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An Enhanced Cluster based Multi-hop Routing Technique in Wireless Sensor Network Using AODV Protocol

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Abstract : - Wireless Sensor Network is one of main extent in physical environmental inquiry. The Cluster based multi-hop routing for the capable network to improve the life time data transmission and energy saving for the network progress. In this Research paper based on Flat Multi-Hop Routing Technique is used to LEACH protocol using reduced overall network power utilization. Hierarchical Multi-hop routing Technique is one of the methods using M-LEACH protocol, while using this method user is able to get the large number of data and packet losses also reduced. Hybrid multi-hop routing Technique using PEACH protocol used by the users are able to get Energy saving is high. My Research contribution going to Enhanced Hybrid Multi-hop Routing(EHYMN) for improve the data transmission with less time , reduced the packet losses and also minimum power utilization for this Ad-hoc On Demand Distance Vector (AODV) protocol is used for the implementation in network simulation tool 2.34 version for get a good Results.

Keywords – *WSN, Cluster Head selection, Energy consumption,Routing techniques,Packet transmission, EHYMN.*

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I. INTRODUCTION

A Wireless sensor networks consist of spatially disseminated autonomous sensor to monitor physical or ecological condition. Such as sound, temperature, pressure etc, and to helpfully pass their data through the network to a main location. The improvement of wireless sensor networks was aggravated by means of military applications such while battlefield surveillance. Today such networks are used in a lot of industrial and consumer applications, related as industrial process monitoring and control, machine health monitoring, and so on. Wireless sensor network Architecture is built a "nodes" – from a small number of more than hundreds or even thousands, where each node is connected to one or sometimes several sensors. A sensor network consists of several detection station called sensor node. All sensor nodes are operational with a transducer, microcomputer, transceiver and power source. Transducer generates electrical signals on based physical effect and phenomena. The microcomputers processes and store the sensor output. Transceivers, which can be hard-wired or wireless, receives instructions from a central computer and transmit data to that computer. Power for every one sensor node is derived from the electric utility or from a battery. The main characteristics of a WSN include Power utilization constraints for nodes using batteries or energy harvesting [14] Ability to handle with node failures, Mobility of nodes, Communication failures, Heterogeneity of nodes, Scalability to great scale of deployment and Ease of use. The progress of Clustering sensor node is a several roles in a network, such as uncomplicated sensing, data storage space, routing and data processing. Clusters are the organizational part for WSN. The dense nature of these networks requires the necessitate for them to be broken down into clusters to simplify tasks such communication. The wireless sensor networks are presents vast challenges in terms of implementation. There are some key attributes that designer carefully consider as Real time operation (or) function, Synchronization of sensor network, Data Aggregation, Quality of services, Power consumption of WSN, Packet (or) Link losses from the node.

II. LITERATURE SURVEY

Sangho Yia et al proposed clustering protocols to minimize the power utilization of every one node, and maximize the network lifetime of wireless sensor networks. However, the majority existing clustering protocols consume huge amounts of energy, incurred by cluster arrangement overhead and fixed-level clustering, for the most part when sensor nodes are densely deployed in wireless sensor networks. In this paper, they propose PEACH protocol, which is a Energy-efficient and adaptive clustering chain of command protocol for wireless sensor networks. By using overhearing character of wireless communication, PEACH forms clusters without supplementary overhead and supports adaptive multi-level clustering. The performance of PEACH is less affected by the sharing of sensor nodes than other clustering protocols. Here they not consider for selecting the channel header in the cluster node.

Vahid Shah-Mansouri et al introduced a maximum

lifetime routing difficulty in wireless sensor networks has received growing attention in current years. One way is to prepare it as a linear programming trouble by maximizing the time at which the first node runs out of energy subject to the flow preservation constraints. The solutions in this problem communicate to the rates allocated to each link. In this paper, they first show that, under certain conditions, the solutions of this problem are not exceptional for some network topologies. Given the practicable solutions set, one can further define a secondary optimization difficulty by minimizing the end-to-end packet transfer delay or power utilization. Rather than solving two sequential optimization problems, in this paper, they propose the use of a regularization method which can jointly maximize the network lifetime and minimize another purpose (e.g., packet delay). They describe the fully distributed implementation and give performance comparisons with other algorithms.

