ENERGY EFFICIENT ROUTING SCHEME IN NETWORK PROCESSING FOR ENHANCING ENERGY LIFE OF NODES IN WSN

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ABSTRACT

Deployment of sensors with complex geographical locations is always the challenging task due to limitations like device becomes inaccessible once implemented, frequent maintenance cannot be done, use complexity and expert handlings. Wireless Sensor Network consists of small nodes having limited sensing, computation, and wireless communications capabilities. Sensor nodes normally sensed data and forward sensed data to the base station such as temperature, sound, vibration, pressure, motion or pollutants.[1] Sensor nodes are resource constraint type of network and contain very tiny size of irreplaceable and not chargeable batteries. Network life is the highly concern, energy become reason to dyes of nodes and network partially fully stops working. We mainly aim to reduce this power consumption and so that the nodes life and distance for movement increases. The framework employs Position Responsive Routing Protocol (PRRP) for WSN which is termed as EERP routing protocol. The objective is to achieve good scalability, long network lifetime and low data collection latency. At the sensor layer, sensors are arranged randomly to self-organize themselves into clusters using random distribution.[3]

Index Terms— Network life, EERP, PRRP

INTRODUCTION

A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes. The general requirement in sear for low-cost, low-power, multifunctional sensors has made wireless sensor networks (WSNs) a prominent data collection paradigm for extracting local measures of interests. In such applications, sensors are generally densely deployed and randomly scattered over a sensing field and left unattended after being deployed, which make it difficult to recharge or replace their batteries. After sensors form into autonomous organizations, those sensors near the data sink typically deplete their batteries much faster than others due to more relaying traffic.[6] When sensors around the data sink deplete their energy, network connectivity and coverage may not be guaranteed.

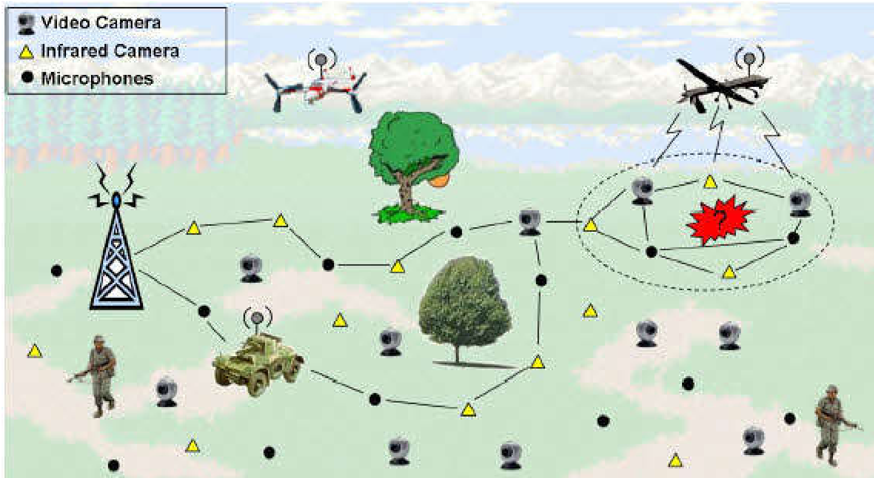

Figure 1.1:- Wireless Sensor Network

Due to these constraints, it is crucial to design an energy-efficient data collection scheme that consumes energy uniformly across the sensing field to achieve long network lifetime. Furthermore, as sensing data in some applications are time-sensitive, data collection may be required to be performed within a specified time frame. Therefore, an efficient, large-scale data collection scheme should aim at good scalability, long network lifetime and low data latency.[9]

The first applications of WSNs were military (surveillance and command and control info), but there are also several civilian applications: structure health monitoring, habitat monitoring, border enforcement, etc. The challenges in WSN usually stem from the limited resources (processing power, transmission bandwidth, memory, battery, etc.) available to each node (to be deployed in large numbers, they have to be inexpensive). [9]

