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## Data aggregation in sensor networks using learning automata

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**Abstract** One way to reduce energy consumption in wireless sensor networks is to reduce the number of packets being transmitted in the network. As sensor networks are usually deployed with a number of redundant nodes (to overcome the problem of node failures which is common in such networks), many nodes may have almost the same information which can be aggregated in intermediate nodes, and hence reduce the number of transmitted packets. Aggregation ratio is maximized if data packets of all nodes having almost the same information are aggregated together. For this to occur, each node should forward its

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packets along a path on which maximum number of nodes with almost the same information as the information of the sending node exist. In many real scenarios, such a path has not been remained the same for the overall network lifetime and is changed from time to time. These changes may result from changes occurred in the environment in which the sensor network resides and usually cannot be predicted beforehand. In this paper, a learning automata-based data aggregation method in sensor networks when the environment's changes cannot be predicted beforehand will be proposed. In the proposed method, each node in the network is equipped with a learning automaton. These learning automata in the network collectively learn the path of aggregation with maximum aggregation ratio for each node for transmitting its packets toward the sink. To evaluate the performance of the proposed method computer simulations have been conducted and the results are compared with the results of three existing methods. The results have shown that the proposed method outperforms all these methods, especially when the environment is highly dynamic.

**Keywords** Sensor networks - Data aggregation - Learning automata

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