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A Virtual Grid-Based Dynamic Routes Adjustment (VGDRA) Scheme for Wireless Sensor Networks Based on Sink Mobility

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Abstract - *Basic building blocks of a wireless network are small devices which are communicating over wireless links with the help of a fixed networked infrastructure. The main aim still remains to conserve energy in these devices. One of the methods of achieving this is using the portable and mobile nature of sink. To balance the energy excretion of nodes, this has always been a good technique to follow. But, due to continuous movement of the node, sending data to the node (aka data dissemination) becomes a very difficult task. For completion of this task, other nodes need to make new paths for every new location of the mobile node. Hence, network suffers loss of energy. In this project, we work around the ground problem of conserving the network energy while dynamic routing of information path towards the sink.*

Key Words: Sensor Nodes, Energy Efficiency Wireless Network, Routing Reconstruction, Mobile Sink.

1. INTRODUCTION

Wireless sensor networks are created by small device communicating over wireless links without using a fixed networked infrastructure. More detailed routing algorithms are essential for the applicability of such wireless networks, as energy has to be conserved in low powered devices and wireless communication always leads to increased energy consumption [7]. The method of selecting best paths in a network is called routing. Routing is executed for many types of networks. Routing conducts packet forwarding in packet switching networks i.e. the transfer of logically addressed network packets from their source in the direction of their final destination, through intermediate nodes. 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 [5]. In an intelligent transport system, sensor nodes located at various places like car parking's, area expecting falling of rocks, can give 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 because the mobile sink keep on changing its position thus for efficient data delivery, nodes should keep the track of latest position of mobile sink. In virtual structure, just a set of nodes covered in the sensor field participate in creating a track of mobile sink's location. Collisions are reduced by this method and retransmissions like in other data dissemination protocols e.g. Directed Diffusion are also reduced [4]. The sensor field is divided into k equal sized cells. Nodes that are close to centers of the cells are selected as cell headers. These cell headers comprise a virtual backbone network. The objective of this virtual structure is to lessen energy consumption by minimizing the routes re-adjustment cost. With virtual grid routing scheme, just a small group of cell headers participates in routes readjustment according to the latest location of mobile sink, which reduces the communication cost [3].

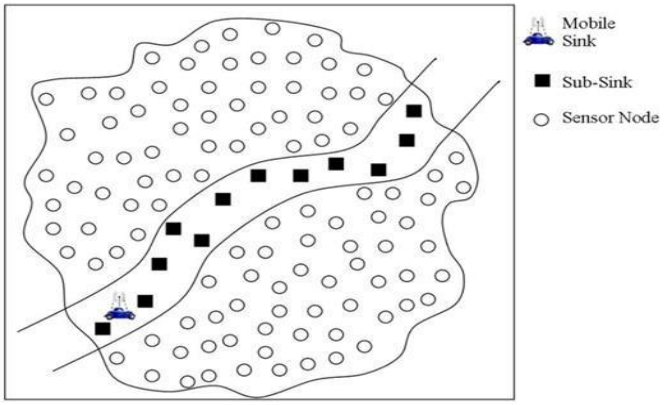

Fig-1: System Architecture of VGDRA

Recently, more and more people are aware that the networked micro-sensor technology will be a promising technology and start to engage in the research of the wireless sensor technology. Wireless sensor networks (WSNs), which are composed of a large number of low-cost, low-power, multifunctional sensor nodes randomly deployed to obtain data from the physical environment in a self-organized manner via wireless communication, brings a significant change for information perception [1]. Up to now, the wireless sensor technology has been applied to different application domains, such as health care, military surveillance and tracking, and environmental monitoring. However, the battery capacity of micro- sensors is limited and batteries are unable to be replaced by humans in an unreachable environment. Hence, energy efficiency is always considered as a key problem full of challenges which hinders the development of the wireless sensor technology [6].

Traditional static node deployment shows n-to 1 communication. This makes that sensor nodes in the vicinity of sink consume more battery power than other regular

nodes and also leads to the hotspot phenomenon more easily. For this purpose, sink mobility is proposed to alleviate the hotspot problem which prevents local nodes from suffering more workload. The hotspots will be changed as the sink moves, which extend the network k lifetime significantly [8].

