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Abstract:
Wireless sensor network has been recognized as a key technology in military applications. Wireless Sensor Network (WSN) is contiguous distributed autonomous sensors to monitor physical or environment conditions and to cooperatively pass their data through the network main location. Mobile Access points (MAs) traverse the network to collect information directly from individual sensors. In the existing system, it uses LEACH protocol to lower the energy consumption required to create and maintain clusters in order to improve the lifetime of the WSN. But this approach generates overhead associated with the sink location acquisition, which would impact the throughput and delay of data transmission as well as the energy efficiency due to the frequency transmission and reception of control messages. However, this would be inefficient in terms of energy consumption as well as delay. To overcome this problem, the proposed methodology uses Distance Vector Multicast Routing Protocol (DVMRP); it requires that a router informs its neighbors of topology changes periodically. The distance vector refers to the fact that the protocol manipulates vectors of distances to other nodes in the network. The vector distance algorithm used to investigate the optimal topology design that minimizes the average number of hops from the sensor to MA, and provide the analysis of throughput under both single-path and multi-path routing cases. Using this methodology, it can ensure reliability, efficiency, and ad-hoc enabled flexibility.

Keywords: Delay, Distance Vector Multicast Routing Protocol (DVMRP), Low Energy Adaptive Clustering Hierarchy (LEACH), Mobile Access Points (APs), Throughput, Wireless Sensor Network.

I. INTRODUCTION

A wireless sensor network is a group of the specialized network with a communication framework for monitoring and recording conditions at diverse locations. Potential applications of sensor networks include video surveillance, air traffic control, monitoring weather condition, traffic monitoring etc[2]. Wireless sensor nodes use access points to connect users with other users within the network and also can serve as the point of correlation between the WLAN and a fixed wired network. Each access point can able to serve multiple users within a defined network area as people move behind the range from one access point to other automatically. A small WLAN usually requires a single access point and increases its number depends on the network users and the physical size of the network. In the mobile access point, data transmission based on the physical speed of the access point which impacts the efficiency parameters throughput and delay [3][5]. In the existing system, it uses [4] LEACH protocol it is a TDMA based MAC protocol which is clustering and a basic routing protocol in wireless sensor networks. It is used mainly to lower the energy consumption required to improve the lifetime of a wireless sensor network. The issue of this approach is the overhead associated with sink location acquisition. In order to overcome this problem, Distance Vector Multicast Routing Protocol (DVMRP) is used. DVMRP protocol is based on the RIP protocol. The router creates a routing table with the multicast group of which it has the ability with corresponding distances. DVMRP serves via a reverse path flooding technique, sending a copy of a received packet through each interface except the one at which the packet arrived. DVMRP channels multicast transmission within unicast packets that are organized into multicast data when they reach their destination.

Single-path Vs Multi-path:

Single-path: In a single-path routing method, only a single path remains between any two networks in the internetwork. While this reduces the routing tables and the packet flow paths, single-path networks are not fault tolerant [11][12].

Multi-path: In a multi-path routing method, multiple paths exist between networks in the internetwork. The multipath network is fault tolerant when dynamic routing is used. It can be more complex to configure. Wireless Access Point (WAP) is an equipment that allows Wi-Fi device to connect to a wired network. In the proposed method it uses Mobile Access Points (MAs), which denote the same meaning as access point along with move in the network. Using MAs it can achieve high monitoring capability. The major features of mobile access points are: Access wherever, cost and convenience, privacy and achieves security.

II. RELATED WORKS

In [2] Noufal.K.P discussed the issues arisen in wireless sensor networks. Routing in wireless sensor networks is limited because of the capabilities of the sensor nodes. The first algorithm was Location-Based Protocols in which sensor nodes are recognized by the location address of the specific nodes. It guarantees each sensor node send their data independently. The second algorithm was Hierarchical Protocols in which nodes are clustered and the transmission
done through the cluster heads. It reduces the power consumption by each sensor nodes.

In [4] Mohamed Lehsaini, Herve Guynenet, and Mohammed Feham introduced the Cluster-Based Energy Efficient Scheme (CES) to improve the lifetime of the network. The CES algorithm used to elect cluster-head to distribute energy across the nodes in the network, which will improve the lifetime of the network. In this algorithm, sensor nodes with the greatest weight will be elected as a cluster-head. The main protocol is LEACH which supports single hop algorithm for homogenous WSNs. In LEACH cluster-head role is rotated periodically among the sensors to equally distribute energy across the nodes in the network.

