Title: OBC-hosted Star Tracker software

Abstract:

Star Trackers have become key methods for platform attitude determination, as they are able to provide to the AOCS (Attitude and Orbit Control Subsystem) a precise measurement of orientation. Satellite Primes now embed Star Trackers in almost any platform, in order to provide platform the adequate pointing accuracy and agility required for the mission.

Recent innovations in the field of Star Tracker image processing have opened up the possibility of embedding, in the same central processor, Star Tracker software alongside the core platform software. This in turn significantly decreases the cost of Star Tracker Optical Heads as data processing is offloaded to shared processing unit. Most of the Star Tracker performance and robustness will be contained in the Star Tracker software itself, with implementation of advanced functionalities such as multiple optical head data fusion and rate estimation. This approach leads to a high level of flexibility, enabling low cost tuning/tailoring of the Star Tracker algorithm according to the specific needs of each mission: robustness to high angular rates, high attitude accuracy for some missions, high robustness to protons in others, etc.

In frame of this project a successfully porting in C programming language was done (by Thales System Romania) for a new Star Tracker algorithm (provided by Leuven University). The resulting Star Tracker software is a space qualified component which is capable of: determining robust individual optical head attitude estimates during tracking and in cold-start conditions (commonly referred to as the lost-in-space problem). Kalman filter based data fusion is used to enhance attitude and angular rate estimates by fusing the up to three optical head attitudes. For validation and testing a RTEMS based test application for the Star Tracker software component was created. The Star Tracker software was tested using a chain of generated images provided by TAS-F which cover a wide range of dynamic conditions. The precision and performance obtained is satisfactory and therefore we consider that this software component could be a viable alternative.