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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (CEN/TS 17297-2:2019) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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Introduction

Whilst some location data are based on a latitude/longitude system or other coordinate systems, others are based on the gazetteer reference to physical objects, e.g. bus stops, streets or bays in a car park. Translations between different location referencing systems are, therefore, a key feature for moving data between systems and between applications. Nearly all ITS applications need some form of location determination and referencing to put the data or information into a spatial context.

In data terms, for most systems, we need to know values and where the data was collected. For example, a loop detector is referenced to a particular point defined generally by a description of the road, the direction, the lane and a stated distance from a known reference point like a junction. Data from a moving probe vehicle will often be defined by XY coordinates based on an agreed location referencing systems such as WGS84. Similarly, public transport information is often referenced to identified routes and stops but historically, without the need to be concerned about where these routes and stops are in geographically physical space.

Historically, applications in the transport sector have spawned location referencing systems that have properties that suit the application itself; this silo approach has resulted in a significant number of incompatible location referencing systems, often within the same organization. A typical road authority can have 10 or more different location referencing systems for traffic control, pavement management, detectors, asset management and content dissemination etc.; none of which are compatible or easily translated from one to another because of different business rules or definitions. An example of this is 'lanes'; is a long exit lane from a motorway counted as a running lane, and where does it start and end?

In public transport information services, location references – where they exist – can be both inconsistent with location information on the infrastructure. For example, even where a bus stop is geo-located as a point in space, this is often unmatched with the road along which the bus will be travelling. Also, there is a logical divergence on whether the "stop" is the point where passengers are expected to stand or the point where the vehicle will stand; whilst this distinction will generally be of no significance for end users of itself, it makes multimodal information – for example, planning a walk-then-bus journey – difficult and unreliable.

More generally, in the Urban-ITS context, multiple applications are required to cooperate. So, in a multimodal environment, the disparity between location referencing systems becomes a major issue.

The only solution is to first identify the characteristics of location referencing that can be "application independent" and then evolve (a) a conversion strategy for the short-term, and (b) a migration strategy for the long term; with constant pressure on budgets, this represents a major challenge.

This document has been produced by the CEN/TC 278/WG 17 Project Team PT 1703 "Location Referencing Harmonisation" under the mandate M/546 on urban ITS (U-ITS).

This document, in examples, mentions tools that can support transformation processes. It is noted that reference to particular tool does not imply that it is the only or best tool for achieving a task, or that it is currently available.

The audience for this document are those who need to combine data which use different location referencing methods due to their different applications, modes or vendors.

The informative Clause 5 describes basics on transformations between location reference systems:

— The concept of transformation is presented in 5.2.

— Data quality in the context of transformations is discussed in 5.3.

The normative Clause 6 specifies transformation requirements and presents transformation examples.

Location referencing inside buildings is not considered in this document.

1 Scope

This document specifies requirements, recommendations, and permissions related to translations between location referencing methods applicable in the urban transport environment.

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.

EN ISO 14819-3:2013, *Intelligent transport systems — Traffic and travel information messages via traffic message coding — Part 3: Location referencing for Radio Data System — Traffic Message Channel (RDS-TMC) using ALERT-C*

ISO 19157:2013, *Geographic information — Data quality*

INSPIRE Technical Guidelines, INSPIRE, *Data Specification on Coordinate Reference Systems — Technical Guidelines. 2014*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TR 17297-1 and the following 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 https://www.iso.org/obp

3.1
accuracy
closeness of agreement between a test result or measurement result and the true value

[SOURCE: ISO 6709:2008, definition 4.1]

3.2
area of use
geographical area in which a specific map projection applies

3.3
location reference
description of an identifiable geographic place

Note to entry: ISO 17572-1 defines a location reference as a “label which is assigned to a location”, while ISO TS 21219-7. TPEG2-LRC defines location referencing as “means to provide information that allows a system to identify accurately a location”

3.4
resolution
unit associated with the least significant digit of a coordinate

[SOURCE: ISO 6709:2008, definition 4.10]

3.5
transformation
operations to change the description of a location (a location reference) from one LRS to another LRS

4 Symbols and abbreviations

AVM	automatic vehicle monitoring
CRS	coordinate reference system
CS	coordinate system
EPSG	European Petroleum Survey Group
ETRS	European terrestrial reference system
EU	European Union
GALILEO	name of the European satellite navigation and time reference system
GIS	geographic information system
GLONASS	Global Navigation Satellite System NOTE 1 Russian: globalnaja nawigazionnaja sputnikowaja sistema NOTE 2 name of the satellite navigation and time reference system of the Russian Federation
GLR	geographic location referencing
GML	geography markup language
GNSS	global navigation satellite system
GPS	global positioning system NOTE 3 name of the satellite navigation and time reference system of the United States of America
INSPIRE	infrastructure for spatial information in Europe NOTE 4 Name of a directive on the EC; aims on creating a European Union spatial data infrastructure
IOGP	International association of oil and gas producers
ITRS	international terrestrial reference system
ITS	intelligent transport systems
LLRM	linear LRM
LRM	location referencing method
LRS	location referencing system
OEM	original equipment manufacturer
OGC	open geospatial consortium
TN-ITS	transport networks for ITS
U-ITS	urban ITS
UTM	universe transverse Mercator

5 Basics on transformations between location reference systems

5.1 Location referencing

The concept of location referencing with location referencing methods (LRMs) and location referencing systems (LRSs) is described in CEN/TR 17297-1.