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# AN EFFICIENT DYNAMIC DEPUTY CLUSTER HEAD SELECTION METHOD FOR WIRELESS SENSOR NETWORKS

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**Abstract:-** In view of the wireless sensor network clustering algorithm at home and abroad, an Efficient Dynamic Deputy Cluster Head Selection [EDDCH] technique is used to solve the problem of unreasonable cluster head selection, it may helpful to increase network life time and reduce energy consumption of cluster communication process. For data transmission, dynamic deputy cluster head selection is required to create the network. Efficient dynamic deputy cluster head selection is performed in view of energy level of node. The node with higher energy level can be taken as Cluster Head [CH] and the node with next energy level as Deputy Cluster Head [DCH]. After the selection of Cluster Head and Deputy Cluster Head nodes, the information of each individual node from the cluster is collected by the cluster head. Further, the deputy cluster head advances the information to base station. Cluster head and deputy cluster head are turned in view of energy levels. Also the proposed work confirms that the data transmission is effective and energy efficient with increase in life time of the network. The simulation outputs show that the proposed work balances the network nodes energy compared with Dynamic Cluster Head Selection Method [DCHSM] algorithm and expands the lifetime of the network with decrease in energy utilization between the hubs of the cluster.

***Key Words*: Cluster Head [CH], Deputy Cluster Head [CH], Energy consumption.**

## 1. INTRODUCTION

Wireless sensor network comprises many number of little, light weight remote sensor hubs, having constrained and comparable communication, processing, and detecting capacities, deployed in expensive numbers to screen the nature or system by the estimation of physical parameters for example temperature, pressure or relative humidity, and to supportively transmit their information through the system of fundamental area. Sensors are composed of are comprised of miniaturized scale electro mechanical frameworks (MEMS), every hub of sensor network comprises of three subsystems: Sensor Subsystem, Processing Subsystem, and Communication Subsystem. Now day's sensors are two directional, engages control sensor activities. The improvement of remote sensor system is utilized in military applications like war field observation and such frameworks are utilized as a piece of few present day and client oriented applications. Instance, Mechanical system is checking & control, machine and machine wellbeing watching etc. The Wireless sensor organize has some awesome points of interests, for example flexible communication and arrangement, minimum power utilization and minimum cost are most utilized in modern agriculture and criminal hunting [1].

The resources of the sensors determines the living span of the sensor hub is shorter, and the whole system can't take care of the checking demand if a few hubs can't work efficiently [2]. The main objective is to reduce the energy utilization of the system but when the separation between sensors increases the energy utilization of the network is more & also maintaining with single cluster head because of data load hence, while designing the wireless sensor networks the energy utilization of the entire network can be completely decreased when the hubs are composed in the form of groups and also the group heads and dynamic deputy cluster head is elected within the clusters depending on energy levels of the sensor hubs to maximizes the life time of the network[3].

## 2. LITRATURE REVIEW

Although more research activities are carried out to enhance the performance of wireless sensor networks but still they have limitations. The survey is conducted on all the existing protocols and techniques used in WSN. The existing protocols and techniques are like low energy adaptive clustering algorithm and also dynamic clustering head election techniques [4]-[5]. The LEACH(low energy adaptive clustering hierarchy) it is an exceptionally understood various leveled directing conventions which encourages random change of group heads to uniformly adjust the energy utilization and all information processing is carried out within the individual group. But in this algorithm group head election is irregular. There is chance of more non cluster member node, collision, and routing issue [6]. Group head communicates with base station in single hop mode which does not take part into reducing the energy utilization and also the additional overheads occurs because of change in cluster head. To improve the performance of WSN they are using technique called energy efficient dynamic deputy clustering algorithm. In this work group head is chosen depending on energy heterogeneity. Here the cluster head does the information collection from the group members & sends aggregated data to sink node due to load in cluster head the life time of network and performance of the network still not satisfactory. we are taking power Consumption and performance of the network

into consideration we are going propose an efficient dynamic deputy clustering algorithm in this work we choose the group head & deputy group head depending on its energy levels and also the multi hop packet transferring to the base station so that we can decrease the energy utilization and we can enhance the performance of the system. Along with that Multi hop communication will increases the communication & enhances the performance [7].

