IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 3 Issue 6, June 2016
ISSN (Online) 2348 – 7968 | Impact Factor (2015) - 4.332
www.ijiset.com

Dynamic Coverage Establishment with Energy Efficient Data Transmission

Nagma Parveen[1], Rajshekar G[2]

[1]PG Student, Department of Computer Science and Engineering,
[2]Assistant Professor, Department of Computer Science and Engineering,
Guru Nanak Dev Engineering College, Bidar, Karnataka State, India.

***Abstract*— One of the essential destinations of wireless sensor network is to give full scope of a detecting field as far as might be feasible. Numerous errands, for example, object following and combat zone interruption identification require full scope whenever. With the restricted vitality of sensor nodes, sorting out these nodes into a maximal number of subgroups able to do observing every discrete point of interest and after that on the other hand actuating them is a pervasive approach to give better nature of observation. In this paper, advanced maximum connected load-balancing cover tree (MCLCT) algorithm to accomplish full coverage too as base station network of every sensing nodes by progressively framing load-balancing cover trees. Such an undertaking is especially figured as a most extreme cover tree issue, which has been turned out to be nondeterministic polynomial complete. The proposed advanced MCLCT comprises of two segments: 1) coverage-optimizing recursive heuristic for coverage management and 2) a probabilistic load-balancing procedure for determining the routing path. Through advanced MCLCT, energy utilization among nodes turns out to be more uniformly because of the enhanced load-balancing which increases the network life time. The simulation results show that the solution performs better than the existing ones.**

***Keywords*— Wireless sensor networks, coverage/connectivity preservation, scheduling, lifetime maximization.**

I. Introduction

Wireless Sensor Networks (WSNs) are shaped by associated wireless sensor nodes that each is reduced furthermore, has the capacity of detecting, preparing, and storing environmental data and corresponding with different nodes. High adaptation to non-critical failure, solid versatility, and thorough detecting scope are the fundamental benefits. These benefits permit wireless sensor systems utilized in many applications e.g. home appliances, surveillance, monitoring etc. As of late, WSNs have likewise turned into a critical territory of examination. With an associated WSN, the data about events detected by every sensor node will be transmitted to the destination BS in a vitality proficient multi-hop way. With a specific end goal to ensure the nature of administration called Quality of Service (QoS) provided by WSNs, accomplishing the particular scope prerequisite and keeping up availability are important. Here, we address the scope issue in conjunction with the network issue. Coverage issues are identified with how well each discrete points of interest (DPOI) in a detecting field is sensed. The coverage preservation issue is one of the significant issues in WSNs that can be concentrated on from various angles. In studies [1]-[5], node situation techniques in light of specific principles were used to decide the ideal arrangement positions. They were completed to meet a particular coverage prerequisite before sensor nodes are put in a detecting field. By considering many specifications, the results produced by these situation systems are hard to be connected to the pragmatic detecting field because of the unavailability of in-situ geographic data. Not quite the same as these concentrates, a few studies [6]-[8] displayed node planning approaches for the situations of random deployment.

Thus, network lifetime can be delayed as much as possible. Few among the studies about scheduling, with a specific end goal to make a compelling usage on sensor nodes, sensor nodes are sorted out into a maximal number of cover sets which can be disjoint ones or non-disjoint ones. It is important to equitably impose the burden of traffic on the relay nodes to ensure the connectivity of WSNs, i.e., load balancing must be accomplished [9]. Such an issue with either the disjoint arrangement or the non-disjoint development is demonstrated to fit in with the Non deterministic Polynomial (NP) - Complete issue. More energy is consumed during the transmission of date hence it is important to form Far-Zone using LEACH protocol [10] .The nodes in every cover set can helpfully screen all DPOIs. Through the substitute enactment for these cover sets, the particular coverage necessity and the longer lifetime could be accomplished. In any case, the network prerequisite that is identified with information transmission in a multi-hop WSN is not being considered in recent studies.

