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Geographic information — Positioning services

Information géographique — Services de positionnement

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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 19116 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Introduction

0.1 General

Positioning services are among the processing services identified in ISO 19119. 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 International Standard defines and describes the positioning service. Other services in this domain are coordinate transformation, metric translation, format conversion, semantic translation, etc.

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 common 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 International Standard 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.

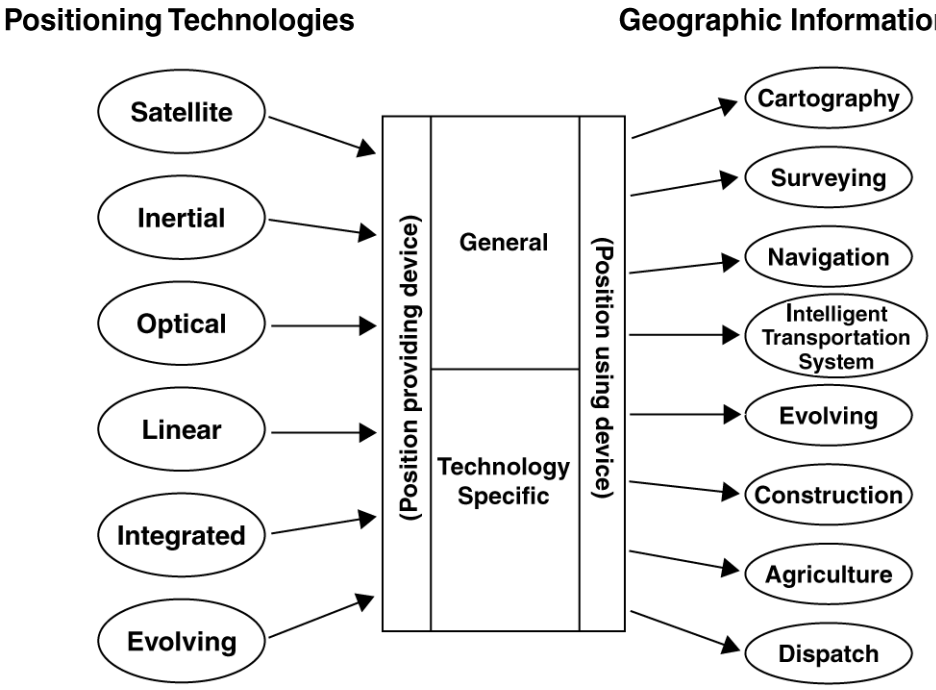

Figure 1 — Positioning services interface allows communication of position data for a wide variety of positioning technologies and users

Modern 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 had neither a common structure for expression of position information, nor a common structure for expression of accuracy. The positioning-services interface specified in this International Standard provides data structures and operations that allow spatially oriented systems, such as GIS, to employ these technologies with greater efficiency by permitting interoperability among various implementations and various technologies.

This interface may be applied to communication among any of the components of systems that generate and use position information. Such systems may incorporate an instrument providing position updates to one or more position-using devices for data processing, storage, and display. For example, a navigation display system may include recording functions that store the history of a vehicle's movement, processing tools that compute guidance updates along a planned course relying on stored waypoints, and a display device that provides the navigator with current position, computed guidance information, and cartography from stored coordinate information. This International Standard specifies an interface that carries position and related information among any of these components, and should be sufficient for communication between the position providing device and any connected position using devices. Additional interfaces may also exist in such a system, for example providing for cartographic portrayal of stored coordinate information, which are outside the scope of this International Standard.

Standard positioning services provide client systems with operations that access positioning results and related information in a uniform manner, isolating the client from the multiplicity of protocols that may be employed to communicate with the positioning instruments. For example, a realized-positioning service could communicate with a GNSS receiver using the well-known NMEA 0183 protocol, translate the information, and provide the positioning results to a geographic information display client through the ISO 19116 standard interface specified in this document. Another realized-positioning service could communicate with a GNSS receiver using a manufacturer's proprietary binary protocol. Through the use of standardized positioning service interfaces, the hardware communication protocols become transparent to the client application.

Evolution of new communication protocols that closely follow the data structures described in this International Standard is also anticipated. Such communication standards will facilitate efficient fulfilment of the information requirements of the positioning services interface and facilitate modular interchangeability of the positioning technology components.

0.2 Potential use of the service

The application of this International Standard is illustrated in Figure 2 by a simplified case for a user obtaining coordinates from a GNSS receiver.

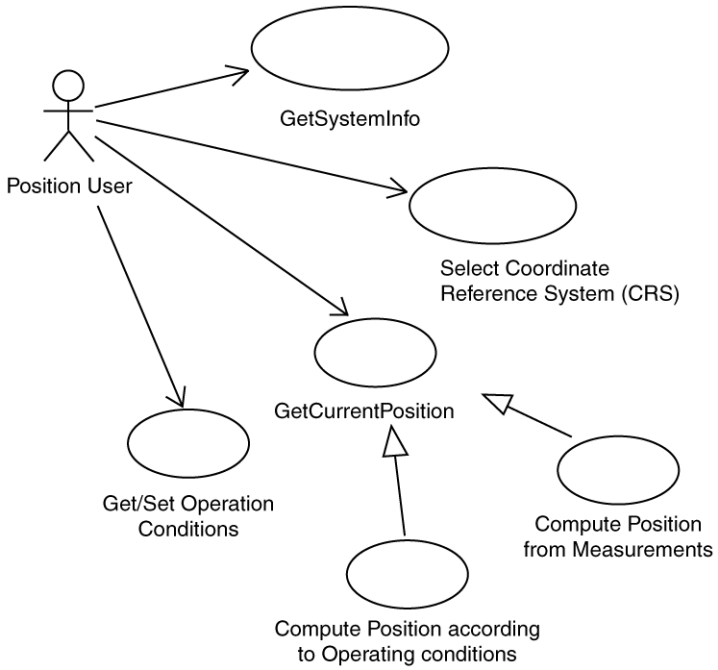

Figure 2 — Use case for getting coordinates from a positioning service

First, the positioning service device transmits system-identification data so that the user can determine the type of positioning system, in this case a GNSS receiver, and whether the system is operational.

Next, the user sets the GNSS receiver to provide coordinates in the desired Coordinate Reference System (CRS) through the interface by performing setMode operations. For instance, the coordinate reference system could be set to NAD27 Virginia State Plane, North Zone, US Survey feet. Note that by using well-recognized CRS names in accordance with the ISO 19111 structure, the user avoids some of the complexity of the definition of the coordinate reference system by using a named datum and mapping projection, and the system interprets these and loads predefined set of parameters.

By performing technology-specific setOperatingConditions operations, the user also sets certain operating conditions of the system so that the position determination will be performed in a desired manner. For example, the user sets the satellite-elevation mask of the GNSS receiver so that satellites that are at low angles in the sky, and consequently, more affected by signal passage through the atmosphere, are excluded from the computation. Certain other operating conditions, such as the current actual positions of available satellites, are not controllable by the user and are determined by the system.

The system then performs measurements according to the operating conditions of the signal from the GNSS satellites and uses these measurements to compute a position cast in the specified Coordinate Reference System.

Finally, the computed position is reported to the user through the PS_Observation data object.

The positioning system also reports on certain operating conditions to help the user decide whether to use the position value. For example, one of the indicators of solution quality is the dilution of precision (DOP) value, which is based on the geometry of the satellites observed to determine the position.

Communication of this information is performed through the standard data structures to the user's display device, which portrays it to the user.