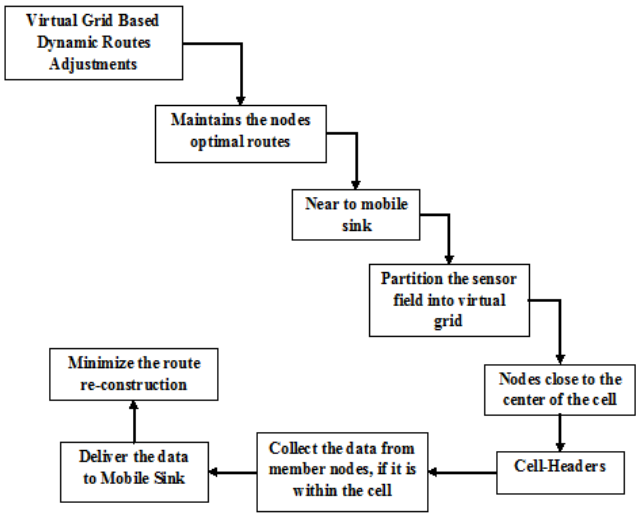

Fig-2: Block Diagram of VGDRA

The common causes of network failure are hardware failures and software bugs, in which that problems manifest both as reach ability failures and through put/latency degradation [4]. To overcome this we are proposing new system.

Wireless sensor networks are created by small devices communicating over wireless links without using a fixed networked infrastructure. More detailed routing algorithms are essential for the applicability of such wireless networks, as energy has to be conserved in low powered devices and wireless communication always leads to increased energy consumption. In current system, the administrator manually decides which ping packet to be sent. Sending programs between every pair of edge ports is neither extensive nor scalable [11]. This system is enough to find minimum set of end-to- end packets that travel each link. However, doing this need away of abstracting across device specific configuration files generating headers and links they reach and finally calculating a minimum set of test packets. It is not designed to identify failures caused from failed links and routers, bugs caused from faulty router hardware or software, and performance problems.

1.1 RELATED WORK

Dr. Mohammed Ali Hussain, Dr. K. Satya Rajesh[2] has providing scalable and efficient routing services in underwater sensor networks (UWSNs) are very challenging due to the unique characteristics of UWSNs. Firstly, UWSN soften employ acoustic channels for communications because radio signals do not work well in water. Compared with radio frequency channels, acoustic channels feature much lower bandwidths and several orders of magnitudes longer propagation delays. Secondly, UWSNs usually have very dynamic topology as sensors move passively with water currents. Gowri K, Dr Chandrasekaran M.K and Kousalya K[7] have says an In WSN, due to continuous message passing, congestion and energy minimization are the primary issues which must be resolved. The base study deals with the efficient path selection for the mobile sink, which collects the data only from the rendezvous points (RP) in the WSN. The nodes which are not RPs will send the data to the nearest RP. Here the mobile sink travels in a specific path, so that nodes which are far from the RPs are unable to deliver the data (packet loss), because of which metrics like throughput, reliability and efficiency gets decreased. In the proposed technique, a novel scheme called HRP (Heuristic based Representative Point selection); a Grid based Dynamic Routes with multiple mobile sinks is proposed for periodic data collection from WSN.

R.Valarmathi and R.Birundha[1] have summarized in wireless sensor networks, exploiting the sink mobility has been considered as a good strategy to balance the nodes energy dissipation. Nodes need to reconstruct their routes toward the latest location of the mobile sink for efficient data delivery. The virtual grid based dynamic routes adjustment (VGDRA) scheme used to minimize the routes reconstruction cost of the sensor nodes while maintaining nearly optimal routes to the latest location of the mobile sink. Here only a limited number of nodes to readjust their data delivery routes toward the mobile sink. Simulation results gives reduced routes reconstruction cost and improved network lifetime.

