A Review on Virtual Grid Based Dynamic Routes Adjustment in WSN

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Abstract— In wireless sensor network, using the sink mobility has been considered as a decent procedure to adjust the hubs or nodes energy dissipation. In spite of its various favorable circumstances, the information scattering to the portable sink is a testing assignment for the asset obliged sensor hubs because of the element system topology created by the sink portability. For effective information conveyance, hubs need to reproduce their courses toward the most recent area of the versatile sink, which undermines the vitality protection objective. As examined already a virtual grid based dynamic routes adjustment (VGDRA) scheme that aims to minimize the routes reconstruction cost of the sensor nodes while maintaining nearly optimal routes to the latest location of the mobile sink. We propose a set of communication rules that governs the routes reconstruction process thereby requiring only a limited number of nodes to readjust their data delivery routes toward the mobile sink. Simulation results demonstrate reduced routes reconstruction cost and improved network lifetime of the VGDRA scheme when compared with existing work. In this review, we analyze the some latest techniques for life time improvement in WSN.

Keywords—Routes reconstruction, mobile sink, energy efficiency, wireless sensor network.

Introduction

Wireless Sensor Network (WSN) – a self-organized network of tiny computing and communication devices (nodes) has been widely used in several un-attended and dangerous environments. In a typical deployment of WSN, nodes are battery operated where they cooperatively monitor and report some phenomenon of interest to a central node called sink or base-station for further processing and analysis. Traditional static nodes deployment where nodes exhibit n-to-1 communication in reporting their observed data to a single static sink, gives rise to energy-hole phenomenon in the vicinity of sink. Sink mobility introduced in [1] not only helps to balance the nodes' energy dissipation but can also link isolated network segments in problematic areas [2].
Also, a few application situations normally require sink portability in the sensor field [3] e.g., in a calamity administration framework, a rescuer furnished with a PDA can move around the hazardous situation to search for any survivor. So also, in a combat zone environment, an administrator can acquire real-time data about any interruption of adversaries, size of assault, suspicious exercises and so on through field sensors while on the move. In an Intelligent Transport System (ITS), sensor hubs sent at different purposes of interest - intersections, auto parks, zones helpless to falling rocks, can give early notices to drivers (versatile sink) well in front of their physical methodology. Abusing the sink's versatility draws out the system lifetime along these lines mitigating vitality gap issue; in any case, it brings new difficulties for the information scattering process. Not at all like static sink situations, has the system topology got to be rapid as the sink continues changing its area [4]. To adapt to the dynamic system topology, hubs need to monitor the most recent area of the versatile sink for proficient information conveyance. Some information scattering conventions e.g., Directed Diffusion [5], propose occasional flooding of sink's topological upgrades in the whole sensor field which gives rise to more impacts and subsequently more retransmissions. Taking into thought the rare vitality asset of hubs, successive proliferation of sink's versatility upgrades ought to be kept away from as it extraordinarily undermines the vitality protection objective. In this respect, to empower sensor hubs to keep up crisp courses towards the versatile sink while acquiring insignificant correspondence cost, overlaying based virtual base over the physical system is considered as a proficient methodology [6]. In the virtual framework based information scattering plans, just an arrangement of assigned hubs scattered in the sensor field are mindful to monitor sink's area. Such assigned hubs assemble the watched information from the hubs in their region amid the nonappearance of the sink and after that proactively or responsively report information to the versatile sink.

Virtual Grid Based Dynamic Routes Adjustment (VGDRA)

Virtual Grid based Dynamic Routes Adjustment (VGDRA) is proposed for periodic data collection from WSN. The aims to optimize the trade-off between nodes energy consumption and data delivery performance using a single mobile sink while adhering to the low-cost theme of WSN. The proposed scheme enables sensor nodes to maintain nearly optimal routes to the latest location of a mobile sink with minimal network overhead. It partitions the sensor field into a virtual grid of K equal sized cells and constructs a virtual backbone network comprised of all the cell-headers In addition, VGDRA also sets up communication routes such that the end-to-end delay and energy cost is minimized in the data delivery phase to the mobile sink. The mobile sink moves along the periphery of the sensor field and communicates with the border cell-headers for data collection. The routes readjustment process is governed by a set of rules to dynamically cope with the sink mobility. Using VGDRA, only a subset of the cell-headers needs to take part in re-adjusting their routes to the latest location of the mobile sink there by reducing the communication cost. Simulation results reveal decreased energy consumption and faster convergence of VGDRA compared to other state-of-the art.

Literature Review

Several virtual infrastructure based data dissemination protocols have been proposed for mobile sink based WSN in the last decade. Based on the mobility pattern exhibited by the sink in the sensor field, the data collection or dissemination schemes can be classified into controlled and uncontrolled sink mobility schemes. In controlled sink mobility schemes **[7] [10]**, the mobility (speed and/or direction) of the sink is manipulated and controlled either by an external observer or in accordance with the network dynamics. The uncontrolled sink mobility based schemes are characterized by the fact that the sink makes its next move autonomously in terms of speed and direction. This paper considers the uncontrolled sink mobility environments and in the following lines, we briefly describe the related works in this context including their methodology and the relative strengths and weaknesses.

Virtual Circle Combined Straight Routing (VCCSR) scheme, which is the converge cast tree algorithm, was suggested by Chen et al. **[11]**. It builds a virtual structure which includes virtual circles and straight lines. A set of nodes are selected as cluster heads along with these virtual circles and straight lines, which builds a virtual backbone network. VCCSR scheme decreases the routes reconstruction cost in directing the sink mobility because of its set of communication rules, but, the cluster-head as a center piece in routes re-adjustment process decrease its energy much earlier.

