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Author: Ms. Kaitlyn Holm
University of Pennsylvania, United States, kmholm@brynmawr.edu

Prof. Jeanne Holm
University of California, Los Angeles, United States, Jeanne.Holm@jpl.nasa.gov

ACHIEVING IMPROVEMENTS IN PLANETARY TERRAIN MAPPING THROUGH NEW MATHEMATICAL MODELS

Abstract

In this paper we will explore the use of spherical mapping in polar space to analyze and predict the intricacies of modeling new mathematical paradigms for terrain mapping on the Earth and other planets. Until recently, our visual depiction of these terrains has been limited to a linear based representation in Cartesian space, which has provided less than accurate error bounds during analysis. New developments in spherical-based arithmetic and polar-based coding have led to the development of an algorithm that has proved to be faster than those currently in use (Joris van der Hoeven, 2009). This new algorithm hasonly been used with limited application, and has yet to be studied in the field of planetary surface mapping.

We analyzed the computational procedures and processed results of data gathered from terrain mapping rovers to compile a comprehensive understanding of modern capabilities. These rovers use frames and resolutions based on linear ranges to construct images, but could easily be made to run this new proposed algorithm. Using MatLab to model the algorithm using data based on Earth, we were able to calibrate the viability of the algorithm. The error produced was within reasonable range, and the algorithm was shown to produce a much faster data set than that achieved through traditional Cartesian space representation. As a result, the algorithm was shown to be reliable enough to prompt further testing on other planetary bodies.