Dr. Roy Lichtenheldt

German Aerospace Center (DLR), Insititute of System Dynamics and Control, Roy.Lichtenheldt@dlr.de

TOWARDS EXPLORATION OF FUTURE MINING CAPABILITIES - TERRAMECHANICS AND ROBOTIC PLANETARY EXPLORATION OF LAVATUBES

Current planetary exploration vehicles are bound to fairly easy terrain. This is mostly due to restrictions by wheeled locomotion, which prohibits larger obstacle crossings and traversal of very soft sand. As space mining would involve exploration of more demanding terrain like craters, steep slopes with soft material and break down, as well as planetary underground environments, smaller more agile rover systems with enhanced obstacle traversabilty are needed.

One key to success of the development of such systems is the simulation and optimization, beginning with the earliest design studies. Thereby, especially the interaction with deformable soils is still a demanding task and not yet fully solved. In the talk, an introduction to DLR's terramechanics model portfolio ranging from real-time capable simple models to high fidelity but computationally slower particle models will be given. Later on, the focus will be shifted to a novel rover system with rimless wheels called "Scout" whos design is based on the models mentioned above. Its system structure and suitability to explore the planetary underground will be explained. Furthermore, the measures to improve the robustness of the Scout will be highlighted.

Given these points, a way towards simulation driven, robotic exploration of future space mining sites will be proposed.