German Research Center for Artificial Intelligence

VaMEx-VIPE

Exploration of difficult to access terrain using visual und proprioceptive data in Valles Marineris

The hominid exploration robot Charlie while walking quadrupedal

The transition into a bipedal posture allows the robot to use its arms for alternative tasks.

Mission Scenario

The DLR Space Administration started the Initiative VaMEx - Valles Marineris Explorer with the aim to explore craters on Mars up to 7 kilometers deep fully autonomous by a heterogeneous swarm of robots. This environment appears due to the earlier volcanic activity as well as the references to water resources extremely promising for a variety of scientific issues. To have a comprehensive picture of Valles Marineris, a canyon on mars, and thus potential niches for extraterrestrial life, areas which are difficult to access have to be included in the exploration in particular. Utilizing a hominid robot platform and novel approaches for fully autonomous positioning, mapping and navigation will help to meet and to deal with the environmental conditions – this is the aim of VIPE.

Exploration Team

The hominid robot Charlie (developed within the project iStruct) will expand the robotic team. This is due to its lightweight and highly integrated design, its agility, and integrated tactile sensors ideally suited to deal with difficult terrain. Furthermore, a novel visual positioning and mapping approach will be developed, featuring a 360° panoramic camera which allows a positioning with very low drift despite the above-mentioned, demanding conditions. This visual positioning is to be supplemented by a complementary proprioceptive approach based on tactile sensors to improve self-localization. This is a prerequisite for movement planning and reactive motion control to allow the robot to overcome obstacles autonomously. By combining the created maps via higher-level network intelligence, a fully autonomous navigation even in difficult terrain will be possible. The technologies to be explored in this project have the potential to be beneficial also for terrestrial applications such as people navigation, service robotics, cave exploration, or search and rescue missions (Fukushima, earthquake zones, etc.). Therefore, however, additional requirements have to be considered. So, a further objective of this project is to explore needed extensions of the developed key technologies to make them usable for terrestrial applications.

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Partner:

Lehrstuhl für Medientechnik

NavVis

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