

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Near-Earth and Interplanetary Communications (5)

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OVERHEAD REDUCING COMMUNICATION STRATEGIES ON THE SURFACE OF A DISTANT
PLANET

Abstract

In the last few years it has become more popular for the space agencies to send not one expensive, but more cheap space-probes to planets in the solar system. Based on recent trends, in the next few years there could be a lot of cheap devices placed on the surface of different luminaries like the planet Mars or the moons of Jupiter and Saturn. If there are many cheap instruments on the surface of a planet to do different tasks, then instead of using point to point communication systems, it is worth using ad-hoc networks. For example, we could place many cheap sensors forming an ad-hoc network on the surface of Mars and collect regularly the measured information using a rover or a robotic plane instead using an immobile probe or slow moving rover.

For such a network, using energy saving and robust solutions is critical. The cost of small devices should be kept as low as possible which supposes easy engineering solutions for the software and hardware. There is no possibility to repair a failed device except in the far future using a high-cost manned mission. Every percent of the battery is important for using the device, because the human recharge is impossible. We need a local and automatic coordination because of the far distance and the delays appearing in the interplanetary communication.

We have dealt with a special type of ad hoc networks, where neither central-control nor addressing exists and the information should be disseminated fast, before the period of validity expires and the entire operation depends on the effective spreading of the information as the system has a very special nature. We constructed an information dissemination algorithm named SPIO which can collect and exchange data on a distant planet faster than the nowadays used point-to-point systems.

Applying for the changing environment it is a tool for working in an automatic environment without human central control on the surface of a distant planet. We can construct a robust communication system if the devices could adapt to the changing environments and could select between different types of information dissemination algorithms without having any information of their global environment.