Dark Frame and Flat Field corrections for images generated by a CMOS image sensor used in a star tracker

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This work presents improvements obtained in night sky images generated by a star tracker after basic dark frame and flat field corrections are applied. These operations led to reduced noise in images and corresponding improvements in detection of faint stars. Improvements in signal to noise ratio and in centroiding accuracy are also presented. To reduce the effects of temporal noise when applying these corrections, averages of hundreds of dark frames and flat field frames were used. Night sky images acquired by this star tracker will be used in a future work as an alternative method to perform its geometric calibration, using the observed stars as a calibration source. The goal of dark field and flat field corrections is to improve centroiding accuracy by mitigating fixed pattern noise and vignetting, therefore improving geometric calibration of this star tracker.

References
1. Fialho, M. A. A. et al. The Brazilian autonomous star tracker development. Napa, 2016. AAS 16-322.
2. Young, S., Driggers, R. G. and Jacobs E. L. Signal Processing and Performance Analysis for Image Systems. 2008. ISBN-13: 978-1-59693-287-6