**AN IMPROVED ENERGY-EFFICIENT CLUSTERING PROTOCOL TO PROLONG THE LIFETIME OF THE WSN-BASED IOT**

**ABSTRACT:**

The Internet of Things relies heavily on wireless sensor networks (WSNs) (IoT). However, the energy resources of sensor nodes in a WSN-based IoT network are restricted. By grouping nodes into clusters to reduce the transmission distance between sensor nodes and base stations, a clustering protocol offers an effective method for ensuring node energy savings and extending network lifespan (BS). Current clustering protocols, on the other hand, have problems with the clustering mechanism, which has a negative impact on their efficiency. We suggest an enhanced energy-efficient clustering protocol (IEECP) in this paper to extend the lifespan of WSN-based IoT devices. The proposed IEECP is divided into three parts. For the overlapping balanced clusters, an optimum number of clusters is first calculated. The balanced-static clusters are then developed using a tweaked fuzzy C-means algorithm in combination with a mechanism to minimise and balance the sensor nodes' energy consumption. Finally, cluster heads (CHs) are chosen in optimal locations by rotating the CH function among cluster members using a new CH selection-rotation algorithm that combines a back-off timer mechanism for CH selection and a rotation mechanism for CH rotation. The suggested protocol, in particular, eliminates and balances energy consumption.

The proposed protocol, in particular, reduces and balances node energy usage by optimising clustering structure, and IEECP is ideal for networks with a long lifespan. The findings of the assessment show that the IEECP outperforms current protocols.

**EXISTING SYSTEM:**

The LEACH protocol  is the first proposed clustering protocol. The main idea is to choose the CH in a clustered manner at each round and then have the nodes join the closest CH to form a dynamic cluster. This network topology is built on the chosen CHs, which is inefficient due to the lack of consideration for node residual energy.  Furthermore, prioritising CH selection results in the forming of complex clusters at each round, resulting in an increase in energy overhead due to cluster formation after each re-selection phase for CHs .A LEACH-centralized protocol (LEACH-C) is another variant of the protocol in which the optimum number of clusters K is calculated using a statistical model. In comparison to LEACH, Base Station BS is in charge of CH selection and cluster creation by the use of the simulated annealing optimization procedure, in which nodes with more than the average energy send their information to the BS at the end of each round.

**DISADVANTAGES:**

1. LEACH does not give any idea about the number of cluster heads in the network.

2. One of the biggest disadvantage of LEACH is that when due to any reason Cluster head dies, the cluster will become useless because the data gathered by the cluster nodes would never reach its destination i.e. Base Station.

3.Some cluster heads at the center of the cluster and some cluster heads may be in the edge of the cluster; this phenomenon can cause an increase in energy consumption and have great impact on the performance of the entire network.

4. CH selection is the most difficult part of dynamic clustering.

5.Inaccurate determination of the optimal number of clusters when using current mathematical models because the distance to the CH has not been estimated correctly.

6. In LEACH-C nodes, energy overhead persists, and the round trip is time-consuming throughout the CH selection process. The main disadvantage in existing method is the unbalanced energy consumption

**PROPOSED METHOD:**

An improved energy-efficient clustering protocol (IEECP) is proposed to prolong the lifetime of the WSN-based IoT which consists of three parts:

Firstly, a modified mathematical model is proposed based on the analysis of the energy consumption model for multi-hop communications and overlapping clusters in order to determine the optimal number of clusters. Secondly, a modified fuzzy C-means algorithm (M-FCM) is proposed in order to produce balanced cluster. Thirdly, a new algorithm is proposed known as CH selection and rotation algorithm (CHSRA) that integrates the back-off timer mechanism for CH selection, with a new rotation mechanism for CH rotation among members of the cluster. This major contribution can be achieved through the following tasks:

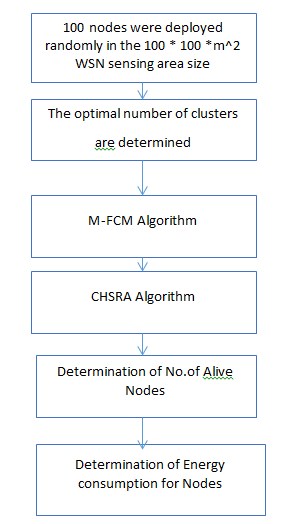
Selecting the optimal number of clusters based on the modified mathematical model by considering the overlapping case among clusters and multi-hop communications,

Forming balanced clusters that reduce the cost in the intra-distance based on modified fuzzy C-means algorithm (M-FCM) that result from a combination of the FCM algorithm with a centralized mechanism,

Reducing the energy overhead that results from the CH selection process in each round by a new integration of the back-off timer mechanism for CH selection with rotation mechanism in one algorithm known as CH selection and rotation model (CHSRA),

Balancing the communication distance among the CHs in the network based on a new objective function for the back-off mechanism, and

Balancing the life of the selected CHs in the cluster based on a new dynamic threshold.



**Block diagram of proposed method**

**ADVANTAGES:**

1.Proposed Protocol IEECP Prolongs the WSN-based IoT lifetime.

2. The proposed protocol reduces and balances the energy consumption of nodes by improving the clustering structure,

3. The evenly distribution of the selected CHs in the monitoring area with low overhead

in the selection process,

4.The optimal number of clusters are determined.

5. IEECP gives idea about the number of cluster heads in the network

6.It balances the distance among CHs in adjacent clusters by adopting the routing information in the CH selection process that leads to balanced energy consumption for CHs. The CH rotation process that relies on a threshold value is possible.

7.The CHSRA ensures the balance in energy consumption for the successive CHs of the cluster. So the Proposed Protocol IEECP gives balanced energy consumption.

**APPLICATIONS:**

1.industrial control

2.environmental monitoring,

3. military surveillance,

4.intelligent transportation systems and medical field.

5.Furthermore, it can function independently in harsh or high-risk places where human presence is not possible

6.Disaster relief operations.

7.Biodiversity mapping

8.monitoring of temperature, pressure, and humidity

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**Software & Hardware Requirements:**

**Software:** Matlab R2018a.

**Hardware:**

**Operating Systems:**

• Windows 10

• Windows 7 Service Pack 1

• Windows Server 2019

• Windows Server 2016

**Processors:**

Minimum: Any Intel or AMD x86-64 processor

Recommended: Any Intel or AMD x86-64 processor with four logical cores and AVX2 instruction set support

**Disk:**

Minimum: 2.9 GB of HDD space for MATLAB only, 5-8 GB for a typical installation

Recommended: An SSD is recommended a full installation of all Math Works products may take up to 29 GB of disk space

**RAM:**

Minimum: 4 GB

Recommended: 8