

Master's Thesis

« Remote Monitoring and Assessment of Energy-Harvesters »

Background

Wireless sensor nodes are tiny devices for environmental data-gathering and event-detection. To achieve easy installation, they are equipped with wireless communication modules. As a node's lifetime is generally limited due to energy constraints, next-generation nodes are equipped with advanced energy storage facilities and energy harvesting modules. The latter are electrical devices that generate electrical power from ambient resources, e.g., sun radiation, vibration, temperature differences, and water flow. Yet, to prevent depleted energy buffers during periods of low harvesting potential, nodes must be aware of the temporal behavior of these sources. This knowledge can also be employed to choose appropriate duty cycles, task schedules, and power modes.

Work Description

In the Institute of Telematics, various energy harvesting power supplies are available. Among them are solar and water-flow harvesters. These devices exhibit different energy production profiles, that have to be determined in order to device proper prediction algorithms to be run on sensor nodes. These algorithms are required in order to allow for valid and fine-grained energy-aware scheduling of sensor nodes, so that the harvested energy can be used efficiently without the risk of accidental depletion.



The roadmap of the thesis is as follows:

1. Implementation of data-gathering software for a testbed consisting of several sensor nodes.
2. Design of a database scheme for the sensor readings.
3. Development of a visualization web frontend for the testbed.
4. Assessment and Analysis of the harvesting profiles of the different kinds of harvesters.
5. Development and Evaluation of advanced prediction techniques for these harvesting sources.

Requirements

- Programming skills in the C language
- Experience with web techniques, such as PHP, HTML, CSS, AJAX, and MySQL
- Statistics, time series analysis, prediction techniques



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