A Study on Network Lifetime of Wsns by using Different Modlation and Clustering Techniques

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***Abstract*—WSNs have many more applications, which are make helpful for our people. Wireless Sensor Networks (WSNs) have the number of sensor nodes, each sensor node has the scarce and the irrecoverable battery power of the sensor node. The most important aspect, should be concentrating on the lifetime of the WSNs. The lifespan of the WSNs relies upon on the battery power of the node. The battery power depends on the data transmission. Energy consumption is directly proportional to the distance travelled and size of the data packet. The size of the packet can be reduced by applying different modulation techniques namely, Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), and Delta Modulation (DM). The distance travelled by the node can be reduced by applying clustering techniques, namely, even and uneven. Compare and analyze all the modules for the better improvement in the network lifetime of the WSNs.**

Keywords—WSN, Energy efficient, Optimization technique, Network Lifetime;

I. INTRODUCTION

The network, which consisting of a number of sensor nodes deployed in remote places is called WSNs. Each sensor node has a limited battery power. Our aim is to efficiently utilize the battery power of the sensor nodes [1].

Rather than having adaptable network topology changes, WSNs have constant change in the network topology. Every node broadcasts the information to all the nodes present in the coverage area.

Sensor nodes play a very important role in the network. Each sensor node consists of limited battery power, storage, communication and computational capabilities. Sensor nodes are made up of four basic components namely sensing unit, processing unit, a transceiver unit and a power unit. They may also have application dependent additional components such as a location finding system, a power generator and a mobilizer user.

The sensor node is a very important entity in the WSNs that are used to collect the data and then it transfers that data to base station, then to the user via the internet. This is shown in figure 1. Sensor nodes consume more energy while transmitting the data. Hence, to efficiently utilize the battery power of the sensor node in the WSNs for which the size of the packet needs to be reduced.

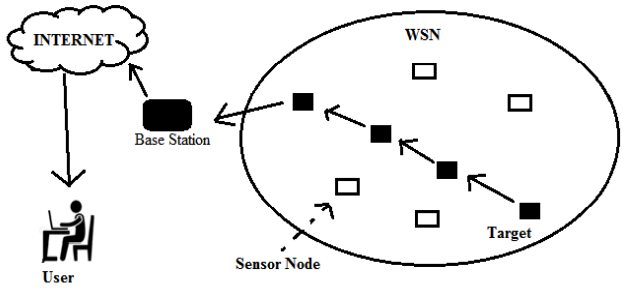


Figure 1: Architecture of the WSNs

A. *Characteristics of WSNs*

Wireless sensor networks are strongly restricted by energy, capacity and computing power. So it is essential to design effective network in order to increase the network characteristics[2]. The important characteristics of WSNs are as follows:

- Minimum Power consumption
- Ability to cope with node failures (resilience)
- Heterogeneity of nodes
- Mobility of nodes
- Communication failure
- Scalability to large scale of deployment
- Ability to withstand in unfavorable environmental conditions
- Cross-layer design
- Ease of use

B. *Major Challenges of WSNs*

The major challenges of WSNs are as follows,

- Mobility and Topology Changes: Due to mobility of sensor nodes, network topology changes dynamically.
- Energy constraints: Every node has a limited battery power, hence energy should be efficiently utilized.

- **Security issues**: Needs to secure the data from unauthorized access users.

II. RELATED WORK

Efficient coverage area of the network is analyzed in this work (An efficient approach for sensor deployments in wireless sensor network) Different patterns were analyzed like triangular lattice, hexagonal and square grid. It was found that triangular lattice is efficient because it covers a larger area with a smaller number of nodes [5].

In this work (Multi-level Clustering Architecture for Wireless Sensor Networks, Energy Efficient Clustering and Routing Scheme for Wireless Sensor Network) rather than allowing the nodes in the network directly transmit the data to the base station; a new approach is applied that is clustering technique. This provides efficient utilization of resources and minimizes the energy consumption in WSNs [6] [7].

In this work (Energy Efficient Protocol for Heterogeneous Wireless Sensor Network using Ant Colony Optimization) to improve the network lifetime, Time Division Multiple Access (TDMA) scheduling algorithm is used. This helps the nodes to be active during the allotted time period. It means that nodes will be active only when the data is transmitted or received [3].

III. SIMULATION USNING NETWORK SIMULATOR 2(NS2)

It is an imitation of actual objects in the world and it was founded in 1989 and it was supported by DARPA in 1995 through the virtual inter network (VINT) test bed project. Based on a refactoring by Steve McCanne network simulator version 2 was initiated. The core of ns2 is composed in OOMD language and OTcl (object Tcl). OTcl language is used to write the simulation script extension Tcl.

