

# Hybrid walking and driving rover

**The SherpaTT rover is equipped with a wheel drive and actuated suspension system. It is intended for planetary exploration and uses redundant embedded CAN networks.**

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SherpaTT driving through sandy dunes of the Moroccan desert; using the active ground adaption, it is possible to keep all wheels in ground contact to share the load of the vehicle; at the same time, the body is kept upright while passing varying inclines (Photo: Florian Cordes, DFKI)

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The DFKI German Research Center for Artificial Intelligence has developed the hybrid walking and driving rover. Recently, it was tested in the deserts of Morocco. The 200-kg robot was running new software enabling a 1300-m drive through sand and stones.

Using the actuated suspension system, it is possible to generate combined walking/driving motions and even short traverses of pure walking motion. The objective is to have an energy efficient (wheeled) locomotion that can be advanced in difficult situations using the active suspension or “legs” of the system. The SherpaTT rover was developed in a first version within the Rimres (reconfigurable integrated multi exploration system) project (2009 to 2012). The second version now active in various field trials was developed in the project Transterra (2013-2017). The tasks of both versions encompass the transportation of a walking scout robot and the transportation and assembly of scientific payloads.

Originally, the SherpaTT rover was not equipped with CAN networks. The researchers used their own LVDSbased (low-voltage differential signaling) communication system, also known TIA/EIA-644. “However, as a secondary aspect, we developed a version of the motor control electronics for a space qualification process in the project”, explained Florian Cordes from the DFKI. “This version is indeed equipped with a redundant CAN interface and is aspired to replace SherpaTT’s motor control units in a future space qualified rover system.”

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SherpaTT on a rock covered patch of desert in Morocco; an autonomous traverse with a total distance of more than 1 km was successfully conducted in this terrain; path planning, obstacle avoidance and path following are completely calculated on board, without the need for interaction with a ground control station (Photo: Jonathan Babel, DFKI)

## Intended for a Mars expedition

The deserts of Morocco close the border of Algeria are similar to the conditions on the Mars. In early December 2018, the two meters long SherpaTT robot was tested there. Some 30 scientists from eleven countries collected findings for the European Peraspera (Latin meaning: Through hardships to the stars) project. The rover with articulated legs is aspired to be used for the exploration of the red planet. In the test, the rover used new software, which enabled an autonomous long-distance travel over steep slopes and gorges as well as opportunistic science, meaning that the rover chose rocks to be further investigated on its own during the mission.

The tested SherpaTT prototype is not yet radiation-hardened and is not designed to withstand extreme temperatures. To achieve this, it will be equipped for example with redundant CANopen networks compliant with the ECSS-E-ST-50-15 specification.

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