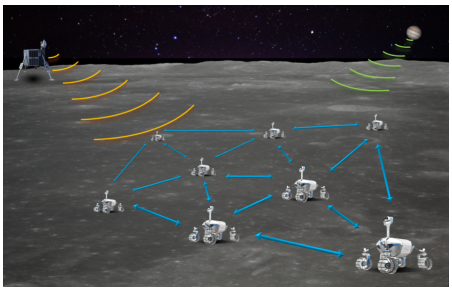
Master Thesis
Routing on TDMA-MAC with MAC Meta-Data

Future space exploration missions will rely on multi-agent systems with many robots collaboratively exploring the unknown. Communication is key to enable collaboration. Through information exchange, the agents can cooperatively navigate and reason on sensed data to accelerate exploration. Communication infrastructure is in general not available, and the terrain to be explored contains radio signal blocking features such as large rocks, hills and craters. Wireless ad-hoc networks with decentralized architecture are required to establish communication links among all agents and deployed sensors, and to dynamically route information within the network accordingly. The MAC can provide additional information to the routing protocol called meta-data, such as TDMA cycles, and observed neighboring agents including link quality.



Mission

DLR develops a swarm-navigation system for simultaneous communication and radio-localization for planetary exploration, and the MAC layer can provide side-information potentially usable by a routing protocol. Higher layer routing protocols in this regard are missing. In this work, existing routing protocols shall be identified or designed which at first make use of the TDMA nature of a MAC in general (reactive or proactive). In a further step, additional meta-data of a MAC that can be useful for routing, such as link quality or localization information to observed neighbors, shall be identified and exploited. Routing protocols shall be evaluated in simulations and compared to ones not leveraging information from prediction.

This topic is in cooperation with the German Aerospace Center (DLR) and ComSys.

Qualifications

- C++ programming
- Simulation environments
- Knowledge about the network stack
- Independent cooperative working

Goals

- Theoretical analysis of existing routing approaches
- Development of a specialized routing approach for a TDMA based MAC layer with side-information
- Evaluation of the routing approach in a simulation environment

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