Reduce Data Transmission Distance Of Wireless Sensor Network With Mobile Sink

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Abstract—Wireless Sensor Networks with portable sink are relied upon to expand the adaptability for gathering data in vast scale detecting and recognizing conditions. Energy saving becomes one of the most crucial features of the sensor nodes to extend their lifetime in such networks. A novel tree-based power sparing plan is proposed in this paper to lessen the vitality utilization in Wireless Sensor Networks with portable sink. We give a dynamic arranging calculation to make a tree-bunch directing structure for the sensor hubs. The imperative objective of this plan is to diminish the information transmission separations of the sensor hubs by utilizing the tree structure and multi-jump ideas. In light of the area of versatile sink, the separations between the sensor hubs, and the lingering vitality of every sensor hub, the proposed conspire settles on a proficient choice for making the directing structure. The vitality utilization is lessened and the lifetime is stretched out for the sensor hubs by adjusting the system stack. Reproduction comes about show the unrivaled execution of our proposed plan and its capacity to build the fitting execution in the vitality utilization, arrange lifetime, throughput, and transmission overhead. Moreover think reasonable postpone time and several of retransmitted messages can be accomplished for the Wireless Sensor Networks with portable sink.

Index Terms— Distance, Energy consumption, Lifetime, Mobile sink, Wireless sensor networks

I. INTRODUCTION

Remote sensor systems (WSNs) have been broadly considered as supplementary innovation in the remote system and versatile frameworks. Intense, cheap, and low-control remote small scale sensors are outlined and utilized as a part of the diverse observing situations [1]-[5]. A WSN contain of countless hubs. Every sensor hub has detecting, figuring, and remote correspondence capacity. The majority of the sensor hubs assume the part of an occasion identifier and an information switch. The sensor hubs are conveyed in the detecting region to screen particular targets and assemble information. At that point, the sensor hubs send the information to a sink or a base station (BS) by utilizing the remote transmission procedures. Amid the current years, numerous vitality productive steering conventions have been proposed for WSNs. Vitality proficient directing conventions can be arranged into four primary plans: Network structure, correspondence show, topology based, and solid steering. A diagnostic review on vitality effective steering conventions for WSNs is given in [6].

A vitality productive steering convention assumes an imperative part in information transmission and reasonable applications. To be productive for WSNs, the most urgent element of a steering convention is the vitality utilization and the augmentation of the system's lifetime. The sensor hubs require more transmission energy to send information when a sink or a BS is settled and situated a long way from the sensor hubs. WSNs with portable sink are required to strike the adaptability for social occasion data in expansive scale detecting and recognizing conditions. Since a sink can arbitrarily move inside the detecting territory to assemble the detecting information, the information transmission separations of the sensor hubs could be decreased. The sink versatility offers the accommodation of information assembling and diminishes the vitality utilization for the sensor hubs. WSNs have been complete in different applications including medicinal services frameworks, combat zone reconnaissance frameworks, condition checking frameworks, different submerged applications, et cetera. Vitality sparing is a standout amongst the most urgent highlights for the sensor hubs to expand their lifetime.

In WSNs, the fundamental power supply of a sensor hub is battery and a sensor hub devours the greater part of its vitality in transmitting and accepting parcels. Notwithstanding, in the most application situations, clients are normally hard to achieve the area of sensor hubs. Because of an extensive number of sensor hubs, the re-arrangement of batteries may be incomprehensible. Also, the battery vitality is number of in a sensor hub and a sensor hub that has its battery depleted could make the detecting territory revealed. The vitality protection turns into an issue worry in WSNs. With a specific end goal to diminish the vitality utilization and broaden the system lifetime, new and proficient vitality sparing plans must be produced. Thus, the execution parameters of enthusiasm for this paper are vitality utilization and system lifetime.

II. RELATED WORKS

Numerous steering conventions have been proposed for UWSNs in light of the unexampled characteristics of UWSNs. In this article we demonstrate a point by point overview of submerged steering conventions. Each directing convention is precisely examined, and its points of interest, inconveniences, and execution issues are featured. What's more, we think about the conventions as far as vitality productivity, way idleness, multi-way ability, unwavering quality, dynamic vigor, gap bypassing, so on. [1]

We propose Ring Routing, a novel various leveled directing convention for remote sensor systems with a versatile sink. The convention forces three parts on sensor hubs: ring hub, standard hub, and grapple hub. Ring hubs shape a ring structure which is a shut circle of single-hub width. [2]. The activity of the proposed convention is separated into rounds, where each round starts with a set-up stage, when the sink discovers its area and areas of CHs, trailed by a consistent state stage, when the detected information exchanged to CHs and gathered in outlines; at that point these edges exchanged to the sink. [3]

This paper considers the uncontrolled sink versatility conditions and in the accompanying lines, we quickly portray the related works in this setting including their approach and the relative qualities and shortcomings. [4] Our proposed arrangements beat the Static Priority approach and the Least Slack Time First strategy by substantial edges. These outcomes propose that our approaches still offer great execution notwithstanding when channel reliabilities are poor. [5]

