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Improved Location Ware Fault Tolerant Mobile Wireless Sensor Network

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Abstract:-A sensor network is composed of a large number of sensor nodes that are densely deployed inside or very close to the phenomenon. Random deployment and self-organization capability In this paper we review some of location aware Routing protocol and describe the ongoing work to improve these routing protocol and in the later section of the paper we have proposed a solution to improve the existing LARP based solution as well as we have proposed the methodology to the existing solution.

Keywords: *fault tolerant, network lifetime, leach, WSN.*

I. INTRODUCTION

Since wireless sensor networks (WSNs) consist of hundreds and thousands of unattended, resource-constraint and low–energy sensor nodes designing energy efficient routing protocols is significantly important. Clustering-based routing protocols are more useful in the context of energy efficiency where several sensor nodes in the communication range of one another form a cluster. Each cluster has a cluster head (CH)[1], which coordinates all the nodes of a cluster. There may be a number of base stations (BS) also known as sink in a WSN that communicate with other networks. A CH aggregates data that are received from all member nodes of a cluster and sends to the BS. Besides CH, there exist gateway nodes in a cluster which are used for inter-cluster communications [2]. Hence, clustering protocols produce limited useful information from large amount of raw sensed data and transmitting this precise useful information to the BS of the network consume less energy [1, 2]. Most clustering protocols of WSN in the literature are designed for static sensor nodes. Thus, these protocols do not work for WSN applications that require mobile sensor nodes, such as habitat monitoring, wild life monitoring, target tracking and battlefield surveillance.

Moreover, these protocols do not support localization of sensor nodes but only assume that each node know their location, which make these protocols inefficient. For instance, low energy adaptive clustering hierarchy (LEACH) Protocol [3] is a standard static clustering protocol of WSN. LEACH is enhanced as LEACH-Mobile [4], LEACH-Mobile-Enhancement [5], and cluster based routing protocol formobile nodes in wireless sensor network (CBR Mobile-WSN) [1] to support mobility of sensor nodes. In these protocols, which are presented in detail in Section 2, if a non-CH sensor node A does not receive Data Request packets from CH or CH does not receive data from node A after sending the data request packet, the node A is assumed to be moved from its previous location. Then the CH discards the timeslot of node A and allocates this free timeslot to a new mobile member node of this cluster. Node A also tries to find a new CH node of a cluster. However, this same condition may also arise for the failure of CH and non-CH cluster members. Thus, these protocols cannot detect the failure of sensor nodes. Moreover, these protocols work in rounds and initiate a new cluster formation phase at every round, where each round comprises cluster formation, CH selection and data transmission phases. This is also not considered energy efficient since a large number of messages are transmitted to form a cluster. To alleviate this problem we propose a location aware fault tolerant clustering protocol for mobile WSN (LFCP-MWSN). In this protocol, a special packet is sent by a non-CH node A if A has no sensed data to send to the CH at its allocated timeslot and thus, saves energy by not sending data at every timeslot. At the end of around a node with the least mobility is selected as a new CH, which is calculated as the ratio of the number movements of a node inside and outside of its cluster. Moreover, CH does not receive data or special packet from a node A at its allocated timeslot if (i) data or special packet transmission fails (ii) node A moves out of the cluster or (iii) node A dies. In such case, CH waits until the next timeslot for node A to confirm the transmissionfailure. If CH does not receive data or special packet from node A in the next timeslot CH deletes node A from its member list, discards the timeslot of node A and also notifies BS the ID of node A. In each frame, a timeslot is kept free for allowing the moving nodes to notify the CH of a new cluster. Thus, if node A moves into a new cluster it sends a JOIN REQUEST message to the CH of new cluster at the free timeslot. CH of this new cluster accepts the JOIN REQUEST of node a only when a timeslot becomes free because of the moving of another node out this cluster. Then the CH of this cluster sends the ID of node A to BS. Thus, if BS receives ID of the node A from two different CH as a leaving node from a cluster at frame x and a new node into a cluster at frame, then node A is considered to be moved from a cluster. Otherwise, node A is considered as a failed node. In addition to this,

LFCP-MWSN supports sensors localization in the cluster formation phase and every time a node moves to a new location since without location information sensors data are meaningless for most of the applications.

