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Geographic information — Schema for coverage geometry and functions

*Information géographique — Schéma de la géométrie et des fonctions
de couverture*



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Contents

Page

Foreword.....	v
Introduction	vi
1 Scope	1
2 Conformance	1
3 Normative references	2
4 Terms, definitions, abbreviated terms and notation	2
4.1 Terms and definitions.....	2
4.2 Abbreviated terms	7
4.3 Notation	7
5 Fundamental characteristics of coverages.....	8
5.1 The context for coverages	8
5.2 The coverage schema	9
5.3 CV_Coverage.....	10
5.4 CV_DomainObject.....	13
5.5 CV_AttributeValues	13
5.6 CV_CommonPointRule.....	14
5.7 CV_DiscreteCoverage	14
5.8 CV_GeometryValuePair.....	15
5.9 CV_ContinuousCoverage	16
5.10 CV_ValueObject	17
5.11 CV_InterpolationMethod	18
5.12 Subclasses of CV_ContinuousCoverage	18
6 Discrete coverages	18
6.1 Discrete coverage types	18
6.2 CV_DiscretePointCoverage	19
6.3 CV_PointValuePair.....	20
6.4 CV_DiscreteGridPointCoverage	20
6.5 CV_GridPointValuePair	21
6.6 CV_DiscreteCurveCoverage	21
6.7 CV_CurveValuePair	22
6.8 CV_DiscreteSurfaceCoverage	22
6.9 CV_SurfaceValuePair	24
6.10 CV_DiscreteSolidCoverage	24
6.11 CV_SolidValuePair.....	24
7 Thiessen polygon coverage	25
7.1 Thiessen polygon networks	25
7.2 CV_ThiessenPolygonCoverage.....	25
7.3 CV_ThiessenValuePolygon	27
8 Quadrilateral grid coverages	27
8.1 General.....	27
8.2 Quadrilateral grid geometry.....	27
8.3 CV_Grid.....	30
8.4 CV_GridEnvelope.....	31
8.5 CV_GridPoint.....	31
8.6 CV_GridCoordinate.....	32
8.7 CV_GridCell	32
8.8 CV_Footprint	33
8.9 CV_RectifiedGrid	33

This is a preview of "ISO 19123:2005". [Click here to purchase the full version from the ANSI store.](#)

8.10	CV_ReferenceableGrid	34
8.11	CV_ContinuousQuadrilateralGridCoverage	35
8.12	CV_GridValueCell.....	36
8.13	CV_GridPointValuePair	36
8.14	CV_GridValuesMatrix.....	37
8.15	CV_SequenceRule	38
8.16	CV_SequenceType.....	38
9	Hexagonal Grid Coverages	39
9.1	General	39
9.2	CV_HexagonalGridCoverage	39
9.3	CV_GridValuesMatrix.....	41
9.4	CV_ValueHexagon	41
10	Triangulated irregular network (TIN) coverages	41
10.1	General	41
10.2	CV_TINCoverage	43
10.3	CV_ValueTriangle.....	43
11	Segmented curve coverages	44
11.1	General	44
11.2	CV_SegmentedCurveCoverage	45
11.3	CV_ValueCurve	45
11.4	CV_ValueSegment	46
11.5	Evaluation	46
Annex A (normative) Abstract test suite		47
Annex B (informative) UML Notation		51
Annex C (informative) Interpolation methods.....		56
Annex D (informative) Sequential enumeration.....		60
Bibliography		65

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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.

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.

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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.