Performance Analysis of On-board Vehicle Sensors on Positioning in GNSS Signal Blockage

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SUMMARY

The GNSS based positioning technique has been widely applied for the vehicle positioning in last two decades. In spite of its high accuracy and reliability in open area, the performance of the GNSS based positioning is significantly unstable in urban canyon. To solve this problem, it is necessary to integrate additional sensors. Recently, to improve driving safety and convenience, the vehicle is equipped with multi-sensors in order to operate ADAS. Therefore, the accuracy of vehicle positioning in urban canyon could be improved using several on-board vehicle sensors built in the vehicle. In this study, GNSS/on-board vehicle sensors integrated vehicle positioning algorithm is developed, and performance analysis is conducted during GNSS outages using real data. Four types of integration strategy are proposed for the integration of the GNSS and the several on-board sensors including wheel speed sensor, steering angle sensor, gravity sensor, and yaw rate sensor. The vehicle positioning algorithm on the basis of the kinematic vehicle model provides horizontal position, vehicle velocity, and yaw through an extended Kalman filter. The performance of four types of vehicle positioning algorithm is compared and analyzed using the data from real test driving.

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