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Utgåva 1

**Geografisk information –
Schema för geometri och funktioner för
yttäckande representation** (ISO 19123:2005, IDT)

**Geographic information –
Schema for coverage geometry and functions**
(ISO 19123:2005, IDT)

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The International Standard ISO 19123:2005 has the status of a Swedish Standard. This document contains the official English version of ISO 19123:2005.

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Foreword

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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.

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ISO 19123 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Introduction

Geographic phenomena fall into two broad categories — discrete and continuous. Discrete phenomena are recognizable objects that have relatively well-defined boundaries or spatial extent. Examples include buildings, streams and measurement stations. Continuous phenomena vary over space and have no specific extent. Examples include temperature, soil composition and elevation. A value or description of a continuous phenomenon is only meaningful at a particular position in space (and possibly time). Temperature, for example, takes on specific values only at defined locations, whether measured or interpolated from other locations.

These concepts are not mutually exclusive. In fact, many components of the landscape may be viewed alternatively as discrete or continuous. For example, a stream is a discrete entity, but its flow rate and water quality index vary from one position to another. Similarly, a highway can be thought of as a feature or as a collection of observations measuring accidents or traffic flow, and an agricultural field is both a spatial object and a set of measurements of crop yield through time.

Historically, geographic information has been treated in terms of two fundamental types called vector data and raster data.

“Vector data” deals with discrete phenomena, each of which is conceived of as a feature. The spatial characteristics of a discrete real-world phenomenon are represented by a set of one or more geometric primitives (points, curves, surfaces or solids). Other characteristics of the phenomenon are recorded as feature attributes. Usually, a single feature is associated with a single set of attribute values. ISO 19107:2003 provides a schema for describing features in terms of geometric and topological primitives.

“Raster data”, on the other hand, deals with real-world phenomena that vary continuously over space. It contains a set of values, each associated with one of the elements in a regular array of points or cells. It is usually associated with a method for interpolating values at spatial positions between the points or within the cells. Since this data structure is not the only one that can be used to represent phenomena that vary continuously over space, this International Standard uses the term “coverage,” adopted from the Abstract Specification of the Open GIS Consortium [1], to refer to any data representation that assigns values directly to spatial position. A coverage is a function from a spatial, temporal or spatiotemporal domain to an attribute range. A coverage associates a position within its domain to a record of values of defined data types.

In this International Standard, coverage is a subtype of feature. A coverage is a feature that has multiple values for each attribute type, where each direct position within the geometric representation of the feature has a single value for each attribute type.

Just as the concepts of discrete and continuous phenomena are not mutually exclusive, their representations as discrete features or coverages are not mutually exclusive. The same phenomenon may be represented as either a discrete feature or a coverage. A city may be viewed as a discrete feature that returns a single value for each attribute, such as its name, area and total population. The city feature may also be represented as a coverage that returns values such as population density, land value or air quality index for each position in the city.

A coverage, moreover, can be derived from a collection of discrete features with common attributes, the values of the coverage at each position being the values of the attributes of the feature located at that position. Conversely, a collection of discrete features can be derived from a coverage, each discrete feature being composed of a set of positions associated with specified attribute values.

Geographic information — Schema for coverage geometry and functions

1 Scope

This International Standard defines a conceptual schema for the spatial characteristics of coverages. Coverages support mapping from a spatial, temporal or spatiotemporal domain to feature attribute values where feature attribute types are common to all geographic positions within the domain. A coverage domain consists of a collection of direct positions in a coordinate space that may be defined in terms of up to three spatial dimensions as well as a temporal dimension. Examples of coverages include rasters, triangulated irregular networks, point coverages and polygon coverages. Coverages are the prevailing data structures in a number of application areas, such as remote sensing, meteorology and mapping of bathymetry, elevation, soil and vegetation. This International Standard defines the relationship between the domain of a coverage and an associated attribute range. The characteristics of the spatial domain are defined whereas the characteristics of the attribute range are not part of this standard.

2 Conformance

This International Standard specifies interfaces for several types of coverage objects. In addition, it supports the interchange of coverage data independently of those interfaces. Thus, it specifies two sets of conformance classes: one for implementation of the interfaces, the other for the exchange of coverage data. Each set includes one conformance class for each type of coverage specified in this International Standard (Table 1).

Table 1 — Conformance classes

Conformance class	Subclause
Simple coverage interface	A.1.1
Discrete coverage interface	A.1.2
Thiessen polygon coverage interface	A.1.3
Quadrilateral grid coverage interface	A.1.4
Hexagonal grid coverage interface	A.1.5
TIN coverage interface	A.1.6
Segmented curve coverage interface	A.1.7
Discrete coverage interchange	A.2.1
Thiessen polygon coverage interchange	A.2.2
Quadrilateral grid coverage interchange	A.2.3
Hexagonal grid coverage interchange	A.2.4
TIN coverage interchange	A.2.5
Segmented curve coverage interchange	A.2.6

In general, the interface conformance classes require implementation of all attributes, associations and operations of relevant classes. This set includes a single conformance class (A.2.1) that supports a simple interface for evaluation of any coverage type, but exposes none of the internal structure of the coverage. The remainder of the set are conformance classes that support interfaces to specific coverage types that expose additional information about the internal structure of the coverage.

The interchange conformance classes require only implementation of the attributes and associations of the relevant classes.