II. Related Work

In remote sensor systems, transfer hub situation has been proposed to enhance vitality productivity.[1] In this paper, the study on two-layered obliged relay nodes arrangement issues is considered, where the transfer nodes can be set just at some prespecified applicant areas. To meet the availability prerequisite, one will need to ponder the associated single-spread issue where every sensor hub is secured by a base station or a relay nodes (to which the sensor hub can transmit information), and the hand-off nodes shape an associated system with the base stations. As of late have seen a urge for creating genuine applications in connection with WSNs.

[2] In some of these applications, for example lookup and alleviation furthermore war zone surveillance, a couple cell nodes will be actualized to in show review a range of interest

and/or conduct particular observing employments. Like endeavour one of the locator's requests between node discourses in this manner supporting system on the web connectivity is vital to the power of WSNs. Sensing coverage is a key usefulness of Wireless Sensor Networks (WSNs).

[3] In any case, it is likewise surely understood that scope alone in WSNs is not adequate, and subsequently organize availability ought to additionally be considered for the right operation of WSNs. In this paper, the issue of k-scope in WSNs such that in every planning round is tended to, each area in an observed field (or basically field) is secured by at any rate k dynamic sensors while every single dynamic sensor are being associated.

An adaptive ant colony algorithm is proposed to beat the untimely union issue in the existing ant colony optimization. The adaptive ant colony is made out of three groups of ants: customary ants, irregular ants and arbitrary ants. Every normal ant seeks the way with the high focus pheromone at the high likelihood, each anomalous ant looks the way with the high fixation pheromone at the low likelihood, and every arbitrary ant arbitrarily looks the way paying little attention to the pheromone fixation. Three gatherings of ants give a decent starting condition of pheromone trails together.

[4] As the advancement estimation goes on, the quantity of the irregular ants and the arbitrary ants diminishes progressively. In the late improvement organize, all of ants change to the normal ants, which can quickly think to the ideal ways. Reproduction results demonstrate that the calculation has a decent improvement execution, and can resolve travelling salesperson issue successfully. In sensor-target observation systems, sensors are ordinarily controlled by batteries with constrained energy and subsequently it is imperative to deal with the energy utilization.

[5] In this paper, a few techniques have been proposed to amplify the lifetime of these systems. One can observe that some reconnaissance applications have lifetime prerequisites. For these reconnaissance applications, it is attractive to minimize the system cost while satisfying the given lifetime prerequisite. In this paper, another issue in which the system expense is minimized while the subsequent lifetime is at any rate equivalent to a given worth L is tended to. To minimize the system cost, the base number of sensors such that all the given targets can be checked for length of time of in any event L and all the detected information can be sent to a given base station is set. The issue is NP-hard is demonstrated and determined a lower bound on the base number of sensors required. A proficient estimate calculation for this issue is composed.

Hypothetically, this estimate calculation has a guess proportion of most extreme is demonstrated, where m is the quantity of targets and l is the quantity of focuses in a little plate focused at the base station with a consistent range.

Tentatively, PC recreation to exhibit that this guess calculation offers near ideal arrangements is led.

Existing work on setting extra transfer nodes in remote sensor systems to enhance system network regularly accept homogeneous remote sensor nodes with an indistinguishable transmission span is discussed [8]. Conversely, this paper addresses the issue of sending transfer nodes to give adaptation to internal failure higher system availability in heterogeneous remote sensor systems, where sensor nodes have distinctive transmission radii. Contingent upon the level of wanted adaptation to internal failure, such issues can be sorted as: 1) full blame tolerant transfer node situation, which plans to send a base number of hand-off nodes to set up $k(k\geq1)$ vertex disjoint ways between each pair of sensor and/or hand-off nodes and 2) fractional flaw tolerant hand-off node position, which intends to convey a base number of hand-off nodes to build up $k(k\geq1)$ vertex-disjoint ways just between each pair of sensor nodes. Because of the diverse transmission radii of sensor nodes, these issues are further muddled by the presence of two various types of correspondence ways in heterogeneous remote sensor systems, in particular, two-route ways, along which remote interchanges exist in both headings; and restricted ways, along which remote interchanges exist in one and only course.

