International Standard

ISO 17438-2

Intelligent transport systems — Indoor navigation for personal and vehicle ITS stations —

Part 2:
Requirements and specification for indoor maps

Systèmes de transport intelligents — Navigation interne pour station personnelle et véhicules ITS —

Partie 2: Exigences et spécifications pour les cartes d'intérieure

First edition
2024-09

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO 17438-2:2024
https://standards.iteh.ai/catalog/standards/iso/d4157dd8-7616-4047-b381-344bee312933/iso-17438-2-2024

Contents

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 17438 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

With the spread of nomadic and mobile devices such as smart phones and the rapid expansion of indoor spaces, many of the services and facilities related to the transport system have become accessible to indoor spaces. Consequently, navigation in indoor space is considered a new killer application in the transport industry.

The objective of this document is to provide a basic data model and encoding format for indoor positioning reference data required for indoor navigation functionality for ITS applications. This document is intended to be used by designers, developers and providers of indoor navigation services. When implemented, this document is intended to:

1) provide developers and designers with concepts and appropriate information to implement indoor navigation services;

2) provide developers and designers with interoperable ways to use indoor navigation data from various sources for indoor navigation;

3) enable the provision of indoor navigation services to users;

4) provide developers and designers with an extendable base for indoor navigation.

iTeh Standards
(https://standards.iteh.ai)
Document Preview

Intelligent transport systems — Indoor navigation for personal and vehicle ITS stations —

Part 2:
Requirements and specification for indoor maps

1 Scope

This document defines requirements and specifications of indoor positioning references, which can be referenced for positioning in indoor space, for supporting indoor navigation functionality of a personal/vehicle (P/V) ITS station.

NOTE   Specific structure and contents of indoor positioning references depend on types of indoor positioning technologies.

This document defines:

a)   the composition of an indoor map for indoor navigation of P/V ITS stations;

b)   the schema and encoding format of the indoor map for indoor navigation at the P/V ITS stations.

This document focuses on the specification and format of the indoor map. The following issues which are adjunctive but essential for commercial navigation services are beyond the scope of this document:

— authorized and authenticated access of users and services, including security;

— payment;

— preparation of indoor data which are necessary for indoor navigation;

— low-level communication protocols required to transfer and share data from and to a roadside ITS station or a central ITS station;

— other issues dependent on implementation of an instance of indoor navigation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 13184-2, *Intelligent transport systems (ITS) — Guidance protocol via personal ITS station for advisory safety systems — Part 2: Road guidance protocol (RGP) requirements and specification*

ISO 17438-1, *Intelligent transport systems — Indoor navigation for personal and vehicle ITS station — Part 1: General information and use case definition*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13184-2 and ISO 17438-1 and the following apply.

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

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

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

3.1.1
nomadic device
ND
implementation of a personal ITS station which provides communication connectivity via portable equipment such as cellular telephones, wireless communication network (3G, 4G and 5G), mobile wireless broadband (WIMAX, HC-SDMA, etc.), etc. and includes short range links, such as IEEE 802.11x, etc. to connect portable devices to the motor vehicle communications system network

Note 1 to entry: In detail, nomadic devices that have hardware security modules and have been certified to be ITS trusted are called a personal ITS station.

[SOURCE: ISO 23795-2:2024, 3.1.1, modified — Note 1 to entry has been added.]

3.1.2
indoor navigation
navigation provided in indoor space

[SOURCE: ISO 17438-4:2019, 3.1.2]

3.1.3
indoor space
space within artificial structures such as buildings and facilities connected with transport corridors or roads

EXAMPLE   A building or indoor parking lot.

[SOURCE: ISO 17438-1:2016, 3.1.2]

3.1.4
ITS station
ITS-S
entity in a communication network, comprised of application, facilities, networking and access layer components specified in ISO 21217 that operate within a bounded secure management domain

[SOURCE: ISO 13184-2:2016, 3.5]

3.1.5
personal/vehicle ITS station
P/V-ITS-S
ITS station implemented in a vehicle or nomadic device

[SOURCE: ISO 13184-2:2016, modified — "personal mobile device" has been replaced by "nomadic device" in the definition.]

3.1.6
well-known binary
WKB
binary equivalent used to transfer and store the same information in a more compact form, which is convenient for computer processing but which is not human-readable

3.1.7
well-known text
WKT
text markup language for representing vector geometry objects

3.1.8
roadside ITS station
R-ITS-S
system that receives and processes vehicular and pedestrian information within a certain zone

Note 1 to entry: The system is installed at the roadside.

[SOURCE: ISO 13184-2:2016, 3.9, modified — "and determines the situation, in order to provide the safety warning and parking guide service to vehicles and pedestrians" has been removed from the definition.]

3.1.9
central ITS station
central ITS-S
C-ITS-S
implementation of an ITS-S in a central ITS subsystem

[SOURCE: ISO 13184-4:2019, 3.1.6]

3.1.10
indoor positioning
determination of a location in an indoor space

[SOURCE: ISO 17438-4:2019, 3.1.7]

3.1.11
indoor positioning infrastructure
infrastructure used to determine locations of personal/vehicle ITS stations (P/V-ITS-S) in an indoor space

EXAMPLE   WiFi, Bluetooth, etc.

