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Research paper

Design of Analytical energy consumption model for data transfer over wireless links

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Abstract

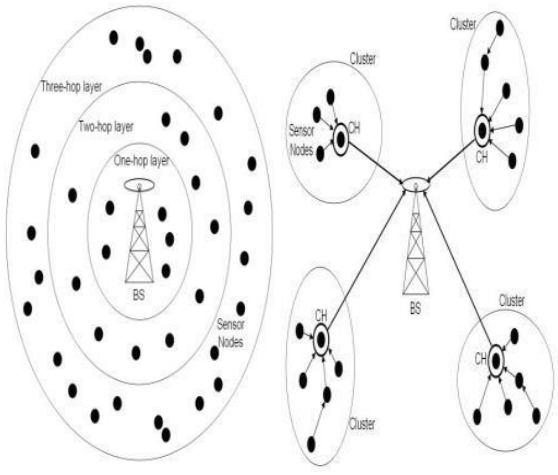
This project investigates about the lowering of vitality utilization in group based remote sensor systems(WSNs). It uses Clustering technique and QPSK methods to lower the energy consumption of nodes in WSNs. This approach has a big advantage to prolong the lifetime of the WSN. The results show that clustering reduces traffic flow, limits vitality utilization, and broaden the lifetime of the sensor network. This project is also implemented with security, effective communication by using set ibs protocol.

Keywords: *Cluster-based; Energy Consumption; Wireless Sensor Networks; Clustering.*

1. Introduction

A wireless sensor network (WSN) is composed of a large number of sensors which are battery-powered devices connected wirelessly. Sensors are dispersed in the field, gather tangible information (e.g., temperature, moistness, vibration, etc and large hand-off information to the base station (BS) . WSNs have many significant applications in environment, health care, industry, country security, etc. However, the limitation of sensor networks is limited backup of vitality and short lifespan. In order to prolong lifetime, the flow of data in the network should be routed along a path that satisfies minimum energy consumption. Deigning such a network based on clustered architecture ensures the efficient utilization of limited capacity of energy. Unlike the layered architecture of WSN, where sensor nodes communicate with a single base station, the clustered architecture groups sensor nodes into disjoined non merging are subsets called clusters, each cluster communicate with a single special node called cluster-head (CH), which communicates with the base station.

Conversation inside a group is called intra-bunch correspondence, while correspondence amongst CHs and the base station is called inter group correspondence. Grouping approach offers numerous advantages. It brings about system adaptability, asset sharing and effective utilization of compelled assets that gives organize topology strength and vitality sparing traits. Furthermore, it reduces communication overheads, allocates resources efficiently, decreases the overall energy consumption and reduces interference among sensor nodes. Also, it enables bandwidth reuse, and improves system capacity.



a) b)

Fig. 1: Wireless sensor network architecture: a) layered architecture, b) clustered architecture. (BS: Base Station, CH: Cluster-Head)

This paper aims at investigating the measures to limit the vitality utilization of the WSN and the impact of clustering on energy consumption of the WSN. The paper is organized as follows. In section II, some previous and related literatures are presented. In section III, the modeling of the problem is explained. In Section IV, the formulation of the problem for minimizing energy consumption in cluster-based WSNs is described. In Section V, the results of the project are shown. Finally, section VI presents the conclusion.

2. Related Work

Several previous works discussed the measures to minimize energy consumption of the WSNs. Some are listed below in a brief manner.

The first and significant hierarchical routing protocol which provide the data fusion is the LEACH protocol. It is a round based protocol and is self adaptive and self organized. Each is organized as two phases: Setup phase and Steady state phase. The setup phase is smaller than the steady state phase. The setup stage is important than steady state phase,because in which the sensor nodes itself randomly elect as the cluster heads and form the network ass different clusters then these cluster head schedule a TDMA schedule for its cluster member nodes.

EEHC is a fast distributed randomized clustering algorithm, for dividing a network into different hierarchical clusters to achieve better energy efficiency. In this the cluster head is known as a volunteer cluster heads.

HEED is a hybrid approach, it is developed as a distributed, energy efficient clustering approach for ad-hoc networks. An important feature of HEED protocol is that it misuses the accessibility of various transmission control levels at sensor hubs. The HEED ends in a consistent number of cycles that is autonomous of systems distance across. It just accept the sensor hubs can control there transmission control level and not think about the circulation of hubs or about hub abilities.

TEEN is a first protocol developed for re-active networks. It is a data centric method. In which at every cluster change, the cluster head broadcast to its members in addition to the attributes are, Hard threshold(HT), Soft threshold(ST). Each time node, sense there environment continuously. By this the sensed values are stored in an internal variable in a node called sensed value (sv). Then the node sends the data only when one of the following conditions is satisfied: 1)The present estimation of the detected quality is bigger than HT. 2)The present estimation of the detected trait contrasts from sv by a sum equivalent to more prominent than the ST.

EEICCP is a clustering routing protocol which uses the multi hop approach for the cluster heads and evenly distribute distributes the energy or power load between the sensor nodes in the network. It uses homogeneous type of nodes. The protocol mainly depends on the idea that the cluster head can may send data directly to the base station that means single hop or it can send by multi hop. But in single hop, it takes lots of energy. It mainly deals with multi hop.

