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INTEGRITY ENHANCEMENT METHOD FOR AIRBORNE MULTI-SENSOR ASSISTED SATELLITE NAVIGATION LANDING SYSTEM

Abstract

Satellite navigation system is very suitable for aircraft landing equipment because of its high measurement accuracy, wide coverage and little influence by weather and terrain. At present, the main factor restricting the application of satellite navigation system in aircraft landing is the low integrity monitoring ability. Integrity of the satellite navigation system is determined by navigation satellite system, space transmission system, ground enhancement system and airborne receiving system. In this paper, the method of improving the integrity of the satellite navigation landing system by using the measurement information provided by airborne inertial navigation system, altimeter and airborne time-keeping system is studied.The main factors affecting the integrity of satellite navigation and landing system are analyzed, and the mathematical model of the airborne integrated navigation system composed of airborne satellite navigation system, inertial navigation system, altimeter and airborne time keeping system is established. In the phase of satellite navigation signal tracking, the position, velocity, acceleration and time information provided by other airborne sensors are used to assist the monitoring of satellite navigation signal quality, so as to improve the reliability of satellite signal pseudo-range and carrier phase measurement. In the stage of formation of the observation information and positioning solution, the redundant measurement information between the inertial navigation system, altimeter, time-keeping system and the satellite navigation system is used to improve the integrity of the satellite navigation landing system. The method proposed in this paper can not only enhance the integrity of the satellite navigation landing system when multiple navigation satellites fail, but also improve the availability of the satellite navigation landing system. The simulation results show that the method can improve the integrity of the satellite landing system by two orders of magnitude.