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RESEARCH ON FAULT DIAGNOSIS SYSTEM FOR SMALL SATELLITE BASED ON INSTRUCTION CRITERION

Abstract

Since the satellite is a complex interdisciplinary system with continuous and discrete, linear and nonlinear characteristics, the real-time monitoring of the satellite data is necessary to keep the satellite's health management. This paper mainly focuses on the design of the self-diagnosis system based on Data Processing System of the small satellite. Self-diagnosis system includes two parts, the diagnosis knowledge base and inference engine. Diagnosis knowledge base is established the data fault model which have the on line erasing and re-injection function. The fault model of satellite data is established on the main criterion which based on incremental instruction criterion table, threshold instruction criterion table and important parameters monitoring table. Increment instruction criterion table includes the indirect instruction ID, the position of value in the telemetry data and the incremental range which need monitored. Threshold instruction criterion table also includes the indirect instruction ID, the position of value in the telemetry data and the minimum and maximum range. Important parameters monitoring table includes the position and range of the important parameter. The inference engine is established a data search management mechanism, which can automatic recognize monitoring data to the diagnostic knowledge base and make the fault tolerant control or trigger a security model for fault isolation according to the results of the diagnosis analysis. Self-diagnosis system is tracked and collected the corresponding telemetry data of the indirect instruction, determined whether the indirect instruction is executed correctly in accordance with the given criterion. For a given test task, the completion of the test results are given through the tracking judgment of the autonomous transmission of the test command based on the self-diagnosis system. For some important parameters, the diagnosis system will monitor its change range and give the health identification. For the thermal control and temperature control of the satellite, the system will automatically monitor and diagnosis. The self-diagnosis system is composed of with the long-term ground electrical test experience and the on orbit test summary. The main point of the self-diagnosis is that, it's completed self-test of the remote control commands, self-test of the independent testing task, keeping monitoring of the key parameters and keeping the satellite temperature under control. The self-diagnosis system is running well currently which boarded on the Test Satellite-5.