TECHNICAL REPORT

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Intelligent transport systems — Spatio-temporal data dictionary for cooperative ITS and automated driving systems

Systèmes de transport intelligents — Dictionnaire de données spatio-temporelles pour les systèmes de conduite automatisée et les STI coopératifs

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Foreword

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This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

Introduction

Cooperative ITS and automated driving systems as energy-saving technology have attracted much attention. These systems are expected to reduce traffic congestion and achieve smoother transportation.

Recently, car manufacturers, car parts manufacturers and IT companies have started driving tests for automated driving systems on the public road. Several car manufacturers have released the schedule of commercial viability and automated driving systems and are expected to put it into practical use within two or three years.

In the existing ITS applications, geographical information are optimally designed for individual systems. Thus, a large amount of resources are required in order to create, provide and maintain this information.

In the future, spatio-temporal data for ITS which includes static and dynamic temporal-spatial data will be required for Cooperative ITS and automated driving systems. In order to create, provide and maintain these data, much more resources will be required.

Spatio-temporal data can be used for different types of application systems. A common understanding and sharing of spatio-temporal data is formulated by this data dictionary. For instance, spatio-temporal data for ITS includes location information or has relationships with location.

Standardization of spatio-temporal data dictionary is expected to contribute to research and development and dissemination of cooperative ITS and automated systems by stakeholders.

Intelligent transport systems — Spatio-temporal data dictionary for cooperative ITS and automated driving systems

1 Scope

This document describes a spatio-temporal data dictionary for cooperative ITS and automated driving systems.

This data dictionary includes static data and dynamic data.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
aggregate domain
data concept that defines a grouping of data elements and/or data frames

3.2
data concept
item that may be stored in a data dictionary that refers to an abstraction or thing in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules

Note 1 to entry: Data concepts can be classified into the following types: object class, value domain, data element, aggregate domain, data frame, message, interface dialogue, dictionary document, or module.

3.3
data concept type
categorization of the kind of data concept

3.4
data dictionary
listing of data concepts and their meta-attributes in a consistent format

3.5
data element
data concept represented by a specific value domain that describes a single atomic property about an object class

Note 1 to entry: A data element is composed of an object class, a property of the represented object class and a value domain.

3.6
data frame
data concept represented by a specific aggregate domain that describes information of interest through a useful grouping of more atomic properties about one or more object classes

Note 1 to entry: The grouping may be a set, sequence, or a choice.

3.7
dynamic data
data which has short life-span data such as a position of vehicle

3.8
message
data concept that is a grouping of data elements, data frames, or data elements and data frames that is used to convey a complete set of information

Note 1 to entry: For the purposes of this document, a message is an abstract description; it is not a specific instance.

3.9
module
data concept that contains the formal syntactic definition, and optionally the semantic definition, of a defined set of other data concepts that are all version-controlled as a single unit

Note 1 to entry: A module can be represented in multiple languages (e.g., ASN.1 or XML Schema) and compiled by computer systems.

3.10
source
document or other reference that was used to develop the pertinent data concept

3.11
spatio-temporal (adjective)
relating to both space and time

3.12
static data
data which do not change automatically

3.13
value domain
data concept that defines a set of permissible values

4 Abbreviated terms

ACC	Adaptive Cruise Control systems
APS	Assisted Parking System
CACC	Cooperative adaptive cruise control
CIWS	Cooperative Intersection signal information and violation Warning Systems
CSWS	Curve Speed Warning Systems
FVCMS	Forward Vehicle Collision Mitigation Systems
GNSS	Global Navigation Satellite System
ITS	Intelligent Transport Systems

JARI	Japan Automobile Research Institute
LCDAS	Lane Change Decision Aid Systems
LKAS	Lane Keeping Assistance Systems
TISA	Traveller Information Services Association

5 Contents and descriptive names of data dictionary

The data dictionary consists of the following items.

Data concept name	descriptive name of data concepts
data concept type	module/message/data frame/data element/aggregate domain/value domain
data status category	dynamic/static
Definition and description	Definition and description of data contents
Data structure	definition of data content by XML schema
Issued by	authors who published the source documents
source documents	original documents
remark	other information

6 Data dictionary description

This data dictionary is described alphabetically.

