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A NEW HIGH PERFORMANCE STAR TRACKER FOR SPACECRAFT

Abstract

Recent advances in CMOS image sensor technology, optics and electronics architecture now allow for a very compact, very high performance star tracker suitable for spacecraft in any orbital regime. Ball has combined these technological advances and developed the CT-2020 star tracker, which features a custom-designed state-of-the-art backside illuminated CMOS image sensor with exceptional radiation tolerance and performance.

Design innovations eliminate the need for an external electronics unit or extra cabling while also allowing for expanded operational envelope with the use of a 15 deg Sun exclusion light shade. This new star tracker can achieve single head accuracies of 1 arc-second autonomous attitude output (total error), while also allowing for customer driven “directed search” mode for even higher accuracy performance. A modular software architecture allows the user to export full frame data from the image sensor simultaneous with full-performance star tracking, resulting in a unique dual-use capable sensor. Additional features include autonomous on-orbit upgradability and re-calibration to retain performance at end of life, making it suitable for high radiation environments. It also contains a built in on-orbit environment simulator with hardware in the loop functionality to allow for efficient spacecraft integration and operational simulation.

Details of this innovation will be discussed in the paper.