IJCSE International Journal of Computer Sciences and Engineering Open Access
Survey Paper Volume-4, Issue-03 E-ISSN: 2347-2693

Survey on Network Lifetime Enhancement Method

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www.ijcseonline.org

Received: Feb/22/2016 Revised: Mar/07/2016 Accepted: Mar/20/2016 Published: Mar/31/ 2016

Abstract—A vital challenge in the design of Wireless Sensor Network is to improve the network lifetime. Wireless Sensor nodes convey limited essential power source. In single static sink node based wireless sensor network, a sensor node spends the most of its energy for relaying data packets particularly which are situated in the surrounding area of the sink node. They distribute their energy so fast because of numerous to one traffic pattern and finally they die. This uneven depletion phenomenon is known as hot spot issue which gets to be more genuine as the number of sensor nodes increase. Replacing these energy sources in the field is normally not feasible. So if the distance between a sensor node and sink node is reduced which leads to decrease in energy utilization. This paper provides asurvey on various methods which are developed to increase the lifetime of a network. The sensor nodes close to the sink will generally consume more battery power than others; thus, these nodes will rapidly drain out their battery energy and shorten the network lifetime of the WSN. Sink relocation is an effective network lifetime augmentation technique, which avoids consuming an excess of battery energy for a particular gathering of sensor nodes. In this paper, propose a moving methodology called energy-aware sink relocation (EASR) for mobile sinks in WSNs. The proposed system utilizes data identified with the residual battery energy of sensor nodes to adaptively conform the transmission range of sensor nodes and the relocating scheme for the sink.

Keywords — Energy consumption, energy efficient routing, network lifetime, Wireless sensor network, mobile sink, sink relocation

I. INTRODUCTION

A network of wireless sensor nodes can be outlined by densely deploying a substantial number of sensor nodes in a given sensing area, from where the sensed data from the different nodes are transferred to a monitoring station called as sink node or base station, which are frequently located far away from the sensing area. Multihop routing or flooding is used to transfer information from a source node to the monitoring station. By having more than one Base station the average number of hops between information source sink pairs will get reduced. This will decrease the energy spent by a given sensor node with the end goal of transferring information from different nodes towards the base station, which, in turn, can conceivably bring about expanded network lifetime as well as in larger amount of information conveyed amid the network lifetime. So the deployment of communication nodes and also the various sink nodes is generally imperative components that influence the lifetime in wireless sensor network.

The WSN has applications in many areas such as climate monitoring, battlefield surveillance, and inventory and manufacturing processes. All in all, because of the sensory environments being unforgiving much of the time, the sensors in a WSN are not ready to be energized or replaced when their batteries channel out of force. The battery depleted out nodes may bring about a few issues, for example, incurring coverage hole and, communication hole issues. Accordingly, a few WSN studies are engaged in designing efficient methods to preserve the battery power of sensor nodes, for instance, outlining duty cycle scheduling for sensor nodes to let some of them occasionally enter the sleep state to moderate energy power, yet, not harming the operating of the sensing job of the WSN; designing energy-efficient routing algorithms to balance the consumption of the battery's utilization vitality of every sensor node; or utilizing some data aggregation methods to aggregate similar sensory data into a single datum to reduce the number of transmitted messages to extend the network lifetime of the WSN. Note that the vast majority of these methodologies can coincide in the working of the WSN.

The other energy saving methodology is to utilize mobile sensors to adjust their locations from a region with a high level of aggregate battery energy of nodes to a low energy region. In spite of the fact that this methodology can extend the network lifetime of a WSN, the relocation of sensor nodes will likewise prolong their battery energy. A trade off methodology is to utilize a mobile sink to relocate its position rather than relocating the sensor nodes.

II. RELATED WORK

Y. Zhou, T. Lei, and T. Zhou [2] author G. S. Sara and D. Sridharan [1], present a survey of routing systems in wireless sensor networks. Authors first summarize the design challenges for routing protocols in WSNs followed by a complete study of distinctive routing methods. Generally, the routing strategies are categorized into three classes based upon the underlying network structure such as flat, hierarchical, and location-based routing. Besides, these protocols can be classified into multipath-based, query based, negotiation-based, QoS-based, and coherent-based depending with respect to the protocol operation. They consider the design tradeoffs between energy and communication overhead savings in every routing paradigm. They likewise highlight the advantages and performance issues of every routing procedure. The paper finally concludeswith conceivable future examination regions.

