Analyzing energy efficiency of sensor networks deployed on the surface of a Solar System Body

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Following the exploration of Moon, the next step could be the exploration of Mars, since many man-made devices already sent measurement results from our closest planet. There is an interesting tendency that the private funding space researches are becoming more and more substantial next to state sponsored space programs. In the process of mapping a distant planet, cost efficiency is high priority since the available resources are limited. A cost efficient method is using sensor networks to explore, which can be done on a lower budget compared to "single-probe" missions [1].

Human intervention is often not possible due to the great distances. Therefore, the usage of sensor networks can partly be a solution to the arising problems, since losing connection with the home base on Earth does hinder the measurements [2]. Another advantage is that the failure of a device does not put the mission at jeopardy [3].

In our work, we assumed such a sensor network, which we examined from different point of view. Real Martian topographical data was used to create a Digital Elevation Model on which we studied different sensor movement algorithms. We analyzed the communication between sensors from the energy-efficiency aspect and we established an energy model to estimate the resource consumption of the sensors.

A simulation program has been developed to examine our sensor network. In this simulation, we compared the efficiency of the algorithms and we investigated how the energy level of the sensors affect the time required to cover the measurement area.

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Keywords:
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