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SYSTEM LEVEL FAULT VERIFICATION OF HIGH-LEVEL AUTONOMIC DEEP SPACE
EXPLORATION PROBES

Abstract

The system level verification is always the central section of deep space exploration probes, because of its heavy complexity. As the exploration distance is increasing, like the MARS misson and the asteroid mission, the probes process more and more autonomic functions, which determine the success or failure of the exploration mission. Due to the less chance of probe-ground interaction, the probe must have the ability of self-health management to some certain. According to the characteristics of the high-level autonomic probes,this paper presents the concrete fault verification program. Firstly, the FMEA analysis of the flight procedure is performed from the top to bottom. Find the key flight event, recognize the possble fault causes of each event, and then give the compensate measures; Secondly, the method of fault injection and variation analysis are used to verify the feasibility of failure plan and the ability of its FDIR; Thirdly, the fault guessing method is used to supplement the test cases. In additon, the testability requirement must be modified in iteration during the three steps mentioned. That is to say, the fault verification design is recommended to perform with the period of probe design simultaneously, which will lead to the reasonable design of probe's status and information flow resource. The method above is used to establish the test cases in some deep space exploration probe now, and the test completeness and effectiveness are improved obviously.