A NOVEL FAULT TOLERANT ROUTING MECHANISM FOR WIRELESS SENSOR NETWORKS

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ABSTRACT—In this project, we present a new fault tolerant routing to address the issues in hierarchical topology, based errors in wireless sensor networks. Hierarchical topology is combining clustering and labelling sensor nodes as gaussian integers. Due to this, the network area is broken up into tiny square grids. With the cluster head forming each grid an integer with a gaussian distribution. These groupings of heads form a gaussian network. Utilizing node symmetry, this project work also discusses the benefits of multi-path routing outlines a novel fault tolerant routing technique. Using a gaussian network in wireless sensor networks. The prime objective of this work is to increase data throughput, fault tolerant data reliability and energy conservation.

Index Terms: Clustering, fault resistance, Gaussian network, multipath routing wireless sensor networks.

INTRODUCTION

In recent years, development and deployment of wireless sensor networks (WSN) is growing at a rapid pace. wireless sensor network [1,2] consists of large number of sensor nodes (small and cost-effective sensing devices with wireless radio transceiver) over a wide area mainly to monitor the environment that does not have infrastructure like power supply, wired internet connection and without human interaction. Each sensor node, having one or more sensors, is capable of collecting, computing and communicating to other nodes. sensor nodes are capable of sensing physical parameters like temperature, humidity, chemical composition etc. from the sensing field.

The sensed data is then processed at node level or cluster level and communicated to sink or base station generally referred as collection points. rapid deployment, self-organization, high sensing fidelity, flexibility, low cost and fault tolerance characteristics of WSNs make them a very promising sensing technique for various applications. WSNs are very useful to collect information from those areas where it is difficult to reach and are seldom accessible.

Promising applications of WSN include wide area monitoring for personnel/vehicles, secure area intrusion monitoring and denial, environmental monitoring, animal habitats, migration, forest fires, natural disasters, subsea monitoring, building monitoring, vehicle traffic monitoring and control, remote site power substation monitoring, patient monitoring, smart home and inventory management and many other real-life applications [3,4] for sensor deployments. wireless sense and control technology is electronics.

WSNs hold the potential to provide low-cost solutions for the problems in military, medical and climatic conditions. wireless sensor network (WSN) is a network of a number of sensors that senses the data from the surroundings, which are further processed and produces output through various processes. each sensor in the network is a node. every time a node collects its data, and it should be transferred to the base station (bs). for transferring packets of data to the bs, the nodes have to aggregate the data bits that are collected into packets. Each time the nodes aggregating the data bits and sending to the bs by itself consumes more energy.

So, the nodes a clustering method was proposed for making all those processes by a single node which is CH of that cluster. through this way, all nodes need not to use their energy to collect data, process it, aggregating it

and sending to the bs every time, a particular node will be elected as a CH for a cluster and it will collect the data, process it, makes the data bits into packets and sends it to the bs at a regular intervals making other nodes energy

LITERATURE SURVEY

[5] Recently, the internet of things (IoT) topology has been used to collect physical, physiological, vital signs of patients in consumer-centric e-health or consumer' wellness care services. in such healthcare systems, varieties of medical sensors are attached to the patients to collect vital signs from those who are under observation. the data gathering process in IoT-enabled wireless sensor network (WSN) suffers from the congestion problem.

[6] The food supply chain process comprises crops collection, processing of food, shipping & delivery to the whole seller in the market. harvested foods decompose from the moment they are harvested due to attacks from enzymes, oxidation, and microorganisms. These include bacteria, mold, yeast, moisture, temperature, and chemical reactions. The spoilage of fresh food has increased over time due to the multistage slow food supply chain process. the identification, traceability, and real-time tracking of goods in supply chains have always been a challenge. benefit greatly through automation based on key technologies of IoT, radio frequency identification (RFID), and wireless sensor networks (WSN). These technologies collect data relevant to the food supply.

[7] IoT (Internet of Things)-based remote monitoring and controlling applications are increasing in dimensions and domains day by day. sensor-based remote monitoring using a wireless sensor network (WSN) becomes challenging for applications when both temporal and spatial data from widely spread sources are acquired in real time. in applications such as environmental, agricultural, and water quality monitoring, the data sources are geographically distributed, and have little or no cellular connectivity. These applications require long distance wireless or satellite connections for IoT connectivity.

