

Summary of SIP-ADUS project (FY2015)

Name of the project	Survey on basic evaluation for effective utilization of satellite positioning technology
Responsible Organization	AISAN TECHNOLOGY Co., Ltd.

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Object of the Project

From a survey conducted for the purpose of assessing the availability of satellite positioning technology in the autonomous cruising: report (“Survey on basic evaluation for effective utilization of satellite positioning technology” 2014), satellite positioning with multi-GNSS and the augmentation signal availability is indicated. At the same time, some problems are raised, such as the problem of reliability, the accuracy deterioration due to multipath and degradation in availability due to the signal blocking ,etc.

In this research work, the data acquisition number was increased from the previous year’s survey to enhance the research accuracy, and the further analysis and investigation of the obstructive factor to take advantage of the satellite positioning technology of multi-path and ionospheric delay, etc. in the autonomous cruising field were carried out in order to implement the study of how to avoid them.

Project Summary

In this study, the following things have been found with respect to the utilization of satellite positioning technology for autonomous cruising / travel support.

(1) Availability of satellite positioning system on urban expressway.

- Positioning accuracy was improved by using augmentation information (DGPS or L1-SAIF ※1), and it proved that lane recognition can be possible by single point positioning.

- By using Carrier phase positioning system (RTK, CMAS※2 / CLAS※3, MADOCA-PPP AR※4), accurate positional information can be acquired. Positioning errors were less than 1.0m.

- If some shielding objects like bridges or side slopes cause deterioration of positioning accuracy, effective utilization of other information (on-vehicle sensor, map) is necessary.

(2) Multipath in urban canyon

- By using observation information of the receiver, multipath noise reduction was achieved to a certain extent. However, the improvement was limited.

- When the vehicle leaves a completely shielded space, positioning became smoothly possible. Recovery time can be shortened by using Multi-GNSS.

- 3-D map and satellite filter calculated by a radio propagation simulator can remove multipath signals.

(3) Others

- Ionospheric delay correction parameters of QZSS (Quasi-Zenith Satellite System) has high accuracy and it was effective in improving the positioning accuracy.

※1 L1-SAIF : L1-Submeter-class Augmentation with Integrity Function

※2 CMAS : Centimeter-class Augmentation System

※3 CLAS : Centimeter Level Augmentation Service

※4 MADOCA-PPP AR : Multi-GNSS Advanced Demonstration tool for Orbit and Clock Analysis-Precise Point Positioning Ambiguity Resolution

Future plan

The following is a subject for future analysis.

- Evaluation and Improvement of satellite positioning technology.

- Examination of countermeasures against positioning obstruction factors.

- Improvement of positioning performance by using spatial information.

- Evaluation of satellite positioning accuracy in the low latitude area.

- continuous performance assessment of satellite positioning systems associated with the upgrade of them.