3. Modelling the Problem

The first and foremost thing comes is clustering. In this project we are dealing with three nodes. Node 1 and Node 2 are almost similar. Node 3 is connected to PC i.e, base station. Node 1 and Node 2 forms one group. The node with highest energy takes the responsibility as cluster head4 The cluster head is responsible in transmitting data from the cluster to base station. Here the nodes have to communicate with the cluster head instead of communicating with the base station. The construction of node 1 and node 2 is as shown in the diagram Fig. 2.

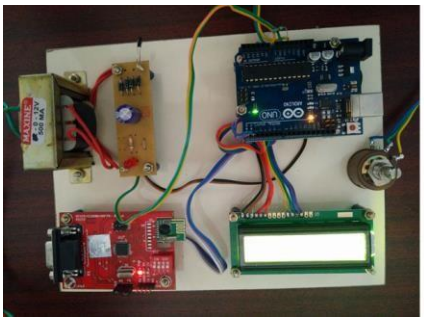


Fig. 2.a

a) Node 1

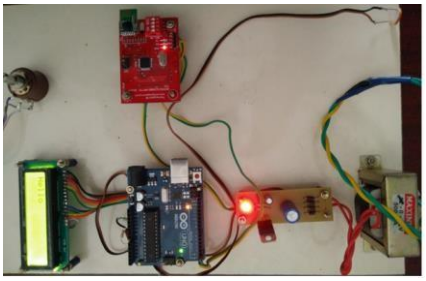


Fig. 2.b

b) Node 2

Node 3 is connected to PC i.e., base station. The base station sends information to other nodes through this Node 3. Node 3 uses its components especially zigbee to communicate with other nodes. The Node 3 is shown in Fig. 3.

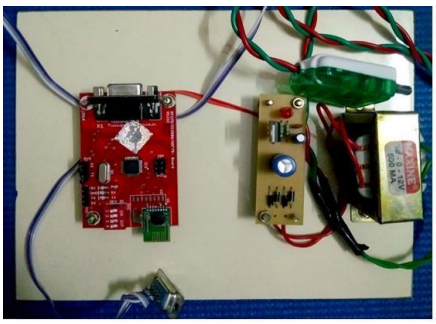


Fig. 3

4. Formulation of the Problem

The nodes should be formulated in such a manner that the network consumes minimum energy. There are many methods for this approach as explained in the Related Work. In this project we are working with only two nodes. Node with higher energy will be cluster head. The cluster head in our project will be decided with the change in potentiometer value. The Node 1 is cluster head as it got the highest energy. It is illustrated in the diagram i.e., Fig. 4.

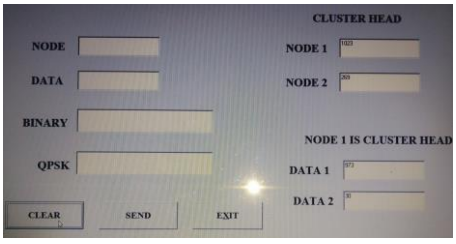


Fig. 4: Node 1 is CH

When Node 2 has got the highest energy, then it will be the cluster head. It takes the responsibility of the communication

between cluster and base station. It is illustrated in the diagram i.e., Fig. 5.

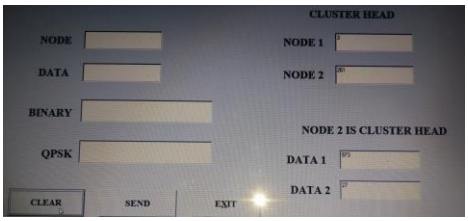


Fig. 5: Node 2 is CH

The transmission is done in QPSK form. This method is also called as quadriphase PSK or 4-PSK. QPSK technique influences utilization of four indicates on the heavenly body graph, which are equispaced around a circle. Having the four stages, QPSK would now be able to encode two bits for each image, as appeared in the outline with Gray coding to limit the bit error rate (BER). QPSK concept is illustrated in the diagram.

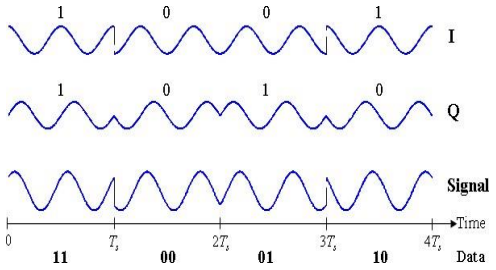


Fig. 6: QPSK Waveform

The final formulation of the problem description is Node 1 and Node 2 will form a cluster which helps in lowering the energy consumption. QPSK transmission will additionally help in reducing the energy consumption. These both are the unique concepts in this project which reduces the overall energy consumption. This rectification in energy consumption in WSNs will highly benefit the human race. Clustering reduces traffic flow, minimizes energy consumption, and extend the lifetime of the sensor network. Transmission of bits

5. Conclusoin

The results obtained proves clustering techniques and QPSK method. When any information sent through the PC to cluster members, the nodes receives it. The clustering technique is what actually helps in reducing the overall energy consumption as mentioned earlierThis project researched about bringing down of vitality utilization in cluster based remote sensor systems(WSNs). Clustering technique adds a great benefit by reducing the energy as it appoints a cluster head which is responsible for the communication between other nodes in group and PC(Base Station). Involving QPSK method in transmitting the data reduces the bandwidth which in turn reduces the energy consumed. This model helps in lowering the energy consumption in cluster based WSNs..

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