[8] This paper presents a complete design, analysis, and performance evaluation of a novel distributed event triggered control and estimation strategy for dc microgrids. The primary objective of this work is to efficiently a novel fault tolerant routing mechanism for wireless sensor networks stabilize the grid voltage, and to further balance the energy level of the energy storage.

EXISTING METHOD

Wireless sensor technology is growing rapidly, especially with many new internet of things (IoT) applications. On the other hand, research is coming out with diversities of approaches to enhance and improve this technology trying to cover the needs in this era. The drawback [9] of sensor technologies is the low battery and short lifetime. So, most of the following research considers sophisticating these weaknesses and suggests different algorithms and approaches to overcome these issues.

Jiao [10} proposed novel leach protocol in the heterogeneous network and compared the simulation results with leach homogeneous system; they choose 500meters * 1200meters area to simulate the protocol. Jiao found that 10 nodes have more energy than the rest of 90 nodes which improves the system lifetime and enhances wireless sensor network performance. [10] explored fifteen different types of clustering wireless sensor protocols which considered more energy efficient and lifetime of the network system. [10] simulated leach using TDMA routing protocol. also, they surveyed the previous approaches for selecting CH and improving the WSN performance such as Euclidian distance from a node to bs, remaining energy and number of nodes in the same cluster.

Increasing the number of dead nodes in the cluster would be the reason for shortening the WSN lifetime. Jin [11] implemented a new protocol for choosing an optimal place for the BS, which overcomes the issues of delivering data and they compared the simulation result with the basic leach protocol with TDMA technique. Commonly when the bs located far away from the node, then transmitting data from a node to bs will cost more energy in the node, which leads to reduce the node lifetime and therefore reduce the network lifetime [10].

Moreover, packet delivery time would be reduced when the sink positioned in the center near the nodes [12]-[15]. the authors proposed an algorithm called distance-based cluster head (DBCH) which the threshold value measured by the following equation: where er is the residual energy of the node for the current round and E0 is the initial energy. this algorithm proposes to select the closest node to the bs as a cluster head. This enhancement considers two-parameter energy and distance. in addition, it considers the distance from the node to cluster head base station and compared the distance from node cluster head and bs. This study simulated the suggestions on a homogenous network.

PROPOSED METHODOLOGY

There exists a several number of techniques for clustering nodes in a WSN, but none of them consider errors while clustering. Even though clustering is better in some of the approaches, none of the clustering algorithms doesn't consider errors in a wireless sensor network. for that, we are implementing, a new approach for error resistant routing algorithm. the approach constructs a gaussian network, for an efficient way to detect the faults in a WSN.[16]

Gaussian network is a network of nodes that have become cluster heads (CHs), for that particular round. all the CHs of all clusters are connected through forming a gaussian network. the gaussian network reveals the behavior of the clusters, so, whenever a cluster undergoes an error, it can be detected easily and the data transmission of that cluster won't be stopped, in fact, it will be shared by the remaining nodes of the Gaussian network[17]-[20] to be sent to the BS.

Fault Identification Mechanism: This paper proposes a hybrid fault-tolerant routing protocol based on a combination of clustering and a gaussian network's hierarchical topology. multiple paths routing our suggestion is known as the wireless sensor network protocol for fault tolerance clustering based on a gaussian network (FCGW)[21]. The fault tolerance method of FCGW concentrates on CH node fault detection and fault recovery.

Consequently, our fault tolerance system consists of fault recovery and fault detection. Accordingly, the fault recovery procedure[22]-[24] will be optimized as multiple path routing based on the symmetric links of the gaussian network and the shortest path routing as in formula.

SOFTWARE DESCRIPTION

MATLAB: MATLAB is an elite dialect for specialized registering. it incorporates calculation, representation, and programming in an easy to-utilize condition wherein issues and preparations are communicated in herbal numerical documentation. run of the mill utilizes comprise: Math and calculation • Algorithm advancement, Data obtaining, Modeling, re-enactment, and prototyping, Data examination, investigation, and representation, Scientific and designing illustrations, Application advancement, including graphical UI building MATLAB is an intuitive framework whose important statistics aspect is an show off that does not require dimensioning. this allows you to tackle several specialized processing issues, particularly those with framework and vector info, in a small quantity of the time it'd take to compose a program in a scalar non intuitive dialect, as an instance, C or Fortran.

