Research Paper Engineering

Energy Efficient Wsn Using Hybrid Compressive Sensing

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ABSTRACT

Compressive sensing reduces the no. of data transmission in wireless sensor network. Wireless sensor networks consist of a network in which node are spatially distributed. These sensor nodes communicates with each other for transferring data from one node to another. These sensor nodes while transfer of data consumes energy. So the energy consumption is high in wireless sensor networks. To reduce the energy consumption the compressive sensing method is given known as compressive sensing. Clustering is made in wireless sensor network for effective communication. Compressive sensing method used to reduce the energy consumption by the sensor nodes so that the energy consumed by the wireless sensor network should be less. MEMAC allows only nodes that have data to send to be included in the schedule which increases the energy efficiency of the protocol. SDMMDA protocol is also used with our proposed method to accurately reconstruct the signal at base node.

KEYWORDS Compressive Sensing, Wireless sensor network, congestion , energy consumption, clusteriing.

Introduction

A wireless sensor networks is a network consisting of group of nodes called as sensor nodes and one sink node or also known as base node. In wireless sensor networks sensor nodes needs to send the data to the base node or called as sensor nodes. This energy is consumed by the sensor nodes to send the data and receiving the data.

To transmit data from one sensor to another by multi-hop routing the traditional data gathering and processing method is used. Finally the data will be transmitted to the sink node respectively to the route. Disadvantage of traditional method lies in the unbalanced energy consumption for each sensor and redundant data transmissions. The sensor closer to the sink will consume more energy than other sensors.

Due to the number of transmissions in wireless sensor network the energy consumed by the sensor nodes is high. As the energy consumed by the sensor nodes increases the chances of failure of sensor nodes also increases, as a result of this the battery consumption of sensor nodes is high and possibility of failure of wireless sensor network also increases. So in this paper we are proposing a method to reduce the energy consumption by sensor nodes. We are trying to reconstruct the signal at sink node and data gathering successfully with high probability.

To avoid the redundant data transmissions, some researches introduce methods of data fusion to process data in Wireless sensor networks. More completed routing protocols and much higher computation ability will be needed for each sensor. Data fusion methods cannot solve unbalanced energy consumption problems. A novel method named compressive sampling theory (CS) has received more attentions at present. In this paper, we investigate compressive data gathering and original signal compressive data gathering and original signal reconstruction in wireless sensor networks (WSNs). By using the Compressive Sampling theory, the energy consumption can be balanced and the redundant data transmissions can also be avoided.

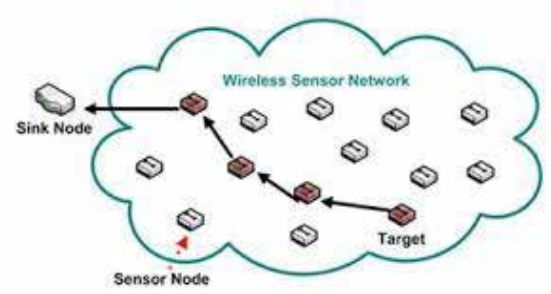


Fig 1. Wireless sensor network

Related Work

Fei Yuan, Yiju Zhan, and Yonghua Wang in 2014 proposed a Data Density Correlation Degree Clustering Method for data aggregation for representative data to be accurate when compared to real data. The work here done can also be conducted on real sampled data. They didn't done it yet.

Jennifer Yick, Biswanath Mukherjee, Dipak Ghosal in 2008 surveyed wireless sensor network on internal platform and underlying operating System, communication protocol stack and network Services and compared different designs and algorithm. Only survey of various data collection techniques is given. Luís M. L. Oliveira, Joel J. P. C. Rodrigues in 2011 surveyed on environmental monitoring and analysis was done on their real deployments. only survey is done on environmental monitoring and no method is proposed.

Fengyuan Ren and Jiao Zhang in 2011 [3] proposes a energy balanced routing protocol for data gathering in wireless sensor network. This paper focuses on routing that also balances the energy consumption. It borrows the concept of potential in classical physics to build a virtual hybrid potential field to send packets to move toward the sink through the dense energy area and steer clear of the nodes with low residual en-

ergy so that the energy is consumed as evenly as possible in any given arbitrary network deployment. Their numerous simulation results show that the proposed solution EBRP makes significant improvements in energy consumption balance, network lifetime, and throughput as compared to the commonly used energy efficient routing algorithm.

BANG WANG in 2011 surveyed on coverage problems in wireless sensor network and also provided comments and discussions on coverage problems. They currently only focuses on two dimensional coverage problems. Samuel Madden, Michael J. Franklin Joseph M. Hellerstein in 2002 proposes a tiny aggregation service for sensor networks which causes magnitude reduction in bandwidth consumption. They do not focus on data collection needs of wireless sensor network. Jun Zheng, Pu Wang and Cheng Li in 2010 studied the problems in applying Slepian–Wolf coding for data aggregation in wireless sensor network and proposed a joint coding scheme with low complexity. The only focus is on data aggregation. Mehmet C. Vuran, Ozgur B. Akan in 2004 introduces a theoretical framework for energy efficient communication protocols in wireless sensor networks. Only a theoretical concept is given not an implementation. Jinhui yuan, hong Chen in 2009 proposed a optimized clustering technique on spatial-correlation which collects data and reduces the messages in WSN and avoids the impact of unpredicted data. They didn't focus on number of transmissions in wireless sensor network.

