INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
INTERNATIONAL ELECTROTECHNICAL COMMISSION
JOINT TECHNICAL COMMITTEE 1 FOR INFORMATION AND COMMUNICATION TECHNOLOGY
ISO/IEC JTC 1/SC 24
Computer Graphics, Image Processing and Environmental Representation
WG 8 Environmental Representation

Referencing Explanatory Report (Revised) for ISO/IEC 18026 Spatial reference model

1. Referenced specifications

- *Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 2000*

- *Department of Defense World Geodetic System 1984 - Its Definition and Relationships with Local Geodetic Systems*

For submission
to: ISO/IEC JTC 1
by: ISO/IEC JTC 1/SC 24/WG 8
Status: **Final Draft International Standard**

This referencing explanatory report (RER) has been generated by SC 24/WG 8 to support the incorporation and use of existing object reference models, reference datums, and reference transformation parameters in ISO/IEC 18026, in accordance with the Guidelines of JTC 1 contained in the document JTC 1 N4046.

2. References for the referenced specifications

The Referenced Specifications (RS) to be included in ISO/IEC 18026 are:

1. Seidelmann, P.K., *et al*. *Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 2000* [online]. Celestial Mechanics and Dynamical Astronomy, vol. 82, p. 83-110. Dordrecht (Netherlands): Kluwer Academic Publishers, 2002 [cited 30 March 2005].
2. US National Geospatial-Intelligence Agency (NGA). *Department of Defense World Geodetic System 1984 - Its Definition and Relationships with Local Geodetic Systems*. Washington: NGA. Technical report TR 8350.2.[1]

[1] The intention of allowing data in the "RT parameters" element to be specified "by reference" is to keep that data current. To this end, the referenced publication (TR 8350.2) must be the current version. Therefore, the edition information has been removed as part of the reference so that updated values may be used as newer versions are released. Also, URLs for both references have been removed since they were no longer valid.

3. Introduction

Spatial information processing requires a robust capability to describe geometric properties such as position, direction and distance. Information may be spatially referenced to local structures (Example: building interiors) and regions (Example: cities), or spatially referenced to the Earth as a whole (Example: global weather). Information may be spatially referenced to other celestial bodies (Examples: astronomical, orbital, and geomagnetic observations). Information may also be spatially referenced to objects defined within contexts such as virtual realities (Example: 3D models). In each of these cases, a spatial reference frame is defined, with respect to which the values of geometric properties may be determined.

It is often necessary to represent position in several different spatial reference frames, simultaneously, according to the context in which the position is to be used. Each spatial reference frame corresponds to a particular way of expressing position. Spatial reference frames may be relative to moving objects (Examples: planets and spacecraft), and therefore have values that are a function of time. It is necessary to specify the time to which the spatial position refers, and the time for which the spatial reference frame is defined.

This International Standard defines the conceptual model and the methodologies that allow the description, and transformation or conversion, of geometric properties within or among spatial reference frames. The spatial reference model (SRM) supports unambiguous specification of the positions, directions, distances, and times associated with spatial information. It also defines algorithms for precise transformation of positions, directions and distances among different spatial reference frames.

The SRM defines relevant aspects of spatial positioning and related information processing. The SRM allows precise and unambiguous specification of geometric properties such as position (location), and direction. The SRM also provides a computational API. To accomplish this, it is necessary to use measurements and values determined by authoritative sources in Earth and other celestial objects.

The SRM is a mandated component of the SEDRIS interchange mechanism described in the multipart ISO/IEC 18023. The SRM addresses emerging requirements for an integrated perspective on the environment. The SRM addresses the needs of a broad community of users, who have a range of accuracy and performance requirements in computationally intensive applications. No other such specification exists in one place that has the scope, depth and breadth of this standard or to its level of precision.

This report describes the referenced specifications along with justification for their use.

4. Referenced specifications

4.1. Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 2000

4.1.1. Referenced specification originator

Every three years, the International Astronomical Union/International Association of Geodesy (IAU/IAG) Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites revises tables giving the directions of the north poles of rotation and the prime meridians of

the planets, satellites, and asteroids. It also revises tables giving the sizes and shapes of these celestial objects and changes since the previous report.

4.1.2. Justification

It is not the purpose of the SRM to publish data but rather provide for its use in ORM specification and in support of doing coordinate operations. However, to increase the utility of the SRM standard and in the interest of supporting interoperability, it was agreed at the editing meeting for the Final Committee Draft that relevant values formulated by ephemeris in the first cited reference would be normatively referenced. This is the case for the values cited from the Working Group's referenced report for various ORMs found in Annex E.

4.1.3. Degree of market acceptance

The report is available for purchase from SpringerLink.com. *Celestial Mechanics and Dynamical Astronomy*, from which this report is available, is considered the definitive source for this type of information.

4.1.4. Rationale why transposition to a formal standard is inappropriate or impractical

The IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites has no desire to advance this report to an ISO/IEC standard. Indeed, this would be more properly advanced as an IAU/IAG standard. There are no plans known to do this.

See the attached letter from the principal author and chairman of the Working Group, P. Kenneth Seidelmann, agreeing to the use of this document as a normative reference.

4.2. *Department of Defense World Geodetic System 1984 - Its Definition and Relationships with Local Geodetic Systems*

4.2.1. Referenced specification originator

The U.S. National Geospatial-Intelligence Agency (NGA), formerly the National Imagery and Mapping Agency (NIMA), has, to date, prepared three editions of its *Department of Defense World Geodetic System 1984* (WGS84) technical report, which describes its latest geodetic and geophysical modelling of the Earth based on the most recent data, techniques and technology available.

4.2.2. Justification

It is not the purpose of the SRM to publish data but rather provide for its use in ORM specification and in support of doing coordinate operations. However, to increase the utility of the SRM standard and in the interest of supporting interoperability, it was agreed at the editing meeting for the Final Committee Draft, when there are values of object reference model (ORM)-specific quantities based on six or more stations, they would be included in the body of the standard. Otherwise, their source would be normatively referenced. This is the case for the values cited in the WGS84 report for various ORMs found in Annex E.

4.2.3. Degree of market acceptance

This report is freely available to all via the world-wide web. The geospatial community uses it routinely for spatial operations. It is considered the definitive source for this type of information.

4.2.4. Rationale why transposition to a formal standard is inappropriate or impractical

The NGA has no desire to advance this report to an ISO/IEC standard. The information contained therein is, in effect, a *de facto* standard.

See the attached letter from the NGA agreeing to the use of this document as a normative reference.