II. LITERATURE SURVEY

In [6], Bajaber and Awan propose dynamic static clustering protocol (DSC) for (WSN) and find the DSC has better performance than LEACH in terms of energy efficiency, network lifetime and communication overhead. DSC protocol has dynamic and static cases. Dynamic case is divided into two phases: setup and steady phase. In the setup phase, the base station (BS) forms clusters and selects CH for each cluster based on the energy levels and positions of the sensor nodes. Then, the BS broadcasts CH ID to all nodes. A sensor node will be a CH if its ID matches with the CH ID. In the steady phase, CH uses TDMA scheme by dividing each frame into x number of timeslots, where x is the total number of non-CH nodes in that cluster. A non-CH node transmits data to the CH only in the allocated timeslots and saves energy by turning its radio off (sleep mode) in all other timeslots. When a round is completed, data transmitted by all non-CH nodes are aggregated and sent by the CHs to the BS. In the next round, the current CH of a cluster selects a node as a new CH, which has the most remaining energy.To provide mobility of sensor nodes, Kim and Chung [4] propose LEACH-Mobile (LEACH-M) routing protocol where cluster formation and CH selection mechanism is same as LEACH. LEACH-M ensures the communication of a node with a CH even if node is in motion by transmitting data request packet from CH to the sensor node in its allocated timeslot using TDMA scheme. For this purpose, a member node A of a cluster with CH B waits two timeslots of two consecutive frames to decide whether A has moved. The node A does not send any data at its allocated timeslot to B until it receives data-request from B and if the node ADoes not receive any Data Request at the beginning of a timeslot (when it is awake) from B then A goes to the sleeping mode and waits for the Data-Request from B until the next frame. If A does not any receive the Data Request in the next frame as well it requests for a JOIN-ACK message to join in a new cluster. Then A joins to a new CH which is in the vicinity of A and from which A receives the advertisement message for the first time by sending a registration message. The CH then sends a TDMA schedule, which contains timeslots that are assigned to all members including new mobile node A. Similarly if a CH does not receive data from A in two consecutive rounds (after sending the Data- Request packet) CH discards A from its membership and removes A from its TDMA slot considering that A has moved.Award et al. propose [1] cluster based routing protocol for mobile nodes in WSN (CBR Mobile-WSN) to reduce energy consumption and thenumber of packets loss of LEACH-M. CBR-M is an adaptive protocol that avoids wastage of timeslots and hence, ensures efficient bandwidth utilization. Each CH keeps some free timeslots to enable other incoming mobile nodes from other clusters to join its cluster. A CH sends data request message to the non-CHNodes and if the CH does not receive data from a member, the packet is considered to be lost and the CH discards the nodes membership, at the end of the frame. Consequently, if a sensor node A does not receive data request message from its CH then A tries to join in a new cluster to avoid loss of packets. If the sensor node A receives Data Request message from CH but A has no data to send, A will not hold any time slot and this timeslot can be assigned to another member node that has data to send. In another scenario, if a sensor node A moves and hence, does not receive data request message from its CH at its allocated timeslot A sends its data to the free CH to avoid the loss of data. Then A sends a registration message to join the cluster of a nearby CH. When a CH finishes receiving data messages from all sensor nodes in a round, the CH checks whether it receives data messages from all members, and then removes the sensor nodes from which the CH did not receive any data. Each sensor node A wakes up one timeslot before its scheduled timeslot to check whether it has really been assigned that timeslot. If A has not been assigned any timeslot it goes back to sleep mode and its timeslot might be used by a mobile sensor node that enters the cluster. This phenomenon reduces energy consumptions. However, CBR-mobile has more average delay as compared to LEACH-M since the moved sensor nodes send data to the free CH whenever that sensor node did not receive any data request from its CH which adds delay to the network whereas in LEACH-mobile assume packets are lost when sensor nodes do not receive any data request from CH.

