

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
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RESEARCH ON METHOD OF IDENTIFYING SIMULTANEOUS MULTI-FAULTY AND  
FAULT-TOLERANCE IN FILTER BASED ON RESIDUAL

**Abstract**

Recent studies suggest that the technology of fault identification, isolation and fault-tolerant are the ensurance of both high-accuracy and high-reliability when multiple faults occur simultaneously in multi-sensor integrated navigation system. Our study, accordingly, presented the method of fault detection and fault-tolerance based on forecast residuals in concentrative filter. The abrupt faults were identified and isolated firstly in this method. And then, based on this, the effects of gradual faults were further removed by adjusting forecast residuals and its variance matrix. This method has the characteristics of no need to traverse the search, small computation, less data need to save, strong real-time and simple implementation. Simulations were performed by the combination of GNSS/SINS under the application background of low earth orbit satellite navigation. The findings indicated that the identifying rate was higher than 99% and the error alarm rate was less than 0.5% when multiple satellites ( $>3$ ) simultaneously had abrupt fault. The filter had strong adaptability to the gradual faults.