Dinu Gopal, Dr C D Suriyakala [4] have analyzed Wireless sensor network are highly distributed autonomous sensor nodes to monitor the environment. The self-organizing ability of WSNs permits one to access data from dangerous and hostile environments which otherwise would not be possible. Some potential applications of WSNs include: habitat monitoring, border patrol, battle field surveillance, remote health monitoring, early warning of natural disasters like forest fire, wildlife tracking, smart transportation, industrial process control and etc. Data dissemination in wireless sensor network consumes lot of energy, various protocols or scheme has been proposed over decades to reduce the energy consumption of wireless sensor network. Survey highlights variety of data dissemination schemes, each scheme has its own advantages and disadvantages. Various schemes are helpful to reduce the energy consumption of wireless sensor network by creating the virtual grid. Grid is constructed only when if there is no valid grid is present in sensor filed and if valid grid is present then be use the exiting grid which reduce the energy consumption

2 . LITERATURE SURVEY

Kiran Bala , Satbir Singh, in the Paper Titled **A Proposed Method to Minimize Energy Consumption in Wireless Sensor** In Wireless sensor network (WSN) communication is widely used due to several attractive features such as wireless nature, low cost, small size devices, less power consumption. In WSNs without the need of any wires easily data communicate from one place to other place within seconds like as sending important information through audio, pictures, text messages, mobile phones etc. It plays an important role in our life and many applications. In this paper firstly we discussed about the three major problems occurred in wireless sensor network which increases the use of energy consumption an affects the performance of the network. The paper also proposed an idea to minimize the problem of energy consumption in WSN and enhances its performance in terms of energy as well as life time of the network also. [10]

Dr. Mohammed Ali Hussain, Dr. K. Satya Rajesh in the paper titled **Location Based Routing Protocols for Underwater Sensor Networks** Providing scalable and efficient routing services in underwater sensor net- works UWSNs are very challenging due to the unique characteristics of UWSNs. Firstly, UWSNs often employ acoustic channels for communications because radio signals do not work well in water. Compared with radio frequency channels, acoustic channels feature much lower bandwidths and several orders of magnitudes longer propagation delays. Secondly, UWSNs usually have very dynamic topology as sensors move passively with water currents. Some routing protocols have been proposed to address the challenging problem in UWSNs. However, most of them assume that the full-dimensional location information of all sensor nodes in a network is known in prior through a localization process, which is yet another challenging issue to be solved in UWSNs. This paper surveys recent routing protocols for sensor networks and presents a classification for the various approaches pursued among that location based is the main concept. Moreover, protocols using contemporary methodologies such as network flow and QOS modeling are also discuss Routing in sensor networks is a new area of research, with a limited, but rapidly growing set of research results. In this paper, we presented a comprehensive survey of routing techniques in wireless sensor networks which have been presented in the literature. They have the common objective of trying to extend the lifetime of the sensor network, while not compromising data delivery. For multiple-sink network settings, we only consider some simple cases in which the sinks are randomly, uniformly deployed on the water surface. Given the routing protocol and the node deployment model, we may find better deployment locations for the multiple sinks to achieve better performance. [11]

Vni kaushik in paper titled **Routing Techniques in Wireless Sensor Networks: A Survey** presented that Wireless Sensor Networks (WSNs) consist of small nodes with sensing, computation, and wireless communications capabilities. Many routing, power management, and data dissemination protocols have been specifically designed for WSNs where energy awareness is an essential design issue. The focus, however, has been given to the routing protocols which might differ depending on the application and network architecture. In this paper, we present a survey of the state-of-the-art routing techniques in WSNs. We first outline the design challenges for routing protocols in WSNs followed by a comprehensive survey of different routing techniques. Overall, the routing techniques are classified into three categories based on the underlying network structure: °at, hierarchical, and location-based routing. Furthermore, these protocols can be classified into multipath-based, query-based, negotiation-based, QOS-based, and coherent-based depending on the protocol operation. We study the design trades between energy and communication overhead savings in every routing paradigm. We also highlight the advantages and performance issues of each routing technique. The paper concludes with possible future research area. [12]