Xiaobing Wu et al proposed a new method of investigate the theoretical aspects of the non-uniform node sharing strategy in wireless sensor networks, which aims to keep away from the energy hole around the sink. They locate that in a circular sensor network with a non-uniform node distribution and stable data reporting, the unbalanced energy reduction among the nodes in the whole network is necessary. This is because although all the internal nodes have used up their energy concurrently, the outmost part of the network may still have power missing. In spite of this reality, suboptimal power efficiency among the interior parts of the network is feasible if the number of nodes increases with geometric part from the outer parts to the inner ones. In our proposed non-uniform node allocation strategy, the ratio between the node densities of the adjacent $(i+1)^{th}$ radiance and the i^{th} radiance is equal to $(2i-1)/q(2i+1)$, where q is the geometric proportion mentioned above. They also here a routing algorithm with this node distribution strategy. Replication experiments demonstrate that when the network lifetime has ended, the nodes in the interior parts of the network accomplish nearly balanced energy reduction, and only less than 10% of the total energy is wasted.

Ahmed E.A.A et al described a essential issue of enlarge the network lifetime of WSNs, which are restricted by low capability batteries. However, most of the previously proposed power aware routing algorithms have a natural problem, which is the separation of the sink node due to the quick power collapse of nodes that are close to the sink. In this paper, proposed a clarification, referred to the same as Hybrid Multi-hop routing (HYMN), which addresses this difficulty by combining two routing strategies, that is flat multi-hop routing and hierarchical multi-hop routing. The earlier method aims at minimizing the total power consumption in the network while the concluding attempts to reduce the amount of transferred data traffic by utilizing data density.

Vahid Shah et al implemented the Wireless sensor networks field information is acquired by way of several battery-equipped wireless devices and is communicate towards a sink node. While the size of the WSNs increases, it becomes ineffective to collect all information in one sink. To engage in this problem, the number of sinks can be enlarged. The data information stream towards every one of the sinks is called a commodity. In this paper make a lexicographically most favorable commodity lifetime (LOCL) routing trouble. A gradual algorithm is proposed to get the optimal routing solution which can guide to lexicographical justice among commodity lifetimes.

Abdulla et al Enhancement based sensor node utilizes its built-in battery for connections and sensing; in the event of battery's exhaustion, the sensor's functionality clippings. In such an instance, part of the networks functionality is missing; also note that changing batteries of a large number of sensor nodes over wide areas in unsafe territory is practically infeasible. Accordingly, a large amount research has been focused on maximizing lifetime of the sensor network; however, most of the previous works do not take into account the separation of the sink node, caused by the death of its surrounding nodes.

III. METHODOLOGY

EXISTING METHODOLOGY

The real environment in overall traffic is usually complex. It is not only contains some predictable traffic a large amount of traffic from end user to internet throws gateways. But always contains a considerable amount of unpredictable peer to peer traffic between end user due to the emerging new application within the community due to the inflexibility of purely flat multi-hop routing and high overhead of purely hierarchical multi-hop routing. Which combination of flat and hierarchical multi-hop routing to give the better result, this is called hybrid multi-hop routing. If the hybrid multi-hop routing technique mostly reduced packet losses and traffic occurrence.

Flat Multi-Hop Routing

Flat multi-hop routing algorithms intend to select paths that minimize the total power consumption used for sending data to sink node. Each node is capable of establish communication with sensor nodes that be positioned within its maximum transmission range, and the individual link use differs depending on the Low Energy Adaptive Cluster head (LEACH) protocol is applied. For example, the authors in have proposed algorithms aiming to minimize the total power consumption whereas routing data from individual sensor nodes to the sink node. According to, the following equations quantify link costs between each pair of nodes[4].

$$Linkcost(a,b)=e_T(a)+e_{R(b)}$$

$$e_T(a)= \epsilon 1 d^{\varphi}{}_{(a,b)} + \epsilon 2 \quad (1)$$

$$e_R(b)= \epsilon 3.$$

Here, the energy cost of transmitting a single unit of data from node a to node b, linkcost (a, b) is attribute to two components, cost on the transmitting node $e_T(a)$ and the cost on the receiving node $e_R(b)$. Also, $e_T(a)$ is proportional to the displacement d(a,b) , between the transmitting node a and receiving node b. φ is the path loss exponent dependent on the wireless fading environment. The drawback of this method is not considered for selecting the channel header in the cluster node. So packet losses can be increased.

