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AN IMPROVED AND ENHANCED SELF ORGANIZING PROTOCOL FOR WIRELESS SENSOR NETWORKS USING EE-SOP ALGORITHM

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Abstract: Wireless sensor networks are real time embedded systems used for in a vary of applications, characteristics and design. Self-organization is serious for a distributed wireless sensor network owing to the spontaneous and arbitrary operation of a large number of sensor nodes over a remote area. Such a network is habitually characterized by its abilities to form an organizational structure without much centralized intervention. An vital intend goal for a smart sensor network is to be able have an energy-efficient, self-organized configuration of sensor nodes that can examine, detect, and track targets of interest in a distributed manner. In this paper proposed new topology Enriched and Enhanced Self Organizing Protocol (EE-SOP) is validated for deployment of WSN nodes with optimized and performance is better than existing algorithm IDSQ, LEACH, SOP and also reduced routing overhead and lesser energy consumption.

Keywords: Wireless Sensor Network, Routing Protocols, SOP, IDSQ, LEACH, Routing Overhead.

INTRODUCTION

Wireless sensor networks (WSNs) are real-time embedded systems used for in a range of applications including traffic control, home automation, smart battlefield, environment monitoring etc. WSN integrates various sensors that are distributed just about a particular node for achieving the computational operations. A major negative aspect of WSNs is resource limitations at the node level. A WSN is made up of a huge numeral of independent nodes prepared with sensing and communication capabilities, but with limited energy and processing resources. WSNs sense physical phenomena and events of interest information cooperatively. WSN nodes are deployed in excess of vast areas in applications including scrutiny, environmental monitoring, health care, traffic control etc.

ARPANET (Advanced Research Projects Agency Network) was one of the most primitive to represent and drew diagrams of network connectivity. The topological studies also focused mainly on a network's physical connectivity. As networks grew complex, newer topologies were proposed and implemented. The growth in networks was with the internet, where the explosion of the Internet network converted network structures into a network of networks. Many studies enclosed a range of aspects correlated to measuring, modeling, and analyzing topology and its evolution. The transition also increased the need for economically structured connectivity. Scientists and mathematicians have been proposing new network models for consistency and efficiency in network performances. At present the networks enlargement resulted from WSNs, an rising technology with a wide range of latent applications. Scientifically advances in Micro Electro Mechanical Systems resulted in the progress of wireless communications and networks (WSN). These networks have been arranged in several industrial and resident applications, wellbeing monitoring [1] [2] and traffic control. A wireless sensor networks is a set of nodes organized into a supportive network. Sensor networks spatially distributed autonomous sensors to monitor physical and environmental conditions at different locations [3], such as temperature, pressure, motion sound, vibration etc. WSN base stations (gateways) communicate with sensors within a sensor network. The sensor nodes broadcast information to the gateway openly or with the help of other nodes in the network [4]. WSNs typically consist of small, inexpensive, resource-constrained devices that communicate among each other. Figure 1 depicts a generic WSN Architecture.

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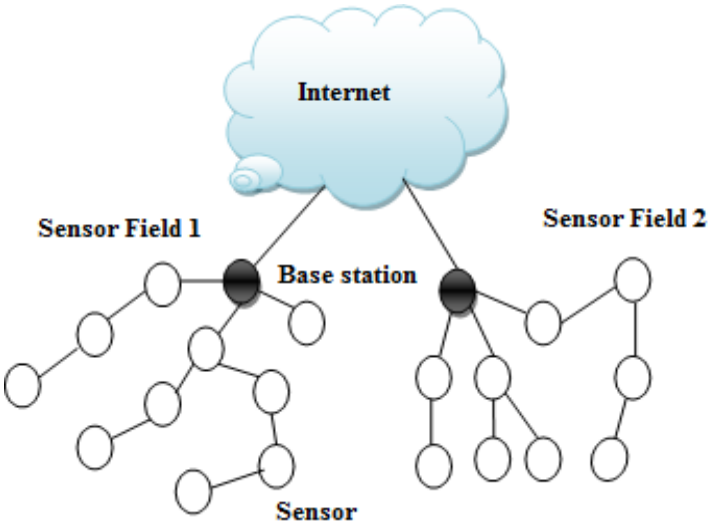

Figure. 1 WSN Architecture

Each node known as a sensor node, has one sensor, an embedded processors with restricted memory, a low power radio and is usually battery operated [5]. Every sensor node of the network is liable for sensing an occasion locally which is desired and at end user event is reported which is for relaying a remote event sensed by other sensor nodes [6]. WSN Topology has many issues as revealed from past studies. They include geographical routing and sensor issues. Geographical routing uses geographic and topological information of the network to accomplish most favorable routing schemes [7]. Intense communication can cause gaps which results in failed deliveries to exterior nodes. If these gaps are not attended to, they create a costlier routing table, exhausting intermediate nodes rapidly. Moreover, most books on complex networks or topology are domain-specific and knowledge based [8] [9], in spite of studies indicating a need for an inherent engineering based filled with domain-specific knowledge in topology constructions. Topology issues have been receiving more attention in WSNs. Prolonging the life of WSN's lifetime is in the deployment of an effective topology. This paper proposes a new topology design called EE-SOP (Enriched and Enhanced Self Organizing Protocol) which segments WSN nodes using clustering for a dynamic topology configuration based on the number of nodes deployed in the WSN.

