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VERIFICATION OF FDIR ALGORITHM FOR SNUSAT-1 ON 3-AXIS MOTION SIMULATOR

Abstract

In this paper, a Fault Detection, Isolation, and Recovery (FDIR) algorithm is verified using 3-axis attitude motion simulator for SNUSAT-1, a standard 2U CubeSat of Seoul National University. SNUSAT-1 has been developed with two operational requirements since 2012. The first one is a QB50 science mission, and the second one is to validate the FDIR Algorithm by Seoul National University in actual space environment. During the verification sequence, however, unexpected errors can be occurred, and it would have a serious effect on the whole missions. Therefore, it is essential to verify the algorithm logic itself and identify problems in system integration before the launch. For this reason, a 3-axis attitude motion simulator with a low-friction spherical air bearing is proposed to confirm the performance of FDIR algorithm on the integrated dynamic system. On the simulator, redundant IMUs and reaction wheels are arranged geometrically same with the configuration of the real satellite to apply the FDIR algorithm which consists of sensor FDIR and actuator FDIR. Parity Space Approach (PSA) for the sensor FDIR and residual method for the actuator FDIR are verified on the motion simulator, and the results are compared with computational simulation results and system requirements. The main contribution of the research is that the implementation of FDIR algorithm for the CubeSat is technically verified on the integrated dynamic system.