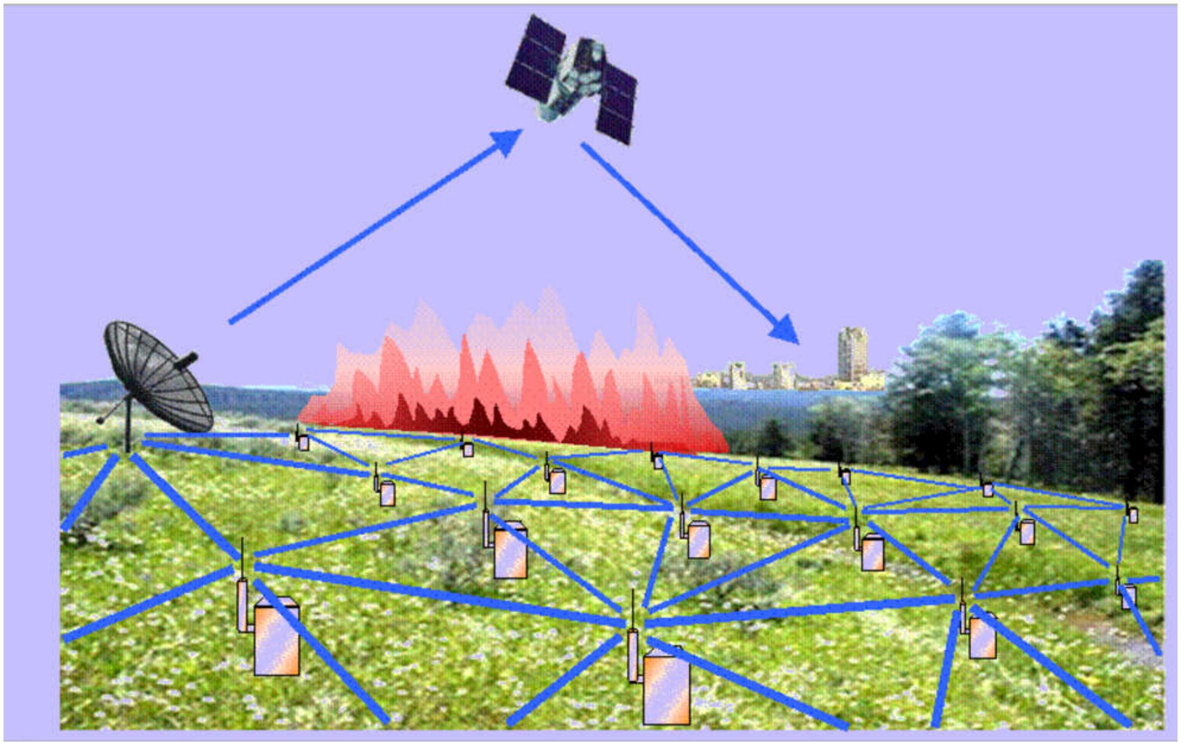

Figure 1.2 Example of WSN

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting.[19] A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

EXISTING SYSTEM

Cluster-based routing protocols in wireless sensor networks

- Routing in WSNs is very challenging due to the inherent characteristics that distinguish these networks from other wireless networks like mobile ad hoc networks or cellular networks. Hierarchical 0 cluster-based routing methods is essential for sensor network applications where a large number of sensors are deployed for sensing purposes.
- If each sensor starts to communicate and engage in data transmission in the network, a great network congestion and data collisions will be experienced, which results in draining of the limited energy from the network. [13]Node clustering will address these issues. In clustered networks, nodes can be partitioned into a number of small groups called clusters. Each cluster has a coordinator, referred to as a cluster head (CH), and a number of sensor nodes (SNs). Clustering results in a two-tier hierarchy in which CHs form the higher tier while SNs form the lower tier.
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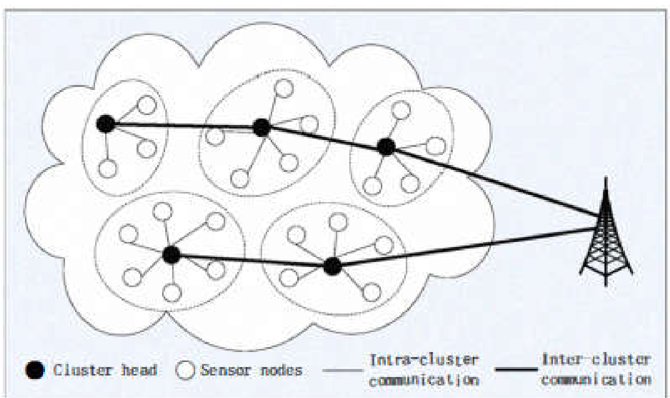


Figure 1.3 Architecture Of Cluster-Based Routing Protocols

DISADVANTAGES OF EXISTING SYSTEM

Number of children nodes is high in the clusters and secondly its Cluster Head, CHleader choosing mechanism works on the basis of energy level, hence it causes more energy drain because of longer distance.

