SLOVENSKI STANDARD
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Geografske informacije - Lokacijske storitve (ISO/DIS 19116:2024)

Geographic information - Positioning services (ISO/DIS 19116:2024)

Geoinformationen - Positionierung (ISO/DIS 19116:2024)

Information géographique - Services de positionnement (ISO/DIS 19116:2024)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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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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.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 287, *Geographic Information*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 19116:2019), which has been technically revised.

The main changes are as follows:

— Issues from the second edition submitted to the Standards Tracker (see github.com/ISO-TC211/StandardsTracker/issues) were checked and considered for update in edition.

— Clause 2 have been updated based on a re-examination of the provisions and UML models in this edition;

— Content from ISO 19116:2019/Amd 1:2021 has been integrated into this edition and the amendment will be cancelled.

— Constructs from ISO 19111 have been checked and updated.

In accordance with the ISO/IEC Directives, Part 2, 2018, *Rules for the structure and drafting of International Standards*, in International Standards the decimal sign is a comma on the line. However, the General Conference on Weights and Measures (Conférence Générale des Poids et Mesures) at its meeting in 2003 passed unanimously the following resolution:

"The decimal marker shall be either a point on the line or a comma on the line."

In practice, the choice between these alternatives depends on customary use in the language concerned. In the technical areas of geodesy and geographic information it is customary for the decimal point always to be used, for all languages. That practice is used throughout this document.

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.

Introduction

Positioning services are among the processing services identified in ISO 19119:2019. Processing services include services that are computationally oriented and operate upon the elements from the model domain, rather than being directly integrated in the model domain itself. This document defines and describes the positioning service.

Positioning services employ a wide variety of technologies that provide position and related information to a similarly wide variety of applications, as depicted in Figure 1. Although these technologies differ in many respects, there are important items of information that are common among them and serve the needs of these application areas, such as the position data, time of observation and its accuracy. Also, there are items of information that apply only to specific technologies and are sometimes required in order to make correct use of the positioning results, such as signal strength, geometry factors, and raw measurements. Therefore, this document includes both general data elements that are applicable to a wide variety of positioning services and technology specific elements that are relevant to particular technologies.