WIRELESS SENSOR ROUTING PROTOCOLS

Design Issues

- Fault Tolerance
- Scalability
- Fabrication Cost
- Power Consumption
- Data delivery models
- Data Aggregation
- Quality of Service
- Node Deployment
- Data Latency and Overhead

Applications of Sensor Networks

- Military – Detection of enemy movements on land and sea area, sensing intruders, surveillances and military situation awareness.
- Emergency Situation – Fire and Water detectors, Hazardous chemical level and Disaster management.
- Physical World – To monitor the environmental water and soil, habitual monitoring, to observe of biological and artificial systems.
- Medical and Health – Sensors for Electrocardiogram, check the pulse oxy-meter, blood flow and pressure, to measurement oxygen, monitor the people location and health condition.

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- Home Networks – Bluetooth, person locator and some home appliances.
- Industrial work – The process control in factory, industrial automation, monitoring and control of industrial equipments.
- Automotives – To monitoring the tire pressure, active mobility and coordinate the vehicle tracking.

Classifications of Routing Protocols

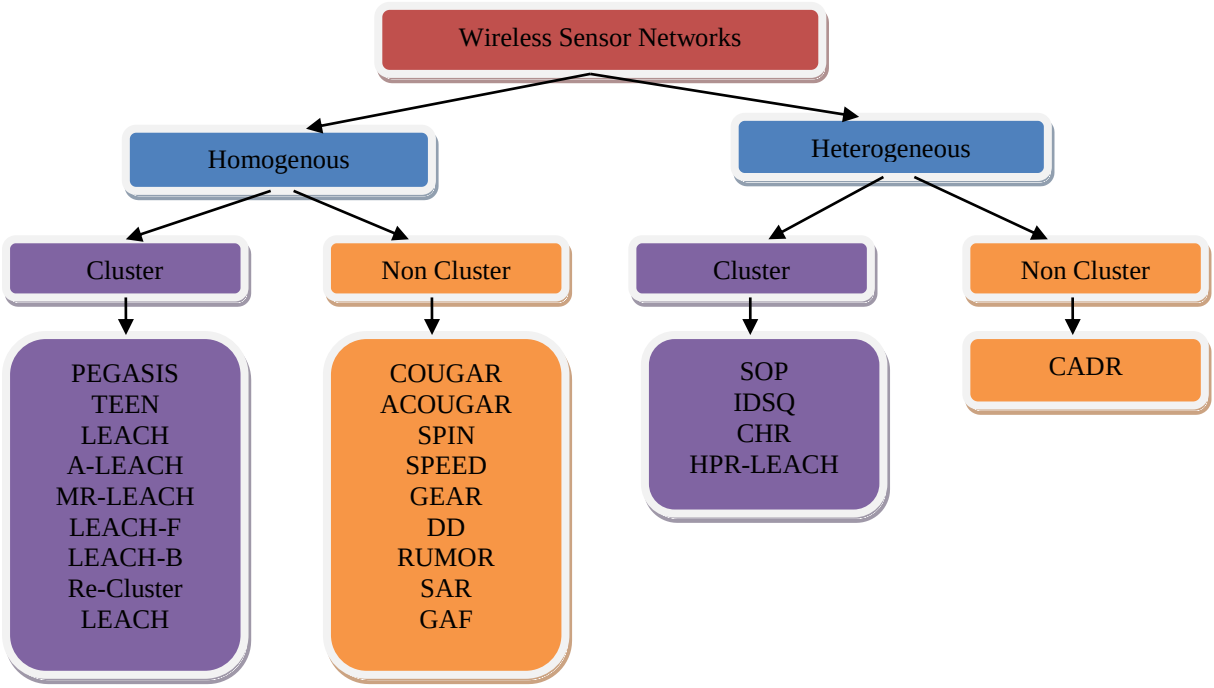

Figure. 2 Classifications of Wireless Sensor Routing Protocols

Routing protocols are also classified and it based on the sensor network architecture [10] [11]. Some WSNs consists of homogenous nodes and heterogeneous nodes. Based on this conception we can sort the protocols whether they are operating on a flat topology or on a hierarchical topology. All nodes are treated equally in flat routing protocols. When node wants to transfer data, it may find a routes consisting of several hops to the sink. A hierarchical routing protocol is a usual approach to take for heterogeneous networks where a few of the nodes are more scheming than the other ones. The hierarchy does not always depend on the power of nodes. In Hierarchical protocols for various nodes are form as a clusters and data from nodes belonging to a single cluster can be aggregated. The clustering protocols have more rewards like scalable, energy competent in ruling routes and simple to manage.

