MASTER'S THESIS

Energy-efficient query processing in wireless sensor networks

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Energy-Efficient Query Processing in Wireless Sensor Networks

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Abstract

In wireless sensor networks, energy efficiency is one of the most important concerns in query processing due to limited power supply. In this thesis, we devise energy-efficient query processing algorithms for wireless sensor networks.

Queries can be classified into two categories: snapshot queries and continuous queries. The first part of our research focuses on snapshot queries. We present a generic two-tier data storage strategy for answering precision-constrained approximate queries in a sensor network. The basic idea is to keep two versions of data in the network. A high-precision version is kept at the sensor node that captures the data while a low-precision version is maintained at the base station. We develop query processing and node refreshment strategies for various types of approximate queries under the two-tier storage.

The second part of this thesis discusses monitoring continuous top-k queries. We exploit the semantics of top-k query and propose a novel energy-efficient monitoring approach, called *FILA*. The idea is to install a filter at each sensor node to suppress unnecessary sensor updates. The correctness of the top-k result is ensured if all sensor nodes perform updates according to their filters. We develop filter setting and query reevaluation algorithms with the objectives of reducing network traffic and prolonging network lifetime.

Trace-driven simulations are conducted to evaluate the performance of the proposed schemes.

The results show that our proposed schemes outperform the existing approaches in terms of both energy consumption and network lifetime under various network configurations.

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