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TOM/TIM REALIZATION -A SATELLITE EO FORMATION FLYING MISSION OF THREE NANO
SATELLITES FOR RETRIEVING MULTI VIEW STEREOSCOPIC DATA

Abstract

In the scope of TOM (Telematik Earth Observation Mission) a 3U+ Cubesat is developed by the ZfT. Its main research goal is the demonstration of photogrammetric observations of (Ash-)Clouds in a formation of three small satellites. Such photogrammetric data from LEO can be used to create 3D images of moving objects (like clouds) in a meaningful resolution. To achieve this goal, three satellites will fly in a formation and point at a ground target simultaneously. This requires formation control, coupled with an AOCS. The mission has precision pointing requirements for the joint observations, therefore a 3-axes attitude control on basis of miniature reaction wheels is essential, which is also supported with several sensor inputs e.g. from precision Sun sensors as well as magnetometers. An Orbit Determination based on GNSS provides the input to the AOCS to perform orbit keeping maneuvers. In order to downlink the image data an S-band transmitter is also integrated into the design. TOM's redundant camera system is an in-house development from ZfT. It is based on COTS components and integrated, tested as well as qualified by ZfT. Additionally a distributed visual servoing approach is intended to be tested, that aims to maximize the jointly observed target area of all three satellites. TOM is built on the successful generic satellite platform from ZfT & S^4 , that has been tested in-orbit during the NetSat mission and several improvements and extensions have been identified and implemented in the system design of TOM. TOM was created as the german contribution to the RLS (Regional-Leaders-Summit) funded TIM (Telematik International Mission) project. In the frame of TIM several international space-research institutes join forces to create a joint cooperation. The TIM ground station network will span 5 continents providing frequent contacts for supporting the mission. Furthermore recorded data is intended to be shared via data repository of collected images for 3D-surface data and geo-information processing.

This paper will introduce the goals of TOM as well as its international framework of the TIM. The system design of the TOM satellites is given as well as the mission design, focusing on the formation flying aspects. Some additional insight is given in to the implementation phase as well as the accompanying tests the satellites are undergoing to guarantee their successful in-orbit performance. Finally an outlook on the in-orbit phase and experiments of the mission is given with respect to the challenges of formation flight.