

Telecommunications and Information Exchange Between Systems

ISO/IEC JTC 1/SC 6

Document Number:	N13495
Date:	2008-02-04
Replaces:	
Document Type:	National Body Contribution
Document Title:	National Body of Korea's contribution to Future Network: A position-based Geographical Addressing Scheme
Document Source:	National Body of Korea
Project Number:	
Document Status:	For discussion at the SC 6/WG 7 meeting on 2008-04-06 in Geneva.
Action ID:	ACT
Due Date:	
No. of Pages:	5
<p>ISO/IEC JTC1/SC6 Secretariat Ms. Jooran Lee, KSA (on behalf of KATS) Korea Technology Center #701-7 Yeoksam-dong, Gangnam-gu, Seoul, 135-513, Republic of Korea ; Telephone: +82 2 6009 4808 ; Facsimile: +82 2 6009 4819 ; Email : jooran@kisi.or.kr</p>	

A position-based Geographical Addressing Scheme

1. Introduction

Various position-based services using position information of objects come to be extended widely due to the development of wireless communication infrastructures and wired/wireless Internet. Especially, the development of wireless technologies makes the position-based service important more. The position-based service based on the mobile communication extends to the ubiquitous environment and comes to integrate the mobile network and ubiquitous sensor network (USN).

USN is an infrastructure network to realize ubiquitous environment using many ubiquitous sensor nodes(u-sensor node) with sensing, processing, and wireless communication capabilities. U-sensor node can get a position information through GPS or manually.

To provide some position information to a node, a geographical addressing scheme is required to process and manage the position information consistently and efficiently. The consistent information presentation is an essential element to deploy a global position-based infrastructure integrating mobile communication networks and USN.

This document proposes a new position-based geographical addressing scheme, in which nodes can get a position information through GPS or manually. According to the new position-based geographical addressing scheme, appropriate geographical routing algorithms and tracking methods of moving nodes will be introduced

2. Definitions

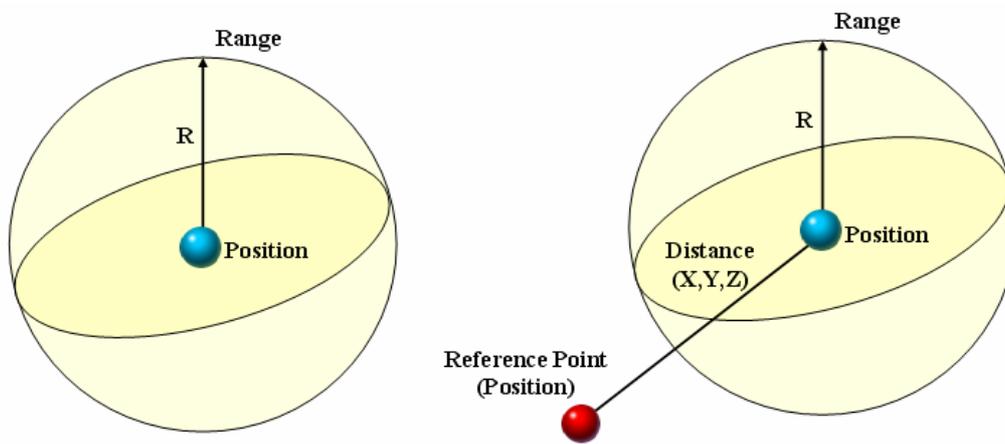
- Position node: u-sensor node which can acquire the position information through GPS or manually.
- Non-position node: u-sensor node which can not acquire the position information.
- Absolute address: position node can be represented by latitude, longitude, altitude and its range from the physically absolute position information.
- Relative address: non-position node can be represented by relative addressing scheme based on the reference point recursively.
- Geographical address: geographical address may be either absolute address or relative address, representing the position of a node.

3. Geographical addressing scheme

It is a general purpose position-based address, which is not restricted only to the USN. Position information representation format can be chosen according to the position-based service requirements

- Physical/symbolic: Position information may be represented by physical address like latitude/longitude or by symbolic position like “empire state building”, “Golden gate” etc.
- Global/local: Position information may be classified by global position information or by local position information according to the range.
- Absolute/relative: Position information may be classified according to the reference point. Relative position information may be represented by direction and distance from a specific reference point.

Position information can be represented according to the service as shown above. However position information should be represented with flexibility and scalability.



(a) Position represented by absolute address

(b) Position represented by relative address

Figure1. Positions represented by absolute address code and relative address code

4. Geographical address format

This section explains different address code, definition, fields meaning and necessity of geographical addressing scheme for u-sensor node.

4.1 GG Address Field Structure

Code Identifier	Range Info	Distance Info	Position Info
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GG address is composed of Code Identifier, Range Information, Distance Information and Position Information. That is, GG Address can represent position information as a specific position and range information as an area centering the position. Also, GG Address can represent relative position that is away as certain distance from the position by using distance information. Code Identifier plays a role that divides GG address format.

Detail description of each field is as following.

1) Code Identifier

- Code Identifier contains the information which divides format and kinds of GG address. That is, it divides whether GG Address is represent by ASCII format, Binary format, or code format defined by user. Also, code identifier divides kinds of position information according to using position information.
- Address represented by using absolute position information becomes absolute position address and address represented by using the rest of GG address, alias, and area code, so on becomes relative position address.
- Composition of range and distance information can be different according to code identifier information. Therefore, when GG Address is made an analysis, rest code must be analyzed after firstly, code identifier information is recognized.

2) Range Information

- Range information represents an area centering the point represented by position information.
- Range Information can be utilized variously as sensing range of sensor node, area covering sensor node or error range of position, so on.
- It is composed of range, unit, and scale, so on. Unit indicates unit using as length when range value is represented such as Km, m, etc. Range Information may not be used according to option.

3) Distance Information

- Distance information is used to indicate the relative position from the point represented by position information. That is, final position represented by GG address is the point

that is away as distance information from the point representing position information.

- Distance Information may not be used according to option. Generally distance information is not used since it is unnecessary information in absolute position code.

4) Position Information

- Position information expresses two positions which are absolute position and reference point of relative position.
- Absolute position information is described by latitude, longitude, and altitude and reference point of relative position is described by using various formats such as GG Address, alias, or area code, so on.
- To divide kinds of position location, code identifier is used.