INTERNATIONAL STANDARD

ISO

19111-2

Geographic information — Spatial referencing by coordinates —

Part 2:
Extension for parametric values

Information géographique — Système de références spatiales par coordonnées —

Partie 2: Supplément pour valeurs paramétriques

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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.

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 19111-2 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

ISO 19111 consists of the following parts, under the general title *Geographic information — Spatial referencing by coordinates*:

— *Geographic information — Spatial referencing by coordinates*

— *Part 2: Extension for parametric values*

Introduction

ISO 19111 describes the elements necessary to fully define various types of reference systems used for spatial referencing by coordinates. In ISO 19111, a coordinate is one of n scalar values that define the position of a point. ISO 19111 allows for coordinates which are angular, such as latitude and longitude, or linear, such as easting and northing. It also describes the concept of a compound coordinate reference system, which uses at least two independent coordinate reference systems to describe a three-dimensional spatial position.

Scientific communities, especially those concerned with the environmental sciences, frequently express spatial position partially in terms of a parameter or function. Within these communities, this parameter or function is treated as a coordinate. Its relationship with a spatial dimension will usually be non-linear. Examples are widespread, but latitude, longitude and pressure is a commonly encountered example.

This part of ISO 19111 defines a parametric coordinate reference system using the concepts of ISO 19111. The provisions of ISO 19111 are then used to include a parametric coordinate reference system as part of a compound coordinate reference system. Optionally, time can also be included as an additional axis or as axes.

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Geographic information — Spatial referencing by coordinates —

Part 2:
Extension for parametric values

1 Scope

This part of ISO 19111 specifies the conceptual schema for the description of spatial referencing using parametric values or functions. It applies the schema of ISO 19111 to combine a position referenced by coordinates with a parametric value to form a spatio-parametric coordinate reference system (CRS). The spatio-parametric CRS can optionally be extended to include time.

The intended users of this part of ISO 19111 are producers and users of environmental information.

Parameters which are attributes of spatial locations or features, but which are not involved in their spatial referencing, are not addressed by this part of ISO 19111.

2 Conformance requirements

Any CRS for which conformance to this part of ISO 19111 is claimed shall be in accordance with Annex A.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19111:2007, *Geographic information — Spatial referencing by coordinates*

4 Terms and definitions

For the purposes of this document the terms and definitions of ISO 19111 and the following apply.

4.1
parametric coordinate system
one-dimensional coordinate system where the axis units are parameter values which are not inherently spatial

4.2
parametric coordinate reference system
coordinate reference system based on a parametric datum

4.3
parametric datum
datum describing the relationship of a parametric coordinate system to an object

NOTE   The object is normally the Earth.

4.4
spatio-parametric coordinate reference system
compound coordinate reference system in which one constituent coordinate reference system is a parametric coordinate reference system and one is a spatial coordinate reference system

NOTE   Normally the spatial component is "horizontal" and the parametric component is "vertical".

4.5
spatio-parametric-temporal coordinate reference system
compound coordinate reference system comprised of spatial, parametric and temporal coordinate reference systems

5   Conventions

5.1   Abbreviated terms

CCRS   Compound Coordinate Reference System

CRS   Coordinate Reference System

CS   Coordinate System

GML   Geography Markup Language

UML   Unified Modelling Language

5.2   UML notation

In this part of ISO 19111, the conceptual schema for describing spatio-parametric referencing is modelled with the Unified Modelling Language (UML). The basic data types and UML diagram notations are defined in ISO/TS 19103 and ISO/IEC 19501.

5.3   Attribute status

In this part of ISO 19111, attributes are given an obligation status:

Obligation	Definition	Meaning
M	Mandatory	This attribute shall be supplied.
O	Optional	This attribute may be supplied.

In Tables 1 to 3, the "Maximum occurrence" column indicates the maximum number of occurrences of attribute values that are permissible, with "N" indicating no upper limit.

