SELECTION OF LEADER TO ACHIEVE ENERGY EFFICIENCY FOR WIRELESS SENSOR NETWORKS

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***ABSTRACT*—**

Wireless sensor network (WSN) consists of sensor nodes. Sensor nodes are used to monitor physical or environment condition such as temperature, pressure, etc., the purpose of sensor node is to cooperatively pass their data through the network to the base station. Energy is the main issue in the design of a WSN. The maximum energy from a sensor node is consumed during the transmission and the computation phases. The main problem in the wireless sensor network is maximized energy consumption. Since sensor nodes have non rechargeable battery they have limited computation capability. Therefore, it is a challenge to minimize the energy consumption of sensor node and to prolong the lifetime of network. In WSN all the sensor nodes are communicating with the base station so the energy consumption is high. The solution to minimize energy consumption is selecting the leader among all the nodes and it is made to communicate with the base station. Increase in Energy Efficient and Energy Balance (IEEEB) is an algorithm which is used to select leader to achieve energy efficiency.To reduce energy consumption, many systems also perform in-network aggregation of sensor data at intermediate nodes en-route to the base station.

Keywords: Energy-efficiency, IEEE-B, Sensor networks.

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I. INTRODUCTION

The wireless sensor network has changed the world around us. They are becoming essential part of our lives because of their various resources. The advancement in wireless communication technologies permits distribution of large scale wireless sensor networks. It has a wide range of application because of its ease of deployment of sensor nodes. Due to the numerous benefits of using wireless sensor networks it support a variety of application including object tracking, traffic control, agriculture, surveillance, home automation, machine failure diagnosis. Wireless sensor networks contains sensors which are spread evenly to measure different environmental conditions such as sound, pollution level, wind speed and direction. A sensor node is a small and simple device with finite computation and resources. Sensor node contains different components includes a radio transceiver, battery, microcontroller, analogy circuit and sensor interface. By using communication components, the sensor nodes transmit the sensed data to other node and to the base station. Base station acts as a supervisory control processor or as a gateway to other networks. Despite the advantage of using wireless sensor networks, their use is limited by energy constraints of sensor nodes. Sensor node contains non-rechargeable batteries, energy efficiency is a major constraint to increase network lifetime. Wireless sensor networks may have a large number of redundant data since various sensors can sense same information. In order to decrease the number of transmissions in the network, bandwidth usage reduction and eliminating unnecessary energy consumption in both transmission and reception, the sensed data should be aggregate.

Various algorithms have been proposed for selection of leader to achieve energy efficiency and enhance the performance of network. Each node elects a particular node as a leader and then all the nodes send their data to the leader. The leader sends it data to the base station. In this paper, an energy efficient algorithm named, IEEE-B is proposed. IEEE-B algorithm considers the residual energy of nodes, distance between a node and a base station and weighted density of node to elect a leader.

II. RELATED WORK AND MOTIVATION

In recent years, researchers have proposed various algorithms for improving the network lifetime by electing the leader based on some methodology. In [7] the author uses three parameters such as energy, concentration and centrality for selection of cluster head to increase the network lifetime. The concentration means the number of nodes present in the surroundings.

The centrality means how central the node is to cluster. In another modification [9], the author uses fuzzy logic methodology to govern mobile base station for minimization of energy consumption. Simulation result show that this method is more efficient when compares to wireless sensor networks with stationary base station. In another modification [8] the author uses battery level, local distance and node density for selection of cluster head. The local distance is the distance between the temporary cluster head and the nodes within predefined constant radius. PEGASIS-T is using fuzzy logic technique to elect leader based on two parameters such as residual energy of node and proximity to base station [11].

The proposed scheme uses three parameters of node such as residual energy, distance between a node and base station and weighted density of node to select leader. IEEE-B (Improving Energy Efficiency and Energy balance) follows the thoughts of LEF-P but fuzzy logic methodology is not considered in this paper. The simulation result show that IEEE-B minimize the energy consumption of all sensor nodes and thereby increasing the lifetime of wireless sensor networks.

III. PROPOSED ALGORITHM

IEEE-B adopts new method to build chain, and uses weighting method when selecting the leader node, that is assigning each node a weight so as to represent its appropriate level of being a leader which considers residual energy of nodes and distance between a node and base station (BS) as key parameters.

