ASTRODYNAMICS SYMPOSIUM (C1)
Attitude Dynamics - Part 2 (6)

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A NOVEL APS STAR TRACKER FOR PICO- AND NANO-SATELLITES

Abstract

STELLA is a miniature star tracker for pico and nano satellites developed at the University Würzburg under financial support of DLR (FKZ 50RM0901). The star tracker features small dimensions and weight as well as low power consumption and fulfills therewith major boundary conditions and requirements of small satellites missions. This paper presents the abilities of STELLA and shows how they contribute to the overall satellite system.

The paper focuses on three mayor topics:

Mechanics: The paper shows and describes the core and optics of the camera and how it can be integrated into a small satellite system. Further on, the star tracker has been subjected to a full qualification program which includes thermal-vacuum, shock, vibrations and radiation tests and therefore the results will be presented.

Electrics/Electronics: This part contains the different logic chips which are used in STELLA and how they communicate and work with each others. Especially the data bus, which is used for (image) data transmission, will be introduced. One special feature is the partial hardware redundancy of the power and main logic system. It can be either controlled by the On-Board-Controller (OBC) of the satellite or works completely autonomous.

Software: Through its special Telecommand/Telemetry – Interface it can be adapted to different system conditions and allows access to all sub modules like memory manager, image sensor control or star recognition and attitude determination. The heart of the software is the star recognition and attitude determination program. It works together with the basic software which grants access to different resources like memory, communication busses or the image sensor itself. The software update function allows alternating the program code for all logic devices in order to adapt the behavior of STELLA. Even applications which are different to star recognition and attitude determination are possible with a suitable software update.

Finally, the paper will show a listing of all essential parameters and abilities, which are proofed through tests and measurements in laboratory environment as well as field tests. Summarized it can be said, that STELLA is a new star tracker, which enables through it low mass, power and dimensions the usage in pico- and nano-satellites.