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VIRTUAL HARDWARE-IN-THE-LOOP TESTING OF THE ADCS OF DHABISAT

Abstract

CubeSats have swiftly grown into a global phenomenon since their inception in 1999. As space missions get more complex, it is frequently necessary to maintain the satellite in a certain attitude required for that mission. CubeSats employ an Attitude Determination and Control Subsystem to attain this desired attitude, often known as ADCS. Thus, it is crucial to conduct accurate and precise testing for the ADCS subsystem and its algorithms to verify their functionality in space. In this paper, the ADCS of the satellite tested was the DhabiSat CubeSat developed at Khalifa University, United Arab Emirates. The testing conducted on the ADCS of DhabiSat was the virtual hardware-in-the-loop (HIL) test. This test provides for means for a satellite to interact with simulated space environment conditions. These simulated models replace the satellite's sensors and actuators, allowing the satellite and HIL simulation to communicate. This permits the ADCS to orient the satellite in a comparable environment to that in which it will be functioning. The HIL simulation was used to determine the required time to detumble and orient the satellite. In addition, it enabled for a more realistic of calculation of the power budget, and this was done by estimating the power consumption of the ADCS actuators in real mission scenarios. The results show that the ADCS algorithms of DhabiSat were all executed successfully.