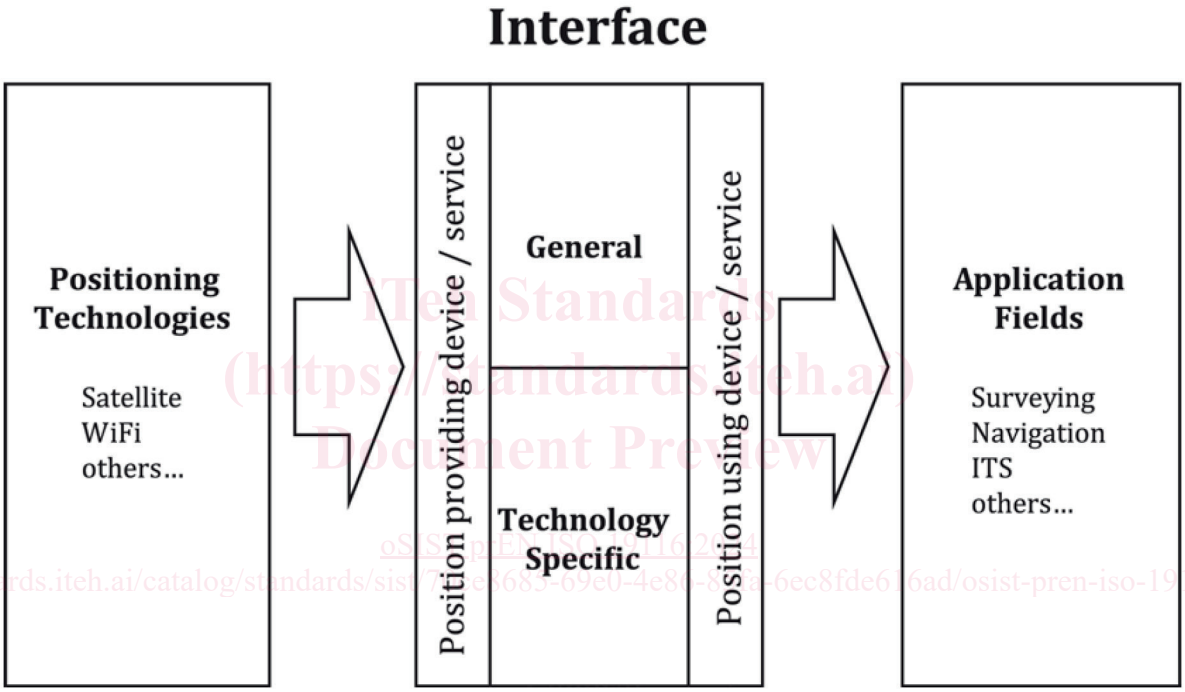

Figure 1 — Positioning services overview

Electronic positioning technology can measure the coordinates of a location on or near the Earth with great speed and accuracy, thereby allowing geographic information systems to be populated with any number of objects. However, the technologies for position determination have neither a common structure for expression of position information, nor common structures for expression of accuracy and reliability. The positioning services interface specified in this document provides data structures and operations that allow spatially oriented systems to employ positioning technologies with greater efficiency and interoperability.

Geographic information — Positioning services

1 Scope

This document specifies the data structure and content of an interface that permits communication between position-providing device(s) and position-using device(s) enabling the position-using device(s) to obtain and unambiguously interpret position information and determine, based on a measure of the degree of reliability, whether the resulting position information meets the requirements of the intended use.

A standardized interface for positioning allows the integration of reliable position information obtained from non-specific positioning technologies and is useful in various location-focused information applications, such as surveying, navigation, intelligent transportation systems (ITS), and location-based services (LBS).

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.

ISO 19103, *Geographic information — Conceptual schema language*

ISO 19111, *Geographic information — Referencing by coordinates*

ISO 19115-1, *Geographic information — Metadata — Part 1: Fundamentals*

ISO 19157-1, *Geographic information — Data quality — Part 1: General requirements*

3 Terms and definitions

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

ISO and IEC maintain terminological 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
absolute accuracy
external accuracy
closeness of reported coordinate values to values accepted as or being true

Note 1 to entry: Where the true coordinate value may not be perfectly known, accuracy is normally tested by comparison to available values that can best be accepted as true.

[SOURCE: ISO/TS 19159-2:2016, 4.1 modified — NOTES 1 and 2 have been deleted and replaced by a new Note 1 to entry.]

3.2
accuracy
closeness of agreement between a test result or measurement result and the true value

Note 1 to entry: For positioning services, the test result is a measured value or set of values.

[SOURCE: ISO 3534-2:2006, 3.3.1, modified — NOTES 1, 2 and 3 have been deleted and replaced by a new Note 1 to entry.]

3.3
attitude
orientation of a body, described by the angles between the axes of that body's coordinate system and the axes of an external coordinate system

Note 1 to entry: In positioning services, this is usually the orientation of the user's platform, such as an aircraft, boat, or automobile.

3.4
coordinate
one of a sequence of numbers designating the position of a point

Note 1 to entry: In a spatial coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2019, 3.1.5]

3.5
coordinate conversion
coordinate operation that changes coordinates in a source coordinate reference system to coordinates in a target coordinate reference system in which both coordinate reference systems are based on the same datum

Note 1 to entry: A coordinate conversion uses parameters which have specified values.

EXAMPLE 1 A mapping of ellipsoidal coordinates to Cartesian coordinates using a map projection.

EXAMPLE 2 Change of units such as from radians to degrees or from feet to metres.

[SOURCE: ISO 19111:2019, 3.1.6]

3.6
coordinate operation
process using a mathematical model, based on a one-to-one relationship, that changes coordinates in a source coordinate reference system to coordinates in a target coordinate reference system, or that changes coordinates at a source coordinate epoch to coordinates at a target coordinate epoch within the same coordinate reference system

Note 1 to entry: Generalization of coordinate conversion, coordinate transformation and point motion operation.

[SOURCE: ISO 19111:2019/Amd.1:2021, 3.1.8]

3.7
coordinate reference system
coordinate system that is related to an object by a datum

Note 1 to entry: Geodetic and vertical datums are referred to as reference frames.

Note 2 to entry: For geodetic and vertical reference frames, the object will be the Earth. In planetary applications, geodetic and vertical reference frames may be applied to other celestial bodies.