In this paper we compared the following routing protocols according to their intend characteristics. The wireless sensor networks homogenous nodes in cluster had some protocols are The Power-Efficient GAthering in Sensor Information Systems (PEGASIS), Threshold sensitive Energy Efficient sensor Network (TEEN) [12], Low Energy Adaptive Clustering Hierarchy (LEACH) [13], A-LEACH, MR-LEACH, LEACH-F,LEACH-B and Re-cluster LEACH. The homogenous in non-cluster had some protocols are COUGAR, Sensor Protocols for Information via Negotiation (SPIN), real time routing protocol (SPEED), Geographical and Energy Aware Routing (GEAR), Directed Diffusion (DD), Rumor Routing (RR) and Sequential Assignment Routing (SAR). Whereas the heterogeneous nodes in cluster protocols are Self Organizing Protocol (SOP) [14], IDSQ, CHR and HPR-LEACH and the non-cluster protocol are Constrained Anisotropic Diffusion Routing (CADR).

ENRICHED AND ENHANCED SELF ORGANIZING PROTOCOL (EE-SOP)

Self of a sensor network is an Self organizing of sensor network is an evolutionary process, where the attributes (data, energy, resources, redundancy, lifetime, topology, etc.) [15] and capabilities

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(sensing, localization, configuration, communication, mobility, recovery, adaptation, etc) of the network are spontaneously enhanced, through autonomous management of the inherent characteristics (described above) of the constitution sensor node.

Wireless sensor networks (WSN) combines sensors and wireless communications using embedded computing. The sink nodes control information and transmissions in the network. In any communication network, topology refers to attaching end points or nodes to a network using interconnections between them. It is a study on geometrical arrangement of computers, remote devices and communication facilities that are interconnected. It has physical and logical elements that are layered in its architecture. Physical Topology implies to the physical design of a network including the devices, it locations and installations. The logical parts refer to data transfers in the design. In Wireless Sensor Networks (WSNs), the network is divided based on Topologies like Tree, Bus, Ring, Star, Circular, Mesh and Grid. Nodes are organized within the network by the Topology defined for the network. Though many topologies have been defined for networking devices, challenges do exist in defining an adequate deployment strategy for wireless sensor networks [16].

SIMULATION RESULTS AND ANALYSIS

In the existing system only use cluster based routing protocol for Low Energy Adaptive Cluster Hierarchy (LEACH), Information Driven Sensor Querying (IDSQ) and Self Organizing Protocol (SOP). This algorithm is not built in rich set of topology construction . But the proposed work is riches and enhances for the performance using Enriched and Enhanced self organizing protocol (EE-SOP) in WSN. This EE-SOP algorithm performance measurement is better compared to existing algorithm that is reduced routing overhead and lesser energy consumption. The design and performance analysis of routing protocols for wireless sensor networks is currently an active area of research. This proposed EE-SOP algorithm better performance compare to existing cluster algorithm LEACH, IDSQ, SOP and reducing routing overhead and also lesser energy consumption.

The results are described below Table 1 is present with various parameters followed for the simulation. EE-SOP uses a Self Organized Topology Dataset for its implementation on NS2 simulating the proposed topology. The number of nodes taken in the requirement phase was 100 nodes and the transmission range is 250 meters.

Table 1 : Simulation Parameters

Parameters	**Value**
Simulation	NS2
MAC Protocol	IEEE 802.11
Examine Protocol	EE-SOP, IDSQ,LEACH,SOP
Mobility Model	Random waypoint
No. of nodes	100
Transmission range	250 meters
Size of network	500m * 500m
Pause time	25s
Hello interval	5.0 s
Simulation duration	500 times

Routing Overhead :

The end-to-end routing overhead reducing in this proposed EE-SOP algorithm compare to existing Low Energy Adaptive Cluster Hierarchy (LEACH), Information Driven Sensor Querying (IDSQ) and Self Organizing Protocol (SOP).