The Abstract Test Suite in Annex A shows the implementation requirements necessary to conform to this International Standard. Table 1 lists the subclauses of the Abstract Test Suite that apply for each conformance class.

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 19107:2003, *Geographic information — Spatial schema*

ISO 19108:2002, *Geographic information — Temporal schema*

ISO 19109:2005, *Geographic information — Rules for application schema*

ISO 19111:2003, *Geographic information — Spatial referencing by coordinates*

ISO 19115:2003, *Geographic information — Metadata*

4 Terms, definitions, abbreviated terms and notation

4.1 Terms and definitions

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

4.1.1
continuous coverage
coverage that returns different values for the same feature attribute at different **direct positions** within a single **spatial object**, **temporal object** or **spatiotemporal object** in its **domain**

NOTE Although the domain of a continuous coverage is ordinarily bounded in terms of its spatial and/or temporal extent, it can be subdivided into an infinite number of direct positions.

4.1.2
convex hull
smallest **convex set** containing a given **geometric object**

[adapted from *Dictionary of Computing*:1996 [2]]

4.1.3
convex set
geometric set in which any **direct position** on the straight-line segment joining any two **direct positions** in the **geometric set** is also contained in the **geometric set**

[*Dictionary of Computing*:1996 [2]]

4.1.4
coordinate
one of a sequence of *n* numbers designating the position of a **point** in *n*-dimensional space

[ISO 19111:2003]

4.1.5
coordinate dimension
number of measurements or axes needed to describe a position in a coordinate system

[ISO 19107:2003]

4.1.6
coordinate reference system
coordinate system that is related to the real world by a datum

[ISO 19111:2003]

41.7
coverage
feature that acts as a **function** to return values from its **range** for any **direct position** within its spatial, temporal or **spatiotemporal domain**

EXAMPLE Examples include a raster image, polygon overlay or digital elevation matrix.

NOTE In other words, a coverage is a feature that has multiple values for each attribute type, where each direct position within the geometric representation of the feature has a single value for each attribute type.

4.1.8
coverage geometry
configuration of the **domain** of a **coverage** described in terms of **coordinates**

4.1.9
curve
1-dimensional **geometric primitive**, representing the continuous image of a line

[ISO 19107:2003]

NOTE The boundary of a curve is the set of points at either end of the curve.

4.1.10
Delaunay triangulation
network of triangles such that the circle passing through the vertices of any triangle does not contain, in its interior, the vertex of any other triangle

4.1.11
direct position
position described by a single set of **coordinates** within a **coordinate reference system**

[ISO 19107:2003]

4.1.12
discrete coverage
coverage that returns the same **feature attribute** values for every **direct position** within any single **spatial object**, **temporal object** or **spatiotemporal object** in its **domain**

NOTE The domain of a discrete coverage consists of a finite set of spatial, temporal, or spatiotemporal objects.

4.1.13
domain
well-defined set

[ISO/TS 19103]

NOTE Domains are used to define the domain and range of operators and functions.

4.1.14
evaluation
⟨**coverage**⟩ determination of the values of a **coverage** at a **direct position** within the **domain** of the coverage

4.1.15
feature
0 abstraction of real world phenomena

[ISO 19101]

4.1.16
feature attribute
characteristic of a **feature**

[ISO 19101]

4.1.17
function
rule that associates each element from a **domain** (source or domain of the function) to a unique element in another **domain** (target, co-domain or **range**)

[ISO 19107:2003]

4.1.18
geometric object
spatial object representing a **geometric set**

[ISO 19107:2003]

4.1.19
geometric primitive
geometric object representing a single, connected, homogeneous element of space

[ISO 19107:2003]

4.1.20
geometric set
set of **direct positions**

[ISO 19107:2003]

4.1.21
geometry value object
object composed of a set of **geometry value pairs**

4.1.22
geometry value pair
ordered pair composed of a **spatial object**, a temporal object or a **spatiotemporal object** and a **record** of **feature attribute values**

4.1.23
grid
network composed of two or more sets of **curves** in which the members of each set intersect the members of the other sets in an algorithmic way

NOTE The curves partition a space into grid cells.

4.1.24
grid point
point located at the intersection of two or more **curves** in a **grid**

4.1.25
inverse evaluation
⟨coverage⟩ selection of a set of objects from the **domain** of a **coverage** based on the **feature attribute** values associated with the objects

4.1.26
point
0-dimensional **geometric primitive**, representing a position

[ISO 19107:2003]

NOTE The boundary of a point is the empty set.

4.1.27
point coverage
coverage that has a **domain** composed of **points**

4.1.28
polygon coverage
coverage that has a **domain** composed of polygons

4.1.29
range
⟨coverage⟩ set of **feature attribute** values associated by a **function** with the elements of the **domain** of a **coverage**

4.1.30
raster
usually rectangular pattern of parallel scanning lines forming or corresponding to the display on a cathode ray tube

NOTE A raster is a type of grid.

4.1.31
record
finite, named collection of related items (objects or values)

[ISO 19107:2003]

NOTE Logically, a record is a set of pairs <name, item>.

4.1.32
rectified grid
grid for which there is an affine transformation between the grid **coordinates** and the coordinates of an external **coordinate reference system**

NOTE If the coordinate reference system is related to the earth by a datum, the grid is a georectified grid.