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TECHNICAL SPECIFICATION

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Release 2

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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies the Release 2 of the Geographical Area Definition.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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Not applicable.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

location referencing: method for referencing a location to facilitate the exchange of location-related information

3.2 Symbols

For the purposes of the present document, the following symbols apply:

a	the distance between the centre point and the short side of a rectangle (perpendicular bisector of the long side) or the length of the short semi-axis of an ellipse
b	the distance between the centre point and the long side of a rectangle (perpendicular bisector of the short side) or the length of the long semi-axis of an ellipse
F	function to determine the spatial characteristics of a point P(x,y) relative to a geometric shape
P(x,y)	point in a Cartesian coordinate system
r	radius of a circle

x	abscissa of a Cartesian coordination system with the origin in the centre of the geographical area and parallel to the long side of a geometric shape
y	ordinate of a Cartesian coordination system with the origin in the centre of the geographical area and parallel to the short side of a geometric shape
θ	azimuth angle of the long side of a rectangle or the long semi-axis of an ellipse
φ	zenith angle of the long side of a rectangle or the long semi-axis of an ellipse

3.3 Abbreviations

Void.

4 Definition of geographical areas

4.1 Overview

Geographical areas shall be specified by geometric shapes. The following geographical areas are defined:

- circular area;
- rectangular area; and
- elliptical area.

Figure 1 depicts all shapes in a single drawing. The shapes are detailed in the following clauses.

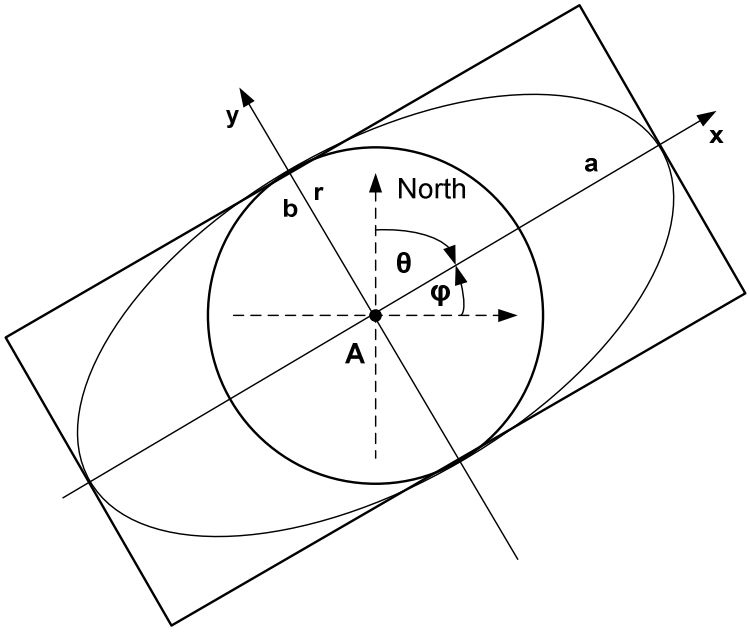

Figure 1: Overview of geometric shapes for the definition of geographical areas

4.2 Definition of a circular area

The circular area shall be described by a circular shape with a single point *A* that represents the centre of the circle and a radius *r* as shown in figure 2.

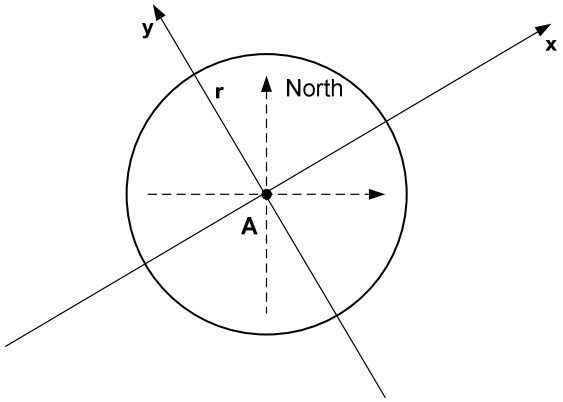

Figure 2: Circular area

4.3 Definition of a rectangular area

The rectangular area shall be defined by a rectangular shape (figure 3) with point *A* that represents the centre of the rectangle and the following parameters:

a the distance between the centre point and the short side of the rectangle (perpendicular bisector of the short side);

b the distance between the centre point and the long side of the rectangle (perpendicular bisector of the long side);

θ azimuth angle of the long side of the rectangle.

