

Autonomous Limb-based Shape Modeling and Optical Navigation

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Abstract

Most small body missions rely on optical navigation for precise body relative navigation. A fundamental part of this process is to build a shape model and the associated landmarks, which are then used to correlate the images to the shape model. This process of building a shape model usually uses stereophotogrammetry (shape from motion) or stereophotoclinometry (shape from shading) both of which are computationally intensive and require human oversight to ensure proper convergence.

In trying to develop a near-term autonomous solution, we are interested in developing a simpler method for building a low-to medium resolution shape model that can be used for autonomous navigation. In this respect, we are inspired by the work of Peter Thomas and collaborators, which can be used to quickly construct shapes based on the limb (and terminator) profiles in optical imagery.

This paper presents the initial steps in this work. We explore achievable navigation accuracy with lower resolution shape models created based on limb and terminator identification in optical imagery.