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SENSOR SCHEDULING OF NODES USING CLUSTER HEAD MECHANISMS [SSNCH]

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ABSTRACT

To monitor the environment periodically our researchers developed many applications using WS networking. While using these, sensors has to carry the sensed data to the main node or cluster head (CH). In this process many nodes will be included for routing purposes. In this paper we will exhibit the how the sensor will carry the information, route calculation, formation of cluster head in the group of nodes. By monitoring of environment we will get various parameters values like moisture, pollution, intensity of light etc.

KEYWORDS: Deployment, path calculation, cost metrics, DL layer, CH, RF transmission.

INTRODUCTION

As the technology is developing more and more a new type of various investigations are raised. In this development sensor technology will play a vital role for the usage of smart devices. As the combination of sensor and wireless technology brought a revolution in wireless communications. The Wireless Sensor networks are embedded with minute energy leveled sensor nodes, so it will be a very challenging level to use the energy for long period.

These nodes are communicate or transferring of data from node to node with other through the RF communication. These are very small in size so portability nature is there. The power consumption will be one of the major problem in the WSN to maintain the network efficiency as they are operated with the batteries. The main purpose of these nodes is capture the data of sensors and sent to the base station with the help of other nodes which are around that node.

To conserve the energy of the nodes we have to keep the node to be in sleep mode which are not used and used when they are active to transfer or receive the data. The sensor nodes are deployed at various places in the forest area, industrial estate etc. to continuous monitor the ecology parameters. For scheduling of nodes we have various methodologies, like to transfer the data when the node is in active mode or sleep mode. The synchronous scheme will be used for the scheduling the nodes where each node consists of one overhead. So by maintaining the overhead to synchronize the node with other will be very difficult. So in this paper we are presenting an asynchronous mechanism to transfer the data from one node to other.

SENSOR SCHEDULING

To monitor or to continuous surveillance of the sensed data can be captured through the sensor nodes of the WSN which are very tiny size requires very less power for its operations like transfer of data from one node to other. While transferring the data these nodes lifetime will be reduced as these are battery operated. For this to maintain a great and good network lifetime of the nodes we have to maintain the one scheduling protocols has to be implement to use less power for its operations.

A scheduling protocol used in the WSN will use maximum number of nodes for the data sensing and data transferring. But in this protocol some nodes are kept in active state and some are will be in inactive state those will also be called as sleeping nodes. So a new scheduling protocol should be used where the minimum nodes should be active with in given time period where the nodes laid at the nearest path from the main node to the base station. So as we are using nodes just to monitor the ecology we need very less energy bands, we can use a NBM (Narrow Band Modulation) can be used.

For this NBM we can use MAC conditions like TDMA [1] which will combine with the MAC protocol and the TDMA mechanisms to form one scheduling protocol for the nodes which are in sleep mode by allocating the timeslots to them we can wake up such nodes during the active periods. So this protocol is designed in such a way that by finding the shortest cost metric from node to the base station the nodes in that route will be in active /wake up state. In this by using the TDMA these will allocates a separate time schedule to every node to acces the medium to transfer the data.

The Scheduling protocol of the WSN using the MAC mechanism have to satisfy the following conditions

- a. NBM Techniques
- b. High throughput
- c. Low complexity in hardware
- d. Access delay, transmission of delay and Overhead, data transfer will be maintained in less

PROTOCOLS EXISTING USED FOR SCHEDULING

There are some already existing protocols which are already implemented in the WSN these are as shown below [2]:

- a. The MAC protocol which is introduces the first Low power listening protocols based on B-MAC protocol. By this Low power consumption can be implemented in the nodes but [2] the disadvantage of this protocol is it does not support the Radio Communications
- b. To overcome this disadvantage a W-MAC protocol can be implemented. In this which reduces the weight of the overhead and then sends the data to the neighbors nodes. But in this protocol will support only some type of Radio Communications.
- c. Inverse Log Scheduling [3] is the one of the MAC protocol for the scheduling of nodes where the nodes are the centralized and deployed in various places. In this we use long range of transmission of data which have worse channels also through the RF communications
- d. The scheduling protocols which are used for the centralized and de-centralized sensor nodes which can cover the both coverage area and the less power consumption. [4] This type of scheduling sensor will be used in the military for the surveillance at the borders.
- e. SIFT is the MAC protocol is designed in which high priority data will be sent first then the next priority. [5]

SS for Wakeup/ active state

As we are deigning the protocol for the Asynchronous type of nodes the nodes should be active state periodically when they receive the data or to transfer the data and in the remaining time these will be kept in sleep mode. While the node are in changing their state to sleep mode to active mode then the below condition has to be checked [6]

$$E_{\text{wasted in switching}} < E_{\text{Saved}}$$

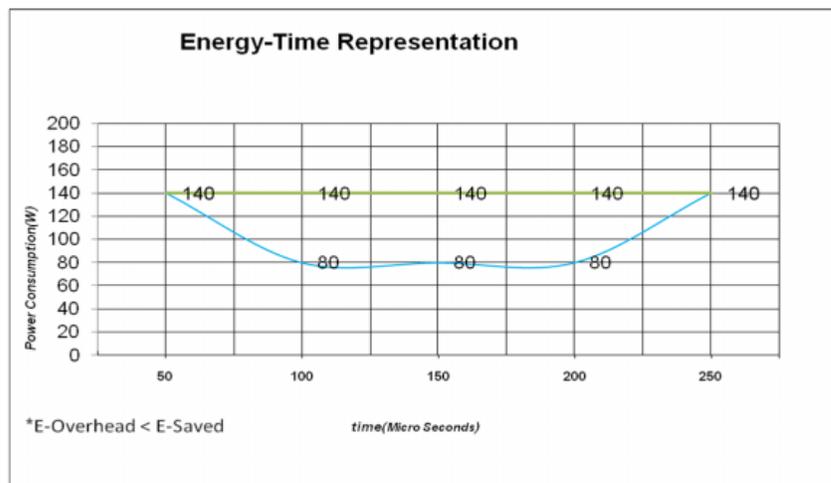


Fig 1: Graphical analysis of the nodes when they are changing their state.