Somasundara et al. [2] discuss a network framework based on the utilization of controllably mobile components to decrease the communication energy utilization at the energy constrained nodes and, along these lines, increase useful network. Also, their methodology gains advantage in delay-tolerant networks and inadequately deployed networks. They first show how their methodology aides reduced energy utilization at battery constrained nodes. Secondly, they describe their framework model which uses their own way to deal with enhancing the performance. As a major aspect of the prototyping effort, they encountered several interesting design choices and trade-offs that affect framework abilities and execution. They describe many of these design challenges and discuss the algorithms developed for addressing these. Especially paper concentrates on network protocols and motion control procedures. Their strategies are utilizing a practical framework and don't expect idealistic radio range models or operation in unobstructed environments.

Sensor network deployment is extremely challenging due to aggressive and unpredictable nature of environments. Mousavi et al., [3] proposed two routines for the self-deployment of mobile sensors. First they proposed a randomized solution that gives both simplicity and applicability to various environments. Provoked by simulated annealing, it increases both speed and energy preservation of the deployment process. The other strategy is recommended for environments where sensors frame a connected graph, at first. At the cost of this additional limitation, they gain significant enhancements.

Akyildiz et al. [4] illustrate the idea of sensor networks that has been created viable by the convergence of micro-electro-mechanical systems technology, wireless communications and digital physics. First, the sensing tasks and also the potential sensor networks applications are explored, and a review of things influencing the look of sensor networks is provided. Then, the communication design is made public for sensor networks, and also they explored algorithms and protocols developed for every layer within the literature. Open analysis problems for the belief of sensor networks are also mentioned.

The self-organizing nature of sensor networks, their autonomous operation and potential architectural alternatives create them appropriate for a variety of data-centric applications. Their wider acceptance seems to be rising on the horizon. During this article N. Jain and D. P. Agrawal [5], tend to present an outline of this state of the art within the field of wireless sensor networks. They tend to conjointly present varied open analysis problems and supply an insight regarding the most recent developments that require to be explored in bigger depth that would possibly create this rising technological area additional helpful than ever.

D. Tian and N. D. Georganas [6], have a tendency to proposed a node-scheduling scheme, which may reduce system overall energy consumption, thus increasing system lifetime, by distinguishing redundant nodes with respect of sensing coverage so distribution them an off-duty operation mode that has lower energy consumption than the traditional on-duty one. Main objective of proposed scheme is to completely protect original sensing coverage in theory. Much, sensing coverage degradation caused by location error, packet loss and node failure is incredibly restricted, less than a hundred and twenty fifth as shown by their experimental results. Additionally, the experimental results illustrate that certain redundancy continues to be secured once node-scheduling, that they have a tendency to believe will give enough sensing dependableness in several applications. They have a tendency to implement the planned scheme in NS-2 as AN extension of the LEACH protocol and compare its energy consumption with the initial LEACH. Simulation results show perceptibly longer system lifetime once introducing their scheme than before.

Hong et al. [7], proposed a efficient routing plan for Mars sensor networks exploiting the similarity of operations between the wireless, multi-hop communications network connecting instruments (sensors) and rover(s) and the packet radio network utilized as a typical ad hoc networking environment. A basic issue in routing methodology that sets the Mars sensor network apart from conventional ad hoc networks is energy preservation and prolonging network lifetime while maintaining connectivity and fulfilling latency constraints. To address this problem, author proposed a multi-path routing plan that assembles a lattice structure for data reply which reduces the congestion and improves the energy efficiency and the reliability in data delivery. Every data packet is conveyed to the base station utilizing one of the multiple paths as indicated by dynamic changing metrics. The balance among different ways that considers the energy use at neighbors is further considered in way determination, which prompts efficient usage of the relay nodes and early death of heavily involved nodes.

S. C. Huang and R. H. Jan [8], introduce an Energy-Aware, Cluster-Based Routing Algorithm (ECRA) for wireless sensor networks to expand the network's lifetime. The ECRA chooses fewnodes as cluster-heads to build Voronoi outlines furthermore, rotates the cluster-head for balancing the load in each cluster. A two-tier architecture (ECRA-2T) is likewise proposed to upgrade the execution of the ECRA. The reproductions exhibit that both the ECRA-2T and ECRA algorithms do better than other routing plans for example, direct communication, static clustering, and LEACH. This solid execution comes from the way that the ECRA and ECRA-2T rotate intra-cluster-heads to balance the load to all nodes in the sensor networks. The ECRA-2T additionally influences the advantages of short transmission distances for most cluster-heads in the lower tier.

