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Review on LEACH, MODLEACH, PEGASIS and APTEEN for WSN

Sumit Pawar[1], Dr. Anil Khandelwal[2]

PG Student [Digital Communication], Dept. of ECE, VNS Group of Institutions, Bhopal, Madhya Pradesh, India[1]

Assistant Professor, Dept. of ECE, VNS Group of Institutions, Bhopal, Madhya Pradesh India[2]

ABSTRACT: Wireless Sensor Network have great demand nowadays. We have seen a wide growth of wireless sensor devices with cellular phones, laptops, mobiles, PDA's etc. Wireless Sensor Networks involves thousands of tiny sensor nodes. In a wireless sensor network a node is affected by energy consumption, packet ratio, battery lifetime, throughputs etc. so to avoid this problem many protocols were introduced, but most of the rank is given to hierarchical routing protocols. In this paper, we analyze LEACH, MODLEACH, PEGASIS and APTEEN protocol, its phases, advantages and disadvantages and also various kinds of attacks on this routing protocol.

KEYWORDS:WSN, LEACH, MODLEACH, PEGASIS and APTEEN.

I. INTRODUCTION

A wireless sensor networks consist of tiny sensor nodes to observe physical or environmental conditions such as temperature, pressure, sound, humidity etc. The network must possess self-configuration capabilities as the positions of the specific sensor nodes are not scheduled. Routing policies and safety issues are a great research challenge now days in WSN but in this paper we will highlight on the routing protocol. A number of routing protocols have been suggested for WSN but the most well-known are hierarchical protocols like LEACH [1] and PEGASIS [2]. Hierarchical protocols are distinct to reduce energy consumption by collecting data and to reduce the communications to the Base Station. LEACH is considered as the most prevalent routing protocol that use cluster-based routing in order to reduce energy consumption. Wireless Sensor Network (WSN) is a device for gathering information about the natural world. WSN technology introduced a low-cost, low-power featured hardware consisting of microcontrollers, storage memory, power supply, single chip radio transceivers, one or more sensors. Typical phenomenon data are collected by sensors and then transmitted to a server. These battery powered sensor nodes are used to monitor and control the physical environment of forest from isolated locations. The sensors are able with small amount of computing and communication capability and can be deploy in ways that wired sensor systems could not be deployed. Even sensor nodes are capable for judgment of illegal logging of some objects in Forest. In the past few years, the applications of Wireless Sensor Network have been widely used and applied in forest and agricultural for environmental monitoring.

II. REALTED WORK

WSN technology can be used for various large scale monitoring purposes, providing sensor measurements at high resolution. This technology, therefore, provides various information regarding different monitoring applications such as forests, waterways, buildings, security, agriculture, battlefield etc. Wireless Sensor Networks (WSNs) can also perform operations such as event detection, aggregation, sensing [4]. Author [5] illustrates the kind of WSN in forest based on Zigbee communication. Authors [6] explain the various frequency spectrum of WSN in regards with its application. Air pollution monitoring using WSN had been explained [7]. The networks allow coordinated signal detection, monitoring, and tracking to enable sensor nodes to simultaneously capture geographically distinct measurements [8]. Authors [9] discussed long-term challenges for WSN technology in environmental monitoring.

PROTOCOL DETAILS

1. ***LEACH***:

LEACH is a hierarchical protocol in which most nodes transmit to cluster heads, and the cluster heads aggregate and compress the data and forward it to the base station (sink).

Each node uses a stochastic algorithm at each round to determine whether it will become a cluster head in this round. LEACH assumes that each node has a radio powerful enough to directly reach the base station or the nearest cluster head, but that using this radio at full power all the time would waste energy.

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Nodes that have been cluster heads cannot become cluster heads again for *P* rounds, where *P* is the desired percentage of cluster heads. Thereafter, each node has a 1/*P* probability of becoming a cluster head again. At the end of each round, each node that is not a cluster head selects the closest cluster head and joins that cluster.
The cluster head then creates a schedule for each node in its cluster to transmit its data. All nodes that are not cluster heads only communicate with the cluster head in a TDMA fashion, according to the schedule created by the cluster head.
They do so using the minimum energy needed to reach the cluster head, and only need to keep their radios on during their time slot.
Shortcomings of LEACH include:

- Remaining energy among the nodes isn't considered when selecting Cluster Heads
- Random and variable size cluster formations
- Random and uneven distribution of cluster heads
- Single hop communication in situations where energy use is less efficient from cluster head to base station

2. ***MODLEACH***:

These protocols modify LEACH, when it introduces an efficient CH (Cluster Head) replacement technique with dual transmit power level. The CH is changed by every round. In every one round, CHs are changed as well as entire cluster formation procedure is repeated. If CH have not use up much power and have extra power than the threshold, it will happen to CH used for the follow round also. By this method, power lost inside routing data for new CH and cluster formation be save. Otherwise, it will be real changed within the same method as in LEACH. Additional, soft and hard thresholds be used toward improve the performance even more

3. ***PEAGASIS***:

Power-efficient gathering in sensor information systems (PEGASIS) is an enhancement over the LEACH protocol was proposed in [70]. It is chain based protocol, in which nodes need to communicate with their closest neighbors and take turns in communicating with BS. Each node in the network uses signal strength to locate the closest neighbor. The chain in PEGASIS consist of nodes closest to each other that forms a path to the BS. The sensor nodes organize themselves to form a chain. If any node dies in between then the chain is reconstructed to bypass the dead node. A leader or a cluster head node is assigned and it takes care of transmitting data to the base station/ sink node. The main goal of PEGASIS is to receive and transmit data to and from the neighbor and take turns being the cluster head for transmission to the Sink Node.