- No practical reliable output.
- Huge energy loss.
- No distance vs. energy plot.

- No real time network and node selection feature.

PROPOSED SYSTEM

Energy Efficient Routing Protocol

- We propose an energy optimization protocol called Energy Efficient Routing Protocol (EERP) that incorporated the Sensor Networks.
- Our simulation results show a significant improvement in the life cycle of the WSN with respect to the proposed protocol.
- We use Low-energy adaptive clustering hierarchy (LEACH) as the clustering protocol.
- We also implement Frequency Hopping Spread Spectrum is a method of transmitting radio signals by rapidly switching a carrier among many frequency channels, using a pseudorandom sequence known to both transmitter and receiver.
- We calculate the Frequency/Energy/Distance Calculation of the nodes in network in this behavior and show our system has better energy feature compared to existing system.

Frequency Hopping Spread Spectrum (FHSS)

- Frequency Hopping Spread Spectrum is a method of transmitting radio signals by rapidly switching a carrier among many frequency channels, using a pseudorandom sequence known to both transmitter and receiver nodes. It is used as a multiple access method in the frequency-hopping code division multiple access scheme.
- FHSS is a wireless technology that spreads its signal over rapidly changing frequencies. Each available frequency band is divided into sub-frequencies. Signals rapidly change ("hop") among these in a pre-determined order. Interference at a specific frequency will only affect the signal during that short interval. FHSS can, however, because interference with adjacent direct-sequence spread spectrum (DSSS) systems. A sub-type of FHSS used in wireless data transfer is adaptive frequency hopping spread spectrum (AFH).This identification of fluctuating frequency detects our bot nodes.

- The overall bandwidth required for frequency hopping is much wider than that required to transmit the same information using only one carrier frequency. However, because transmission occurs only on a small portion of this bandwidth at any given time, the effective interference bandwidth is really the same. Whilst providing no extra protection against wideband thermal noise, the frequency-hopping approach does reduce the degradation caused by narrowband interference sources.
- One of the challenges of frequency-hopping systems is to synchronize the transmitter and receiver. One approach is to have a guarantee that the transmitter will use all the channels in a fixed period of time. The receiver can then find the transmitter by picking a random channel and listening for valid data on that channel. The transmitter's data is identified by a special sequence of data that is unlikely to occur over the segment of data for this channel and the segment can have a checksum for integrity and further identification. The transmitter and receiver can use fixed tables of channel sequences so that once synchronized they can maintain communication by following the table. On each channel segment, the transmitter can send its current location in the table.

