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Energy Efficient Hierarchical Routing Protocol for WSN

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Abstract **- Network considered being fully utilized and best efficient [1] when resources used by it are in optimal shape. Ad-hoc network is the specific type of network that need efficiently used resources for its working in field as ad-hoc devices are limited by their energy and need timely resources. Wireless sensor network are very tiny in size and their cost is also quite low but due to limited resources, these sensor seek best utilization of resources so to save energy and to increase lifetime for network. Routing in wireless sensor network is quite an issue if it comes to optimal resources utilization. Many protocols are in act to perform routing in wireless sensor network which including leach, Pegasis, E-pegasis, Chiron [2] etc. These protocols provide good use of resources and have some advantages and disadvantages over each other in sense of lifetime, delay, efficiency, data delivery and stability. Since the requirement of a energy efficient data gathering protocol [3] is very important to serve the purpose in wireless sensor network so in our research we will try to change the idea relating to the data gathering and transmission of the existing model, as chain leaders belonging to certain covering angle will only transmit the gathered data to the another chain leader of the same covering angle in sequential manner. Our research can provide better efficiency and resource consumption. Since Chiron is latest protocol and provides some good results over other protocols so we are proposing the changes in Chiron protocol so that to use more resources with less delay.**

Keywords **- Wireless Sensor Network, Chiron, Routing protocol, delay, lifetime.**

I. INTRODUCTION

The sensor network growing at a fast rate and most growing part is wireless sensor networks which considered to be containing large number of battery powered devices which act as sensors. These sensors are tiny in size and very limited with resources and are randomly distributed in particular sensor filed which can be attended and unattended according to the requirements for sensing and collecting the wanted data from the surroundings, and thus reporting the fused information to a remote *Base Station* (BS). Due to distributed environment it is quite a difficult task to fulfill the battery refilling and this recharging problem act as short coming for wireless sensor network. So with limited resources, how to conserve node's power and thus prolong [4] the network lifetime is a critical issue in WSNs. As it is very important to conserve the power of the nodes so that the life time of the entire network can be conserved. Hence the requirement of a power efficient data gathering protocol is very important to serve the purpose in wireless sensor network. In the proposed work, it is being tried to change the idea relating to the data gathering and transmission of the existing model, as, chain leaders belonging to certain covering angle will only transmit the gathered data to the another chain leader of the same covering angle. And in this way data will be transmitted to the sink through multiple data streams, so that the burden of data transmission is being shared by the chain leaders of different covering angles, which will reduce the consumption of power required by head nodes to transmit large amount of data through a single data stream. It is also expected that the model will improve the latency, because the number of hops required for transmission of data through multiple streams are less than it required for a single data stream.

II. LITERATURE REVIEW

From different papers studied:

Kuong-Ho-Chen et al., has proposed a chain based routing protocol [6] which has been discussed to mitigate the problem of data propagation delay, redundant transmission. The placement of the Base station is on the Beam Star concept. Comparison have been made with other chain based protocols like-PEGASIS and EPEGASIS. The simulation environment is MATLAB.Simulation [8] results show that the proposed protocol is superior to some existing chain based routing protocols.

N.Vlajic et al., have investigated the real world applicability of the known theoretical benefits associated with the use of mobile sink(s). In particular, authors have examined the pros and cons of deploying path constrained mobile sink(s) in IEEE802.15.4 / Zig-Bee based WSNs. One of the biggest challenges of the conventional multi-hop many to one WSN system is the so called hot spot problem. Namely in these systems the nods from the sink's one-hop neighborhood are required to forward data on behalf of others, more distance nodes.

Sung-Min Jung et al., has discussed the performance of PEGASIS (Power Efficient Gathering in Sensor Information systems) protocol. Compared the performance of PEGASIS with LEACH (Low Energy Adaptive Clustering Hierarchy) protocol. Found 'redundant data transmission' as one of the major drawback of PEGASIS. Discussed Enhanced PEGASIS (EPEGASIS), compared with PEGASIS [5] and got 35% better performance than PEGASIS.

