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Author: Mr. Matthew Cross
Faculty of Engineering, Carleton University, Canada, mcross8@uwo.ca

Prof. Alex Ellery
Carleton University, Canada, aellery@mae.carleton.ca

MARTIAN REGOLITH PARAMETER EXTRACTION AND MOBILITY MAPPING WITH A MICRO ROVER SCOUT

Abstract

Efficiently traversing the Martian landscape requires extensive knowledge of the soil parameters to be inputs into an online traction control system to minimize energy consumption. Regolith properties influence the wheel-terrain interaction and performance of wheeled off-road vehicles. Martian regolith is taken to be predominantly sand however local variations in its composition is generally unknown. Examining the traction performance of an instrumented micro rover allows for the regolith to be studied online while the rover is traversing the landscape. The regolith knowledge is then fed back into the traction control system to improve the performance and reduce power consumption of the rover. Larger rovers can follow a path of greatest mobility and efficiency by mapping the local regolith condition with a scout rover. Variations in the regolith can be analogous to the change in moisture, mineral, or organic content as seen in Earth soils. Future missions can use this soil data to search for water or evidence of life. This paper presents a method for extracting both compaction and shearing parameters with an instrumented micro rover chassis and the creation of an online mobility map to improve efficiency of future autonomous and manned surface exploration.