Further scheme called Hexagonal cell-based Data Dissemination (HexDD) was suggested in [1**2]** that builds a hexagonal grid structure for real-time data delivery. The dynamic situations of multiple mobile sinks are considered in this. It results in high energy consumption mainly at higher sink's speeds but it makes early hot-spot problem.

Oh et al. suggested a scheme based on data dissemination known as Backbone-based Virtual Infrastructure (BVI) in **[13]**, which makes use of single-level multi-hop clustering and points to reduce the total number of clusters.

It employs HEED **[14]** for clustering in which main concern is given to residual energy level of nodes for electing the CH nodes. The multi-hop clustering is a fine approach to reduce the number of clusters, on the other hand, the root node which is the focus in routes adjustments generates early energy depletion which reduces the lifetime of network.

Multiple Enhanced Specified-deployed Subsinks (MESS) in **[15],** creates a virtual strip in the centre of sensor field thereby placing enhanced wireless nodes (sub-sinks) having more storage capacity at equal distances. The same approach has been proposed in Line-Based Data Dissemination (LBDD) **[16]** that makes a vertical line by dividing the sensor field into two equal sized blocks.

Along with this, another similar approach was found in **[17]**, which points a virtual rail (RailRoad) in the middle of the sensor field. The main drawback of MESS, LBDD, and RailRoad is the early energy depletion of nodes close to the virtual structure.

Quadtree-based Data Dissemination (QDD) scheme was suggested by Mir and Ko in **[18]**, it also results in early energy depletion of nodes, same as in the above schemes. This method also reduces the overall network lifetime.

A further approach called Virtual grid based Two-Tier Data Dissemination (TTDD) in **[19]** dedicatedly forms a uniform per source node virtual grid structure approaching the complete sensor field. TTDD prevents the flooding of the sink's topological updates but the per source virtual grid construction reduces the network lifetime.

Geographical Cellular-like Architecture (GCA) in **[20]** creates a cellular-like hierarchical hexagonal virtual structure for handling sink mobility. GCA however prevents flooding of location information of sink, however there is increase in latency and packet loss ratio because of non-ideal data delivery paths.

Hierarchical Cluster based Data Dissemination (HCDD) in **[21]** approaches a hierarchical cluster architecture in which the second level cluster-heads of the mobile sink are selected as routing agents which are responsible for maintaining the track on most recent location of mobile sink. In high sink mobility, nodes that are using HCDD experiences high energy consumption. In this approach, the data delivery paths are not optimal which results in high latency.

Virtual Grid based Dynamic Routes Adjustment (virtual grid routing) in **[22],** builds a virtual backbone network and uses straight line communication but in this approach, distance priority communication is used, which will decrease the energy consumption and improves the network lifetime.

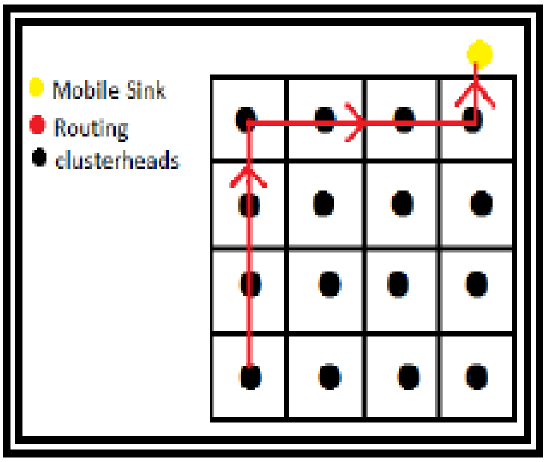

Figure 1: Straight line communication in VGRDA.

Figure 1 show the straight line communication which is used in VGRDA. Figure 2 shows the communication based on distance priority which is used in our distance enhancing grid routing approach.

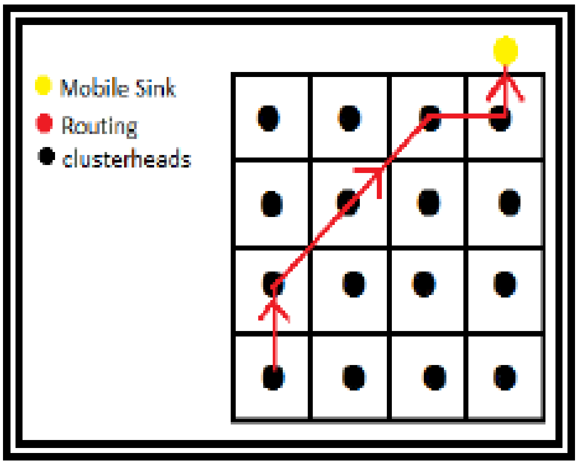

Figure 2: Shortest distance in enhancing grid routing approach.

Conclusion

According to previous approaches the Dynamic Routes Adjustment (VGDRA) plan that acquires slightest correspondence cost while keeping up almost ideal courses to the most recent area of the portable sink. Our VGDRA plan parcels the sensor field into a virtual matrix and develops a virtual spine structure included the cell header hubs. A versatile sink while moving around the sensor field continues changing its area and associates with the nearest marginal cell-header for information accumulation. Utilizing a set of correspondence guidelines, just a set number of the cellheaders participate in the courses recreation prepares along these lines diminishing the general correspondence cost. As far as hubs vitality utilization, the reenactment results uncover made strides execution of our VGDRA plan for various system sizes.

Considering the extent of this paper, we have excluded the genuine information conveyance model. After reviewing to investigate the execution of our VGDRA plan at various sink's speeds and diverse information era rates of the sensor hubs. The VGDRA plot however offers a light weight arrangement and does not force numerous requirements on part of the asset compelled sensor bits, yet its functional execution on genuine equipment should be affirmed. We likewise point to build up a little proving ground for the useful usage of the proposed VGDRA plan on genuine equipment (bits) and assess its outcomes.

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