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REVIEW ARTICLE

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A Novel Optimization Based Energy Efficient Routing Protocol to Increase the Survivability of WSN(wireless sensor network)

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Abstract: Large scale wireless sensor networks (WSNs) can be used for various pervasive and ubiquitous applications such as security, health-care, industry automation, agriculture, environment and habitat monitoring and these are harshly restricted by storage capacity, energy and computing power. So it is essential to design effective and energy aware protocol in order to enhance the network lifetime and to reduce energy consumption.

Keywords: WSN, PSO, GE, ABC, QoS

I. INTRODUCTION

Wireless Sensor Networks (WSN) are intended for monitoring an environment. The main task of a wireless sensor node is to sense and collect data from a certain domain, process them and transmit it to the sink where the application lies. However, ensuring the direct communication between a sensor and the sink may force nodes to emit their messages with such a high power that their resources could be quickly depleted. Therefore, the collaboration of nodes to ensure that distant nodes communicate with the sink is a requirement. In this way, messages are propagated by intermediate nodes so that a route with multiple links or hops to the sink is established [3].

WSN consist of four main components: A radio, a processor, sensors and battery. A WSN is formed by densely deployed sensor nodes in an application area. In most deployments, the sensor nodes have self-organizing capabilities, to form an appropriate structure in order to collaboratively perform a particular task. Wireless Sensor Networks (WSNs) is a class of wireless ad hoc networks in which sensor nodes collect, process, and communicate data acquired from the physical environment to an external Base Station (BS) [1].

II. CLASSIFICATION OF SENSORS

The sensors are classified into three categories:

A. **BS (Base Station):** A base station, in contrast to a sensor node possesses of much more computational power, larger memory and it is often connected to a better source of energy. On a base station, sensed data can be stored, visualised and analyzed. The base station should also provide a Graphical User Interface to interact with the user or even forward sensed data to a remote server via the Internet.

B **CH (Cluster Head)**: In our approach, cluster heads are elected distributed based on the parameters of the residual energy and the number of neighbors. CH is in charge of data receive, data process, data aggregation and data transmission. The energy consumption of CH is much quickly than normal nodes.

C. **NSN (Normal Sensor Node):** Sensor nodes are usually small and cheap components powered by batteries, equipped with a sensor and a wireless communication system. A sensor node gathers some of environmental properties (e.g. temperature, pressure or moisture of air), translates them into digital form1 and sends them wirelessly via other sensor nodes to a base station.

III WIRELESS SENSOR NETWORK ARCHITECTURE

The wireless sensor network architecture consisting of one sink node (or base station) and a (large) number of sensor nodes deployed over a large geographic area (sensing field). Data are transferred from sensor nodes to the sink through a multi-hop communication paradigm [7]. The energy consumption for transmission of data is more compared to data processing [5]. The energy cost of transmitting a single bit of information is approximately the same as that needed for processing a thousand operations in a typical sensor node. The energy consumption of the sensing subsystem depends on the specific sensor type. In general, energy-saving techniques focus on two subsystems: the networking subsystem, and the sensing subsystem . The lifetime of a sensor network can be extended by jointly applying different techniques. For example, energy efficient protocols are aimed at minimizing the energy consumption during network activities. However, a large amount of energy is consumed by node components (CPU,

radio, etc.) even if they are idle. Power management schemes are thus used for switching off node components that are not temporarily needed. Specifically, it focuses primarily on the networking subsystem by considering duty cycling. Furthermore, the main techniques suitable to reduce the energy consumption of sensors when the energy cost for data acquisition i.e. sampling cannot be neglected. Finally, introduce mobility as a new energy conservation paradigm with the purpose of prolonging the network lifetime. These techniques are the basis for any networking protocol and solution optimized from an energy-saving point of view [6].

IV UNIQUE FEATURES OF SENSOR NETWORKS

The following are the unique features of the wireless sensor network [8]

- Large scale of deployment
- Unattended operation
- Small-scale sensor nodes
- Limited power they can harvest or store
- Harsh environmental conditions
- Mobility of nodes.
- Network topology is dynamic
- Heterogeneity of nodes

V OPTIMIZATION TECHNIQUES FOR ROUTING IN WSN

1. Energy Efficiency: Multiple routes can communicate a node and the sink. The aim of energy-aware algorithms is to select those routes that are expected to maximize the network lifetime. To do so, the routes composed of nodes with higher energy resources are preferred [3].
2. Data Aggregation : Since sensor nodes may generate significant redundant data, similar packets from multiple nodes can be aggregated so that the number of transmissions is reduced. Data aggregation is the combination of data from different sources according to a certain aggregation function, e.g., duplicate suppression, minima, maxima and average. This technique has been used to achieve energy efficiency and data transfer optimization in a number of routing protocols [4].
3. Multipath Communication : With this technique, nodes use multiple paths from an origin to a destination in the network. As multipath communications are intended to increase the reliability and the performance of the network, these paths should not share any link [3].
4. Quality of Service : In some applications, data should be delivered within a certain period of time from the moment it is sensed, otherwise the data will be useless. Therefore bounded latency for data delivery is another condition for time-constrained applications. However, in many applications, conservation of energy, which is directly related to network lifetime, is considered relatively more important than the quality of data sent [4].

VI CHALLENGES AND CONSTRAINTS OF WIRELESS SENSOR

Networks

Despite the innumerable applications of WSNs, these networks have several restrictions, e.g., limited energy supply, limited computing power, and limited bandwidth of the wireless links connecting sensor nodes. we summarize some of the routing challenges and design issues that affect routing process in WSNs [4]

Node deployment: Node deployment in WSNs is application dependent and affects the performance of the routing protocol. Energy consumption without losing accuracy: sensor nodes can use up their limited supply of energy performing computations and transmitting information in a wireless environment.

Node/Link Heterogeneity: In many studies, all sensor nodes were assumed to be homogeneous, i.e., having equal capacity in terms of computation, communication, and power.

Fault Tolerance: Some sensor nodes may fail or be blocked due to lack of power, physical damage, or environmental interference. The failure of sensor nodes should not affect the overall task of the sensor network.

Connectivity: High node density in sensor networks precludes them from being completely isolated from each other. Therefore, sensor nodes are expected to be highly connected.

VII METHODOLOGY

At first stage, a detailed literature study would be conducted on the basics of wireless sensor networks, types of networks and various problems & challenges associated in designing of WSN. Then a deep study of existing routing protocols and energy adaptive techniques will be preceded which enhances the network performance. After that use of various optimization techniques like GA, PSO, ABC will be understood in area of WSN. Literature study will lead us towards refining the structure of the proposed design. Afterwards, the proposed solution will be implemented in MATLAB simulator and a thorough performance analysis would be performed. Obtained results would be analyzed and compared with the existing techniques.

VIII CONCLUSION

Conducting the detailed literature review on the WSN clustering techniques and routing protocols to know their advantages and disadvantages and the various optimization techniques like Genetic Algorithm, Particle Swarm Optimization (PSO) and their application in solving the WSN problems and design a hybrid technique by combining the existing WSN protocol with latest optimization algorithm to improve the performance of WSN in terms of enhanced lifetime/low energy consumption. Finalize the proposed model simulation by resolving problems. At the end analyze and compare the final results obtained from the proposed model in order to conclude the effectiveness of the proposed model.

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