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FIGHT RESULTS FROM THE THREE-AXIS ATTITUDE DETERMINATION AND CONTROL SYSTEM OF THE DELFI-N3XT NANOSATELLITE.

Abstract

The Delfi-n3Xt triple-unit Cubesat is the second project of its kind implemented by the Chair of Space Systems Engineering (SSE) of Delft University of Technology (TU Delft). It was launched in November 2013 onboard a DNEPR rocket, with the main objective of performing a technology demonstration of several miniaturized systems capable of increasing the capabilities of nanosatellite platforms. In particular, one of the main novelties of Delfi-n3Xt is the presence of an advanced attitude determination and control system (ADCS) with full 3-axis active control. The ADCS system of Delfi-n3Xt is designed to detumble the satellite after orbit injection and align it for purposes of sun pointing, ground station tracking and thruster pointing. The physical implementation of the ADCS system was done using magnetometers and sun sensors for determination and magnetorquers and micro-reaction wheels for control. A redundant set of microcontrollers with algorithms is also used. The algorithms have two levels: one for basic detumbling and several advanced modes where the determination is based on the implementation of an Extended Kalman Filter. Since its launch, the ADCS determination system of Delfi-n3Xt has provided a large amount of data, that give the possibility to evaluate the ADCS algorithms implementation and its applicability to the design of the ADCS system future nanosatellite missions. This paper will describe the final design implementation of the ADCS system for Delfi-n3Xt, the system performance based on the telemetry data received from the satellite results and lessons learnt to be applied for an analysis of future CubeSat missions. and the next steps to be taken by the next mission design team.