## 3. PROBLEM STATEMENT

Unreasonable cluster head election and energy utilization is one of the serious issues in WSNs. This creates tasks for industries and educational sectors. Hence energy consumption handling is one of the key points to expand the network life time. The main goal is to decrease the energy usage of the network but when the distance between sensors increases the energy usage of the network is more & also maintaining with single cluster head because of data load hence, while designing the wireless sensor networks the distance can be fixed and also the cluster heads and dynamic deputy cluster head is elected within the clusters on the bases of energy levels of the sensor hubs to enhance the life time of the system.

## 4. PROPOSED WORK:

The research about energy consumption, life time of network and coverage of the network is done, but the average energy utilization and the life time of the network system still not satisfactory. In request to expand the energy efficiency and life time of the system. An efficient dynamic deputy cluster head election technique for wireless sensor system is proposed.

In this work wireless sensor networks, sensor hubs are regularly gathered into individual distinctive gathering called as group/cluster. Each group consist of group head (CH), Deputy Cluster Head [DCH] and its members for communication. CH and DCH are elected based on average energy levels. Here Cluster Head Collect data from sensor nodes and Deputy Cluster head performs information accumulation and advances information to Base station node i.e. Sink node. Figure 1 shows a tree diagram of group head & dynamic deputy group head selection process. Grouping it's utilized as a part of WSNs since it give diminished general energy utilization, expanded coverage area, packet delivery ratio and system lifetime.

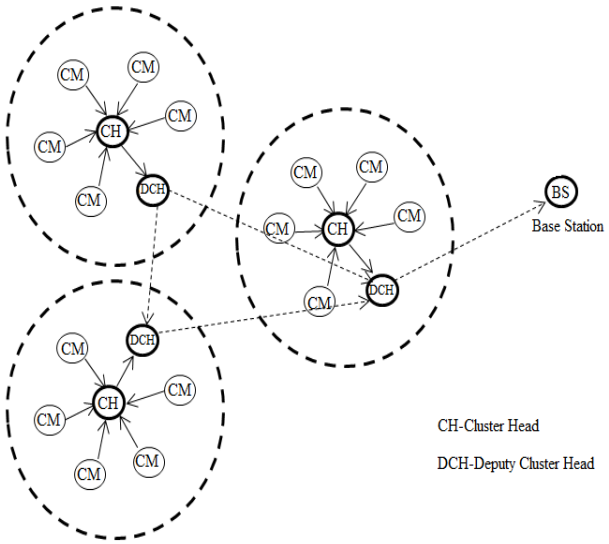


**Figure: 1** Tree diagram of Cluster Head & Deputy Cluster Head Selection.

### 4.1 METHODOLOGY:

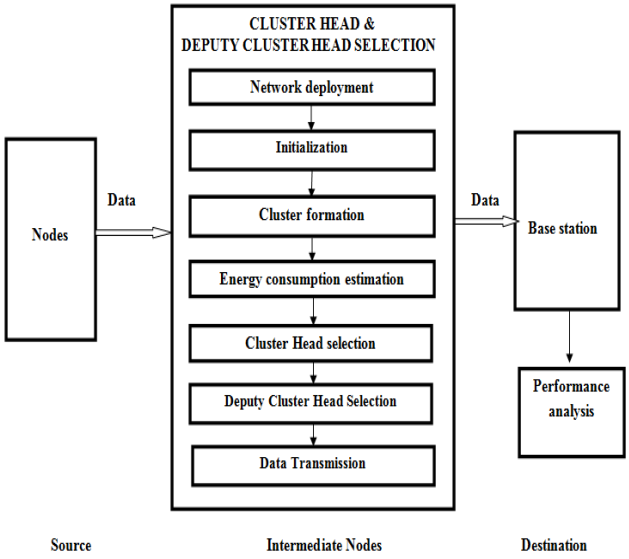


**Figure: 2** the Procedure for Cluster Head & Deputy Cluster Head Selection.

**Steps involved in process of deputy cluster head selection given below:**

1. Initialization of network: the sensors hubs are deployed in the monitoring zone and the destination node can collects the location and energy information of all the hubs.

2. The monitoring zone is divided in two numbers of groups by vornoi diagram & the perception probabilistic model is proposed.

3. Energy of all the hubs is estimated and hub which is having higher energy within the group members selected as cluster head in group one.