6 Spatio-parametric referencing

6.1 Overview

ISO 19111 defines a *coordinate reference system* (CRS) as a coordinate system which is related to an object (such as the Earth) by a datum. A *coordinate system* (CS) is a set of mathematical rules for specifying how coordinates are to be assigned to points. A coordinate system will have one or more axes. A *datum* defines the position of the origin, the scale, and the orientation of a coordinate system. ISO 19111 describes several subtypes of coordinate reference system, coordinate system and datum. This part of ISO 19111 defines a further subtype of each to accommodate parametric referencing.

6.2 Parametric coordinate reference system

A parametric coordinate reference system shall be a subtype of a single CRS. Figure 1 shows the UML schema, which shall consist of one parametric coordinate system and one parametric datum, these elements being according to 6.3 and 6.4.

Table 1 specifies the attributes of a parametric coordinate reference system inherited from SC_SingleCRS.
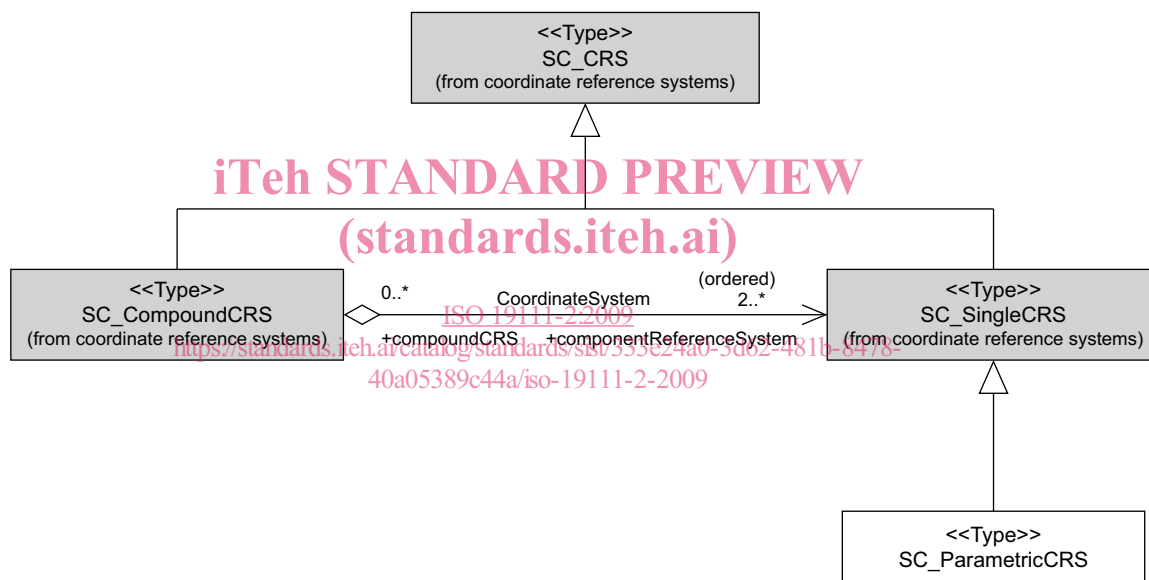

Figure 1 — UML schema for parametric CRS

Table 1 — Defining elements of SC_ParametricCRS class

Description:	One-dimensional coordinate reference system which uses parameter values or functions.				
Stereotype:	Type				
Class attribute:	Concrete				
Inherited from:	SC_SingleCRS				
Association roles:	(aggregation) datum to CD_ParametricDatum [1], association named *DefiningDatum* (aggregation) coordinateSystem to CS_ParametricCS [1], association named *CoordinateSystem* (associations inherited from SC_SingleCRS)				
Public attributes:	Six attributes inherited from SC_SingleCRS:				
Attribute name	**UML identifier**	**Data type**	**Obligation**	**Maximum occurrence**	**Attribute description**
CRS name	Name	RS_Identifier	M	1	This is the primary name for the CRS. Aliases and other identifiers may be given through the attributes alias and identifier.
CRS alias	Alias	GenericName	O	N	An alias by which this CRS is known.
CRS identifier	Identifier	RS_Identifier	O	N	An identifier which references elsewhere the CRS's defining information; alternatively, an identifier by which this CRS can be referenced.
CRS scope	Scope	CharacterString	M	N	Description of usage, or limitations of usage, for which this CRS is valid. If unknown, enter "not known".
CRS validity	domainOfValidity	EX_Extent	O	N	Area or region or timeframe in which this CRS is valid.
CRS remarks	Remarks	CharacterString	O	1	Comments or information on this CRS, including data source information.