This method gives the solution for selecting the leader by considering the higher residual energy among all the nodes. This is performed by considering the current and the predicated residual energy of the nodes, ahead with the number of rounds that they can be a leader to maximize the network lifetime. In IEEE-B, the base station is pretended to have absolute energy and communicating power with the nodes. It is expected that the base station is fixed at a position of the sensor field. The leaders have the ability to transfer the data. The data transmitting nodes are made to communicate with the leader and the dates are transferred, other nodes are kept under the sleep mode. By this the energy consumption is reduced for the network.

The main typical feature of IEEE-B is selecting the leader. A particular node is selected as a leader to minimize the total energy consumption of the network. By considering the weight of the node, distance between the base station and the node and residual energy a leader is selected among all the nodes for the every round by this the energy consumption is minimized in the WSN.

The steps in order to create a network and select a leader are as follows:

1. The Base station builds a Time Division Multiple Access (TDMA) chart and appeals the nodes to announce them.
2. Each node gives a message to announce its location and energy level to its nearby nodes. By keeping this information, each node forms a neighbor information chart that records the position and the energy level and it transfers the chart with all information to its nearby node. While the process taking place all the nodes are the applicant of the leader and each node has an exclusive ID that is also kept in the chart and transferred.
3. By this network is created and then the data's are transferred and the nodes are made to communicate.

For communication purpose some steps a used they are,

- When there is no incoming links and there occurs the failure of the link. Fig(1) Set $lid_i = i;$

  $(T_i,oid_i,r_i)=(-1,-1,-1);$

  $\delta_i=0;$

  else

  $(T_i,oid_i,r_i)=(t,i,0)$

  $\delta_i=0$

- When there is the no outgoing links then there occurs the link reversal fig(2) and the message updating is carried out and with the levels of nodes.(T_j,oid_j,r_j) are not equal for all j €N_i .
- When node has a range of $r_j=0$ and the reference updates levels (T_i,oid_j,r_i) for all j€N_i. fig(3).
- When reversal node is updated and created a network then it selects a new leader and the information is updated.
- In Fig(1) represents the node detection and the election of leader among the nodes A,B,C,D,E,F.
- The link between the node B and D is checked for their height and changes the link between them and again the leader is elected between the nodes. Fig (2)

- Nodes elect itself a leader and update a message with the other nodes. Fig (3).
- If the node gets no link then there will be the change in link and route of packet transmission. Fig(4) represents the change in leader if there is link breakage and new link formation. And the messages gets updated then and there.