Manpreet kour, Bhisham Sharma, Dr. Trilok c. Aseri in this paper titled **"a study of traffic redirection based congestion control protocols for wireless sensor networks"** Congestion in wireless sensor networks can be controlled either by adjusting the data rate (traffic control), or by providing alternative path for the data packets (resource control). In this paper, we present an overview of resource-based congestion control protocols. Firstly, the basic aspects of congestion control in wireless sensor networks are described. Secondly, a detail of existing resource-based congestion control protocols is presented. Thirdly, the comparison of these protocols is shown on the basis of various parameters .Finally, the conclusion of the paper is provided. [13]

3. PROPOSED METHOD

1. Deploy N number of sensor nodes

2. Depending upon the number of nodes, divide the complete area into multiple zones. Number of zones is directly proportional to the number of nodes

3. Select source and sink

4. Mobile sink is used here

5. Use shortest distance to find a perfect route between source and sink

6. All the nodes in a zone will be accessible to the respective zone header. Hence we need to transfer the information to respective zone header first

7. Once zone header has the information, it can transmit it directly to the sink node

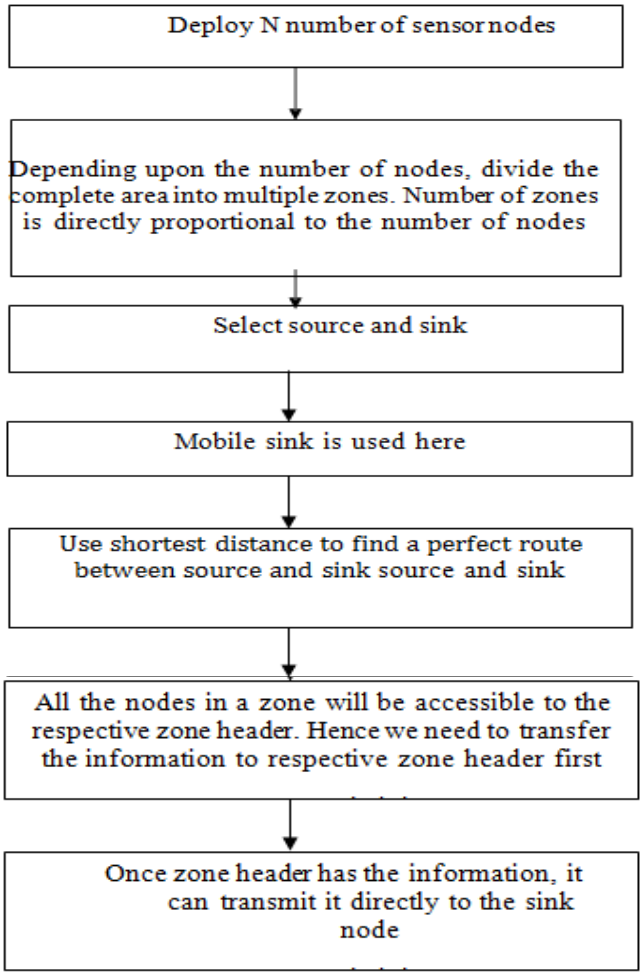

Fig.3.1: Block diagram of Proposed Methodology

4. RESULT ANALYSIS

As per mentioned in the Previous Chapter in Methodology. The implementation has been done and due to get the following results:

