of a **concept** by a descriptive statement which serves to differentiate it from related concepts

[ISO 1087-1:2000, definition 3.3.1]

4.7
delimiting characteristic
essential characteristic used for distinguishing a **concept** from related concepts

[ISO 1087-1:2000, definition 3.2.7]

NOTE The delimiting characteristic *support for the back* may be used for distinguishing the concepts “stool” and “chair”.

4.8
designation
designator
representation of a **concept** by a sign which denotes it

[ISO 1087-1:2000, definition 3.4.1]

NOTE In terminology work three types of designations are distinguished: symbols, appellations and **terms**.

4.9
domain
⟨general vocabulary⟩ distinct area of human knowledge to which a terminological record is assigned

NOTE 1 Adapted from ISO 12620:1999.

NOTE 2 Within a database or other terminology collection, a set of domains will generally be defined. More than one domain can be associated with a given **concept**.

4.10
domain concept
concept that is associated with a specific **domain**

NOTE A concept may be associated with several domains and separately identified as a domain concept in relation to each.

4.11
essential characteristic
characteristic which is indispensable to understanding a **concept**

[ISO 1087-1:2000, definition 3.2.6]

4.12
general concept
concept which corresponds to two or more objects which form a group by reason of common properties

[ISO 1087-1:2000, definition 3.2.3]

NOTE Examples of general concepts are “planet”, “tower”.

4.13
generic concept
concept in a **generic relation** having the narrower **intension**

[ISO 1087-1:2000, definition 3.2.15]

4.14
generic concept system
concept system in which concepts that belong to the category of the narrower **concept** are part of the extension of the broader concept

NOTE Adapted from ISO 12620:1999.

4.15
generic relation
genus-species relation
relation between two **concepts** where the **intension** of one of the concepts includes that of the other concept and at least one additional **delimiting characteristic**

[ISO 1087-1:2000, definition 3.2.21]

NOTE A generic relation exists between the concepts “word” and “pronoun”, “vehicle” and “car”, “person” and “child”.

4.16
homonymy
relation between **designations** and **concepts** in a given language in which one designation represents two or more unrelated concepts

[ISO 1087-1:2000, definition 3.4.25]

NOTE 1 An example of homonymy is:

bark

1 “sound made by a dog”

2 “outside covering of the stem of woody plants”

3 “sailing vessel”

NOTE 2 The designations in the relation of homonymy are called homonyms.

4.17
intension
set of **characteristics** which makes up the **concept**

[ISO 1087-1:2000, definition 3.2.9]

4.18
monosemy
relation between **designations** and **concepts** in a given language in which one designation only relates to one concept

[ISO 1087-1:2000, definition 3.4.23]

NOTE The designations in the relation of monosemy are called monosemes.

4.19
partitive relation
part-whole relation
relation between two **concepts** where one of the concepts constitutes the whole and the other concept a part of that whole

[ISO 1087-1:2000, definition 3.2.22]

NOTE A partitive relation exists between the concepts “week” and “day”, “molecule” and “atom”.

4.20
polysemy
relation between **designations** and **concepts** in a given language in which one designation represents two or more concepts sharing certain **characteristics**

[ISO 1087-1:2000, definition 3.4.24]

NOTE 1 An example of polysemy is:

bridge

1 “structure to carry traffic over a gap”

2 “part of a string instrument”

3 “dental plate”

NOTE 2 The designation in the relation of polysemy are called polysemes.

4.21
subordinate concept
narrower concept
concept which is either a specific concept or a partitive concept

[ISO 1087-1:2000, definition 3.2.14]

4.22
superordinate concept
broader concept
concept which is either a **generic concept** or a comprehensive concept

[ISO 1087-1:2000, definition 3.2.13]

4.23
synonymy
relation between or among **terms** in a given language representing the same **concept**

[ISO 1087-1:2000, definition 3.4.19]

NOTE 1 The relation of synonymy exists, for example, between *deuterium* and *heavy hydrogen*.

NOTE 2 Terms which are interchangeable in all contexts are called *synonyms*; if they are interchangeable only in some contexts, they are called *quasi-synonyms*.

4.24
term
verbal **designation** of a **general concept** in a specific subject field

[ISO 1087-1:2000, definition 3.4.3]

NOTE A term may contain symbols and can have variants, e.g. different forms of spelling.

4.25
terminological data
data related to **concepts** or their **designations**

NOTE The more common terminological data include entry term, **definition**, note, grammatical label, subject label, language identifier, country identifier and source identifier.

[ISO 1087-1:2000, definition 3.8.1]

4.26
terminological dictionary
technical dictionary
collection of **terminological entries** presenting information related to **concepts** or **designations** from one or more specific subject fields

[ISO 1087-1:2000, definition 3.7.1]

4.27
terminological entry
part of a **terminological data** collection that contains the terminological data related to one **concept**

[ISO 1087-2:2000, definition 2.22]

4.28
vocabulary
terminological dictionary which contains **designations** and **definitions** from one or more specific **subject fields**

[ISO 1087-1:2000, definition 3.7.2]

NOTE The vocabulary may be monolingual, bilingual or multilingual.

5 Symbols and abbreviated terms

The following abbreviated terms are used in this document.

GIS Geographic Information System

LBS Location-Based Services

UML Unified Modeling Language

6 Semantic interoperability of geographic information

6.1 Introduction

The production of geographic information to address real-world business problems often requires the input of spatio-temporal data sourced from multiple data suppliers. The manner in which the data is combined depends on the nature of the problem under consideration, and may vary from the simple assembly of thematic overlays through to sophisticated integration, analysis and rendering. In every case, the data suppliers and processors must share a common understanding of the data's characteristics to ensure its appropriate interpretation and use. The more complex or automated the processing becomes, the more necessary it is for this understanding to be unambiguous.

A challenge that arises when combining disparate datasets stems from differing terminology conventions adopted by the contributing suppliers. Frequently, a dataset will originate from a community of professionals that provide geospatial support to a particular industry (for example, road transport). The terminology used to describe the content, relationships and behaviour of the data reflects the industry's alignment of geographic information concepts with its specialist culture, conventions and practices. A particular concept, therefore, may be identified by different terms or definitions depending on the industry context in which it is used.

The issue is illustrated by the following example. The branch of mathematics dealing with topology identifies the concepts of “node” and “directed edge”, defining them as follows:

— node – 0-dimensional topological primitive;

— directed edge – directed topological object that represents an association between an edge and one of its orientations.

Similarly, the field of location-based services (LBS) includes the concepts of “junction” and “link”, and defines them as follows:

— junction – single topological node in a network with its associated collection of turns, incoming and outgoing links;

— link – directed topological connection between two nodes (junctions), consisting of an edge and a direction.

In both instances, the LBS term is an alias for the topology term; “junction” is synonymous with “node” and “link” with “directed edge”. The terms and definitions therefore address identical underlying concepts. However the concepts are described within the context of the respective professional disciplines and expressed in language that is more readily acceptable to the respective communities of interest.