IV. Proposed Work

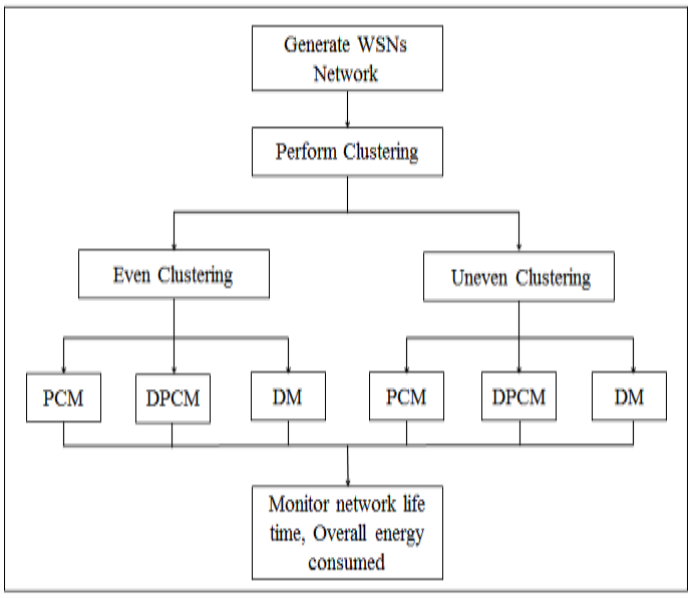


Figure 2: Work Flow of the Proposed Work

The following figure 2 shows the workflow of the proposed work. The network is divided into even and uneven cluster. The modulation techniques are applied, namely PCM, DPCM and DM.

A. Clustering

Clustering means divide the whole network into smaller number of groups consisting of sensor nodes. Group the network as even or uneven cluster. The following steps shows that clustering approach,

1. Node Deployment
2. Group the network as even or uneven clustering
3. Initially the Base Station (BS) will choose the Cluster Head (CH), the center of the cluster becomes the CH.
4. CH broadcast the messages to the nodes in the network, informing that it is a CH.
5. The nodes present in the cluster send the data to the CH.
6. CH performs aggregation, then send to the BS.
7. After the first round CH select the highest energy level of the node has new CH.
8. Repeat from step 4.
9. Procedure repeats until the node has battery power to perform the task.

Even Clustering - In this the area/radius of each cluster remains same.
Uneven Clustering - In this area/radius of each cluster reduces with constant value as it approaches the Base Station.

B. Data Optimization phase

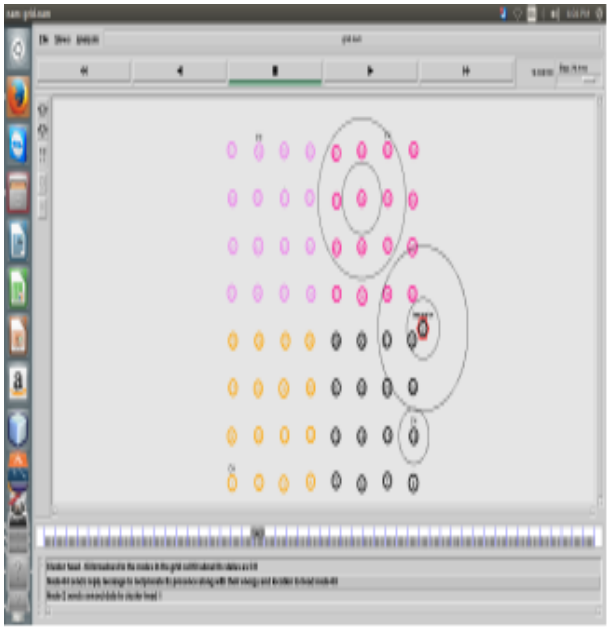
Different modulation techniques are used to compress the data, namely PCM, DPCM, and DM technique.

a. PCM: Simple pulse code modulation where payload is the complete sensed data which is converted to digital.
b. DPCM: Differential pulse code modulation where difference in previous and present sensed value is transmitted.
c. DM: Delta modulation it is reduced to one bit. Only that bit will be sent as a message.

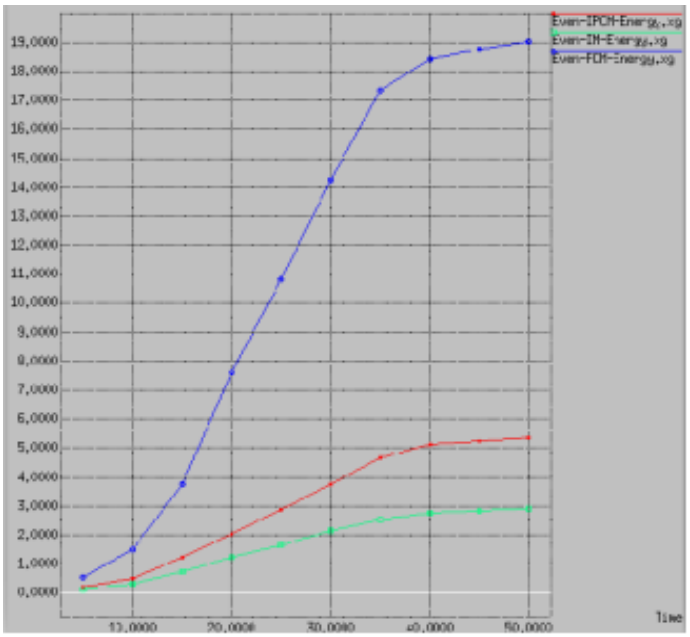
V. RESULTS AND ANALYSIS

Snaphot1 shows the even clustering technique. All the CH in the even cluster transmitts the data to the BS. Snaphot2 shows the uneven clustering technique. All the CH in the uneven cluster transmitts the data to the BS.

