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VGDRA Protocol for Mobile Sink in WSN

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Abstract – *Recently, a virtual Grid-based dynamic routes adjustment scheme for mobile sink-based wireless sensor networks is introduced. This paper presents the proposed implementation of VGDRA and its comparative analysis, in which we are discussing the approach of efficient data delivery using communication of distance priority i.e. avoiding straight line communication which Optimal routes to mobile sink's latest location.*

Index terms - wireless sensor networks, distance priority, energy model, mobile sink, routes reconstruction.

1.INTRODUCTION

Wireless sensor network (WSN) consists of nodes with computation, sensing and communication capabilities. These nodes can communicate either among each other or directly to an external mobile sink. A larger number of sensor nodes allows for sensing over larger geographical area with greater accuracy. WSN has been widely used in various environments. E.g. in Disaster management system, a rescuer can check for any survivor around the affected area using a PDA device. In an intelligent transport system (ITS), sensor nodes placed at various places like car parks, area admitting to falling rocks, can provide early warnings to drivers (mobile sink) at an earlier time than their physical approach. Also in an area where a battle is fought, a commander can acquire information about trespass of enemies, attacks etc via field sensor on the move. In this approach, dynamic network topology is used as the mobile sink keeps on changing its location therefore for efficient data delivery, nodes need to keep the track of latest location of mobile sink. In virtual structure, only a set of nodes covered in the sensor field participates in making a track of mobile sink's location. This scheme reduces collisions and retransmissions like in other data dissemination protocols e.g. The sensor field is divided into k equal sized cells. Nodes which are close to the cell's centers are chosen as cell headers. These cell headers comprises virtual backbone network. The aim of this virtual structure is to reduce energy consumption by minimizing the routes read, Using This scheme, only a small group of cell headers take part in routes readjustment according to the latest location of mobile sink, which reduces the communication cost.

was used in previous VGDRA scheme. While maintaining nearly our scheme aims to minimize the routes reconstruction cost of sensor nodes. In this approach energy model for reducing energy consumption of nodes is used, which will improves lifetime and also reduce cost consumption, avoiding straight line communication which was used in previous VGDRA schme.

1.1 Related work

Various virtual structure based data dissemination protocols have been introduced in WSN. In this paper, we will discuss some of the previously introduced protocols and compare them with our proposed approach. This paper considers the uncontrolled sink mobility which means that the speed and/or direction of the mobile sink is not controlled. In this type of sink mobility, sink makes its next move freely in terms of direction and speed, whereas in controlled sink mobility scheme, the speed and /or direction of the sink is operated and controlled by an external observer or according to network dynamics. Virtual Circle Combined Straight Routing (VCCSR) scheme was introduced by Chen et al. [1] which is the converge-cast tree algorithm. It forms a virtual structure containing virtual circles and straight lines. A set of nodes are chosen as cluster heads along these virtual circles and straight lines, which forms a virtual backbone network. VCCSR scheme reduces the routes reconstruction cost in managing the sink mobility due to its set of communication rules, but, the cluster-head being the centerpiece in routes re-adjustment process, depletes its energy much earlier. Another scheme called Hexagonal cell-based Data Dissemination (HexDD) was proposed in [2] which makes a hexagonal grid structure for real-time data delivery. In this, the dynamic conditions of multiple mobile sinks are considered.

This scheme results in high energy consumption mainly at higher sink's speeds but it creates early hot-spot problem.

Oh et al. proposed a scheme based on data dissemination

called Backbone-based Virtual Infrastructure (BVI) in [3] that creates use of single-level multi-hop clustering. It points to minimize the total number of clusters. it employs HEED [4] for clustering in which priority is given to residual energy level of nodes for electing the CH nodes. The multi-hop clustering is a good approach to minimize the number of clusters, on the other hand, the root node which is the centerpiece in routes adjustments generates early energy depletion which reduces the network lifetime. Multiple Enhanced Specified-deployed Sub-sinks (MESS) in [5], makes a virtual strip in the centre of sensor field. An identical approach has been proposed in Line-Based Data Dissemination (LBDD) [6] which creates a vertical line by partitioning the sensor field into two same sized blocks. Along with this, another comparable approach was found in [7], which points a virtual rail (RailRoad) in the centre of the sensor field. The main disadvantage of MESS, LBDD, and RailRoad is the early energy depletion of nodes near to the virtual structure.

Quadtree-based Data Dissemination (QDD) scheme was proposed by Mir and Ko in [8], which also results in early energy depletion of nodes as in above schemes. This approach also reduces the overall network lifetime. Another approach called Virtual grid based Two-Tier Data Dissemination (TTDD) in [9] dedicatedly creates a uniform per source node virtual grid structure approaching the entire sensor field. TTDD even though avoids 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 [10] makes a cellular-like hierarchical hexagonal virtual structure to handle sink mobility. GCA however avoids flooding of location information of sink, but 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 chosen as routing agents which are responsible for maintaining the track on latest location of mobile sink. In high sink mobility, nodes which are using HCDD suffer from high energy consumption. In this approach, high latency is there because the data delivery paths are not optimal.

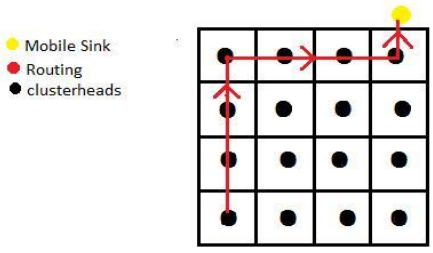

Fig 1. VGDRA approach showing straight line communication.

Virtual Grid based Dynamic Routes Adjustment (VGDRA) in [11], creates a virtual backbone network and uses straight line communication but in our proposed approach, In this approach use of distance priority communication is there which will reduce energy consumption and improves the network lifetime.It is noticed that better data deliveryperformance can be attained at the expense of more energy consumption. The main aim of this paper is to improved data delivery performance which reduces the energy consumption and improves the network lifetime.

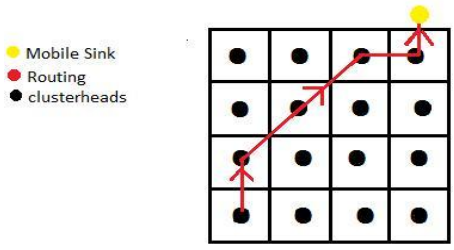

Fig 2. Proposed approach showing the selection of cluster head on the basis of shortest distance between next clusters choosen for communication or the nearest cluster.

1. Conclusion

In this paper, the comparison of various techniques with VGDRA is studied. Now, the main objective of a proposed approach is the selection of cluster head is based on shortest distance between next clusters choose to communication or nearest cluster. We are also considering energy model to reduce energy dissipation. This approach will improve energy consumption and data delivery performance. Lifetime of the network will also be improved.

2. References

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