

## 无线传感器网络中基于数据分布表的Top-k查询协议

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摘要：

Top-k查询要求返回在某种比较规则下的前k个网络数据，如最高（或最低）的k个监测值，是很多无线传感器网络应用中的重要查询。本文提出了基于数据分布表的Top-k查询处理协议DDT-Q。DDT-Q采用跨层优化策略；以Sink为根，建立最短路径生成树，树中各节点都维护反映其子树节点感应数据分布的数据分布表DDT，根据DDT，把查询请求只分发（路由）到对查询结果有影响的数据源节点，实现对查询路由和返回数据的选择优化；节点利用数据分布表和查询参数k按子返回数据量大小为子节点“按需”分配通信时隙数，即利用数据分布表指导MAC层的优化。实验结果表明，DDT-Q在不同的网络配置下，在能量消耗和查询延迟性能方面都优于基于TAG的查询策略。

关键词：无线传感器网络；数据分布表；Top-k查询；跨层优化

## DDT-based Top-k Queries Protocol in Wireless Sensor Network

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**Abstract:**

Top-k queries aims to find the top k network data, e.g., monitoring data with the highest (or lowest) rank under certain rules. It is important to many wireless sensor network applications. This paper proposes an energy-efficient Top-k querying approach called DDT-Q. The basic idea is to use a cross-layered optimization strategy. It builds a minimal spanning tree rooted at the sink. In the tree, every node maintains a DDT (Data Distribute Table) for its subtree. DDT is used to direct Top-k queries to the appropriate nodes with influential data in the network, thus achieving optimization of query routes and selection of returned data. Every node makes use of DDT and que parameter k to decide how much bandwidth (communication slots) to allocate in an 'on demand' fashion based on the returned data volume to its children nodes. The information in DDT is utilized here to guide optimization of the MAC layer. The results show that DDT-Q substantially outperforms the existing TAG-based approach in terms of both energy consumption and query latency under various network configurations.

**Keywords:** Wireless Sensor Networks; DDT; Top-k; Cross-layer optimization