In this paper, we propose a sink migrating plan to direct the sink when and where to move to. Some scientific execution investigations are given to exhibit that the proposed sink moving plan can draw out the system lifetime of a WSN [6]. In this paper, we call this issue the postponement mindful vitality proficient way (DEETP). We demonstrate that the DEETP is a NP difficult issue and propose a heuristic technique, which is called weighted meet arranging (WRP), to decide the voyage through a versatile sink hub. [7]

III. PROPOSED ARCHITECTURE

An efficient tree-based power saving scheme is proposed to reduce the data transmission distances of the sensor nodes so that a significant improvement on the energy saving and network lifetime can be achieved in wireless sensor networks with mobile sink. In the proposed scheme, a tree-cluster routing structure for the sensor nodes is created by adopting the dynamic sorting algorithm and employing the multi-hop concepts. Based on the location of mobile sink, the distances between the sensor nodes, and the residual energy of each sensor node, the proposed scheme makes an efficient decision for creating the routing structure. The energy consumption is reduced and the lifetime is extended for the sensor nodes by balancing the network load. And also we are doing in this share sink node contribution for the efficient energy preserving.

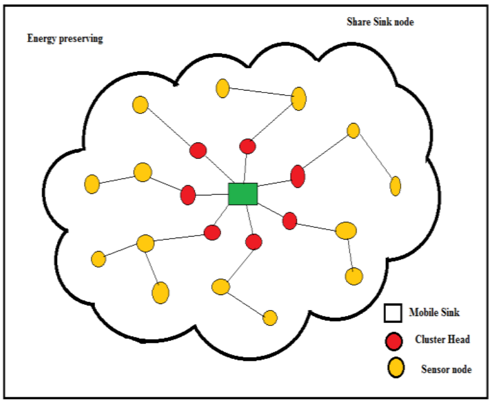

Figure 1 Proposed System Architecture

Suitable routing structure for the sensor nodes is an important feature in the issues of energy consumption. Our proposed framework is to shorten the data transmission distances of the sensor nodes. This is a key factor to reduce the energy consumption in WSNs with mobile sink.

IV. DYNAMIC SORTING ALGORITHM

Table 1 Parameter Used In Proposed Algorithm

Symbol	Definition
N	Number of sensor nodes
M	The side of the given square field
$min\_distance$	The temporary variable for recording the minimal distance between two nodes
i	The identification of the sensor node i
$total\_energy$	Total residual energy for all of the sensor nodes
avg_energy	The average residual energy for all of the sensor nodes
$d(\alpha, \beta)$	The distance between node α and node β
MS	Mobile sink
hop_node	The temporary variable for recording the hop sensor node
hop_node_state	The Boolean variable for determining that a sensor node connects to the hop sensor node or the mobile sink
$energy[i]$	The residual energy of sensor node i
$sorted\_order[].node$	The array for recording the sensor node with the sorted order

- **Pseudo code of dynamic sorting algorithm**

1. **Input**: *N, M, locations of sensor nodes, and energy of sensor nodes*.
2. **Output**: *A tree-cluster routing structure*
3. **Initialization**: *total_energy = 0, min_ distance =* $\sqrt{2}M$*, temporary result = null, and hop_node_state = false*
4. **For** (*i = 1*; i <= *N*; *i++*)
5. Calculate *d*(*i, MS*) //Calculate the distances between the *MS* and the sensor node *i*
6. *total_energy = total_energy + energy*[*i*]
7. **End For**
8. *avg_energy = total_energy /N*
9. *sorted_order*[].*node* is sorted according to *d*(*i, MS*) in ascending order
10. **For** (*α = 1*; *α <= N*; *α*++)
11. Calculate *d*(*sorted_order*[*α*].*node, MS*)
12. **For** (*β = 1*; *β <= α-1*; *β*++)
13. Calculate *d*(*sorted_order*[*α*].*node, sorted_order*[*β*].*node*)
14. Calculate *d*(*sorted_order*[*β*].*node, MS*)
15. **If** (*d*(*sorted_order*[*α*].*node, MS*) < *d*(*sorted_order*[*α*].*node, sorted_order*[*β*].*node*) and *hop_node_state == false*)
16. *hop_node_state = false*
17. **Else**
18. **If** (*min_ distance > d*(*sorted_order*[*α*].*node, sorted_order*[*β*].*node*))
19. *hop_node = sorted_order*[*β*].*node*
20. *hop_node_state = true*
21. *min_ distance = d*(*sorted_order*[*α*].*node, sorted_order*[*β*].*node*)
22. **End If**
23. **End If**
24. **End For**
25. **If** (*hop_node_state == true*)
26. *sorted_order*[*α*].*node* connects to the *hop_node* and this case is stored in *temporary result*
27. **Else**
28. *sorted_order*[*α*].*node* connects to the *MS* and becomes a CH when its residual energy is higher than *avg_energy*, and this case is stored in *temporary result*
29. **End If**
30. *min_ distance =* $\sqrt{2}M$
31. *hop_node_state = false*
32. **End For**
33. *The temporary result is the final tree-cluster routing structure*

