

ISO 19130-1:2018 (E)

Geographic information — Imagery sensor models for geopositioning — Part 1: Fundamentals

Contents

	Foreword
	Introduction
1	Scope
2	Normative references
3	Terms and definitions
4	Symbols and abbreviated terms
5	Conformance
6	Notation
7	Image geopositioning: Overview and common elements
7.1	General
7.2	Type of geopositioning information
7.3	Calibration data
7.3.1	General
7.3.2	Geometric calibration
7.3.3	Radiometric calibration
7.4	Ground control points
7.4.1	General
7.4.2	Control point types
7.4.3	Control point schema
8	Physical Sensor Models
8.1	Sensor types
8.1.1	General
8.1.2	Frame sensor
8.1.3	Pushbroom sensor
8.1.4	Whiskbroom sensor
8.1.5	Synthetic Aperture Radar (SAR)
8.2	Physical Sensor Model approach
8.2.1	Physical Sensor Model introduction
8.2.2	Physical Sensor Model parameters
8.2.3	Interior sensor parameters
8.2.4	Exterior sensor/platform parameters
8.2.5	Ground-to-image function
8.2.6	Image-to-ground function
8.2.7	Error propagation
8.2.8	Adjustable model parameters
8.3	Quality associated with Physical Sensor Models
8.4	Physical Sensor Model metadata
8.4.1	General
8.4.2	Overview of the Physical Sensor Model schema
8.5	Location and orientation
8.5.1	Overview
8.5.2	Position
8.5.3	Attitude
8.5.4	Dynamics

8.5.5	Position and orientation of a sensor relative to the platform
8.6	Sensor parameters
8.6.1	SD_SensorParameters
8.6.2	Detector array
8.6.3	Sensor system and operation
8.6.4	SD_OpticsOperation
8.6.5	Distortion correction
8.6.6	Microwave sensors
9	True Replacement Models and Correspondence Models
9.1	Functional fitting
9.2	True Replacement Model approach
9.2.1	General
9.2.2	Types of True Replacement Models
9.2.2.1	Polynomials
9.2.2.2	Coordinate normalization
9.2.2.3	Direct Linear Transform
9.2.2.4	True Replacement Model based on grid interpolation
9.2.2.5	Ground-to-image and image-to-ground transformations
9.2.2.6	Rigorous error propagation with a True Replacement Model
9.2.2.7	Adjustability for True Replacement Model
9.2.2.8	Summary
9.3	Quality associated with a True Replacement Model
9.4	Schema for True Replacement Model
9.5	Correspondence Model approach
9.5.1	General
9.5.2	Limitations of Correspondence Models
9.5.3	3D-to-2D Correspondence Models
9.5.4	2D-to-2D Correspondence Models
9.6	Schema for Correspondence Models
Annex A	(normative) Conformance and testing
A.1	Geopositioning information
A.2	Ground control points
A.2.1	GCP collection
A.2.2	GCP repository
A.3	Physical Sensor Model
A.3.1	Sensor model completeness
A.3.2	Platform information
A.3.3	Sensor information
A.3.4	Optics
A.3.5	SAR
A.4	Functional fitting
A.5	True Replacement Model
A.6	Correspondence Model
Annex B	(normative) Geolocation information data dictionary
B.1	Data dictionary overview
B.1.1	General
B.1.2	Data type/class
B.1.3	Obligation/Condition
B.1.4	Domain
B.2	UML models for geolocation information
B.2.1	Physical Sensor Model
B.2.2	True replacement and correspondence models
B.2.3	Codelists
Annex C	(normative) Coordinate systems
C.1	Introduction
C.1.1	Overview
C.1.2	Earth coordinates
C.1.3	Sensor coordinates
C.2	Platform position with respect to the Earth
C.2.1	General