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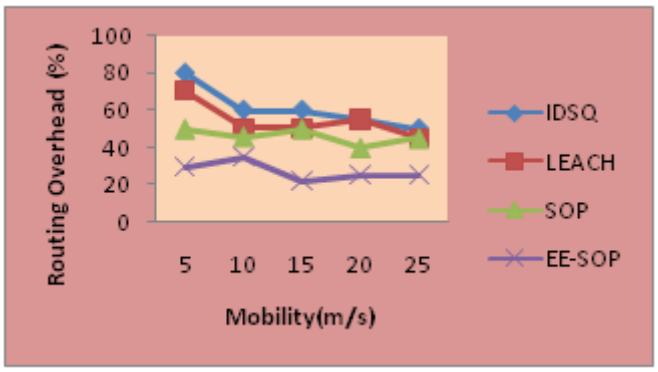

Figure. 3 Routing Overhead(%) Vs. Mobility(m/s)

In Figure.3 the proposed EE-SOP algorithm provides better performance compared to existing IDSQ, LEACH, SOP algorithm and also reduced routing overhead with mobility is increased.

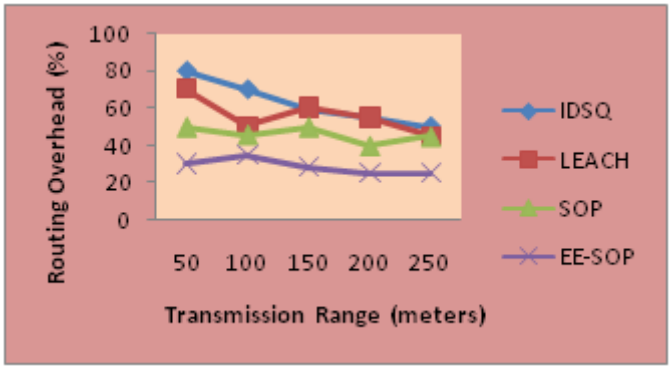

Figure. 4 Routing Overhead(%) Vs. Transmission Range(meters)

In Figure.4 the proposed EE-SOP algorithm provides better performance compared to existing IDSQ, LEACH, SOP algorithm and also reduced Routing overhead with transmission range is increased.

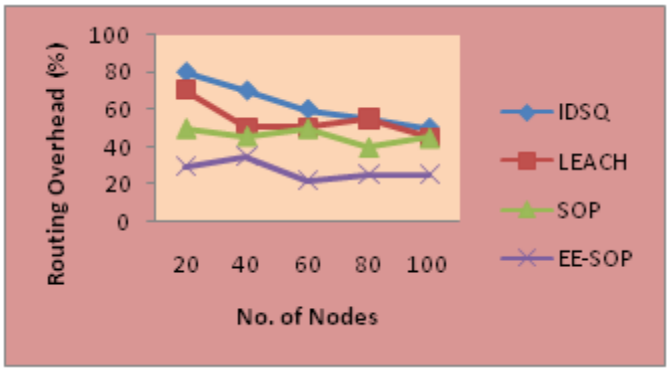

Figure. 5 Routing Overhead(%) Vs. No. of Nodes

In Figure.5 the proposed EE-SOP algorithm provides better performance compared to existing IDSQ, LEACH, SOP algorithm and also reduced routing overhead with number of node is increased.

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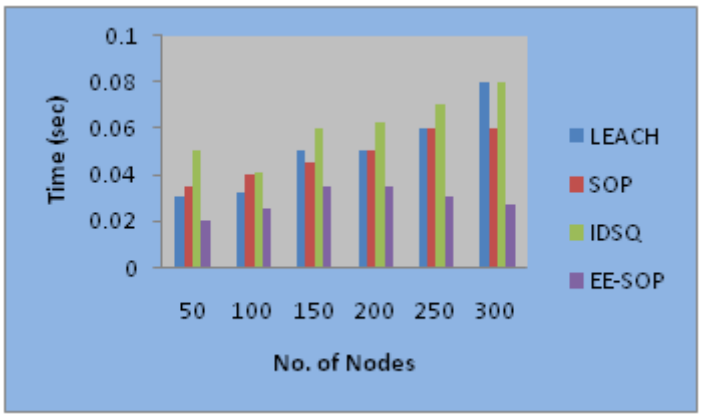

Figure. 6 EE-SOP Energy Consumption

In Figure.6 the proposed routing protocol EE-SOP is aimed at lesser energy consumption and faster information transfer between nodes. It is an efficient protocol which defines its organizing enriched topology structure performance better compared to existing algorithm IDSQ, LEACH and SOP algorithm.

CONCLUSION

Wireless sensor networks consist of large sets of resource-constrained nodes. The design of effective, robust, and scalable routing protocols in these networks is a challenging task. The basic components of wireless sensor network are light-weight, low power, small sized sensor nodes. Some of the typical areas of applications of sensor networks are military, civil, healthcare, agricultural, environmental, industrial to commercial and also covered the design of the WSN. In this paper proposed new topology Enriched and Enhanced Self Organizing Protocol (EE-SOP) is validated for deployment of WSN nodes with optimized and better performance compared than existing algorithm IDSQ, LEACH, SOP and also reduced routing overhead and lesser energy consumption.

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