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

Part 1:
General information and use cases definition

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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.

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO 17438 consists of the following parts, under the general title *Intelligent transport systems — Indoor navigation for personal and vehicle ITS station*:

— *Part 1: General information and use cases definition*

— *Part 2: Requirements and specification for indoor map data format*

— *Part 3: Requirements and specification for indoor positioning reference data format*

— *Part 4: P/V and central ITS stations interface requirements and specification for Indoor positioning and map data*

Introduction

This international standard defines requirements and specifications for indoor map data format, positioning reference data, and Interface between the P/V ITS station and central ITS station for supporting indoor navigation.

Applications supporting indoor navigation for personal and vehicle ITS stations via nomadic and mobile device need indoor map data and positioning reference data through the existing ITS station components.

The following standards are subject to analysis in regard to their applicability in supporting indoor navigation service provision via nomadic and mobile device.

— ISO/TR 10992, *Intelligent transport systems — Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles*

— ISO 14825, *Intelligent transport systems — Geographic Data Files — Overall Data Specification*

— OGC 10-191r1, *Requirements and Space-Event Modelling for Indoor Navigation*

— OGC 12-019, *OGC City Geography Markup Language (CityGML) Encoding Standard*

— CEN/TS 00278207, *Identification of Fixed Objects for Public Transport*

— ISO 24099, *Navigation Data Delivery Structures and Protocols*

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

Part 1: General information and use cases definition

1 Scope

This part of the standard specifies the indoor navigation system architecture including additional components that are added to the existing ITS system and use cases in providing indoor navigation to various types of users including drivers, passengers and pedestrians using personal and vehicle ITS stations:

- — The personal and vehicle ITS station in the role as end user terminal running indoor navigation functionality,
- — Indoor map containing indoor geometry, network topology and POI data reflecting characteristics of indoor space,
- — Indoor positioning reference data containing information of positioning infrastructure; WiFi AP, RFID Reader, Bluetooth AP etc.,
- — Data providers to provision the indoor map or indoor positioning reference data,
- — Indoor data registry server to provision the information of indoor data server,
- — Indoor positioning functionality in the personal and vehicle ITS station using indoor positioning reference data,
- — Indoor positioning functionality in the central ITS station using indoor positioning reference data,
- — Interface between the P/V ITS station and central ITS station to communicate indoor map data and indoor positioning reference data,

This part of standard includes "General Information" which provides a general overview and structure about each part of the standard. It also specifies "Use Cases: related to the indoor navigation for personal and vehicle ITS station.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited is applied. For undated references, the latest edition of the referenced document (including any amendments) is applied.

ISO/TR 10992, *Intelligent transport systems — Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles*

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/TR 10992 and the following apply.

3.1.1
ND
nomadic device
used to connect to the on-board unit and request and display information. Examples of nomadic devices are PDAs, mobile phones, smart phones, etc

3.1.2
indoor navigation
location based service to guide user to destination using indoor map data and the current location of the user in indoor space

3.1.3
indoor space
area limited to a building or a structure and not outside

3.1.4
indoor map data
data to present information about indoor space. It includes indoor geometry, network topology, and POI data

3.1.5
indoor positioning reference data
group of information which can be used to determine a ND or user's position. Detailed compositions vary depending on the positioning technologies, such as WiFi, RFID etc

3.1.6
indoor positioning
process of deciding location of P/V ITS station in the indoor space

3.1.7
indoor-outdoor seamless navigation
route guidance service between indoor and outdoor and/or vice versa

3.2 Abbreviated terms

RFID	Radio Frequency Identification
ND	Nomadic Device
RP	Route Planning
RG	Route Guidance
TBT	Turn By Turn
POI	Point Of Interest
GPS	Global Positioning System
PND	Personal Navigation Device
P/V	Personal/Vehicle
XML	Extensible Mark-up Language

4 General information

4.1 Document overview and structure

This standard provides all documents and references required to support the implementation of indoor navigation. The standard consists of the following documents.

— Part 1: General information and use case definitions

This part provides an overview of the document set and structure along with the use case definitions and a common set of resources (definitions, references) for all subsequent parts.

— Part 2: Requirements and specification for indoor map data format

This part specifies all technical requirements and a materialized specification for the map exchange when a P/V ITS station downloads indoor map data from central ITS station.

— Part 3: Requirements and specification for indoor positioning reference data format

This part specifies all technical requirements in regards to the indoor positioning reference data format which are used to determine locations of P/V stations with reference to the corresponding indoor map data.

— Part 4: Requirements and specification for interface between P/V and central ITS stations

This part specifies the interface requirements for map and indoor positioning reference data related to the personal, vehicle and central ITS stations.

Figure 1 depicts the document structure of the “Indoor navigation for P/V ITS stations” document set.

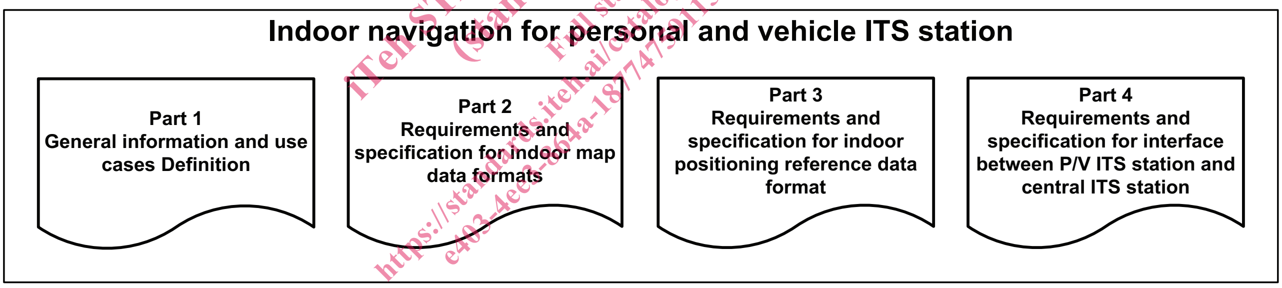

Figure 1 — Document structure

4.2 Purpose of this standard

The main purposes of this standard are to:

a) Identify the requirements for indoor navigation,

b) Identify the usability of existing International Standards for indoor navigation,

c) Identify additional works required to develop the specification of indoor map and indoor positioning reference data format,

d) Identify additional works required to develop common software interfaces between a P/V ITS station and a central ITS station.

4.3 Indoor navigation system architecture

By default, indoor navigation system architecture follows the existing ITS communication architecture with additional indoor navigation functionality. Therefore, the following four basic components are also included in the indoor navigation architecture:

— the vehicle subsystem component (Vehicle Station),

— the mobile subsystem component (Personal Station),

— the roadside subsystem component (Roadside Station),

— the central subsystem component (Central Station).

However, in the indoor navigation system architecture, the vehicle station and personal station share the same functionalities and roles in the aspect of a mobile user. Therefore, in this standard, the two components will be referred to a combined component called “P/V ITS Station”.

To offer indoor navigation functionality, additional necessary elements are defined as follows.

— the indoor map data

— the indoor positioning reference data

— the indoor map data provider

— the indoor positioning reference data provider with indoor positioning engine

— the indoor data registry server

— the indoor navigation function modules in the personal, vehicle and central ITS stations

— the indoor positioning infrastructure

Figure 2 depicts the indoor navigation system designed for ITS.