

# SpaceClimber

## A Free-Climbing Robot for Extraterrestrial Craters



Art drawing of the SpaceClimber prototype



Possible operational environment for the system, photo was taken during the Apollo program ©NASA



The fully functional SpaceClimber integration-study in the DFKI Robotics Innovation Center Space TestBed

### A Robust, Energy-Efficient Climbing Robot for In-Situ Exploration in Difficult Terrain

The aim of the project “SpaceClimber” is the development of a biologically inspired, energy-efficient, and adaptively free-climbing robot for steep canyons.

Regions, such as rock fields, which require highly mobile systems in order to carry out in-situ examinations, typically belong from a scientific point of view to the most fascinating places on moon and mars. Their attraction is only topped by crater and canyon walls which are even more difficult to explore.

It is assumed that from these slopes, comparable to slopes on the earth, it is possible to get access to a variety of sedimentary layers from different eras. Therefore, these places are predestined for exogeological and exobiological investigation. Of particular scientific interest on the moon are the asteroid craters at the poles, where it is expected to find old (inter)-stellar particles as well as volatile substances, e.g., frozen water.

The “SpaceClimber” will prove that legged systems present a very suitable solution to future missions in unstructured, uneven terrain, in particular in crater and crevices in the rock. The robot system to be developed will be able to safely control up to 80 % non-uniform grades. Local autonomous navigation will be possible due to special sensor technology and new software algorithms for slope navigation.

Thus, in the field of planetary mobility, a technology will be developed which will make future crater and canyon exploration possible. Special emphasis is given to robustness, energy efficiency, redundancy, and autonomy of the robot.

As high stability in steep terrain is of utmost importance, the development and realization of novel feet concepts play an important role in the “SpaceClimber” project.

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