Identification and Significance of Innovation

Excavation tasks for lunar exploration will require moving hundreds to thousands of tons of regolith per year. Moving this much regolith will require substantial machinery, but transportation costs on the order of $50K to $100K per kg make optimization economically vital. Honeybee Robotics proposes to develop a software tool for facilitating lunar excavation system trades in support of selecting an optimal architecture.

Estimated TRL (1 – 9) at beginning and end of contract: 2→4

Phase 1 Technical Objectives and Work Plan

Technical Objectives

- Determine a set of excavation means, excavation tasks, and data products that are useful and relevant to LSS.
- Determine a theoretical basis that represents our best current understanding of lunar excavation.
- Select a software platform that is appropriate to the models and compatible with NASA computing.
- Demonstrate basic software functionality for a test case.

Work Plan
1. Determine the LSS-relevant inputs and outputs.
2. Determine state-of-the-art excavation equations.
3. Select a suitable software platform.
4. Build the excavation equations into a software module.
5. Debug and demonstrate the software module for a limited case study.

NASA and Non-NASA Applications

NASA Applications: Trade studies for optimizing Lunar Surface System Excavation Architecture

Military Applications: Trade studies for optimizing robotic range clearance and other automated tasks.

Commercial Applications: Trade studies for evaluating architectures for introducing robotics to open pit mines.

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