SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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WIRELESS SENSOR NETWORKS FOR MOON EXPLORATION

Abstract

Space exploration missions have always been on the agenda of the world space agencies. In the last decade, the idea of sending a man to the Moon or Mars has regained strength and now almost all agency roadmaps have manned missions as a long term goal. In order to prepare for sending humans to other planets, it is necessary to study and monitor the targeted planetary environments. This exploratory work needs to be carried out beforehand in preparatory missions or as part of actual manned missions, providing support information to astronauts.

This paper presents the European Commission collaborative project SWIPE, a new approach to using Wireless Sensor Networks for planetary surface characterization. The proposed networks use spatially distributed sensors, cooperating to monitor physical and environmental conditions and capable of passing their data through a network to a central processing location. The network is based on ad-hoc networking technology, a state of the art terrestrial technology with applications to areas such as emergency rescue in infrastructureless or remote regions, where connectivity to the outside world is limited. SWIPE applies this concept to a Moon exploration scenario. Hundreds of small wireless sensors (also called smart dust) can be dropped from an orbiting satellite onto the Moon surface to assure a uniform and sufficient coverage. These sensors create their own ad-hoc network while some of them, equipped with satellite communication capabilities, establish a link between the WSN and an orbiter or directly with Earth. Data gathered from

the sensors is processed using state of the art data fusion techniques and sent to the orbiter and later to Earth. The sensor for this project is a micro-meteorological station, capable of measuring radiation, temperature, dust deposition and illumination in different wavelengths. Each station is autonomously powered and has networking and data processing capabilities.

The paper will describe the SWIPE project in more detail. Emphasis will be put on presenting the first results, focused mainly on the mission definition and the system requirements. Although the project is focused on the Moon, the concept and results can be extrapolated for other planetary exploration missions. Ultimately, SWIPE can enable the collection of new types of surface data (enabling local spatial and temporal diversity) that can only be achieved using sensor networks, contributing to a better knowledge of the conditions that astronauts will face on future manned missions.