MATLAB highlights a collection of more utility-specific arrangements known as tool booths. important to most clients of MATLAB, device kits permit you to learn and apply particular innovation. tool compartments are exhaustive accumulations of MATLAB capacities (m-records) that reach out the MATLAB condition to take care of precise training of problems. territories in which tool stash are reachable include flag coping with, manipulate frameworks, neural structures, fluffy reason, wavelets, pastime, and several others.

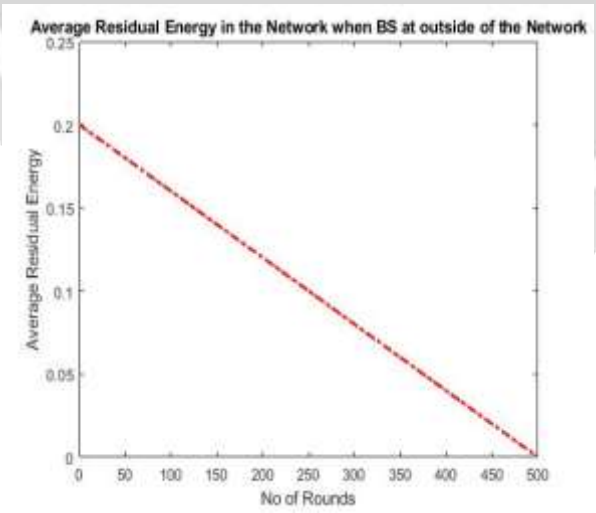

Fig 1. Base Station Locating At cen ter of the Network.