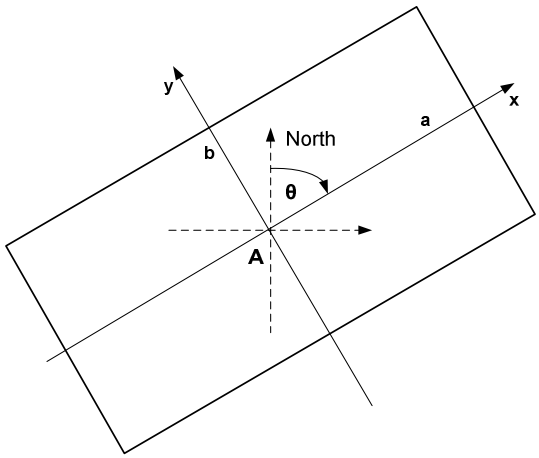

Figure 3: Rectangular area

4.4 Definition of an elliptical area

The elliptical area shall be defined by an elliptical shape (figure 4) with point *A* that represents the centre of the ellipse and the following parameters:

a the length of the long semi-axis;

b the length of the short semi-axis;

θ azimuth angle of the long semi-axis.

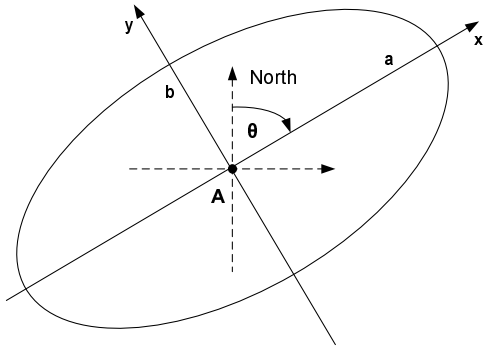

Figure 4: Elliptical area

5 Elementary geometry

5.1 Geometric function F to determine spatial characteristics of a point P(x,y)

This clause defines a function F that an ITS station can use to determine whether a point P(x,y) is located inside, outside, at the centre, or at the border of a geographical area. The function has the following properties:

$$F(x,y)\begin{cases} =1 & \text{for } x=0 \text{ and } y=0 \text{ (at the centre point)} \\ >0 & \text{inside the geographical area} \\ =0 & \text{at the border of the geographical area} \\ <0 & \text{outside the geographical area} \end{cases}$$

where: x, y are the geographical coordinates of P.

The function F(x,y) assumes the canonical form of the geometric shapes: The Cartesian coordinate system has its origin in the centre of the shape. Its abscissa is parallel to the long side of the shapes. Point P is defined relative to this coordinate system.

5.2 Geometric function F for a circular area

For a circular area the function F is defined by equation (1).

$$F(x,y) = 1 - \left(\frac{x}{r}\right)^2 - \left(\frac{y}{r}\right)^2 \quad (1)$$

5.3 Geometric function F for a rectangular area

For a rectangular area the function F is defined by equation (2).

$$F(x,y) = Minimum\left(1 - \left(\frac{x}{a}\right)^2, 1 - \left(\frac{y}{b}\right)^2\right) \quad (2)$$

5.4 Geometric function F for an elliptical area

For an elliptical area the function F is defined by equation (3).

$$F(x, y) = 1 - \left(\frac{x}{a}\right)^2 - \left(\frac{y}{b}\right)^2 \quad (3)$$

Annex A (informative): Bibliography

- EU FP7 GEONET Project: "Deliverable D2.2 Final GeoNet Specification", January 2010, ETSI Document ITSWG3(10)0011.
- ISO 17572-3 (December 2008): "Intelligent transport systems (ITS) - Location referencing for geographic databases - Part 3: Dynamic location references (dynamic profile)".
- SAE J2266 (October 2004): "Location Referencing Message Specification (LRMS)".
- ISO/TS 18234-6 (June 2006): "Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams - Part 6: Location referencing applications".
- National Imagery And Mapping Agency, Department of Defense (NIMA) Technical Report TR 8350.2: "World Geodetic System 1984", 3rd edition, January 2000.

History

Document history		
V1.1.1	July 2021	Publication as ETSI EN 302 931
V2.0.0	July 2022	Publication
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