

Title: A Modular Platform for Modeling, Simulation, and Hardware-in-the-Loop Analysis of Planetary Rovers

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Abstract: In this project, a flexible and modular path planning optimization platform with embedded modeling, animation, simulation, and hardware-in-the-loop capabilities is developed. This advanced simulation platform permits complex mission and operation planning by minimizing power consumption or operation risk in an efficient manner. The platform will also provide a modular rover modeling environment where a variety of rover configurations can be established based on different connections between rover components. Each component is modeled and added to the platform library as a block with inputs and outputs. Their specific characteristics/parameters can be easily modified allowing for flexibility in studying different rover configurations. In addition, the components' interactions with the environment such as temperature, solar radiation, terrain conditions is modeled for a more accurate path planning. This platform also allows for hardware in the loop testing such that hardware components can be incorporated into the simulated rover model. In this manner, system level as well as component testing can take place before a full prototype is available. A 3D virtual reality of the rover while traversing through the optimized path is also provided for mission visualization.