4. The weight of all the nodes is calculated by using distance and energy of nodes.

5. The node having highest weight in cluster neighbor groups is elected as cluster heads

6. The next energy level in cluster one is selected as Deputy group head and weight of neighbor group cluster is calculated and having highest weight elected as deputy cluster head

7. After the election of group head node and deputy group head, group head collects the data from every member of the cluster and Deputy group head forwards data to destination and finally, the group head and Deputy group Head are rotated depending on weight & energy level of nodes.

**Packet Delivery Ratio (PDR):**

The packet delivery ratio is defined as the ratio of packets received at base station and the number of packets transmitted/generated at source. Packet delivery ratio (PDR) equation (1) can be given below:

$$PDR = \frac{\text{Received Packets}}{\text{Generated packets}} \quad (1)$$

**Average Residual Energy:**

The total amount of energy remaining in a hub at the present instance of time is called as remaining energy. The remaining energy of network calculated by using following formula (2) given below:

$$\text{Residual Energy} = \frac{\sum(Ie-Ec)}{\text{Number of packets transmitted}} \quad (2)$$

Where Ec is the energy consumed by nodes, Ie is Initial energy of hubs and $R_e$ is the Residual energy of hubs.

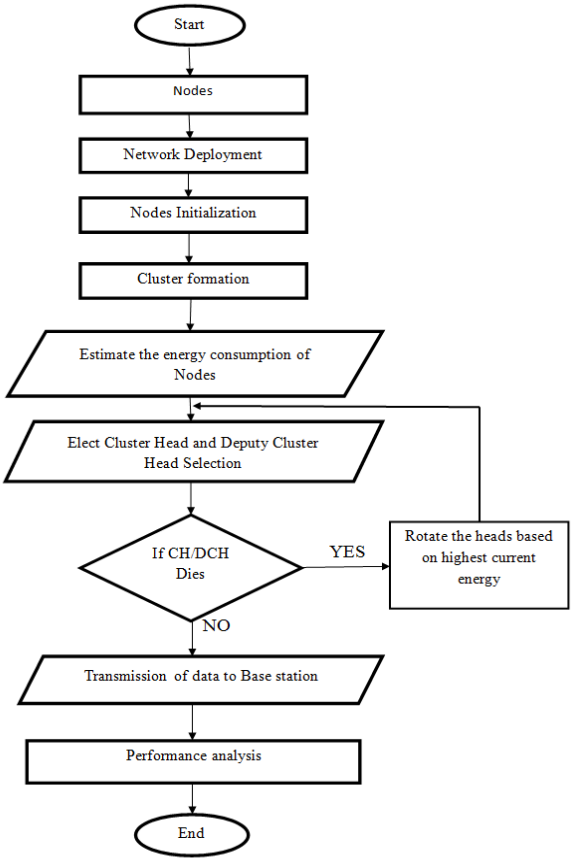


**Figure: 3** Flow chart for cluster head selection

## 5. SIMULATIONOUTPUTS

➢ **Packet delivery ratio:**

The Packet Delivery Ratio (PDR) is defined as the ratio of how much number of packets are transmitted to the destination node from the packets generated at the source, i.e. transmitted. In existing system we had a problem of unreasonable cluster head selection and cluster head over load that will avoid packets from being sent to base station node. So that's the reason Packet Delivery Ratio will diminish but in proposed system we are properly selecting group head and deputy group head depending on energy levels that will avoid the unnecessary node failure to sink node. So that we can increase the PDR which is shown in figure 4.We have maximum PDR for proposed EDDCHSM (shown as red color) than the existing ones.

