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OPTIMIZING STAR TRACKER INSTALLATION ORIENTATION ON LOW EARTH ORBIT AGILE SATELLITE PLATFORMS: AN ANGLE EXCLUSION APPROACH CONSIDERING SUN AND EARTH DAZZLE CONSTRAINTS.

Abstract

This paper presents a study on the installation orientation of star trackers on agile satellites in a way that optimizes their performance under sun and earth dazzle constraints. Star trackers are crucial components in Attitude and Orbit Control Subsystems (AOCS), and their proper installation is essential for the success of satellite missions that require high precision attitude determination. The glare from the sun and the moon, to which the star tracker's camera is sensitive, affect negatively the sensor performance. To optimize the star tracker installation orientation on agile satellites under these constraints, we propose an approach that considers three attitude control modes: nadir pointing, stereo imaging and off-pointing modes. The proposed approach utilizes an angle exclusion method algorithm to determine the optimal installation area for the star tracker. The algorithm calculates the risk percentage of dazzle, considering the satellite's sun and earth angles and the star tracker's field of view. The results show that the proposed approach effectively minimizes the risk of dazzle while ensuring optimal functionality of the star tracker. The study also shows that optimal installation area varies depending on the attitude control mode, highlighting the importance of considering the different attitude modes in star tracker installation orientation in addition of the working orbit. The results of this study provide valuable insights for engineers and mission planners seeking to optimize the performance of star trackers onboard the agile satellites.