[a]

absolute geo coordinate

Data concept name	AbsoluteGeoCoordinate	Data status category	static
		Data concept type	data element
Definition and description	AbsoluteGeoCoordinate specifies a geo position with longitude and latitude values with a deca micro degree accuracy stored in 24 bit integer value. Longitude: 24-bit representation of a longitude value in deca micro degree precision. Latitude: 24-bit representation of a latitude value in deca micro degree precision. Altitude: Elevation of location in metres above/below Mean Sea Level.		
Data structure	<xs:complexType name="AbsoluteGeoCoordinate"> <xs:sequence> <xs:element name="longitude" type="tdt:IntSi24"/> <xs:element name="latitude" type="tdt:IntSi24"/> <xs:element name="altitude" type="tdt:IntSiLoMB" minOccurs="0"/> </xs:sequence> </xs:complexType>		
Issued by		source document	ISO/TS 21219-22:2017
Remarks			

acceleration

Data concept name	Acceleration	Data status category	dynamic
		Data concept type	data element
Definition and description	Acceleration provides a value and unit of vehicle acceleration. Value of unit of acceleration is given by unit code which is assigned as 0,01 m/sec*sec, 0,02 m/sec*sec, 0,1 m/sec*sec, 0,25 m/sec*sec, 1 m/sec*sec, 0,01 G and 0,02 G.		
Data structure	<xs:complexType name="Acceleration" > <xs:sequence> <xs:element name="valueOfAcceleration" type="xs:unsignedInt"/> <xs:element name="unitCodeOfAcceleration" type="FourBitCode"/> </xs:sequence> </xs:complexType>		
Issued by	JARI	source document	proposed CITS data dictionary
Remarks			

acceleration set

Data concept name	Acceleration Set	Data status category	dynamic
		Data concept type	data element
Definition and description	Acceleration Set provides accelerations of three axial directions of vehicle.		
Data structure	<xs:complexType name=" AccelerationSet"> <xs:element name="longitudionalAcceleration" type="Acceleration"/> <xs:element name="lateralAcceleration" type="Acceleration"/> <xs:element name="verticalAcceleration" type="VerticalAcceleration"/> </xs:complexType>		
Issued by	JARI	source document	proposed CITS data dictionary
Remarks			

acceleration confidence

Data concept name	Acceleration confidence	Data status category	dynamic
		Data concept type	data element
Definition and description	AccelerationConfidence provides the confidence of acceleration of the vehicle. It is a confidence level of 95 % of reliability.		
Data structure	<xs:simpleType name="AccelerationConfidence" > <xs:element name="accelerationConfidence" type="Confidence"/> </xs:simpleType>		
Issued by	JARI	source document	proposed CITS data dictionary
Remarks			

accuracy millimetre

Data concept name	AccuracyMillimetre	Data status category	static
		Data concept type	value domain
Definition and description	It is one of the accuracy expressions for a length or distance. Unit is a millimetre.		
Data structure	<xs:simpleType name="AccuracyMillimetre"> <xs:restriction base ="xs:float"> <xs:minInclusive value="0,0"/> </xs:restriction> </xs:simpleType>		
Issued by		source document	ISO 22837:2009
Remarks			

advisory point

Data concept name	AdvisoryPoint	Data status category	static
		Data concept type	data element
Definition and description	Advisor Point provides a location and contents of the advisory on the road.		
Data structure	<xs:complexType name="AdvisoryPoint"> <xs:sequence> <xs:element name="roadSectionId"type="ID32bit"/> <xs:element name="roadElementId"type="ID32bit"/> <xs:element name="advisoryPointId" type="ID32bit"/> <xs:element name="positionStartAdvisoryPoint" type="PointLocation"/> <xs:element name="positionEndAdvisoryPoint" type="PointLocation" minOccures="0"/> <xs:element name="lengthAdvisoryPointFromStartIPC" type="Length" minOccures="0"/> <xs:element name="numAdvisoryPointFromStartIPC" type="xs:unsignedInt" minOccures="0"/> <xs:element name="lengthAdvisorySection" type="Length" minOccures="0"/> <xs:element name="advisoryAttribute" type="FourDigitCode" minOccures="0"/> <xs:element name="advisoryText" type="xs:string" minOccures="0"/> </xs:sequence> </xs:complexType>		
Issued by		source document	ISO 14296:2016
Remarks			

