IAF SPACE PROPULSION SYMPOSIUM (C4)
Liquid Propulsion (1) (1)

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DESIGN AND IMPLEMENTATION OF A VERIFICATION SYSTEM FOR AUTONOMOUS CONTROL AND HEALTH MONITORING OF LIQUID-PROPELLANT ROCKET ENGINE

Abstract

Both the autonomous control system and health monitoring system of liquid-propellant rocket motors are safety-critical systems that require more and more reliability and safety. However, the verification of the engine's autonomous control system and health monitoring system is an expensive and time-consuming task, which requires a large number of test runs. To solve the problems of complex structure, bad working environment, and high test cost of a rocket engine, a system verification platform was proposed to fully verify the engine's autonomous control system and health monitoring system. First of all, based on the idea of modularization and aiming at the characteristics of a large liquid-propellant rocket engine, the overall architecture of the verification system is designed and completed. At the same time, the functional requirements of the engine simulator and engine fault injection modules in the verification system are defined respectively. Then, the hardware and software construction of the engine simulator module and the development of the fault injection module are completed by using the method of automatic code generation and hardware real-time simulation based on Links-RT. Finally, the reliability and effectiveness of the module are guaranteed by comparing it with the existing test data. The results show that the simulation data and the test data have a high degree of fitting, which meets the practical engineering requirements, and provides basic conditions for the development and optimization of the autonomous engine control system and health monitoring system.