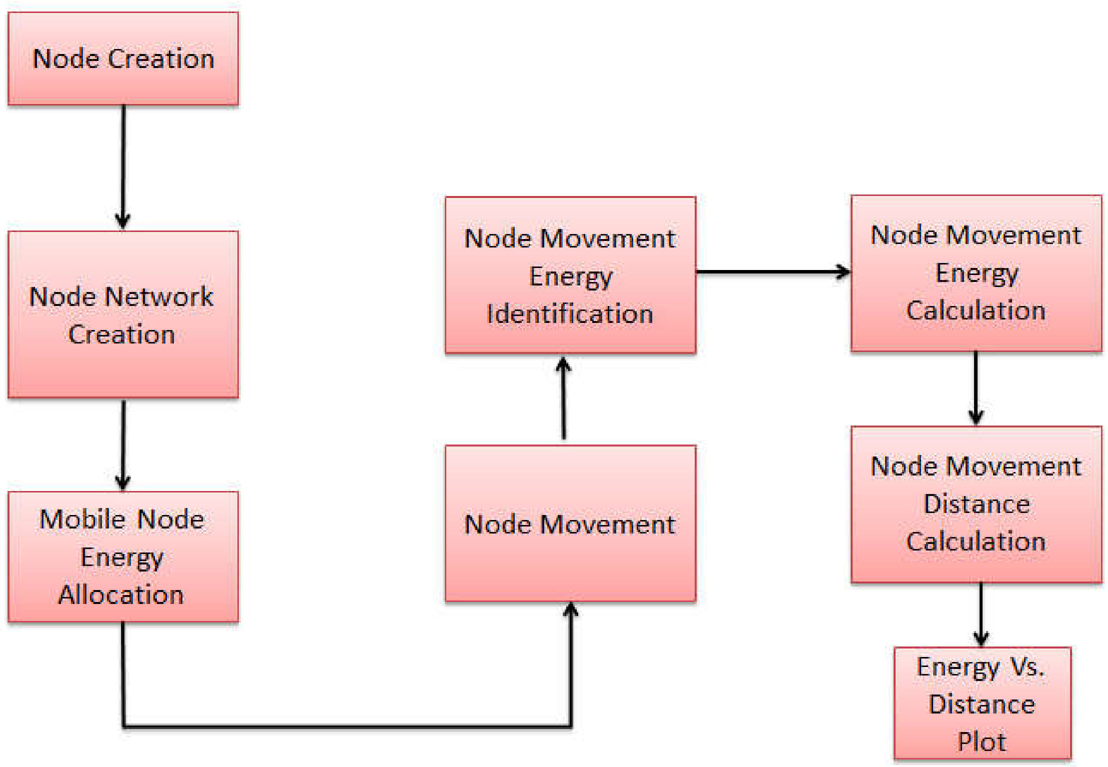


Figure 2.1 Energy Vs Distance Plot

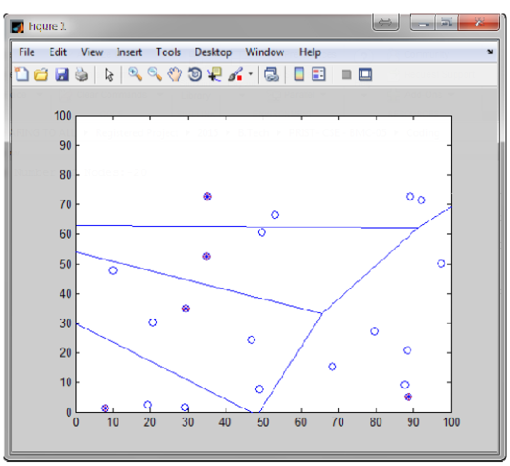
- In the US, FCC part 15 on unlicensed system in the 902–928 MHz and 2.4 GHz bands permits more power than non-spread-spectrum systems. Both frequency hopping and direct sequence systems can transmit at 1 Watt. The limit is increased from 1 milliwatt to 1 watt or a thousand times increase. The Federal Communications Commission (FCC) prescribes a minimum number of channels and a maximum dwell time for each channel.
- In a real multipoint radio system, space allows multiple transmissions on the same frequency to be possible using multiple radios in a geographic area. This creates the possibility of system data rates that are higher than the Shannon limit for a single channel. Spread spectrum systems do not violate the Shannon limit. Spread spectrum systems rely on excess signal to noise ratios for sharing of spectrum. This property is also seen in MIMO and DSSS systems. Beam steering and directional antennas also facilitate increased system performance by providing isolation between remote radios.

ADVANTAGES OF PROPOSED SYSTEM

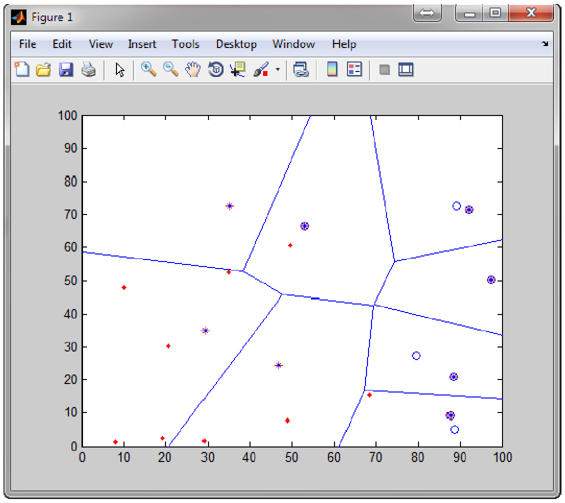
- Practically working reliable network.
- Minimum possible energy consumption.
- Real time distance vs. energy plot.
- Real time network and node selection feature.
- Reliable relaying of data from the sensor nodes.
- Low-cost, low-power WSNs with wide applicability.