In [8] Gokhan Mergen and Lang Tong discussed the maximum throughput of an opportunistic slotted ALOHA protocol. It is used to achieve throughput when the number of users gets increased. To find the throughput Signal-to-Interference-Ratio (SIR) threshold method is used. In the ALOHA protocol, nodes transmit its backlogged packets without channel in the message over time. In ALOHA protocol, users can adjust their transmission.

In [13] Gokhan Mergen, Qing Zhao and Lang Tong introduced Sensor Network with Mobile Access point (SENMA) in which sensor nodes are grouped and each cluster contains a mobile Access Points (APs). SENMA offers energy efficient transmission and multihop ad-hoc architecture. Mobile APs significantly reduces the timing recovery and synchronization. Each APs work independently.

The system performs sensor nodes are clustered and each cluster connected along with the mobile access points. The cluster also includes Cluster Head (CH), Center Cluster Head (CCH), and Ring Cluster Head (RCH). The sensor nodes send their data to the base station using the above cluster heads. In this system it limits the average number of hops from the sensor to mobile access points, which will increase throughput, reduce delay and using the energy efficiently.

III. THE PROPOSED ENERGY EFFICIENT TRANSMISSION SCHEME

To overcome the problems arise in the existing system, the following method is proposed. In the existing system, it uses Sensor Network with Mobile Access Point (SENMA) in which mobile access point traverse the network to collect information from the individual sensor. But the transmission of data is affected by the physical speed physical speed of the APs and their length. To resolve this problem, Mobile Synchronized Wireless Sensor Network has been proposed. This method uses Distance Vector Multicast Routing Protocol (DVMRP), which improve the throughput, reduce delay and enhance the energy of the system.

A. Mobile Access Points (MAs)

In wireless sensor network (WSN), the access point is a station where transmits and receives data. Access Points connects users to other users within the framework. Data transmission is done via the access points in the wireless sensor network.

B. GENERAL DESCRIPTION

In the proposed method, the network is split into cells of radius d. Each cell includes single Mobile Access Points (MAs) attached to it. Each cluster is controlled by the cluster head (CH), who is responsible for getting data from all the cluster members. Additionally, Center Cluster Head (CCH) is deployed in the middle of each cell, and K ring cluster head (RCH) are added on the ring of radius R_0. The CCH and RCH can initialize direct communication with the MA or with other RCH which is closer to the MA. All the nodes within a distance R_0 from CCH route its data to the MA through CCH. Remaining nodes route its data to the MA through the nearest RCH. Once the sensor node is within MAs coverage then direct communication take place when required. After receiving all the data from the sensor nodes, the MA delivers it to a Base station (BS). This method commonly analyzes the throughput of the system under both single path and multipath routing is used. This proposed system is independent of the speed of the MA, which has a higher advantage than SENMA. This method proposes that the average number of hops between the sensor and its nearest CH is minimized.

FIGURE 1. MOBILE ACCESS POINTS

Figure 1. shows the access points [14] which give wireless network services to their surrounding users.

FIGURE 2. SYSTEM ARCHITECTURE

Figure 2 describes the system architecture of the proposed method. Deploying the nodes from SENMA, it delivers sensor nodes to the system. Then elect the cluster head based on the Local Energy Estimation algorithm. Using this algorithm sensor nodes with the highest energy can be elected as the Cluster Head (CH). This algorithm can be used to elect the CCH and RCH. If the sensor node within the distance R_0, route the data to MA through CH. All the other nodes send their data...
to the nearest RCH. MA collects data from all the sensors. Then MA forwards the data to the Base Station (BS).

C. Data Collection

Data collection from individual sensors can be event based or periodic. Data transmissions from the sensor node to CHs, between CHs, and from CCH/RCH to the MA are done on different channels to avoid intrusion between different communication links. Let the communication range of every sensor node and CH be \( r_c \) and \( R_c \) respectively. CH have larger storage capacity and longer communication range than SNs which is denoted as \( R_c > r_c \). But sensors are not involved in inter-cluster routing method in order to minimize its energy consumption. To improve the throughput and minimize the delay, a number of hops in routing should be minimized. MA moves physically for data collection only when the routing paths do not work.

D. Distance Vector Multicast Routing Protocol (DVMRP)

DVMRP is an Internet-based routing protocol which provides an energetic mechanism for connection-less datagram delivery to a group of hosts across an internetwork. DVMRP uses a distance vector distributed routing algorithm which builds peer-group multicast delivery. DVMRP routing decision depends on the source address of the packet. This protocol is based on the RIP protocol. It generates a routing table with the multicast group with an idea of the corresponding distances.

