

Wireless sensor networks (WSNs) are widely applied in data collection applications. Energy efficiency is one of the most important design goals of WSNs. In this article, we examine the tradeoffs between the energy efficiency and the data quality. First, four attributes used to evaluate data quality are formally defined. Then, we propose a novel data compression algorithm, Quality-Aware Adaptive data Compression (QAAC) to reduce the amount of data communication to save energy. QAAC utilizes an adaptive clustering algorithm to build clusters from dataset; then a code for each cluster is generated and stored in a Huffman encoding tree. The encoding algorithm encodes the original dataset based on the Huffman encoding tree. An improvement algorithm is also designed to reduce the information loss when data are compressed. After the encoded data, the Huffman encoding tree and parameters used in the improvement algorithm have been received at the sink, a decompression algorithm is used to retrieve the approximation of the original dataset. The performance evaluation shows that QAAC is efficient and achieves a much higher compression ratio than lossy and lossless compression algorithms, while it has much smaller information loss than lossy compression algorithms.