OUTPUTS

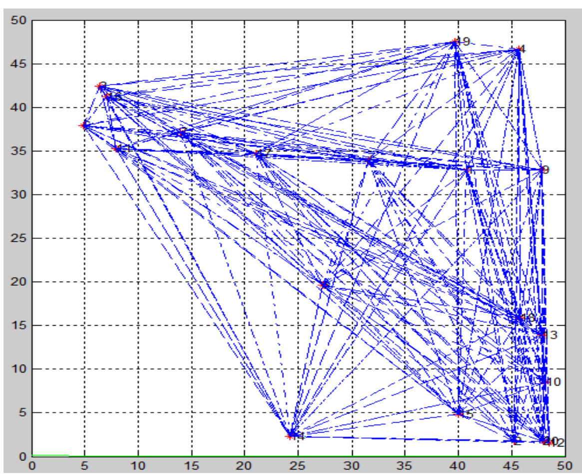
Active nodes



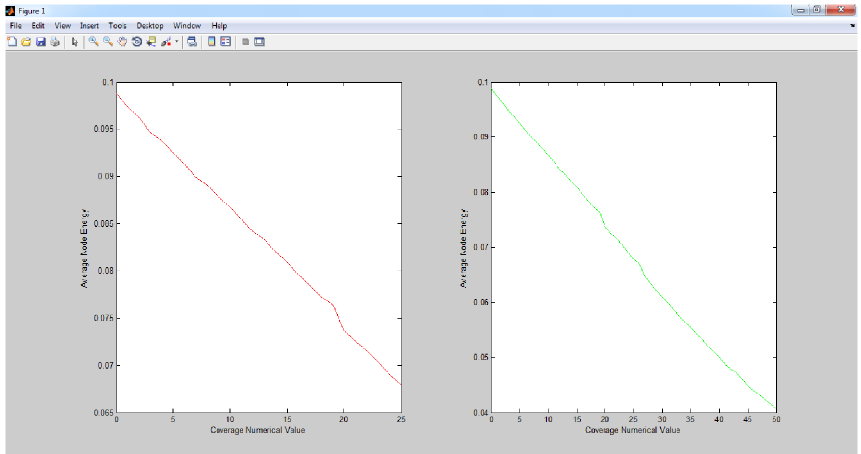
Dead Nodes



Node Connectivity



Comparison Result



PRRP VS EERP with FHSS

CONCLUSION

In our phase 1 work we created node and network to implement EERP and FHSS. After phase 1 we implemented phase 2 to show the feasibility of the proposed protocols with respect to the energy consumption distance coverage. We used LEECH as clustering algorithm. The results shows that EERP can greatly reduce energy consumptions by alleviating routing burdens on nodes and balancing workload among cluster heads. Sensor Network has important role and use, due to it's diversify approach and range of applications. WSN is the only most suitable and easy way of deployment in remote and hard areas. Routing is the main expensive operation for nodes energy consumption. This paper proposed new routing protocol known as Energy Efficient Routing Protocol. Our proposed EERP addresses energy efficiency, data throughput and routing hole under certain controlled conditions. Our simulation based research results will show a significant energy efficiency improvement of 35% to 45% by increasing overall energy efficiency and life time.

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APPENDIX

Matlab (Matrix Laboratory) is a high-performance language for scientific and technological calculations. It integrates computation, visualization and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. It is a complete environment for high-level programming, as well as interactive data analysis. Some typical applications are

- system simulations,
- algorithm development,
- data acquisition, analysis, exploration, and visualization, as well as
- Modeling, simulation and prototyping.

Matlab was originally designed as a more convenient tool (than BASIC, FORTRAN or C/C++) for the manipulation of matrices. It was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects. After- wards, it gradually became the language of general scientific calculations, visualization and program design. Today, Matlab engines incorporate the LAPACK and BLAS libraries, embedding the state of the art in software for matrix computations. It received more functionalities and it still remains a high-quality tool for scientific computation. Matlab excels at numerical

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computations, especially when dealing with vectors or matrices of data.

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