The asynchronous Mac Protocol is designed in such a way to be useful for transferring the data from node to the base station we use the following parameters.

- i. R_s - Sleep mode
- ii. R_t - Transmitting state
- iii. R_r - Receiving state
- iv. R_l - listening state

If 't' is the time slot for the node which is transferring the data then denoted as $R_{t,t}=1$ if the node is not sending any data then $R_{t,t}=0$. So for the four states the equation is [7]

$$R_{t,t} + R_{r,t} + R_{l,t} + R_{s,t} = 1$$

So for every cycle, the radio checks the four states whether there is any node sending or receiving the data or listening mode or it is in active mode or in sleep mode. Etc., can be known by this formula.

The energy will be used for the radio transmissions so the energy used by the node when the node is changing from sleep mode to active mode

$$E_{\text{wasted in switching}} = t_{s-a} (p_{\text{active}} + p_{\text{sleep}}) / 2$$

The energy saved by the node while switching from sleep mode to active mode shown in below equation

$$E_{\text{Saved}} = (t_a - t_s) p_{\text{active}} - (t_{a-s} (p_{\text{active}} + p_{\text{sleep}}) / 2 + (t_a - t_s - t_{a-s}) p_{\text{sleep}}$$

CREATION OF CLUSTER HEAD (CH)

In the WSN we have a group of nodes in this we have to maintain the communication from every node to the other node and they should to maintain communication with the base station to send or receive the data to the nodes and perform the commands as allotted to it. In the group of nodes to get shortest path they will maintain the nodes in active state and form one route to get a efficient way of communication from base station to the nodes in this one node will form as a main node to which all the nodes will be connected as child nodes. That main node will called as Control Node or Cluster Nodes where the child nodes forms a cluster notation.

In the Cluster based routing protocol is the one of the best protocol for routing in shortest path. As we are using nodes for the ecology monitoring the energy efficiency used is very less. And in the formation of the clusters no one cluster will have same node as common node. These will not have any overhead then weight on the data transmission will be reduced more. All the nodes will become active based on their weight on the nodes.[9] Then at this time those nodes will be active and then transfer the data or receive the data. In a tree all the clusters will have different weight to which various clusters will have various time slots.[10] The time slots will be allocated to the nodes in decreasing mode of weight to the nodes in the tree structure. This mechanism will be followed for scheduling the nodes in WSN for Environmental monitoring. So by this we can concise the energy levels.[11] This formation of CH will be followed by using the LEACH protocol. In this Leach protocol will be used for finding the shortest route for transmission of data from various cluster heads to the main node and main node to the base station

SIMULATION

The formation of cluster heads and creation for cluster region can be simulated using the NS2 simulator. In the graphical analysis we can clearly show that how much they are efficient in energy saving. NS2 (network Simulator version 2) will be used for simulation of scheduling protocol. This is a software which can script by using the languages like C++ and TCL for coding purpose. We applied the cluster techniques in the spanning trees and the path trees ie., SPT and the MST. With the scheduling algorithm we will have less power consumption for the data transmission and the data receiving.

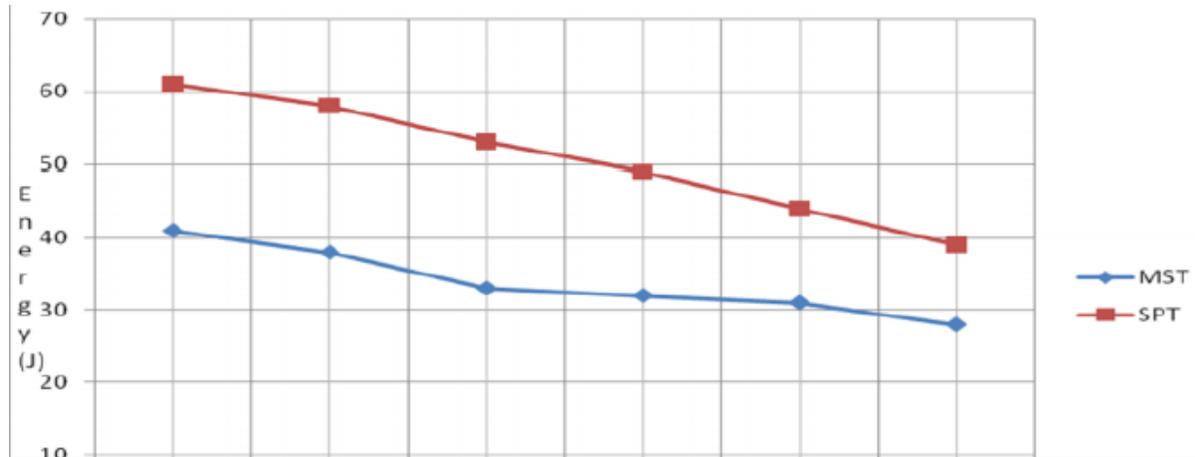


Fig 3: MST vs SPT using NS2

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