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SPACECRAFT POSE ESTIMATION USING A MONOCULAR CAMERA

Abstract

This paper propose a process for spacecraft pose estimation using monocular camera images. This process uses a unique combination of methods in image processing, feature extraction and matching, outlier removal via statistical consensus, and the use of perspective-n-point solvers including efficient-PnP and *SoftPOSIT* for camera to spacecraft pose estimation. While implementing the pose estimation process, two novel solutions were presented in the image processing and to enhance the iterative *SoftPOSIT* PnP solver. A histogram equalization by region scheme allows the adjustment of the pixel intensity with much faster speed than the conventional methods, this scheme handles images with pixel intensity already spanned to its full range. Secondly, three improvements were made to a perspective-n-point solver called *softPOSIT*. These improvements include techniques for reducing false matches as a result of local minimum trapping and strategies for iteration control parameter initialization by using the trace of the correspondence distance, and by using centroid matching. Results show the proposed pose estimation method is sufficiently stable and fast for real-time spacecraft pose estimation.