III. PROPOSED WORK

Clustering in mobile WSN provide vast range of dynamic behavior as well as improvement in the performance in the system parameters, but the existing algorithm does not

Consider the mobility of cluster heads, that's why in the proposed work we will also allow the mobility of a CH out of cluster in the current round.

IV. METHODOLOGY

The methodology adopted to complete this work includes both the combination of qualitative and quantitative approaches.

This work is based on qualitative approach as it improves the performance or quality by comparing different attributes or characteristics. The proposed algorithm works with the following assumptions.

- All sensors are mobile.

- Once a node is selected as a CH, it remains in the same cluster.
- Initially, all sensors have the same energy.

A node in each cluster is equipped with GPS and work only for localization. This node is known as an anchors node. Sensors are heterogeneous in terms of their roles since they work as anchor nodes, cluster heads, and cluster members.

V. RESULT AND DISCUSSION

The simulation of proposed algorithm is done over the MATLAB and operating system is used windows 8 with the system configuration having processor i5 and ram of 4gb, the figure 1-2 depict the performance of our proposed algorithm as the energy

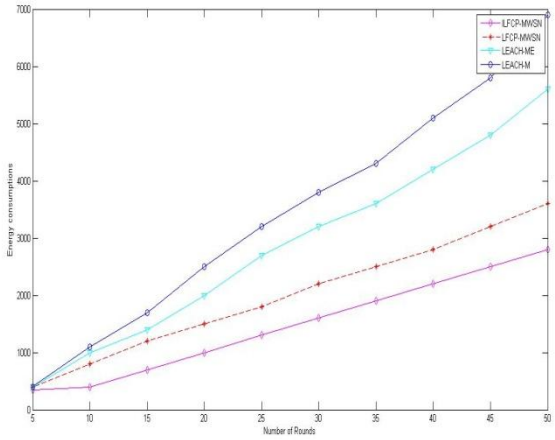

Figure 1 energy consumption with respect to no of rounds

Consumption of our proposed is less than the existing algorithm, shown in figure 1, and consecutly the network lifetime gets increases which has been shown in figure 2

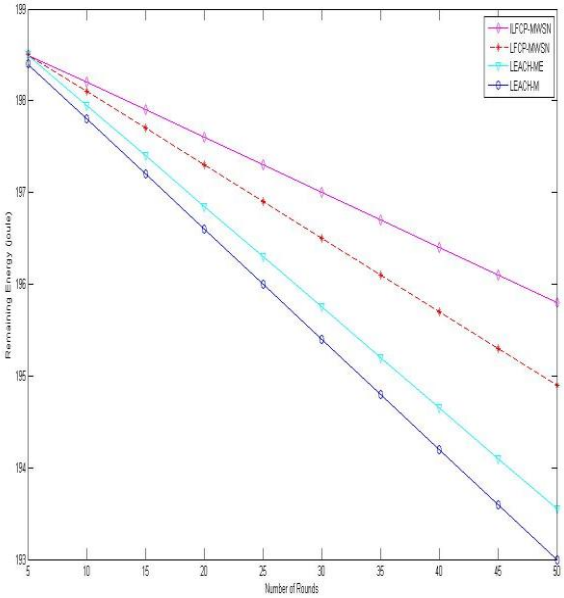

Figure 2 network lifetime with respect to no. of rounds

VI. CONCLUSION AND FUTURE WORK

In this paper we have improved the existing location aware fault tolerant clustering protocol for mobile WSN with giving the mobility to the cluster head, the result discussedin this paper proves the efficiency of our proposed algorithm.

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