Multi Tier Data Collection and Estimation, Utilizing Queue Model in Wireless Sensor Networks

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Abstract : In this paper, target parameter is estimated with desirable precision in hierarchical wireless sensor networks (WSN) while the proposed algorithm also tries to prolong network lifetime as much as possible, using efficient data collecting algorithm. Target parameter distribution function is considered unknown. Sensor nodes sense the environment and send the data to the base station called fusion center (FC) using hierarchical data collecting algorithm. FC builds underlying phenomena based on collected data. Considering the aggregation level, x, the goal is providing the essential infrastructure to find the best value for aggregation level in order to prolong network lifetime as much as possible, while desirable accuracy is guaranteed (required sample size is fully depended on desirable precision). First, the sample size calculation algorithm is discussed, second, the average queue length based on M/M[x]/1/K queue model is determined and it is used for energy consumption calculation. Nodes can decrease transmission cost by aggregating incoming data. Furthermore, the performance of the new algorithm is evaluated in terms of lifetime and estimation accuracy.

Keywords : aggregation, estimation, queuing, wireless sensor network

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