R. C. Shah and J. Rabaey [9] proposed a novel mechanism called energy aware routing that is based upon sub-optimal paths to give substantial gains. Simulation results are moreover exhibited that show increment in network lifetimes of up to 40% over practically identical plans like directed diffusion routing.

Sensor deployment is a vital issue in planning sensor networks. Wang et al. [10], they summarize and assess disseminated self-deployment protocols for mobile sensors. After finding a coverage hole, the proposed protocols compute the target positions of the sensors where they ought to move. They utilize Voronoi graphs to find the coverage holes and outline three movement-assisted sensor deployment protocols, VEC (VECtorbased), VOR (VORonoi-based), and Minimax based on the rule of moving sensors from densely deployed ranges to sparsely deployed ranges. Simulation results demonstrate that their protocols can give high scope inside of a short deploying time and limited movement.

Table 1: SURVEY TABLE

Paper Name	QOS	Efficiency	Security	Routing Consideration
Controllably mobile infrastructure for low energy embedded networks [2].	No	Yes	No	Yes
Energy conserving movement-assisted deployment of ad hoc sensor networks [3].	No	No	No	No
Current trends in wireless sensor network design [5].	No	Yes	No	Yes
A node scheduling scheme for energy conservation in large wireless sensor networks [6].	No	Yes	No	Yes
Load balanced energy aware communications for Mars sensor networks [7].	No	No	No	Yes
Energy aware routing for low energy ad hoc sensor networks [9].	No	No	No	Yes
Movement-assisted sensor deployment [10].	No	Yes	No	Yes
A Network Lifetime Enhancement Method for Sink Relocation and Its Analysis in Wireless Sensor Networks [11].	No	No	No	No

III. PROPOSED SYSTEM

This paper proposes a novel method called energy-aware sink relocation (EASR), which adopts the energy-aware routing MCP as the underlying routing method for message relaying.

Here first step is that all nodes are deployed and then crate a network. Then select the sink node and source node appropriately and create the all possible paths. After that selection of shortest path from all available possible path and finally send data securely. Check for the energy. Consumption if energy less than threshold then find the alternate path or else relocate sink.

IV. IMPLEMENTATION DETAILS

In the proposed system, four modules are implemented.

i) Node deployment: as graph G (V,E) where v represent nodes and E represents paths between nodes.

ii) Create the all possible paths: after selection of sink and source node, all possible paths created.

iii) Shortest Path: from all available possible paths, shortest path is calculated and data is transferred through that path.

iv) Check energy consumption: check for the energy consumption if energy less than threshold then find the alternate path or else relocate sink.

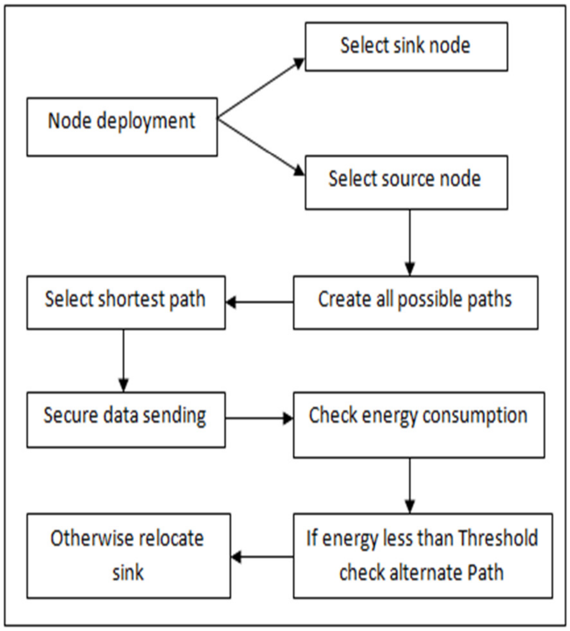

Fig. 1: System Architecture

V. CONCLUSION

This paper provides a survey on different methods which are developed for enhancing the lifetime of a network, together discussing the advantages and limitations of previous methods. The exhausting speeds of battery energy of sensor nodes will altogether influence the network lifetime of a wireless sensor network. Most researchers have designing energy-aware routing schemes to save the battery consumption to extend network lifetimes. A relocatable sink is another methodology for extending network lifetime by avoiding staying at a certain location for too long which may harm the lifetime of nearby sensor nodes. This methodology not just relieves the trouble of the hot-spot issue, but can also integrate the energy-aware routing to enhance the performance of the extending network lifetime. The energy-aware sink relocation technique (EASR), which uses energy-aware routing MCP as the underlying routing method for message relaying increases the lifetime of a network.

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