IV. NETWORK TOPOLOGY DESIGN

To investigate the network topology design of the system, it needs to calculate the optimal radius \( R_0 \) and the ring radius \( R_t \) which minimizes the average number of hops from any CH to the MA[1]. Minimizing the number of hops directly improves the throughput. A number of hops are proportional to the distance between the source and their corresponding sink [8].

![FIGURE. 3. SYSTEM WITH FOUR POWERFUL RCHS](image)

Figure 3 shows the circularly shaped cell [1]. The Cluster Head (CH) is uniformly distributed in a circle of radius d.

V. SYSTEM MODULES

The proposed system contains the following modules to achieve the target of the system.

Deploying Nodes to from SENMA

SENMA consists of two different types of nodes, they are Sensor nodes and Mobile Access Points.

Sensor nodes are low power and low-cost nodes, but it limits processing and communication capability. But in contrast, mobile access points are equipped with powerful processors and well-equipped transceivers.

Cluster Formation

The network is split into cells of radius d. Each cell contains single powerful Mobile Access Points(MA) with its. These clusters are controlled by the Cluster Head(CH). CH, RCH, CCH are elected based on the sensor nodes.

Center/Ring Cluster Head Selection

Center/Ring Cluster Head is selected by Center Cluster Head Election Algorithm using Local Energy Estimation(CCHEA) that uses energy levels of neighboring sensor nodes as well as local energy level to restrict the decrease of the CH probability of the sensor nodes.

Data Collection By Center/Ring Cluster Head

Data collection from the sensors can be event based or periodic. Data transmissions from SNs to CHs, between CHs, and from CCH/RCHs to the MA are made over different channels to avoid interference between different communication links. The communication range of each sensor node and CH be \( r_c \) and \( R_c \) respectively. CHs have larger storage capacity and longer communication range than SNs, i.e., \( R_c > r_c \). Assume shortest path routing between the CHs and the CCH/RCHs.

Data Delivery to Base Station

Data collected from the center/ring cluster head is transmitted to Mobile Access Point. This data collection can be event based or periodic. The mobile access point delivers the data to base station.

VI. RESULTS

This system describes the performance of Mobile synchronized wireless sensor network through simulation values and comparison values. Here the system assumes that SNs and CHs are distributed in each and every cell, and TDMA/FDMA is used for scheduling. It considers the following parameters. The range of cluster heads is \( R_c = 30 \) m and that of sensors is \( r_c = 15 \) m, the assumed values for \( R_0 \) and \( R_t \) are set according to the proposition I, the path loss exponent is \( \beta = 2 \). And threshold value is \( \gamma = 5 \) dB, and the bandwidth reuse measure is \( N_{max} = 2 \). Take the packet size is 16 bytes and rate of data is 5 Kbps, then the packet duration is 25.6 ms. In this simulation, the collision effect or interference among clusters use the same channel or frequency band is take into account. The neighboring CHs with distance smaller than \( N_{max} R_0 \) from active CH is participating in the system performance.

Time Vs Throughput

The Time Vs Throughput graph describes the analysis of throughput based on time. Throughput normally used to measure the amount of data that can be transmitted at a time. Throughput can be measure using the parameter kbps.
Figure 4 shows the graphical representation of Time Vs Throughput. Throughput can be analyzed in both single path and multipath routing cases.

**Time Vs Delay**
The Time Vs Delay graph describes the delay based on time. Delay normally measured as the amount of time it gets delayed compared to the expected time of data delivery.

**Time Vs Energy**
The Time Vs Energy graph shows the energy of the system it can sustain to a certain level. Energy is measured as the amount of energy it can use in data transmission and the ability to maintain the lifetime of the system. Energy is measured in joules.

Figure 6 shows the energy maintained by the proposed system based on time. Energy is simply the lifetime of the network while using the resources continuously.

**D. Time Vs PacketLoss**
The Time Vs PacketLoss graph shows that the no of packets lost during data transmission. Packetloss calculated based on the time parameter. It usually measured in kbps.

Figure 7 shows the amount of packet loss during the data transmissions.

**VII. CONCLUSION**

The proposed method achieves better performance, which improves the throughput of the system, reduces delay, efficient usage of energy and very low packet loss. The Mobile Access Points (MAs) coordinate the sensor nodes and its data transmission; this proposed methodology achieves a highly resilient, reliable, and scalable system. This methodology reduces the average number of hops from any sensor to the MA. Throughput analysis is done in both single-path and multi-path system. The Future work related to the suggestion that the problem arises in MAs. Sometimes MAs needs to be recharged or reloaded. If possible, exchange the defect MAs with the new MAs which is only done by the Base Station (BS). To resolve the above problem, Base Station (BS) needs high energy and efficient management functionalities.

**VIII. REFERENCES**


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