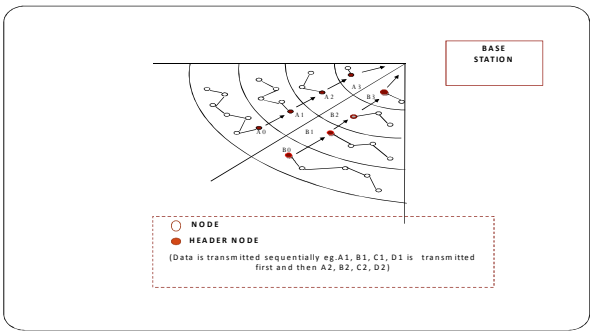
Liu Yueyang et al., has investigated a new chaining algorithm Energy-Balanced-PEGASIS (EB-PEGASIS) to overcome "long chain" in PEGASIS. PEGASIS uses greedy algorithm [7] to form data chain, which brings some benefits. But, it cannot avoid "long chain" which causes redundant data transmission. EB-PEGASIS can

avoid long chain in chaining process through average distance of network. E-PEGASIS can guarantee approximately the same in consumed energy of sensor nodes, and avoid the dying of some nodes early than other nodes to prolong the life time of sensor network. It forms a chain of sensor nodes, where each sensor node only communicates with their neighbors. Sensor nodes are deployed in harsh physical environment. Sensor nodes have very limited computational capability because they are limited by the battery power. It has been a challenge to maximize the use of energy of these sensor nodes to extend the network life time. Authors have also implemented the PEGASIS protocol. The impact of the following leader node selection strategies for every round-Random, Shuffle, High-Energy, 2-block, and 4-block. Authors have studied the PEGASIS protocol for both TDMA and CDMA systems. For each combinations of network topology and sink location, authors have identified the leader selection strategy that yields the longest network life time and the minimum energy delay per round.

Kuong-Ho Chen, Jyh-Ming Huang, Chieh-Chuan Hsiao have discussed about sensor protocol Chiron that Due to the power restriction of sensor nodes, efficient routing, in wireless sensor networks, is a critical approach to saving node's energy and thus prolonging the network lifetime. Even the chain-based routing is one of significant routing mechanisms, several common flaws, such as data propagation delay and redundant transmission, are associated. In this paper, they propose an energy efficient Chain-Based Hierarchical Routing Protocol, named as CHIRON, to alleviate such deficiencies. Based on the Beam Star concept, the main idea of CHIRON is to split the sensing field into a number of smaller areas, so that it can create multiple shorter chains to reduce the data transmission delay and redundant path, and therefore effectively conserve the node energy and prolong the network lifetime. Simulation results show that, in contrast to Enhanced PEGASIS and PEGASIS protocols, the proposed CHIRON can achieve about 15% and 168% improvements on average data propagation delay, 30% and 65% improvements on redundant transmission path, respectively. By these contributions, the network lifetime can also be extended to about 14%~7% and 50%~23%, under various small and large simulation areas, respectively.

III. PROPOSED WORK

The proposed work is to make some changes in the existing model of Chiron i.e. chain based hierarchical routing protocol. In Chiron sensing field is divided into two covering angles and then data is transmitted to the destination by changing the covering angles. As data has to change its angle rapidly. This makes it decrease in the parameter like delay, lifetime of the network. In our proposed work data is transmitted direct to the base station without change in covering angle and in the sequentially manner. By this method the parameter (delay, lifetime of the network) are improved. As data is not changing its path so resource consumption is also decreased.



III. PROBLEM FORMULATION

As Energy saving and data delivery with minimal delay became the vital parameters for wireless sensor networks so different protocols tends to find better solution for these things. As proposed earlier pegasis, e-pegasis and Chiron provides solutions to these challenges and motivates to enhance the implementation and improvements in earlier discussed protocols. Our Research provides some enhancements in Chiron protocols by making changes in the process of transmission. Our research will considered routing only within defined angles so to make data delivery fast and delay as minimal as possible.

IV. RESEARCH METHODOLOGY

To achieve the set objectives, we will do the research in following steps:

Step 1: Deep study and extensive literature survey to understand different power efficient data gathering protocols in wireless sensor network.
Step 2: Literature survey on various chaining methods and their coding techniques.
Step 3: Designing the proposed model using MATLAB [8]
Step 4: Running the simulation to validate the result.
Step 5: Propose better solutions for routing in wireless sensor network.

V. CONCLUSION

The purpose of this Research is to improve the parameter like delay and lifetime of the network to improve the energy-efficiency and latency in data gathering in wireless sensor networks by creating multiple streams of data from network to the sink in sequential manner. Our research could provide great solutions for data delivery with fast rate as we will enhance the routing process and will try to cut off the delay. We are seeking better results from previously implemented protocols for wireless sensor network. Although sensor field will be covered and divided in angle range but data will go with

ease and quick as compared to other protocols which in turns minimize the delay and make improvements in the data delivery, stability and lifetime of the network. In future we can work for fault tolerance of proposed work to find out further issues and to maintain stability in proposed protocol.

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