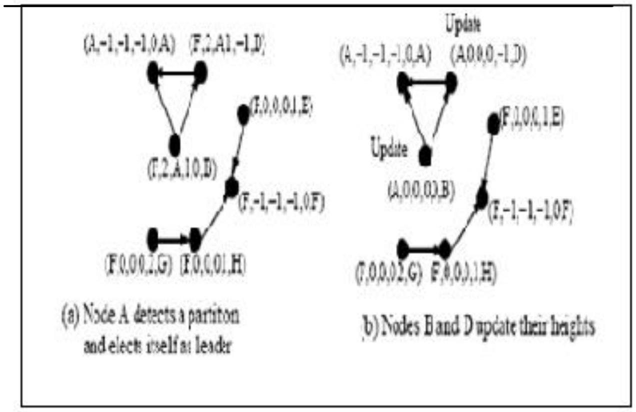

Fig1: Node detection and leader of election

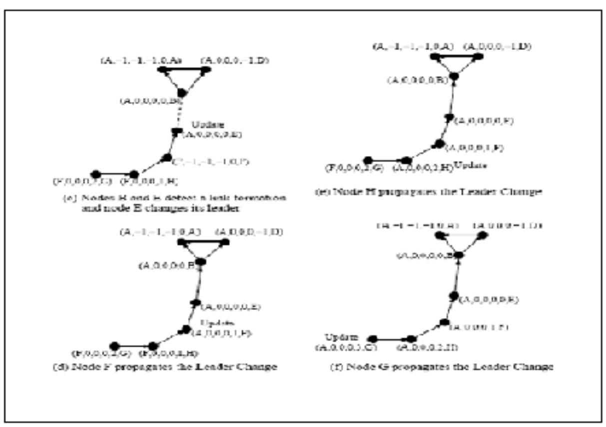

Fig 2: Node B and D check for their height

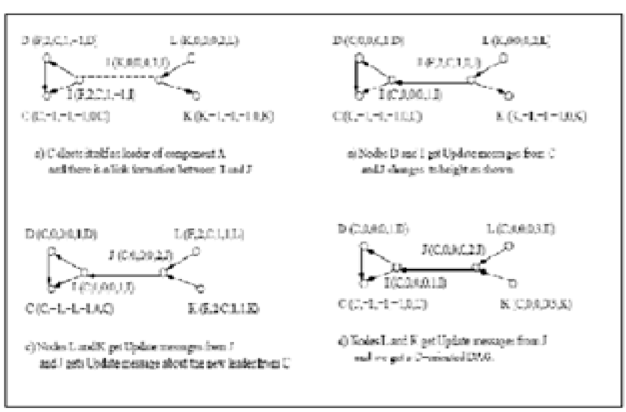

Fig 3: Link formation

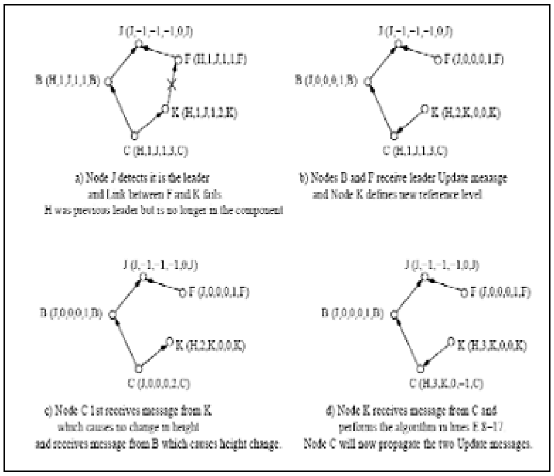

Fig 4: Updated information

IV. SIMULATION RESULTS AND ANALYSIS

- The proposed MBPSO-based task allocation approach is simulated in ns2 environment to evaluate its performance and make comparative analysis
- In random 50 nodes are distributed in a 500*400.
- The nodes are fixed
- The node have same energy and same processing methods
- The power level for every node changes according to the node communicating with base station directly.

SIMULATION PARAMETER	**VALUE**
Number of nodes	50
Packet size	512 bytes
Interfernce queue	Droptail
Simulation area	500x400msq
Packet rate	11bps
Initial energy of node	100J

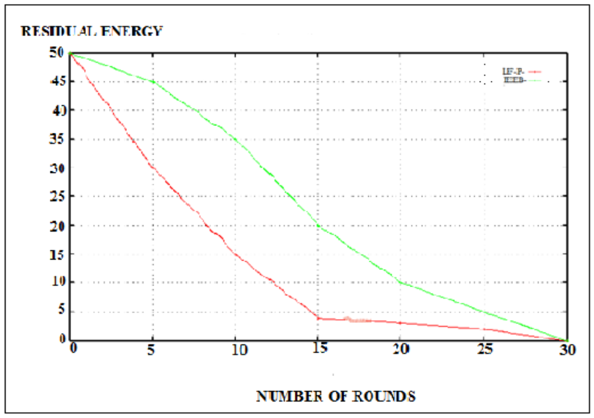

Fig 5: No of rounds vs residual energy

Fig 5, shows that the residual energy as per the number of rounds. In IEEEB, the residual energy is high when compared to LEF-P.If the residual energy is high, morenumber of packets can be transmitted and the efficiency can be achieved by IEEEB.