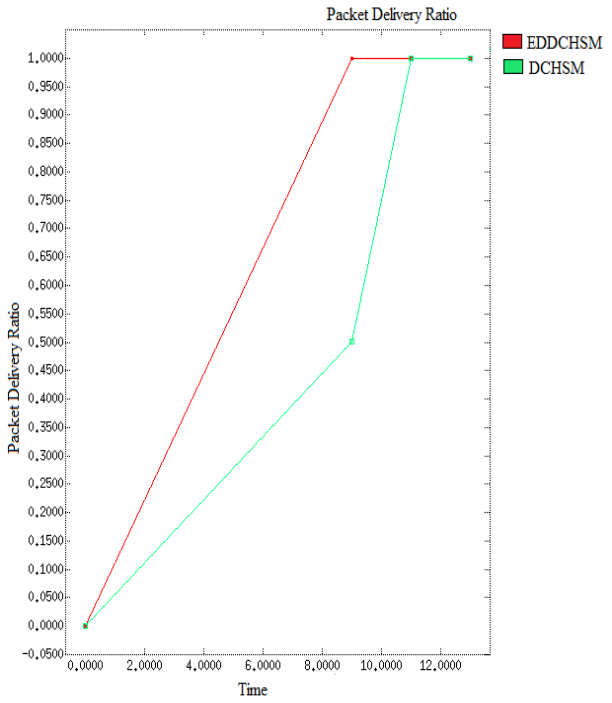


**Figure: 4** Packet Delivery Ratio.

**Table 1:** Packet Delivery ratio

| Time(ms) | 0 | 9 | 11 | 13 |
|---|---|---|---|---|
| EDDCHSM | 0 | 1.0 | 1.0 | 1.0 |
| DCHSM | 0 | 0.5 | 1.0 | 1.0 |

The above Table shows the comparison between the two cluster head selection methods namely, Efficient Dynamic Deputy Cluster Head Selection Method (EDDCHSM) and Dynamic Cluster Head Selection Method (DCHSM) with respect to time. By looking the values of PDR (Table 1) in both methods, it can be said that the EDDCHSM is efficient than the DCHSM.

- **Average Residual Energy**

The amount of energy remaining in node with respect to certain time interval is called as residual energy. The average remaining energy graph is shown in figure 5. In existing systems there is chance of more non cluster member node, collision, and routing issue. Group head communicates with base station in single hop mode which does not take part into reducing the energy utilization but in proposed work we are selecting cluster head and deputy cluster heads based on energy levels and also using multi hop routing will reduces the extra energy consumption while transmission to base station.

Hence the average remaining energy is more which is shown in figure 5. We have more remaining energy for proposed EDDCHSM (shown as red color) than the existing ones.

The average residual energy values of nodes after the simulation are written in the table 2. By comparing both energy values of cluster head selection methods, it is seen that the EDDCHSM is better in consumption of less energy. In other words more residual energy can be saved.

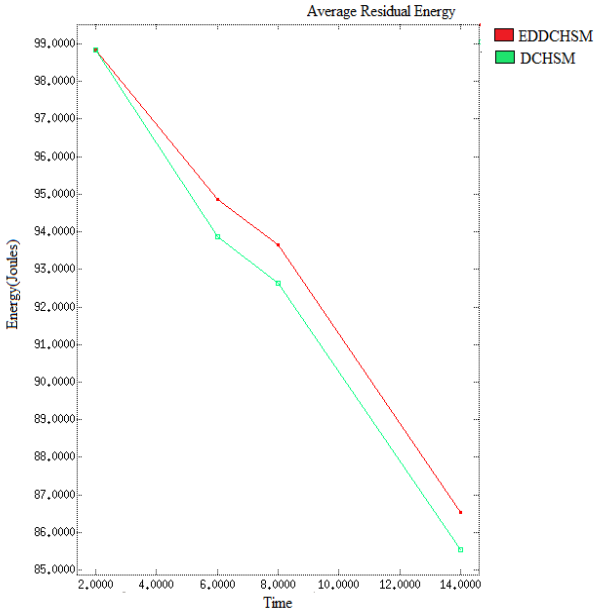


**Figure: 5** Average residual Energy of nodes

**Table 2:** Average residual Energy of nodes

| Time(ms) | 2 | 6 | 8 | 14 |
|---|---|---|---|---|
| EDDCHSM | 98.8462 | 94.860 | 93.64 | 86.53 |
| DCHSM | 98.840 | 93.86 | 92.64 | 85.53 |

- **Throughput**

Throughput is defined as successful packet delivery rate in bits per seconds. The packet delivery rate graph can be plotted with respect to time as shown in the figure 6. By the selection of two cluster heads (CH & DCH) in the group of nodes, the occurrence of the cluster head overload is maid minimum based on energy levels. As per this concept of cluster head selection method, the performance of throughput is made high compared to Dynamic cluster head selection method (DCHSM).

