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Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and
Development (3)

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SCALABILITY ANALYSIS OF LEGGED ROBOTS FOR SPACE EXPLORATION

Abstract

So far, wheeled locomotion has been used extensively for planetary exploration with drawbacks specifically in unstructured terrains and sloped areas. In particular, the environment of low-gravity celestial bodies offers a unique set of unknowns of which a potential system has to account for.

Meanwhile, terrestrial legged locomotion has advanced rapidly over the last decade. The current generation of legged robots, such as the MIT Cheetah, Boston Dynamics' Spot and ETH Zurich's ANYmal, use advanced actuation and new control algorithms to (dynamically) traverse and interact with complex environments.

Research groups around the globe have already started to exploit the possibility of applying legged systems for space exploration. Examples include DFKI's Space Climber, NASA's Scorpion and others. However, these systems have not yet reached the full potential of the technology.

This paper presents the outcome of research on scalability and application of the technologies used in state of the art legged robots for space exploration with respect to the global exploration roadmap. A special focus is laid on potential locomotion gaits as well as advantages and disadvantages in comparison to conventional wheeled systems.