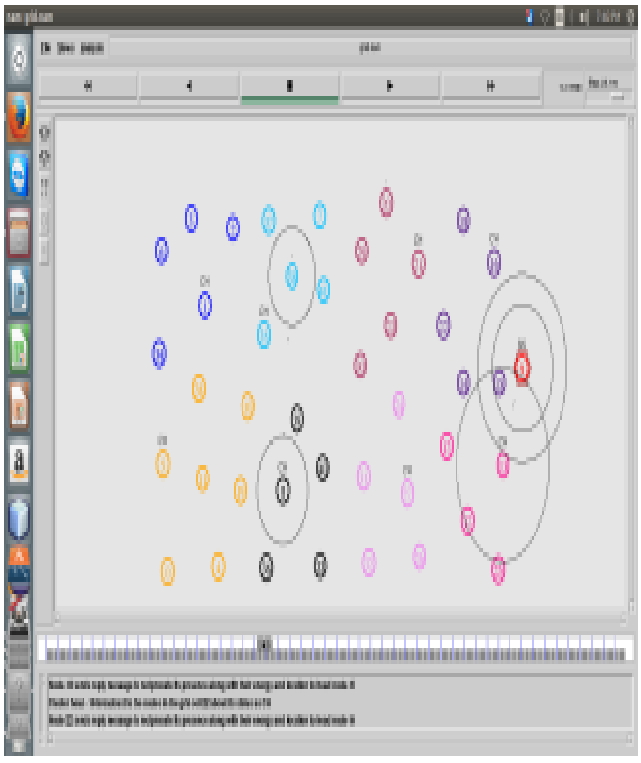
Snapshot 3 and Snapshot 4 shows the energy consumption by the sensor node in the WSNs. By applying different modulation techniques namely, PCM, DPCM,and DM.



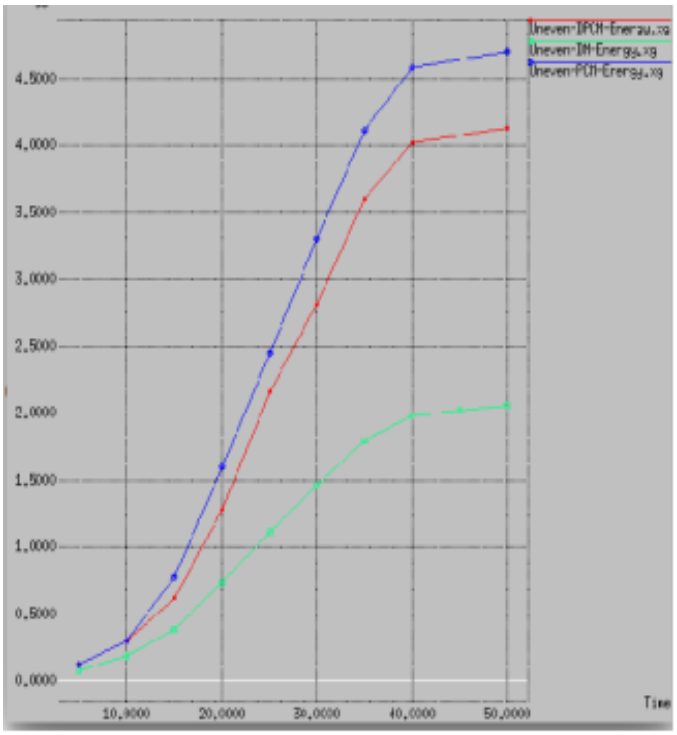
Snapshot 1: All the CH in the even clustering, transfers the data to BS



Snapshot 3: Energy consumption in the Even Modulation Techniques



Snapshot 2: All the CH in the uneven clustering, transfers the data to BS



Snapshot 4: Energy consumption in the uneven modulation Techniques

Table 1: Energy consumption by the sensor node by applying the techniques and unit of measurement is in Joules (J)

Modulation\Clustering	EVEN	UNEVEN
PCM	19.0 J	4.7 J
DPCM	5.3 J	4.3 J
DM	3.0 J	2.0 J

From table 1 observe that, uneven clustering gives the best result when compared to the even clustering. Because the uneven cluster has the different size of clusters hence it consumes better battery power of the sensor node. The DM gives the better output when compared with the all modulation technique. Because it transfers only one bit of data.

CONCLUSION

In the presented work various factors which influence energy consumption and network lifetime were considered such as deterministic triangular grid sensor deployment, even and uneven clustering. It has been observed that clustering of nodes improves the overall efficiency of the network, with even cluster size, the energy consumption is reduced and for uneven clustering it is much improved. Therefore packet size optimization is employed. PCM, DPCM and Delta modulation are used to reduce the size of the data packets.

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