A Study of Adaptive Fault Detection Method for GNSS Applications

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Abstract : A purpose of this study is to develop efficient detection method for Global Navigation Satellite Systems (GNSS) applications based on adaptive estimation. Due to dependence of radio frequency signals, GNSS measurements are dominated by systematic errors in receiver's operating environment. Thus, to utilize GNSS for aerospace or ground vehicles requiring high level of safety, unhealthy measurements should be considered seriously. For the reason, this paper proposes adaptive fault detection method to deal with unhealthy measurements in various harsh environments. By the proposed method, the test statistics for fault detection is generated by estimated measurement noise. Pseudorange and carrier-phase measurement noise are obtained at time propagations and measurement updates in process of Carrier-Smoothed Code (CSC) filtering, respectively. Performance of the proposed method was evaluated by field-collected GNSS measurements. To evaluate the fault detection capability, intentional faults were added to measurements. The experimental result shows that the proposed detection method is efficient in detecting unhealthy measurements and improves the accuracy of GNSS positioning under fault occurrence.

Keywords : adaptive estimation, fault detection, GNSS, residual

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