

Limb-Fitting Performance for Horizon-Based Optical Navigation with Cassini Images of Dione and Rhea

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Image processing has been an integral component of spacecraft navigation for decades. While a variety of optical navigation (OPNAV) techniques have been successfully used on past missions, this work focused on horizon-based methods. Specifically, this study explores the performance of a recently published OPNAV technique that combines an improved subpixel horizon localization technique with a non-iterative solution for spacecraft position relative to an ellipsoidal body. Since the technique has already been shown to work well on synthetic imagery, performance analysis is conducted using real images of the Saturnian moons Dione and Rhea from the Cassini Imaging Science Subsystem. Limb fit residuals are presented for hundreds of images of each body as a way determining how well the ellipsoidal horizon arc fits the data. Further, results from a few specific images are highlighted to illustrate key algorithm behaviors.