[SOURCE: ISO 19111:2019, 3.1.9]

3.8
coordinate system
set of mathematical rules for specifying how coordinates are to be assigned to points

[SOURCE: ISO 19111:2019, 3.1.11]

3.9
coordinate transformation
coordinate operation that changes coordinates in a source coordinate reference system to coordinates in a target coordinate reference system in which the source and target coordinate reference systems are based on different datums

Note 1 to entry: A coordinate transformation uses parameters which are derived empirically. Any error in those coordinates will be embedded in the coordinate transformation and when the coordinate transformation is applied the embedded errors are transmitted to output coordinates.

Note 2 to entry: A coordinate transformation is colloquially sometimes referred to as a 'datum transformation'. This is erroneous. A coordinate transformation changes coordinate values. It does not change the definition of the datum. In this document coordinates are referenced to a coordinate reference system. A coordinate transformation operates between two coordinate reference systems, not between two datums.

[SOURCE: ISO 19111:2019, 3.1.12]

3.10
datum
reference frame
parameter or set of parameters that realize the position of the origin, the scale, and the orientation of a coordinate system

[SOURCE: ISO 19111:2019, 3.1.15]

3.11
height
distance of a point from a chosen reference surface positive upward along a line perpendicular to that surface

Note 1 to entry: A height below the reference surface will have a negative value.

Note 2 to entry: Generalisation of ellipsoidal height (h) and gravity-related height (H).

[SOURCE: ISO 19111:2019, 3.1.38]

3.12
inertial positioning system
positioning system employing accelerometers, gyroscopes, and computers as integral components to determine coordinates of points or objects relative to an initial known reference point

3.13
instant
0-dimensional geometric primitive representing position in time

Note 1 to entry: The geometry of time is discussed in ISO 19108:2002.

[SOURCE: ISO 19108:2002, 4.1.17]

3.14
integrated positioning system
positioning system incorporating two or more positioning technologies

Note 1 to entry: The measurements produced by each positioning technology in an integrated system may be of any position, motion, or attitude. There may be redundant measurements. When combined, a unified position, motion, or attitude is determined.

3.15
linear positioning system
positioning system that measures distance from a reference point along a route (feature)

EXAMPLE An odometer used in conjunction with predefined mile or kilometre origin points along a route and provides a linear reference to a position.

3.16
map projection
coordinate conversion from an ellipsoidal coordinate system to a plane

[SOURCE: ISO 19111:2019, 3.1.40]

3.17
measurement precision
precision
closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions

Note 1 to entry: Measurement precision is usually expressed numerically by measures of imprecision, such as standard deviation, variance, or coefficient of variation under the specified conditions of measurement.

Note 2 to entry: The "specified conditions" can be, for example, repeatability conditions of measurement, intermediate precision conditions of measurement, or reproducibility conditions of measurement (see ISO 5725-3).

Note 3 to entry: Measurement precision is used to define measurement repeatability, intermediate measurement precision, and measurement reproducibility.

Note 4 to entry: Sometimes "measurement precision" is erroneously used to mean measurement accuracy.

[SOURCE: ISO/IEC Guide 99:2007, 2.15]

3.18
motion
change in the position of an object over time, represented by change of coordinate values with respect to a particular reference frame

EXAMPLE This may be motion of the position sensor mounted on a vehicle or other platform or motion of an object being tracked by a positioning system.

3.19
operating conditions
parameters influencing the determination of coordinate values by a positioning system

Note 1 to entry: Measurements acquired in the field are affected by many instrumental and environmental factors, including meteorological conditions, computational methods and constraints, imperfect instrument construction, incomplete instrument adjustment or calibration, and, in the case of optical measuring systems, the personal bias of the observer. Solutions for positions may be affected by the geometric relationships of the observed data and/or mathematical model employed in the processing software.

3.20
optical positioning system
positioning system that determines the position of an object by means of the properties of light

EXAMPLE Total Station: Commonly used term for an integrated optical positioning system incorporating an electronic theodolite and an electronic distance-measuring instrument into a single unit with an internal microprocessor for automatic computations.

3.21
performance indicator
internal parameters of positioning systems indicative of the level of performance achieved

Note 1 to entry: Performance indicators can be used as quality-control evidence of the positioning system and/or positioning solution. Internal quality control may include such factors as signal strength of received radio signals [signal-to-noise ratio (SNR)], figures indicating the dilution of precision (DOP) due to geometric constraints in radiolocation systems, and system-specific figure of merit (FOM).