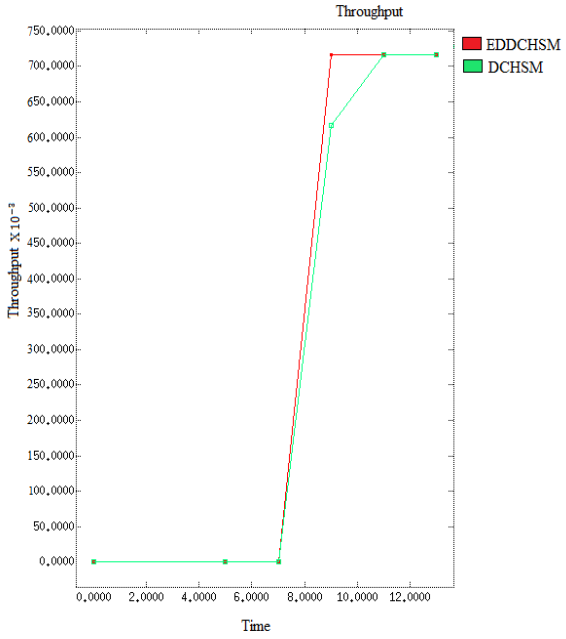


**Figure: 6** Throughput

**Table 3:** Throughput

| Time(ms) | 0 | 5 | 7 | 9 | 11 | 13 |
|---|---|---|---|---|---|---|
| EDDCHM | 0 | 0 | 0 | 0.7167 | 0.7167 | 0.7167 |
| DCHSM | 0 | 0 | 0 | 0.6167 | 0.7167 | 0.7167 |

It is seen that the throughput i.e. the packet delivery Success rate of proposed work (EDDCHSM) is high compared to Dynamic cluster head selection method (DCHSM).the above table 3 gives the throughput values of both methods to say that EDDCHSM is better in performance wise.

- **Packet drop**

Packet Drop can be defined as the number of packet loss or dropped with respect to time. The figure 7 shows the plot of packet drop of the both cluster head selection methods with respect to time. The packet drop or packet loss is almost zero in proposed work (EDDCHSM) compared to the existing system (DCHSM).

**Table 4:** Packet Drop

| Time(ms) | 0 | 5 | 7 | 9 | 11 | 13 |
|---|---|---|---|---|---|---|
| EDDCHSM | 0 | 0 | 0 | 0 | 0 | 0 |
| DCHSM | 0 | 0 | 0 | 0.001 | 0 | 0 |

The above table 4 shows the packet drop values of the both cluster head selection methods. It is clearly seen that the packet loss in EDDCHM is comparatively Zero with DCHSM. So it can be said that the proposed work (EDDCHSM) is good.

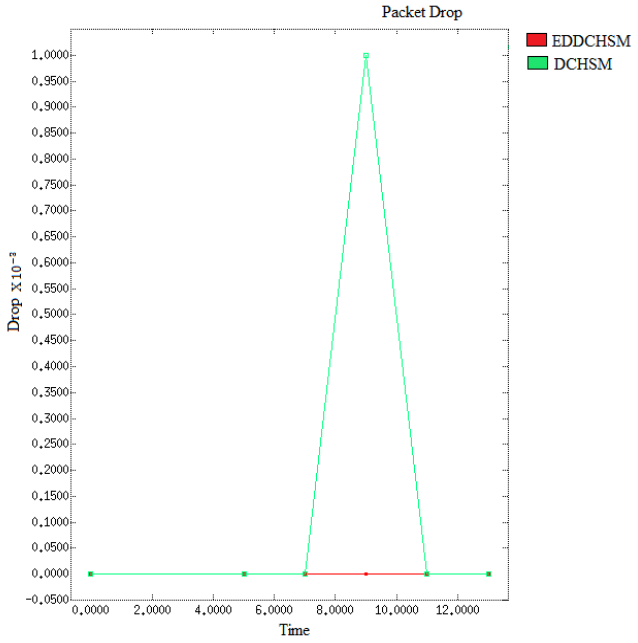


**Figure: 7 Packet Drop**

## 6. CONCLUSION

An efficient dynamic deputy cluster head selection method for wireless sensor networks is proposed in this work by analyzing the sensor network energy consumption based on energy heterogeneity. The proposed work mainly focused on four major aspects, including average residual energy of the network, packet delivery ratio, throughput and packet drop. The performance is compared with dynamic cluster head selection method (DCHSM) algorithm, it is shown that, this method overcomes the imbalance of energy usage, improves information redundancy in the process of transmission and increases the life time of the network.

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