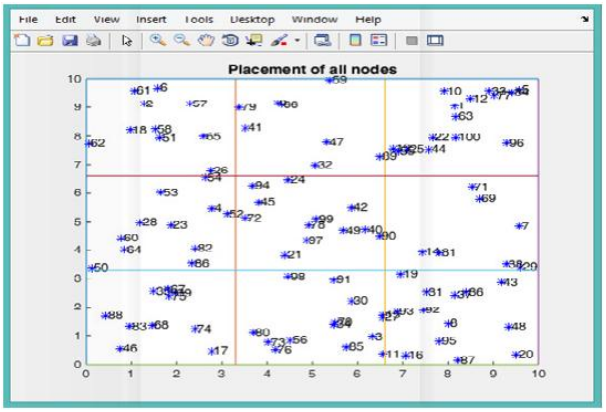

Fig: 5.1 Placements of all Nodes

As per shown in fig: 5.1 we deploy n number of sen- sor nodes

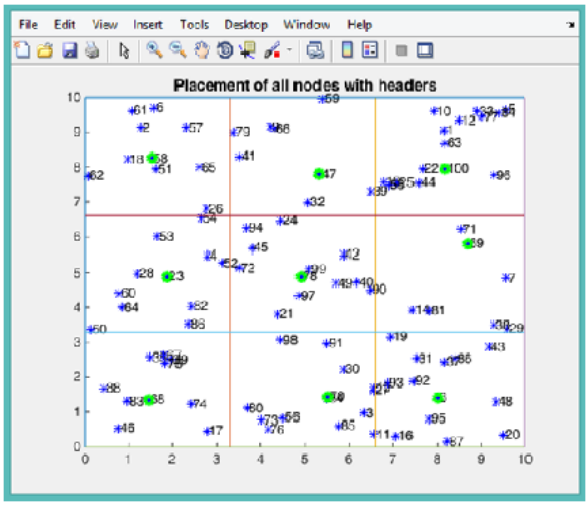

Fig 5.2 Placements of all nodes with Headers

As per shown in fig: 5.2 complete area divided into multiple zones. Numbers of zone are directly proportional to number of nodes that means when we increase the number of node. The number of nodes will increase in each zone

As per represented in the fig: 5.2 header nodes of each zone is connected to each other.

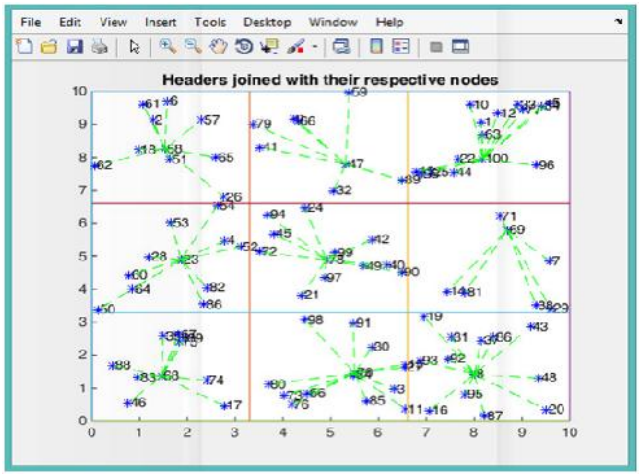

Fig 5.3 Headers joined with their respective Nodes

As per shown in fig: 5.3 now select source and sink (destination).In this case; mobile destination is used. Now the algorithm finds the shortest distance for a perfect rout between source and sink. Each zone has its own header node and all reference nodes are connected to the header node as per represented in the fig: 5.3.

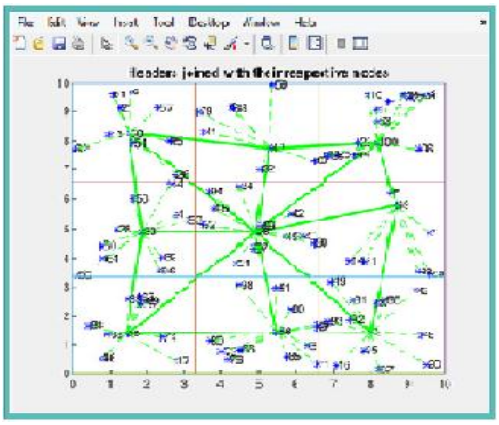

Fig 5.4 Headers joined with their respective nodes

In both figures (5.4 and 5.5); the sensor and receiver nodes are mentioned.