Hierarchical Multi-Hop Routing

The cluster based hierarchical multi hop routing technique is used to Multi-hop Low Energy Adaptive Cluster head (M-LEACH) protocol. The M-LEACH protocol can be Organized by themselves these nodes are monitoring continuously. In M-LEACH network is randomly divided into a number of clusters, where each cluster is manage by the cluster head. Each sensor node chooses it cluster head on the bases of signal strength of the received data or information. Then sensor node transmits data to the cluster head, which transmit an aggregated data to the base station or sink. A hierarchical multi hop routing algorithm is used to produce energy efficient hierarchical cluster. The hierarchical clusters are created using a function as [2]

$$T(n) = \frac{p}{1-P(r \bmod 1/p)}, n \epsilon G \quad (2)$$

N is given the no of node, P is a priority for probability of a node being selected cluster. R is the current round and G is the set of node that have not yet become head set. Members for the last 1/p rounds. Each node clustering the cluster head selection will generate round between 0, 1. If the number is a reduced amount of than the threshold (T (n) the node will become a cluster head. But the main drawback of this method is power utilization is high.

Hybrid Multi-Hop Routing

In which is hybrid of the two contemporary multi-hop routing, namely flat multi-hop routing that utilize efficient transmission distance and hierarchical multi-hop routing that capitalizes on data aggregation. Power Efficient Adaptive Cluster head (PEACH) protocol used in Hybrid Multi-Hop Routing (HYMN) approaches. This HYMN approach is provide rigorous analysis for optimize it and model its power consumption [14].

$$E= \lambda * E(d) * m \quad (3)$$

Where λ denotes the average number of hops the data has to be relayed in wireless sensor network to reach the sink. E(d)is the energy consumed to transmit a unit of data over a far ,which d is the Average distance transmission , m is the volume of data. The Hybrid multi-hop routing Technique used by the users are able to get Energy saving is high. but the main drawback of this method is data aggregation and packet losses at medium level.

PROPOSED METHODOLOGY

The proposed novel method for Enhanced Hybrid Multi-hop Routing (EHYMN). Here, nodes are formed in cluster wise. After Cluster Member (CM) to cluster head(CH) collection, CH is connected with some intermediate CH which is placed between cluster Head and sink. This CH is linked with any other Cluster regions. Using this kind of routing is provided, efficient routing between cluster nodes with sink. Wherever in this approach is the next cluster head search and found in the same range of height in the level surface. In the flat multi-hop source to destination for the distance is fixed and the time is more. In hybrid multi-hop finding the cluster head in zigzag method and the distance is unidentified and time is also unknown. So when I have combined both approaches. The time and distance are known and the searching is happening in a optimistic height and certain range, so we are saving the power consumption. Hence we are saving the life time of the network [12].In Ad-hoc On Demand Distance Vector (AODV) protocol used minimizing the power consumption of CHs by means of multi-hop communications can visibly delay their power exhaustion.

Algorithm: Enhanced Hybrid Multi hop Routing

Routing of cluster in network: (both Sink and Cluster Member (Vs) Cluster Head)
Step 1: Create the number of nodes N
Steps 2: Configure the nodes with parameters
Steps 3: If create the Cluster Head statically
Step 4: CH e > energy level of normal node
Step 5: If data aggregate from CM to CH * (flat & hierarchical)
Step 6: If CH received Data ACK with CH
Step 7: Messages sent with Sink by CH (CH>CM energy)

The above Enhanced Hybrid Multi-hop Routing algorithm is described how to forming energy valuation based the cluster member and cluster head selection.

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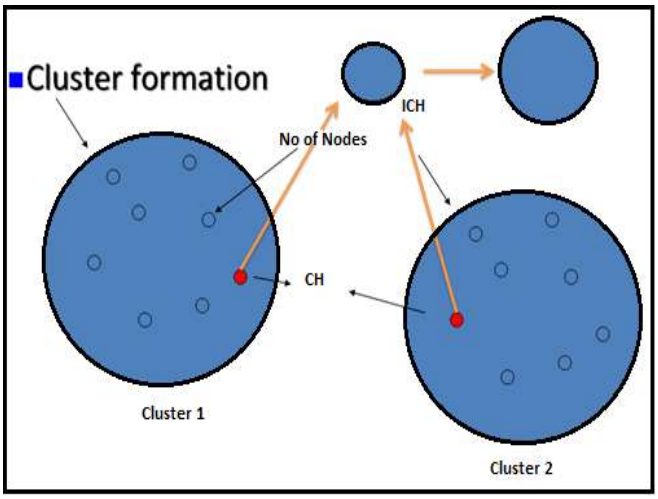


Fig.1 Enhanced HYMN

The fig.1 represents selection of CH both flat and Hybrid level, cluster head and cluster member are selected in predefined format case. After flat cluster head selection, Where cluster head selected based on position of node which is closes with Sink node and intermediate cluster head nodes. The main work for this intermediate cluster head speed of retransmitting packets and reduced packet losses.