4. ***APTEEN***:

Adaptive Periodic Threshold-sensitive Energy Efficient Sensor Network protocol (APTEEN) is an extension to TEEN and aims at both sending periodic data and react to time critical events. On the other hand, APTEEN combines the feature of proactive and reactive networks and transmits data in adjustable time intervals while it still responds to sudden changes in attribute values. APTEEN is based on a query system which allows three types of queries: historical, on-time, and persistent which can be used in a hybrid network. The CH selection procedure is based on the method used in LEACH-C.

Table 1: Protocols used for Energy Efficient system in WSN

1. Source and Destination Based		
SPIN (Sensor Protocol for Information via negotiation)	**DC** (Data Centric)	**LEACH** (Low –Energy Adaptive Clustering Hierarchy)
2. Path Establishment based		
Proactive DD, SPIN	**Reactive** PEGASIS	**Hybrid** RR (Rumor Routing) APTEEN (Adaptive Threshold Sensitive Energy Efficient Sensor Network Protocol)

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3. Network Structure Based		
Flat Based Routing EAR (Energy Aware Routing) Flooding Gossiping SPIN	**Hierarchical Based Routing** - PEGASIS (Power Efficient Gathering in Sensor Information System) -LEACH - HPAR(Hierarchical Power active Routing) - HEED (Hybrid Energy Efficient Distributed Routing)	**Location Based Routing** GAF (Geographic Adaptive Fidelity) GEAR (Geographic Energy Aware Routing) SAR (Sequential Assignment Routing)

III. CONCLUSION

The proposed review is expected not only to solve most of the challenges affecting routing process in WSN, but also to have a network with high throughput, minimal delay and able to predict the communication between the nodes. The best result for increasing the quality of sensing with low power consumption and low cost is what we expect. The further author will simulate the above protocols and find the best optimum solution to be used for WSN.

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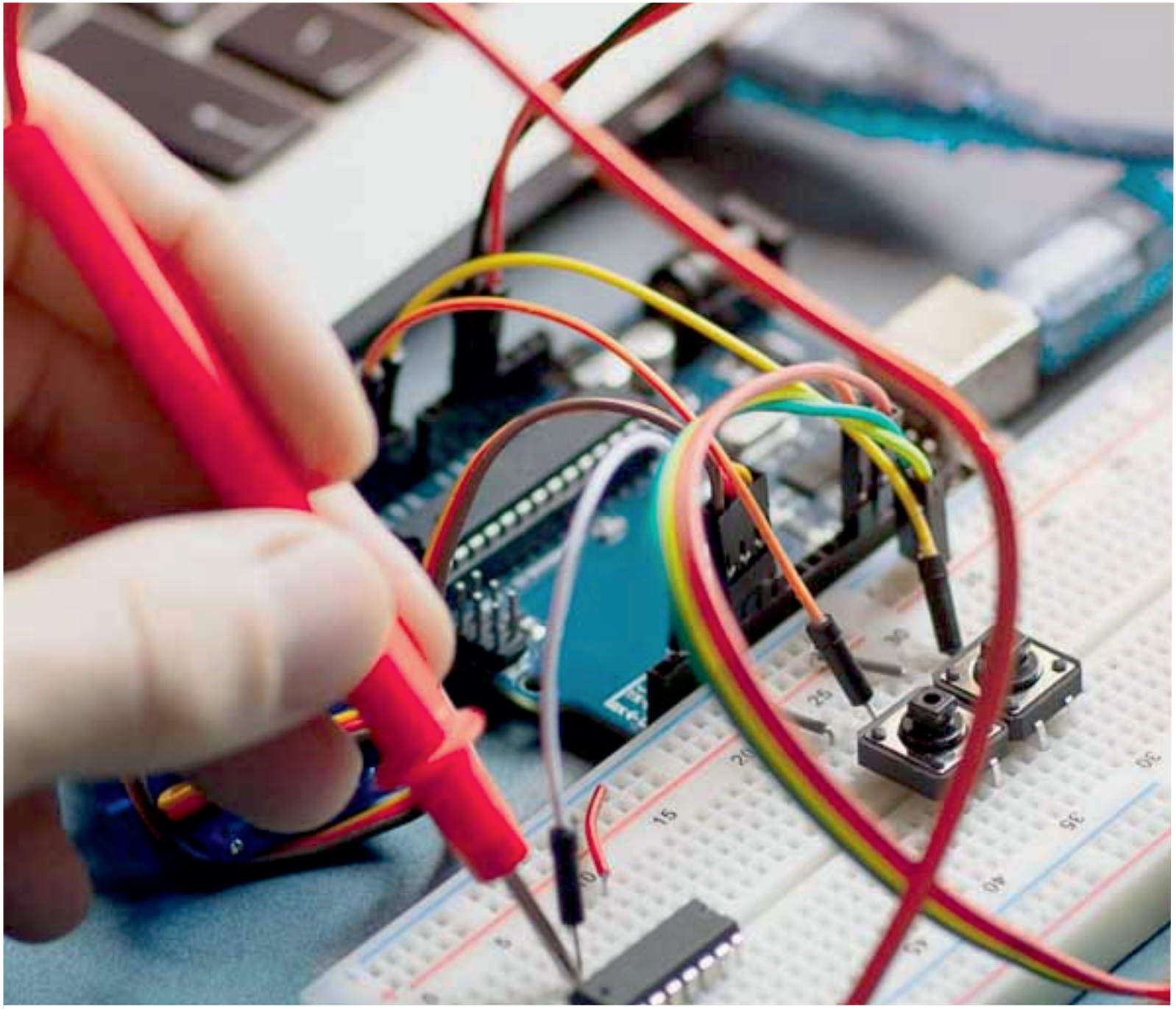

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