V. RESULT

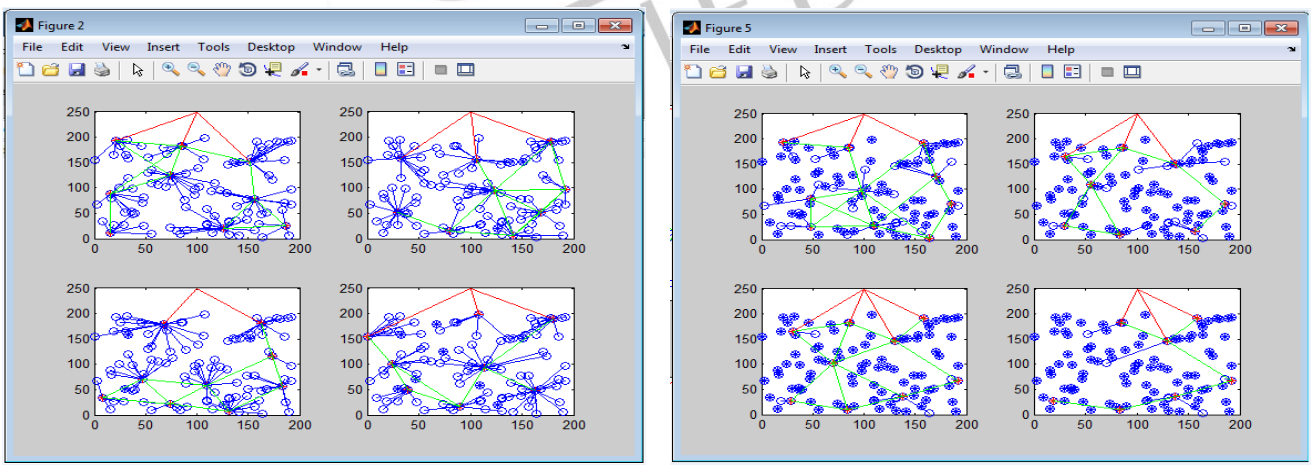

Figure 2 Simulation Network

VI. SYSTEM ANALYSIS

In this section, we explore the temporal and spatial evolution of energy hole based on our analytical result. The traffic load and energy consumption of the sensor nodes and the network lifetime can be determined, where the end condition is that the sink can’t receive any data in a data period, which consists of two cases. One is all nodes die due to energy exhaustion. The other is some nodes still have remaining energy, but the sink is isolated from the outer nodes after the formation of the energy hole. Accordingly, even if the network still has remaining energy, the network becomes useless and is also considered as disabled. We can easily judge the algorithm is terminated in which case by checking if there are sensor nodes with remaining energy in the network. If it is the second case, the formation of energy hole should be analyzed temporally and spatially. According to our analytic model, at least one sensor node will die after each network stage. Since the location of the dead nodes can be determined by algorithm 1, we can check if the dead sensor nodes form a continuous dead ring with the width d and d ≥ rafter every network stage. The network might be partitioned by the continuous dead ring, which is precisely the energy hole of the network. Demonstrate show to decide the emerging time and boundary of the energy hole.

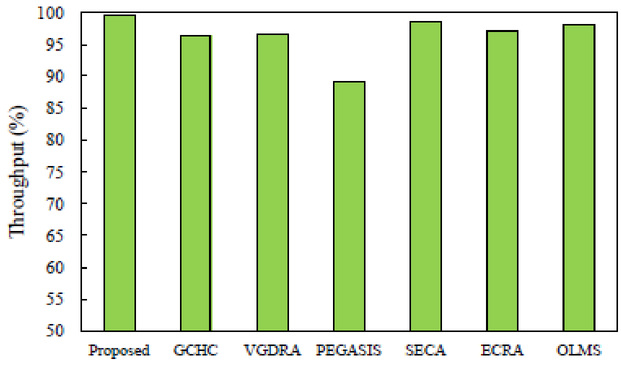

Figure 3 Throughput

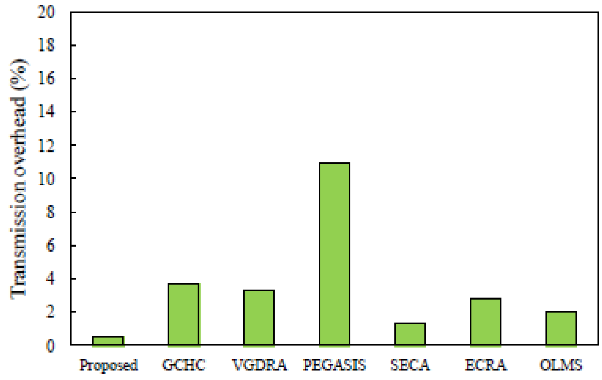

Figure 4 Transmission Overhead

VII. CONCLUSION

By keeping the embedded devices in the environment for monitoring enables self-protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through the network.

The results obtained from the measurement have shown that the system performance is quite reliable and accurate. The important parameters of the environment such as temperature, humidity, CO and CO_2 are checked by the respective sensors. The measured parameters are transmitted to the thingspeak cloud through the ESP8266 Wi-Fi Module. Finally we can see the graph of environment parameter on mobile phone as well as laptop through browser.

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