

Reduced energy consumption using MEMAC protocol in WSN

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Abstract

Wireless sensor networks consists of spatially distributed sensor nodes. These sensor nodes communicates with each other for transferring data from one node to another. Energy is consumed by the sensor nodes while transfer of data. 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. MEMAC is combination of contention based and scheduled based protocols to achieve significant amount of energy saving. Hybrid compressing used with MEMAC protocol will reduce more energy consumption and network lifetime will be increased.

Keywords: *Compressive Sensing, Wireless sensor network, congestion , energy consumption, clustering..*

1. 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.

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.

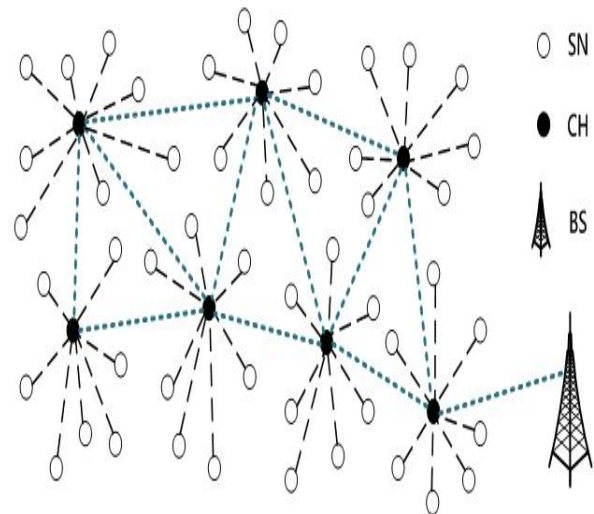


Fig .1 Wireless sensor network

2. Related Work

The compressive sensing approach is studied in various papers. The literature review of papers with their drawbacks is given below.

| Reference no. | Description | Drawback |
|---------------|--|---|
| 1. | Ruitao Xie and Xiaohua Jia in 2014 proposed a hybrid compressive sensing approach to reduce the data transmission in wireless sensor network | The factor of energy consumption is not considered here |
| 2. | Shivendra Dubey and Chetan Agrawal in 2013 gives the survey of various data collection techniques in wireless sensor network | Only survey of various data collection techniques is given. |
| 3. | Fengyuan Ren and Jiao Zhang in 2011 proposes a energy balanced routing protocol for data gathering in wireless sensor network | only find routes for each data source to the same sink so lack of understanding of time-varying potential field |
| 4. | Liu Xiang, Jun, Luo and Athanasios Vasilakos in 2011 investigated the energy efficient aspect of applying compressed sensing (CS) to data collection | They don't focus on to reducing energy consumption by involving network partition. |

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|----|---|---|
| | in wireless sensor networks (WSNs) and solution techniques to obtain both the optimal and the near optimal aggregation trees. | |
| 5. | Bashir Yahya, Jalel Ben-Othman in 2009 proposes an energy efficient mobility aware medium access control protocol to reduce energy consumption by sensor nodes. | They do n't focus on minimizing congestion in the wireless sensor network |
| 6. | S. Chen, Y. Wang, X.-Y. Li, and X. Shi in 2009 studied the theoretical limitations of data collection with respect to delay and capacity of sensor network. | Only focus on data collection capacity of randomly deployed sensor network. |
| 7. | S. Lee, S. Patten, M. Sathiamoorthy, B. Krishnamachari, and A. Ortega in 2009 proposed energy efficient compressive sensing using spatially-localized sparse projection and to keep transmission cost low the measurement of clusters of adjacent sensors | Don't focus on design of optimal clustering scheme |

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| | <p>is taken , so framework for efficient data gathering is given. It outperforms over state of the art CS techniques because it achieves power savings with localized aggregation.</p> | |
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3. 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. MEMAC allows only nodes that have data to send to be included in the schedule which increases the energy efficiency of the protocol. MEMAC is combination of contention based and scheduled based protocols to achieve significant amount of energy saving. Now MEMAC protocol consists of following four phases:

1. Network Creation-Creating network for connectivity. Basically in general Wi-Fi network if there are n numbers of nodes in network which are actively participated in message transfer or communication. Then if any node say node no 1 want to communicate with node no 16 then for this communication or message transfer; firstly node must connect with its neighbor nodes and so on; up to the destination node 16. Out of that it will choose shortest path to reach up to destination and then it will send message packets. This process is happen in various wireless networks. But due to some disadvantages this system is fail to acquire reliability and proper flow control in energy efficient way. So all this disadvantages are overcome in MEMAC system.

2. Cluster Creation- Clusters which are dynamically formed contain all nodes in sensor network. In

MEMAC system, for eg. when node no. 1 want to communicate with node no. 16, then node 1 firstly communicate with its own cluster head. After that ch1 communicate with ch2 which is cluster head of node no. 16 and then finally ch2 transfer message which is come from node no 1 to destination node (i.e. node no 16). In this way in MEMAC system three way communications is happen. So it is faster and energy efficient system.

3. Head Calculator-Clusters Head created with respect to cluster quantity. phase-In this phase CH broadcast the calculated schedule to the other node within cluster. The schedule contains those nodes which have data to send only. The current schedule does not consider nodes that want to leave or join the cluster. If the number of request message is greater than number of join or leave messages, then frame length is increased otherwise decreased.

4. Leave/Join Operation- In case of request or leave phase the contention period should be long enough to enable all Sensor node. In MEMAC protocol handles the channel access through the following four phases: request\leave\join phase, schedule calculation and distribution phase and data transfer phase. In case of request or leave phase the contention period should be long enough to enable all sensor nodes that have data to transmit contain for the channel in order to acquire the access to send its request to CH as well as those nodes which are expected to leave or join the cluster should the CH by sending message of leave or join.

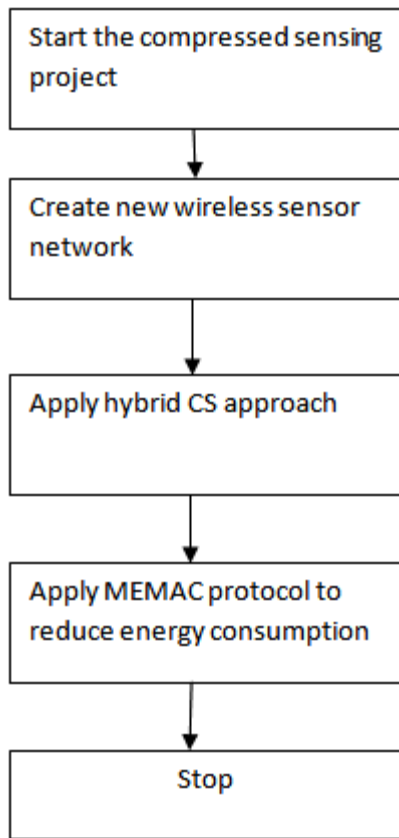


Fig.2 Proposed method

The proposed method is as shown above. After applying hybrid CS approach we are using MEMAC protocol to again minimize energy consumption in wireless sensor network.

4. Conclusion

In existing system energy consumption is reduced by reducing number of transmission in wireless sensor network. Here we are proposing a method in which by combining the mobility aware energy efficient protocol with existing system we are trying to reduce more energy consumption in wireless sensor network.

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