III. PROPOSED SYSTEM

In this paper, we develop a novel maximum connected load-balancing cover tree (MCLCT) algorithm to achieve full coverage as well as BS-connectivity of each sensing node by dynamically forming load-balanced routing cover trees. The proposed MCLCT is composed of two sub-strategies: a coverage-optimizing recursive (COR) heuristic and a probabilistic load-balancing (PLB) strategy. The COR heuristic aims at finding a maximum number of disjoint sets of nodes, which can be achieved by one of the sensor nodes (such as the sink node). The PLB strategy is used to figure out the appropriate path from each node to the BS after the disjoint sets are initiated. For each possible transmission path from a given node to the candidate parent nodes, the PLB strategy will assign different probabilities in order to more uniformly distribute the load.

IV. IMPLEMENTATION

To implement the proposed approach the following modules are required. They are:

- Route Request (RREQ)
- Route Reply (RREP)
- Cooperative Forwarding
- Performance Evaluation

Route Request (RREQ)

In this project we introduced biased backoff scheme. Using this scheme we have send the RREQ to the destination node. First we have to calculate the backoff delay. Source node

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sends the RREQ to their neighbor nodes and calculates backoff delay using this formula,

$$t_{ij} = HopCount/\sum_{k} P_{ik}\, P_{kj} \,.\, T \qquad \ldots(1)$$

Let t_{ij} denote the backoff delay. Which node has a shorter backoff delay that node select as a guide node. This process will continue to reach the destination node. In case the destination node shall receive the same RREQ multiple times, it will only reply to the first RREQ neglect others.

Route Reply (RREP)

After getting the RREQ, the destination has to send the RREP to the source node. Before sending the RREP the destination has to check if it is selected hop node. If there is yes, it will send the RREP else again search the selected hop. Intermediate nodes also check the nodes as a selected hop node. Suppose that node not a selected node, the will be dropped otherwise forward the RREP to source.

Cooperative Forwarding

The source node broadcasts a data packet, which includes the list of forwarding candidates and their priorities. Those candidates follow the assigned priorities to relay the packet. Each candidate, if received data packet correctly, it will start the back delay. The ACK send the source node, which one of the candidate having shorter timer. If no forwarding candidate successfully received the data packet, the sender will retransmit the data packet if the retransmission mechanism is enabled. During the data transmission if there is any collision occurred, they will choose the helper nodes and send the data through the helper. So, the data will reach the destination within the particular time.

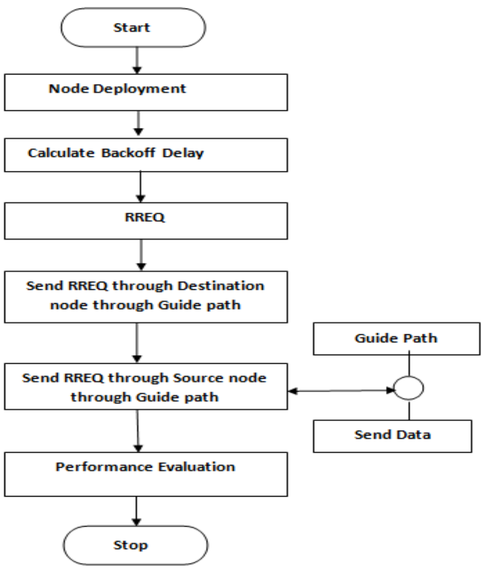

Fig.1 Block diagram of proposed system

Performance Evaluation

In this section, evaluate the performance of simulation. We are using the xgraph for evaluate the simulation. We choose the three evaluation metrics: Packet delivery ratio – the ratio of the total number of packets received by the destination node to the number of packet sent by the source, Packet loss – the total number of packet losses, during the data transmission, End-to-End delay – the time taken to be data transmitted from source node to destination node. We used two parameters that are, time and packets. Along these parameters we have to evaluate the simulation performance in xgraph.