Ruitao Xie and Xiaohua Jia in 2014 [1] proposed a hybrid compressive sensing approach to reduce the data transmission in wireless sensor network. They proposed a hybrid CS method, to find the optimal size of clusters that can reach to minimum number of transmissions and proposed a centralized clustering algorithm. Within a cluster, data are collected to the cluster heads by shortest path routing; at the cluster head, data are compressed to the projections using the CS technique. Finally, They present a distributed implementation of the clustering method. Extensive simulations confirm that the method can reduce the number of transmissions significantly.

Liu Xiang,Jun, Luo and Athanasios Vasilakos [4] in 2011 investigated the energy efficient aspect of applying compressed sensing (CS) to collect data in wireless sensor networks (WSNs) and solution techniques to obtain both the optimal and the near optimal aggregation trees. They first defined the problem of minimizing energy consumption through joint routing and compressed aggregation. They further proposed two solution techniques to obtain both the optimal for small scale problems and the near-optimal for large scale problems aggregation trees.

Proposed Method

Here we are proposing a method to reduce energy consumption in wireless sensor network. In our proposed method we are using An Adaptive Mobility Aware and Energy Efficient MAC Protocol for Wireless Sensor Networks along with the SDMMDA protocol.

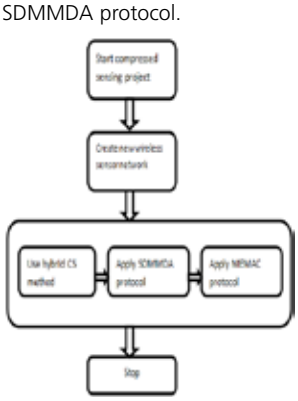


Fig. 2. Proposed method

First we create a wireless sensor network. Then we apply a hybrid compressive sensing approach to the network. Then by applying a MEMAC protocol and a SDMMDA protocol we are trying to reduce the energy consumption in a sensor network.

Now MEMAC protocol consists of following four phases:

Network Creation : In network creation a wireless sensor network is created.

Cluster Creation : Here clusters in the network are created for communication.

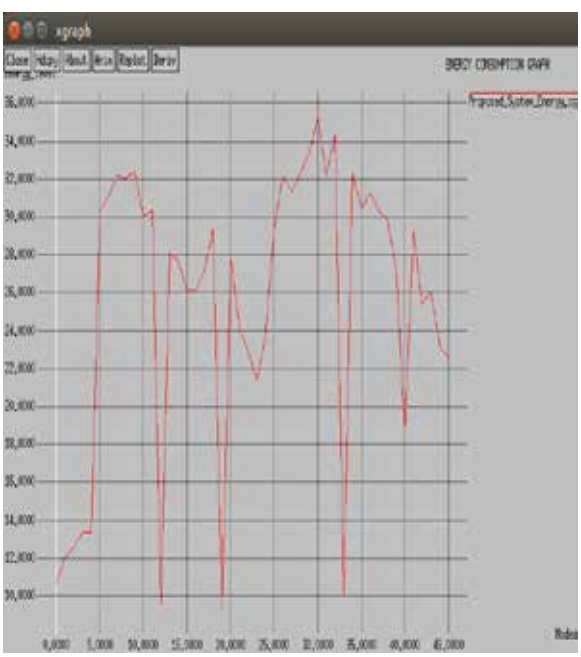
Head Calculation : In head calculation the cluster head is calculated for each cluster in network.

Leave/Join operation : Here it is checked if any sensor node in a network wants to join or leave the network.

Now using SDMMDA protocol the signal which is gathered at base node in the form of data is reconstructed as the signal used there is compressed.

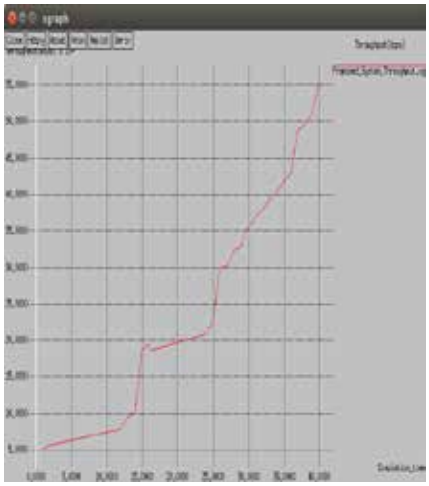
So by using this method we are trying to reduce the energy consumption and we are trying to get back the original signal at sink node which will be more accurate.

Experimental results



The above graph shows the result of our work. In the above graph the energy consumed by each node during the simulation is shown. Here we are trying to reduce the energy consumption by each node.

The graph below shows throughput at a specific time. The x axis denotes the simulation time and the y axis shows the throughput. Here we are trying to increase the throughput of the sensor network.



conclusion

In existing system energy consumption is reduced by reducing number of transmission in wireless sensor network. Though it is comparatively high. So here we are proposing a method in which by combining the mobility aware energy efficient protocol and SDMMDA with existing system we are trying to reduce more energy consumption and reconstructing the accurate signal at sink node in wireless sensor network.

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