altitude

Data concept name	Altitude	Data status category	static
		Data concept type	value domain
Definition and description	It provides a value of the Altitude of ITRF94 coordinate. Unit of standard resolution is 10 mm and unit of high resolution is 1 cm.		
Data structure	<xs:complexType name="Altitude"> <xs:choice> <xs:element name="StandardResolutionAltitude" minOccurs="0"> <xs:simpleType > <xs:restriction base="FiveDigitSignedInt"/> </xs:simpleType> </xs:element> <xs:element name="HighResolutionAltitude" minOccurs="0"> <xs:simpleType> <xs:restriction base="SevenDigitSignedInt"/> </xs:simpleType> </xs:element> </xs:choice> </xs:complexType>		
Issued by		source document	ISO 14296:2016
Remarks			

ambient air pressure

Data concept name	AmbientAirPressure	Data status category	dynamic
		Data concept type	data element
Definition and description	It provides an ambient air pressure sensed by OBU/RSU conformity SAE J2735 The value of data expresses 1,090 hPa from 580 hPa. Value "0" means "unknown", unit is 2 hPa.		
Data structure	<xs:simpleType name=" AmbientAirPressure" > <xs:element name="ambientAirPressure" type="xs:unsignedByte"/> </xs:simpleType>		
Issued by	JARI	source document	proposed CITS data dictionary
Remarks			

angle of curved road

Data name	AngleOfCurvedRoad	Data status category	static
		Data concept type	value domain
Definition and description	Central angle between the curve start point and the curve end point [radian]		
Data structure	<xs:simpleType name="AngleOfCurvedRoad" type="EXTERNAL"/>		
Issued by		source document	ISO 11067:2015 CSWS
Remarks			

availability of moving adjoining lane

Data concept name	AvailabilityOfMovingAdjoin-ing Lane	Data status category	static
		Data concept type	value domain
Definition and description	It is one of the attributes of the lane. It provides availability of moving to adjoining lanes.		
Data structure	<xs:simpleType name="AvailabilityMovingAdjoiningLane"> <xs:union> <xs:simpleType> <xs:restriction base="xs:string"> <xs:enumeration value="do not move to right and left"/> <xs:enumeration value="do not move to right and can move to left"/> <xs:enumeration value="can move to right and does not move to left "/> <xs:enumeration value="can move to right and left "/> </xs:restriction> </xs:simpleType> <xs:simpleType> <xs:restriction base=""TwoBitCode"/> </xs:simpleType> </xs:union> </xs:simpleType>		
Issued by		source document	ISO 14296:2016
Remarks			

available service

Data concept name	AvailableService	Data status category	static
		Data concept type	data element
Definition and description	This is services in Parking Facility (i.e. fuel station, car wash, toilet, restaurant, shop, shower room, break room)		

Data structure	<xs:simpleType name=" AvailableService" type="SixteenBitAssignedCode" />		
Issued by		source document	ISO 16787:2016 APS
Remarks			

axle location

Data concept name	AxleLocation	Data status category	static
		Data concept type	aggregate domain
Definition and description	This is location of the axle of the vehicle. Location is shown by the length from a bumper. conformity SAE J1939 Unit value of location is given by 4 bit code which is assigned as 0,01 m, 0,05 m, 0,1 m, 0,2 m.		
Data structure	<xs:complexType name="AxleLocation"> <xs:sequence> <xs:element name="LRPos" type="FourBitCode" /> <xs:element name="FRPos" type="FourBitCode" /> <xs:element name="valueOfAlexPositionFromBumper" type="ThreeDigitUnsigned-Int"/> <xs:element name="unitOfAlexPosition" type="FourBitCode" minOccurs="0"/> </xs:sequence> </xs:complexType>		
Issued by	JARI	source document	proposed CITS data dictionary
Remarks	Real value of location is the product of a valueOfAlexPosition and unitOfAlex.		

axle weight

Data concept name	AxleWeight	Data status category	static
		Data concept type	value domain
Definition and description	It provides the weight of the axle of vehicle. conformity SAE J1939 Unit value of weight is given by 4 bit code which is assigned as 0,1 Kg, 0,2 Kg, 0,5 Kg, 1 kg, 10 Kg, 20 Kg.		