IV. EXPERIMENTAL RESULTS

AODV Protocol is one of the most important in technology utilization. The wireless sensor is mainly used in mobile application, military surveillance, health monitoring. Still now number of researches based on wireless sensor network, various methodologies can be recognized in various fields. But my contribution is compared with three main Methodologies that are Flat Multi-Hop Routing, Hierarchical Multi-Hop Routing and Hybrid Multi-Hop Routing.

Table.1 Multi-hop Routing Techniques Results

Time in ms	Flat Multi-hop Routing	Hierarchical Multi-hop Routing	Hybrid Multi-hop Routing	Enhanced Hybrid Multihop Routing
	Packets			
0.7	55	35	45	50
1.3	120	80	140	155
3.6	290	180	280	295
3.8	304	190	305	335

In the above table.1 Multi-hop Routing techniques are compared with new Enhanced Multi-hop Routing. The Packets are delivered based on the timing. The time can be calculated in millisecond. Packet delivery ratio is number of delivered data packet to the destination.

$$PDR = \sum \text{No. of Packet receive} / \sum \text{No. of Packet send} \quad (4)$$

The Packet delivery ratio formula represents how much of packets should be transmitted from source to destination with proper Multi-hop routing via. Evaluate the number of packets delivery in that network like Multi-hop Routing CH approaches in any wireless Networks. Here packets delivery is evaluated with respective to time. Whenever time increase the packet delivery also increased simultaneously.

Fig.2 Formation of Clustering

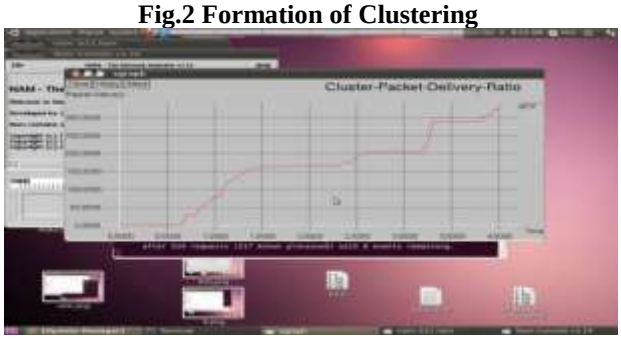
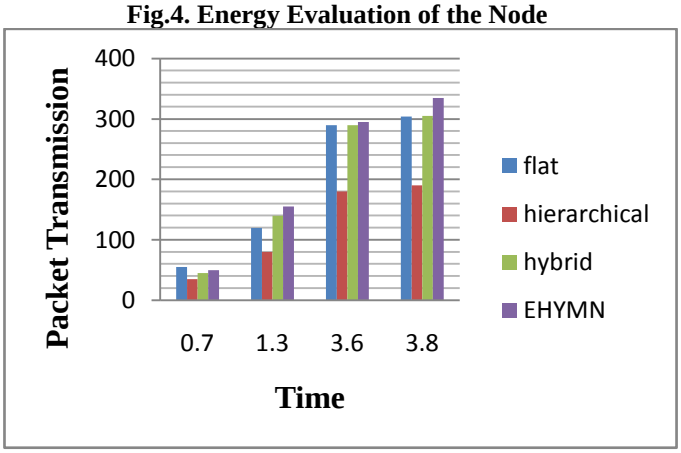


Fig.3 Packet Transmission of the Node

Fig.4. Energy Evaluation of the Node



Comparison table for Existing and Proposed

Depending upon those results Enhanced Hybrid Multi-hop Routing delivered the large amount of packets in minimized time. The packets are delivered with minimum loss

and also saving energy of those particular packets. Compared the existing methods like flat, hierarchical, hybrid techniques the proposed method Enhanced Hybrid Multi-hop Routing gives the better result and the time of delivering the packets are also reduced.

V. CONCLUSION

In this work AODV protocol is used in WSN. The multi-hop routing technique is very helpful in the field of wireless sensor network increase the speed of data transmission and energy consumption for this network. The routing techniques are most essential problem in EHYMN along with the network literature. All most all the multi-hop routing techniques like flat, hierarchical, hybrid are suited to the wireless sensor network. The EHYMN development on the parameters like be considerably better quality of the wireless sensor network results data transmission, packet losses, energy consumption and avoid traffic occurring.

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