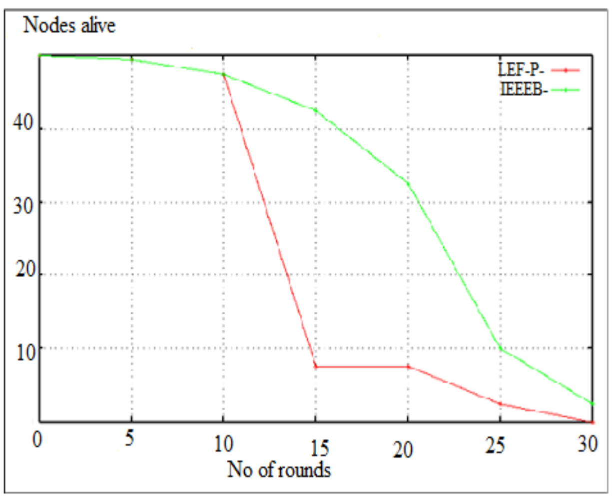

Fig 6: No of rounds vs Nodes alive

Fig 6, shows that number of alive nodes as per the number of rounds.In IEEEB, for every round more number of nodes are alive whereas its not the case in LEF-P. If more number of nodes are alive means, the network lifetime gets enhanced. It shows the clear gain in the network lifetime and stability region of IEEEB. There is a concession between the lifetime and the reliability of the system. We can still have some feedback about the sensor network from the last alive node even though this feedback may not be reliable.

Fig 7, shows that probability to be a leader based on the weighted density of node. If the weighted density of node is high the probability to become leader is also high. Leader plays a main role to achieve energy efficiency and to increase network lifetime. As we consider the node are fixed and for every round the leader is elected and the data is transmitted to the base station.

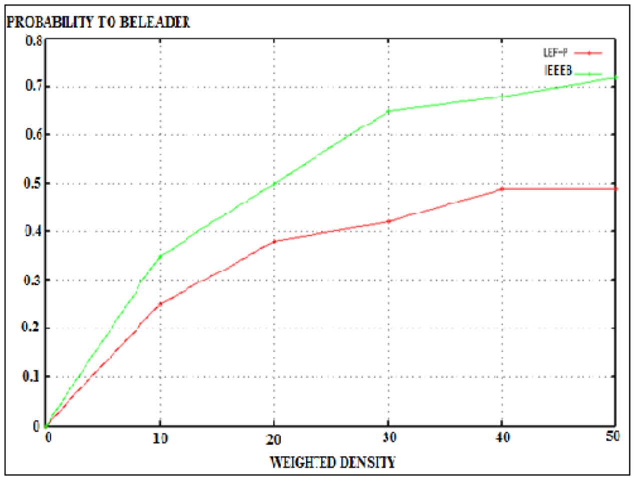

Fig 7: Weighted density of node vs probability to be leader

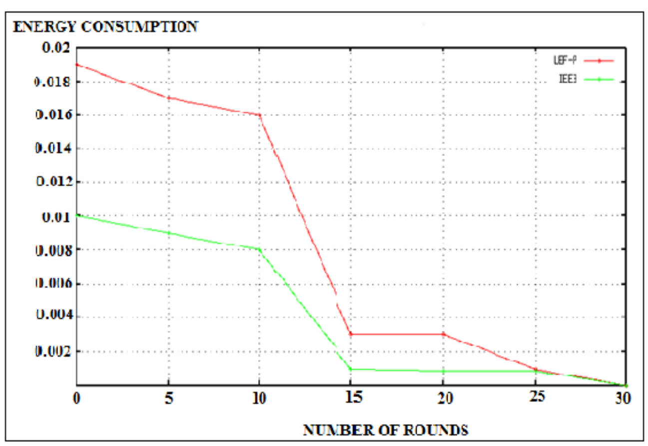

Fig 8: Number of rounds vs energy consumption

Fig8 shows that the energy consumption for each round of IEEEB. LEF-P consumes more amount of energy for number of rounds. IEEEB consumes less amount of energy when compared to LEF-P. The advantage of IEEEB is that it decreases the total energy consumption and each node's energy consumption is balanced, to extend the lifetime of WSN. Therefore the energy efficiency is high for IEEEB than LEF-P.

V. CONCLUSION

One of the disadvantages in wireless sensor network is Energy efficiency due to the minimum energy resource of sensor. Data transmission dominated the energy consumption is increased and thereby the energy efficiency is reduced .BY using the IEEB algorithm the leader is selected ,for every round the leader is elected and the data is collected from nodes and send required information to the base station and the remaining node are keep slept. By using the algorithm the energy efficiency is high and prolongs the network life time. It should satisfy some of the factor such as cost, fault tolerance, topology. By calculating the distance between the particular nodes on the base of signal strength, the leader is elected and energy consumption is estimated.

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