

SPACE EXPLORATION SYMPOSIUM (A3)  
Interactive Presentations (IP)

Author: Mr. Eugen Svoboda  
Graz University of Technology (TU Graz) / Svoboda Entwicklungs GmbH & CO KG, Austria

ROVERBALL - A MOON SURFACE DEVICE  
AS CONTRIBUTION TO ESA'S MOON VILLAGE.**Abstract**

Roverball is a new and innovative approach for a Moon surface robot. This device is a hybrid out of a roving, rolling and hopping device. The objective is to operate safely in rough terrain and have a higher point of view. The purpose of this so called Roverball is science and entertainment. This paper treats all structural, mechanical and locomotion subsystems of this nanoprobe. It is prepared in partial compliance of the SpaceTech masters program of the Graz University of Technology, Austria, which is sponsored by ESA.

The Roverball can operate in a small swarm or also individually. In all cases a bigger robotic device nearby is needed for energy distribution, as a communication gateway to Earth and as piggyback transportation opportunity for long duration and distance travel. With the support of this robot, the Roverballs will also survive the harsh lunar night. Different terrain environments including different soil characteristics are potential operational constraints. The Roverball will have an independent operations time of up to a few hours. The overall diameter of this device will be less than 20 cm with a mass of less than 2.5 kg. The main technical challenges are the mechanical hopping mechanism, the continuously communication with the supporting robot (gateway) during operations and the energy transfer from the supporting robot to the Roverballs.

Because of the small size of the Roverballs the Moon environment itself is even more challenging. During the operational time on lunar day (and not just for the lunar night survival mode), it may be shadowed e.g. by a bigger rock. The whole system including the locomotion subsystem with its hopping mechanism has to withstand extreme temperature gradients and the omnipresent lunar dust.

For the entertainment and science purpose the Roverballs have to contain a high definition camera, acceleration sensors and also a "lab on a chip" for different scientific measurements.

The locomotion type combination of this innovative concept is unique. It unifies the major advantages of nanorovers, spherical mobile robots and hoppers in one design. This gives the Roverball a competition advantage in the evolving new space market. The paper presents the design of the locomotion system and discusses the challenges and problem areas.