ON THE METHOD OF OBTAINING INDOOR POSITIONING INFORMATION FOR REALIZATION ADVANCED GEOSPATIAL INFORMATION SOCIETY

Sayaka Takeuchi and Masaaki Shikada
Kanazawa Institute of Technology (KIT) Nonoichi-machi Ishikawa 921-8501, JAPAN
Tel: +81-76-294-6712 Fax: +81-76-294-6713
E-mail: light1599@jupiter.kanazawa-it.ac.jp, shikada@neptune.kanazawa-it.ac.jp

1. ABSTRACT

To obtain indoor positioning information by GPS satellite is difficult now. The Japanese Government executed a new law NSDI (National Spatial Data Infrastructure). for a spatial information society on May 30, 2007. In this law, everybody can know positional information in real time anytime and anywhere. In addition, it is necessary to keep satellite positioning for realization of seamless positioning, and to promote ubiquitous network technology [1] [4]. However, the technology has not been established yet. Our laboratory is conducting a study of referring to positioning by Real-Time GIS, GPS, and IC tag for realizing an advanced spatial information society.

The research is to confirm whether absolute positions can be obtained accurately by Virtual Reference System-GPS (VRS-GPS), and Differential-GPS (D-GPS). However, GPS receiver could not receive signals from GPS satellites at an area surrounded by canopies and buildings. Therefore, Integrated Circuit Tag (IC tag) was used where GPS signals could not be received to obtain information on the absolute position. The IC tag is used in distribution service, but the method for using geoinfomatics has not been established yet [5] [7] [8].The experiment was conducted to verify the reading rate of IC tag on different types and conditions. There are two types and it is classified to passive and active types. The passive type performs communicate by receiving radio waves from an antenna device and sending back information. It can be miniaturized and thinned easily, and it can be produced at a low price. The active type's communication can perform by automatically transmitting be IC tag's reader, and it needs a battery. It has an advantage of achieving a longer distance radio waved than the passive type although the battery needs to be changed. The method is different by a purpose of use. The IC tag has

many advantages of transmitting and receiving the information, and obtaining the absolute position without any contact [6]. Different condition of passive type was experimented to verify the reading rate at the outside and inside of a laboratory. An experiment was performed where the IC tag was buried under the shielding material, and it was read when reader move through the material. The experiment was conducted by a hand truck to which the IC tags reader was attached. The UID（Unique Item identification）of the IC tag was recognized and the reading rate was investigated. The reading rate was expressed for 1,000 IC tags. As the thickness of shielding materials is increased, the reading rates tend to decrease. However, each material shows a high reading rate. On the results of experiments, height of 15cm is the best suited. In addition, an experiment was conducted to show position information to obtain seamlessly GPS positioning and IC tag on the GIS. IC tags can complement that GPS receiver could not receive signals from GPS satellites at an area surrounded by canopies and buildings. As a result, an area where GPS receiver did not receive signal will appear on the GIS. The reader could receive information continuously with IC tags and it is possible to get the position seamlessly from outdoor to indoor. We will encourage using IC tag buried under the fixture construction as the results [2] [3].

The Japanese Government executed a new law for a Spatial Information Society and has been providing a New Base Map (BM) for free now. BM can obtain anyone on the website which Geographical Survey Institute (GSI) managed. Anyone can get high-accuracy position data by overlapping GPS data and IC tag to the BM, and can edit too. However, to use of IC tag has not been established for the general public yet. It is necessary to do additional experiment of indoor positioning.

We hope that our research will help to revise basic map defined by NSDI in high accuracy and for arriving at an early advanced spatial information society.

2. REFERENCES

[1]M. Shikada, “APPLICATION OF REAL TIME GIS, REMOTE SENSING AND IC TAG FOR REALIZATION OF GEOSPATIAL INFORMATION SOCIETY,” *Geoscience and Remote Sensing,* In-tech, pp.153-180, 2009.

0

[2]S. Takeuchi “REALIZATION OF ADVANCED SPATIAL INFORMATION SOCIETY BY REAL-TIME GIS, GPS, AND IC TAG,” *Geoinformation Forum 2009,* Japan Association of Surveyors, Japan, (CD-ROM) 1-6, 2009

[3]S. Takeuchi “ON THE AVAILABILITY of REAL-TIME GIS, GPS and IC TAG for UBIQUITOUS SOCIETY,” Map Asia 2009, Annual Asian Conference and Exhibition on Geospatial Information, Technology and Applications, Singapore, (CD-ROM) 1-6, 2009

[4]M. Moriya, “ESTABLISHMENT OF MAP UPDATE TECHNIQUE FOR LOCAL GOVERNMENT BY USING GPS, GIS AND REMOTE SENSING,*” International Geoscience and Remote Sensing Symposium,* IEEE, Boston, Proceedings CD-ROM, 2008

[5]S. Shimano, “APPLICATION OF REAL TIME GIS, REMOTE SENSING AND IC TAG FOR REALIZATION OF GEOSPATIAL INFORMATION SOCIETY,” *International Geoscience and Remote Sensing Symposium,* IEEE, Boston, Proceedings CD-ROM, 2008

[6]M. Shikada, “System to Refer High Accuracy Positioning Information by GIS, GPS and IC tag for Realization of NSDI,” *Research-subsidized projects of JACIC*, JACIC, Japan, pp. 33-54, 2008.

[7]A. Tatsuo(Kokudo Kaihatu Center Co. Ltd.), “ Universal Map for Spatial Information Society by using REAL TIME GIS, GPS and Remote Sensing,” *International Geoscience and Remote Sensing Symposium,* IEEE, Barcelona, p255(CD-ROM), 1-3, 2007

[8]S. Shimano, “Universal Map for Local Government by Using REAL TIME GIS,” *International Geoscience and Remote Sensing Symposium,* IEEE, Denver, 0-7803-9510-7/06, 1-4, 2006.