6.3 Parametric coordinate system

A coordinate system shall be of the parametric type if a physical or material property or function is used as the dimension. The parameter can be measured or could be a function defined in other contexts, but in parametric coordinate systems it forms the coordinate system axis.

EXAMPLE 1   Pressure in meteorological applications

EXAMPLE 2   Density (isopycnals) in oceanographic applications.

A parametric coordinate system shall be a subtype of a coordinate system and shall be used as a part of a parametric coordinate reference system. Figure 2 shows the UML schema and Table 2 describes the attributes, inherited from CS_CoordinateSystem, as defined in ISO 19111.

A parametric coordinate reference system shall be one-dimensional and shall have one axis. The defining elements are described in ISO 19111:2007, Tables 27 and 28.
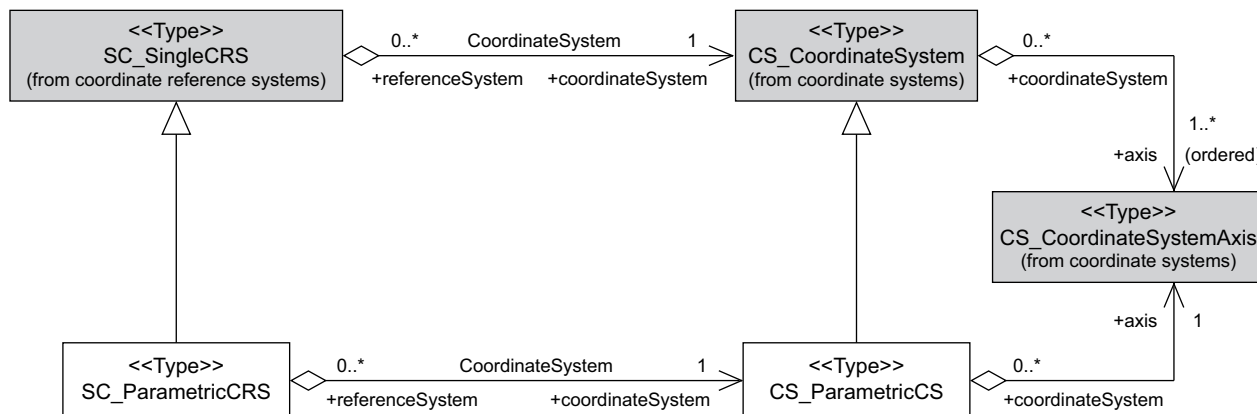
Figure 2 — UML schema for parametric coordinate system

Table 2 — Defining elements of CS_ParametricCoordinateSystem class

Description:	One-dimensional coordinate reference system which uses parameter values or functions. The values or functions can vary monotonically with height. A ParametricCS shall have one axis association.
Stereotype:	Type
Class attribute:	Concrete
Inherited from:	CS_CoordinateSystem
Association roles:	(aggregation) coordinateSystem from SC_ParametricCRS [1], association named *CoordinateSystem* (reverse: referenceSystem to SC_ParametricCRS [0..*] navigable only from SC_ParametricCRS — see Table 1) (associations inherited from CS_CoordinateSystem, including (aggregation) axis to CS_CoordinateSystemAxis [1])
Public attributes:	Four attributes inherited from CS_CoordinateSystem:

Attribute name	UML identifier	Data type	Obligation	Maximum occurrence	Attribute description
CS name	Name	RS_Identifier	M	1	This is the primary name for the coordinate system. Aliases and other identifiers may be given through the attributes alias and identifier.
CS alias	Alias	GenericName	O	N	An alias by which this coordinate system is known.
CS identifier	identifier	RS_Identifier	O	N	An identifier which references elsewhere the coordinate system's defining information; alternatively, an identifier by which this coordinate system can be referenced.
CS remarks	remarks	CharacterString	O	1	Comments or information on this coordinate system, including data source information.