- C.2.2 Geodetic coordinate reference system
 - C.2.2.1 Discussion
 - C.2.2.2 Global geodetic coordinate reference systems
 - C.2.2.3 Topocentric coordinate system
 - C.2.2.4 Platform coordinate reference systems
 - C.2.2.4.1 Basic platform CRS
 - C.2.2.4.2 Platform CRS corrected for attitude
 - C.2.2.4.3 Platform CRS corrected for attitude and heading
 - C.2.2.4.4 Satellite platform coordinate reference system
 - C.2.2.5 Platform position extensions for satellite implementation
 - C.2.2.6 Satellite platform time
 - C.2.2.7 Earth rotation effect
- C.3 Sensor position relative to platform
 - C.3.1 Overview
 - C.3.2 Gimbals
 - C.3.2.1 Overview
 - C.3.2.2 Gimbal position vectors
 - C.3.2.3 Gimbal attitude
 - C.3.2.4 Gimbal stage reference system
- C.4 Passive detector coordinates
 - C.4.1 General
 - C.4.2 Frame (area) sensor
 - C.4.3 Common Coordinate System
 - C.4.4 Pushbroom sensor
 - C.4.5 Whiskbroom sensor
- C.5 SAR coordinates
 - C.5.1 General
 - C.5.2 Slant plane coordinates
 - C.5.3 Ground plane coordinates
 - C.5.4 Inflated ellipsoid coordinates

Annex D (informative) Frame sensor model metadata profile supporting precise geopositioning

- D.1 General
- D.2 Frame sensor interior descriptions
 - D.2.1 Typical imagery sensor storage layout
 - D.2.2 Pixel-to-image line, sample coordinate transformation
 - D.2.3 Film and charged coupled device array distortions
 - D.2.4 Principal point
 - D.2.5 Optical distortions
 - D.2.6 Atmospheric refraction
 - D.2.7 Summary
- D.3 Collinearity equations

Annex E (informative) Pushbroom/Whiskbroom sensor model metadata profile

- E.1 General
- E.2 Pushbroom sensor Interior description
 - E.2.1 Pushbroom sensor coordinate system
 - E.2.2 Pushbroom sensor time
 - E.2.3 Imaging process
 - E.2.4 System operation dependencies
- E.3 Whiskbroom sensor description
 - E.3.1 Whiskbroom sensor introduction
 - E.3.2 Whiskbroom sensor coordinate system
 - E.3.3 Whiskbroom pixel-to-image coordinate transform
 - E.3.4 Whiskbroom time
- E.4 Methods for solution
 - E.4.1 General
 - E.4.2 Spline Model for the system
 - E.4.3 Gauss-Markov and Gauss- Helmert models as stochastic models
 - E.4.3.1 Stochastic model introduction
 - E.4.3.2 The Gauss-Markov model
 - E.4.3.3 The Gauss- Helmert model
 - E.4.4 Self calibration
- E.5 Adjustment for atmospheric refraction

Annex F (informative) Synthetic aperture radar sensor model metadata profile supporting precise geopositioning

- F.1 General**
- F.2 SAR sensor imagery systems**
 - F.2.1 General**
 - F.2.2 Basic radar principles**
 - F.2.3 SAR radar principles**
 - F.2.3.1 General**
 - F.2.3.2 Range resolution in SAR**
 - F.2.3.3 Azimuth resolution in SAR**
 - F.2.4 SAR imaging modes**
 - F.2.4.1 General**
 - F.2.4.2 Stripmap mode**
 - F.2.4.3 Spotlight mode**
 - F.2.4.4 Scan mode**
 - F.2.4.5 ScanSAR mode**
 - F.2.5 SAR sensor coordinate systems**
 - F.2.6 Important SAR terms**
- F.3 SAR geometry**
 - F.3.1 Equations**
 - F.3.2 External influences**
- F.4 Application of sensor model**
 - F.4.1 SAR geopositioning**
 - F.4.1.1 General**
 - F.4.1.2 Mono image with an elevation source**
 - F.4.1.3 Stereo intersection**
 - F.4.2 Adjustable parameters**
 - F.4.3 Covariance matrices**

Page count: 152