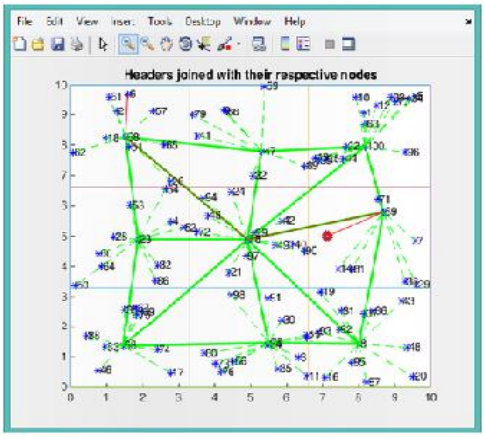

Fig 5.5 Headers joined with their respective nodes

Nodes using VGDRA proposed scheme incur least cost compared to other schemes in constructing the virtual structure. The VCCSR considers fixed number of cluster-head nodes irrespective of the network size and thus as a result, A high population of the sensor nodes take part in the cluster-head election. Similarly, the BV Incurs considerable communication cost in clustering the network where all the nodes exchange residual energy level information. Compared to VCCSR and BVI, nodes using Hex DD perform local processing thereby causing les communication over head. On contrary, using VGDRA proposed scheme, the total number of cells and thus the cell-headers is a function of the total number of nodes.

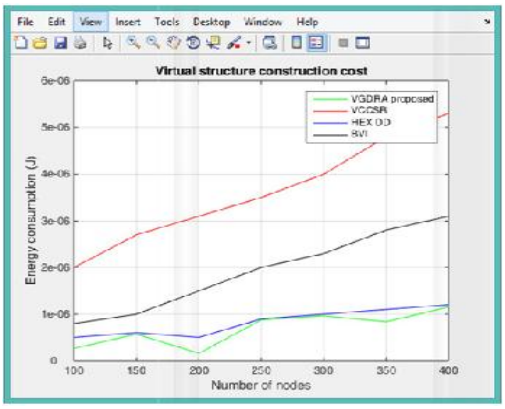

Fig: 5.6 Virtual Structure Construction Cost

The per round routes reconstruction cost represents the nodes energy expenditure in re- adjusting the data delivery routes as the sink moves around the sensor field and complete some round of the sensor field using the VGDRA proposed scheme, the average nodes' energy consumption in reconstructing the data delivery routes to the latest location of the mobile sink is significantly less compared to the other schemes. This is mainly attributed to the least propagation of sink's location updates by following the set of communication rules of the VGDRA proposed while preserving nearly optimal routes towards the latest location of the mobile sink. Using our VGDR A proposed scheme, only a partial sub-set of cell-header nodes takes part in the routes reconstruction process thereby reducing the overall routes reconstruction cost as the mobile sink completes one round of the sensor Field.

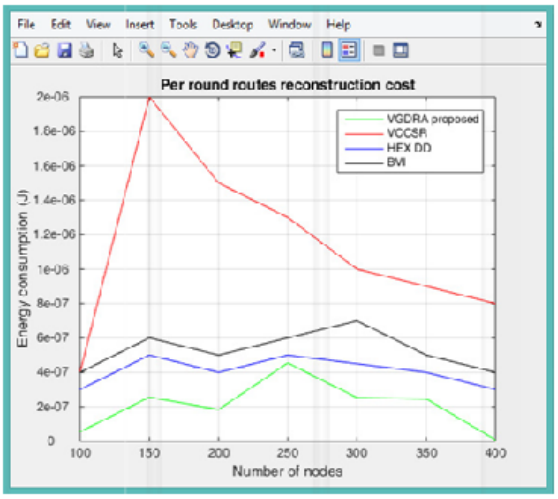

Fig: 5.7 Per Round Routes Reconstruction Cost

5.CONCLUSIONS AND FUTURE SCOPE

A Virtual Grid Routing scheme is implemented in MATLAB. The energy model is considered to reduce energy dissipation which will improve the energy consumption and data delivery performance. This technique divides the area into equal number of zones. A mobile sink while moving around the sensor field keeps on changing its

location and connects with the nearest border-line cell-header for data collection. Network lifetime is improved and routes reconstruction cost is reduced by this scheme. In future work, we aim to improve the performance of our proposed scheme by using communication based on distance priority which will improve the lifetime of network and reduce the routes reconstruction cost even more than this scheme. Energy consumption will also be reduced by using distance priority communication.

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BIOGRAPHY

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