V. Results and Discussion

After implementing the proposed system on NS2 platform, the results obtained are as follows:

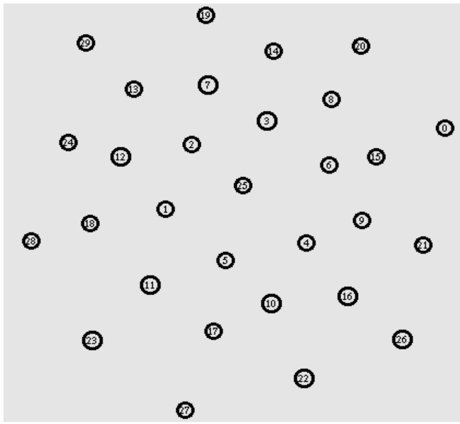

Fig.2 Network Creation

In figure 2 it is showing the network formation stage, which is also defines the topology of the network.

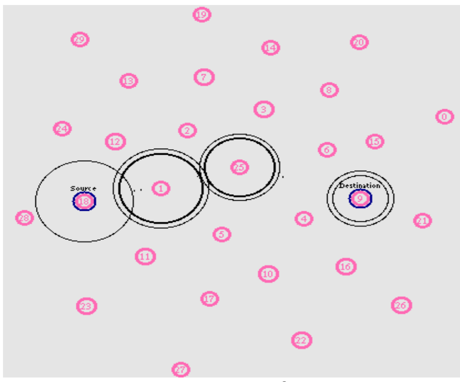

Fig.3 Network Configuration

Here the network is configured i.e. the nodes are identified as source, destination etc.

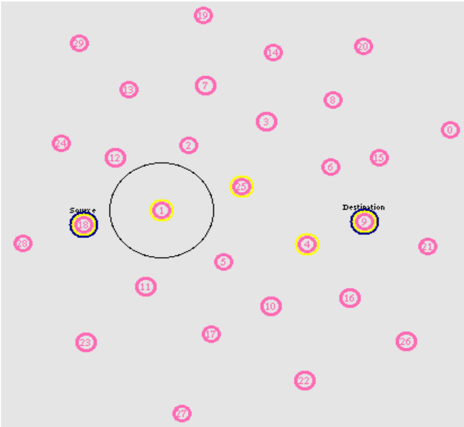

Fig. 4 Data Transmission

Here we can able to see the transmission operation i.e. data is transmitted from source to destination through guide path.

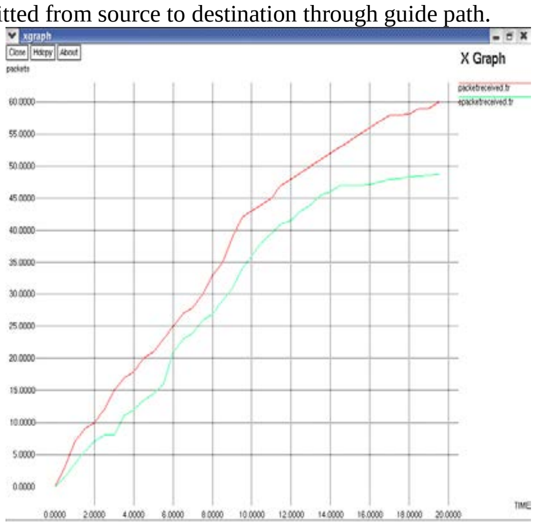

Fig.5 Packet Received Comparison graph

The figure 5shows the comparison graph of Packet received parameter drawn using Xgraph. Here proposed is better i.e. the amount of packet received is more for proposed system as compared to existing system.

Fig.6 Delay Comparison graph

The figure 6 shows the delay comparison graph drawn using Xgraph. The delay occurs less for proposed system compared to existing system.

VI. Conclusions

In this we have presented an efficient algorithm to deal with the MCT problem. The goal of the MCT problem is to sustain full sensing coverage and connectivity of WSNs for a long time. In the proposed MCLCT, two algorithms are employed, and they are a COR heuristic and a PLB strategy. The COR heuristic is able to rapidly find a maximum number of cover sets according to the global information of WSNs. Each cover set comprises a small number of sensing nodes. Afterwards, the PLB strategy dynamically determines the best parent node to relay sensed data using local information among neighbor nodes while achieving even energy consumption of nodes.

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