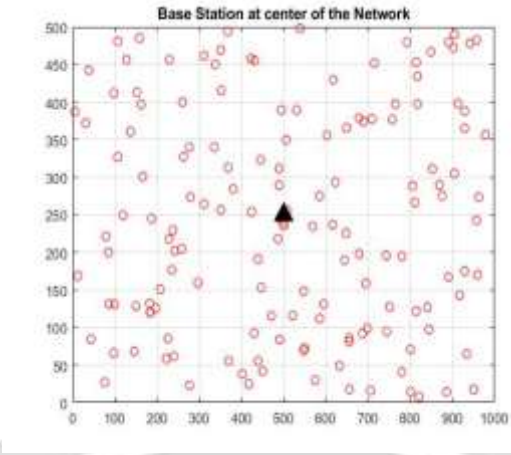

Fig 2. Base station locating outside of the network

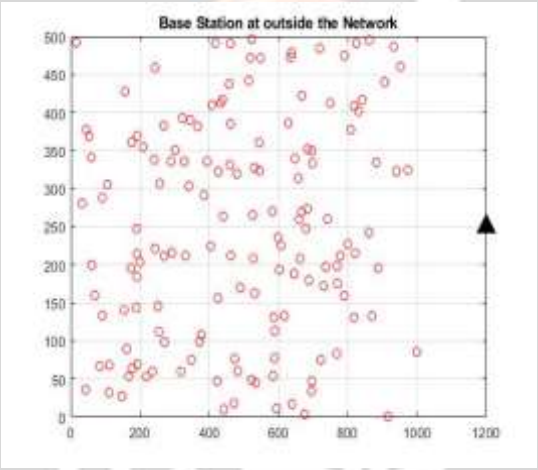

Fig 3. Average Residual energy when base station locating at the center

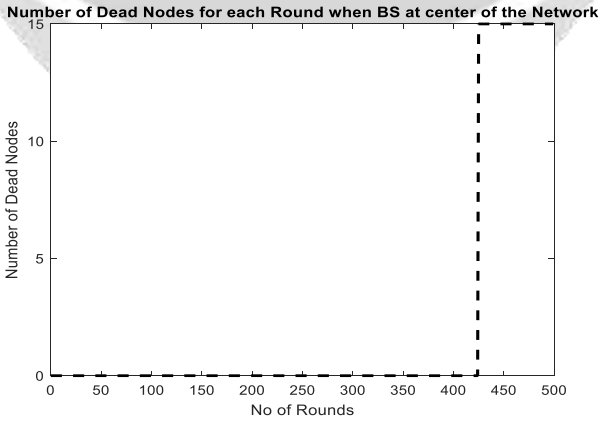

Fig 4. Average Residual energy when base station locating outside of the network

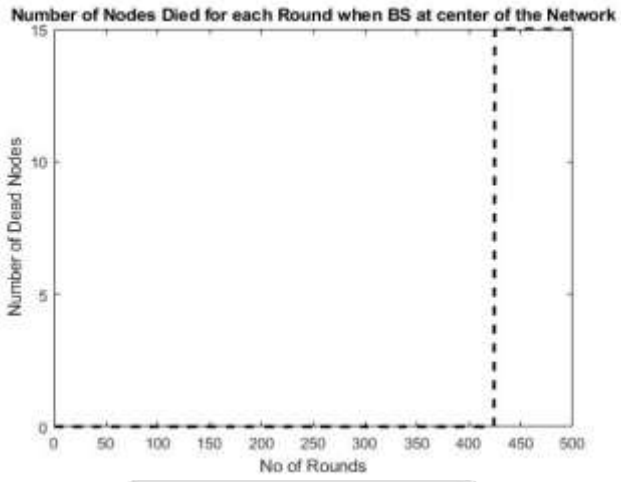

Fig 5. No of dead nodes for each Round when base station locating center of the network

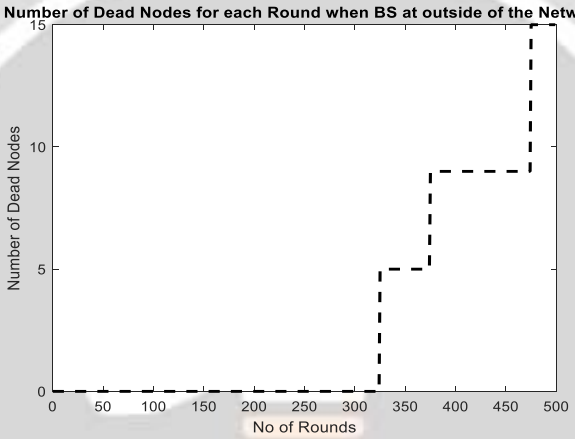

Fig 6. No of dead nodes for each Round when base station locating outside of the network

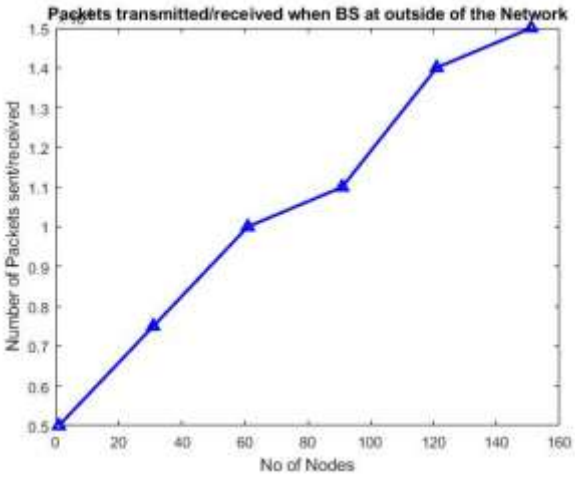

Fig 7. Packets Transmitted or Received when base station locating center of the network

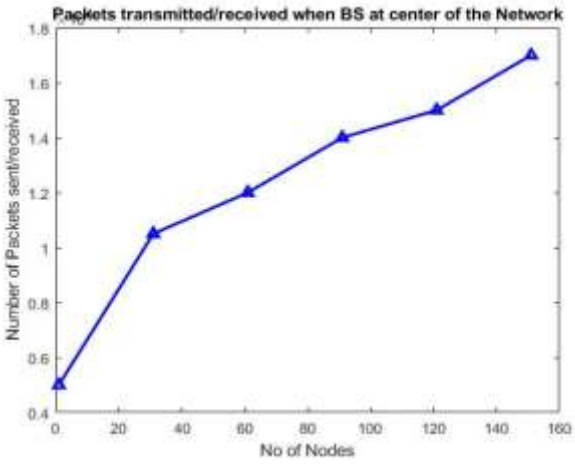

Fig 8. Packets Transmitted or Received when base station locating Outside of the network

CONCLUSION

In this work, we have constructed a hierarchical topology for wireless sensor network using the Gaussian network connection properties and clustering routing. According to our approach, the sensors are randomly distributed in a rectangular area and clustered into several square grids. The CH nodes are connected together to form a Gaussian network, so this approach has improved fault tolerance through symmetric links and multi-path routing. In addition, the CH nodes are represented as Gaussian integers, which are used in the routing protocol to reduce the complexity of routing algorithms. The future scope of this work is to enhance the energy conservation with increased number of rounds in the simulation.

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