Overview of SAND-E: Semi-Autonomous Navigation for Detrital Environments

Rovers are the state of the art for the exploration and detection of past habitability and life on other worlds. One of the most basic functions of a rover is terrain navigation. Information collected by the rover is used autonomously to mitigate terrain hazards such large rocks, while humans qualitatively assess hazardous geologic terrain such as soil type and degree of rock cover. Planetary scientists use the same information to select targets such as drill sites, and for basic scientific analysis such as characterization of rock outcrops. Although the data is complementary, data from terrain analysis for navigation and terrain analysis for scientific investigations are poorly integrated. The lack of integration creates science and operation inefficiencies that limit exploration of habitable environments. As new modes of exploration come online, such as unmanned aerial systems (UAS) (e.g., the Mars Helicopter Scout and Titan Dragonfly), a need exists to integrate terrain data and science analysis to improve operational and scientific outcomes during exploration.

We present an overview of a project aimed at evaluating the effectiveness and capability rover and UAS-based semi-automated terrain analysis using the Automated Soil Assessment Systems (ASAS) developed by Mission Control Space Services for navigating, selecting targets for sampling, and characterizing mafic detrital sediments along glacio-fluvial-aeolian sand transport pathways in Iceland. We describe recent advances in automated terrain analysis in sandy environments and scientific uses of terrain assessment from sandy environments. We assess fluvial and aeolian terrains in Iceland and show how terrain analysis data can inform scientific characterization of these environments.

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