[SOURCE: ISO 17438-4:2019, 3.1.11]

3.1.12
indoor positioning reference
information to support indoor positioning

Note 1 to entry: Detailed specifications and contents of indoor positioning references depend on the specific indoor positioning technologies.

EXAMPLE   A good example of an indoor positioning reference is information about indoor positioning infrastructure. For Wi-Fi based positioning, the indoor positioning infrastructure information includes the Wi-Fi APs information, such as location, SSID, and RSSI values of APs.

[SOURCE: ISO 17438-4:2019, 3.1.12, modified — Example 1 and Example 2 have been combined into a single Example.]

3.1.13
indoor navigation data
data needed for indoor navigation, which includes indoor maps and indoor positioning infrastructure information

[SOURCE: ISO 17438-4:2019, 3.1.13]

3.2 Abbreviated terms

ASN   abstract syntax notation

C-ITS-S   central ITS station

CRS   coordinate reference system

EPSG   European Petroleum Survey Group

ITS   intelligent transport systems

ITS-S   ITS station

M/O/C   mandatory/optional/conditional

MO   maximum occurrence

POI   point of interest

P/V-ITS-S   personal/vehicle ITS station

R-ITS-S   roadside ITS station

WKB   well-known binary

WKT   well-known text

4 Requirement and conformance

4.1 Requirements

This document defines use cases and data specifications between a P/V-ITS-S and a C-ITS-S for using indoor maps. In the definitions of data types for supporting the indoor maps, there are mandatory, optional or conditional fields. Mandatory fields shall be provided and conditions for conditional fields shall be satisfied. These are the requirements embedded in the definition of data types for supporting client-based positioning.

Specific encoding of each data types can be adapted for implementation. There can be additional requirements for specific encoding.

4.2 Conformance

For the purpose of conformance to the indoor maps of which specifications are defined in Clause 7, multiplicity of the elements in an indoor map should be observed through their implementations.

5 Conventions

This document is based on the conventions of ASN.1 (Abstract Syntax Notation One) formats.

6 Indoor map for indoor navigation functionality

6.1 Overview

Indoor maps for indoor navigation consist of the following components.

a) Background map — The background map in an indoor mapping system serves as the base layer, providing the fundamental visual guide for users. The background map can be a form of vector and raster maps, which is aligned with a geographic indoor space. By displaying the background map, the

indoor space can be visualized on the user's device. The background map helps ensure that the map provides an effective and accurate representation of the physical environment for users navigating through it.

b) Route network map — The route network map serves as a comprehensive guide for navigation through interconnected pathways within indoor spaces. It outlines the paths, providing information on how different areas of the indoor space are linked together, and how they can be navigated. It details specific points of interest, their types, and the routes connecting them. The map incorporates dynamic features, such as permissible directions of movement, the timings during which specific routes are accessible, and the periodicity of these access times.

c) Space map — The space map provides a representation of the semantic structure of an indoor environment. The semantic structure represents the organization and interrelation of spaces such as rooms, corridors and stairs within one or more buildings, emphasizing the navigable and functional areas rather than the architectural elements that define these spaces. It highlights the relationships between these spaces, facilitating a clear spatial understanding and navigation.

d) Set of POIs — The set of points of interest (POIs) is a collection of notable locations or features that have been marked for special consideration within the indoor maps. These can include specific rooms, areas, individual objects or facilities. Each point in this set is linked to a specific location of indoor nodes or indoor semantic space. It can be highlighted or prioritized for users to navigate the indoor space or find specific locations.

In addition to these components, other types of positioning resources can also be considered according to the configuration of systems and services to be implemented and the type of indoor positioning to be used.

6.2 Scope of indoor maps

This document focuses specifically on requirements and specifications of indoor navigation maps for P/V-ITS stations. It includes the data types and formats for features, network, POIs and base map within indoor maps. Annex A provides the ASN.1 schema encoding.

6.3 Use cases of indoor maps

This document refers to and uses the use cases UC 2.1 – Searching for indoor maps, and UC 2.2 – Retrieving indoor maps, defined in ISO 17438-4:2019, 7.2.2.1 and 7.2.2.2. UC 2.1 is the use case for searching for candidates of indoor maps that satisfy given conditions, and UC 2.2 is the use case for downloading the searched indoor maps. This document defines the contents of indoor maps which are transferred to a P/V-ITS-S, as described in UC 2.2.

7 Definition of indoor map

As described in Table 1, the indoor maps for indoor navigation at a P/V-ITS-S are transferred to a P/V-ITS-S from a C-ITS-S using the "map" attribute of "indoor-map" message defined in ISO 17438-4:2019, 8.9.

The whole ASN.1 schema for indoor positioning references shall be as defined in Annex A of this document.

Table 1 defines the "IndoorMap" data type, describing an indoor map, which consists of indoor features, indoor networks with relevant indoor cell spaces, indoor POIs and base maps.