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CHALLENGES FACING THE DEVELOPMENT OF LUNAR ISRU ROVER TECHNOLOGIES

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Abstract

In-situ resource utilization (ISRU) presents a cost-effective means to enable human exploration architectures by providing hydrogen and oxygen for human consumption, life support, power systems and/or propellant. As such, renewed interest in lunar exploration has motivated efforts to characterize lunar resources, develop the technologies for resource extraction and production and develop lunar infrastructure using in-situ materials. The Canadian Space Agency has identified planetary surface vehicles and excavation and drilling for ISRU as key priority areas for planetary exploration.

In this work, the results of over four years of development in the area of lunar rover technology in Canada are presented, with a particular focus on ISRU related missions. An overview of simulation and prototyping activities and field test campaigns provide insight into technological challenges facing the development of lunar ISRU rovers. Some key areas which this work will focus on include: rover power systems, mobility and traction systems, navigation and localization techniques, environmental and operational challenges and simulation, prediction and planning tools. Finally, recommendations for path-to-flight rover development activities are provided.