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Soft Computing Algorithm for Routing in Internet of Things (IoT)

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ABSTRACT

The Internet of Things (IoT) is an emerging technology commonly used in wireless sensor networks. IoT consists of a variety of physical devices that are connected to the Internet for the transmission of data without any human or human interface. It is a self-configuring network where any sensor node can exit or join the network at any point in time. Security and data aggregation are the key drawbacks of IoT. This paper explores the data aggregation in IoT that can be enhanced by the use of clustering techniques. The main concept used in this paper is to efficiently use power-conscious clusters of optimal routing algorithms such as LEACH, etc. The experimental result also shows that the suggested method used in this paper is stronger when combined with the clustering strategy.

Keywords: Leach, Clustering, IoT, WSN

I. INTRODUCTION

Generally, wireless sensor networks are a set of dedicated sensors used to gather information about the physical state of the environment and to coordinate data via wireless connections. The sensor in the network tracks real-time and physical conditions such as temperature, humidity, pressure, vibration and generates sensory data. The sensor nodes can be deployed in any random manner[2]. There is no predetermined topology for sensor nodes[1][3]. The sensor nodes can communicate by using radio signals. The wireless sensor node is connected to communicators, radio transceivers, sensing devices and power components. Each node in the network is a constrained resource with limited storage space, power consumption, processing speed and limited bandwidth. Large sensor nodes are densely deployed; each node may be close to each other. Every sensor is linked to the base station[4]. The base station transmits the data to the entire network. The wireless sensor network is intended to have a long life span because it uses batteries that reduce its power consumption. The sensor node will vary in size from the shoebox to the size of the dust. Wireless sensor networks consist of smart nodes that are identical to smart devices that are fitted with wireless communication devices that can automatically connect to a network that collects data from sensor devices[6].

Wireless Sensor Network has an OSI architecture that involves five layers and three cross layers. The three cross-levels are power management, mobility

management and task management. The five layers are the physical layer, the data link layer, the network layer, the transport layer and the application layer. WSN's topology can differ from star network to multi-hop wireless mesh network. Wireless sensors have a broad range of uses, such as military applications, agriculture, industrial and consumer applications, computer health and monitoring systems, health monitoring applications, and so on. The main downside of the wireless sensor network is that when the node fails, the whole network will crash. The key concern is the use of data on the wireless network sensor. It is important to reduce the amount of data consumed in order to maximise the life of the network. The network should be linked to IoT[7-8] to improve the existence of the wireless sensor network.

IoT is the interconnecting of smart objects using Internet technology that allows users to collect the database through the Internet. The IoT sensor nodes gather information from the external environment and transfer to the base station. The collected information will be moved from the base station to the main station or server. IoT can be defined by three things: human interface, computer interface, machine interface, human interface. It is an environment in which real and virtual things are linked and managed through the Internet, irrespective of their communicative devices, which may be wired or wireless[9][11]. IoT is made between interconnected devices and interconnected computers. The sensor in the vicinity gathers information such as temperature, humidity, pressure, etc. and transmits the information to the processor[10]. As aggregated information is obtained via the Internet of Things. The main aim of IoT is to communicate with all users via a variety of means and services. The transport of data from one location to another is the primary objective of IoT.

II. EFFECTIVE CLUSTERING BASED LEACH (LOW ENERGY ADAPTIVE CLUSTERING HIERARCHY) ALGORITHM

Data aggregation is most important and fundamental problem in the sensor networks. To overcome this problem, specific protocol is implemented to increase the energy efficiency of the network. Cluster based algorithm are used in data aggregation technique. In LEACH (low energy adaptive clustering hierarchy) algorithm, is a TDMA (Time Division Multiple Access) based MAC protocol with simple routing protocol. Leach algorithm is intended for sending the data packets through the inter cluster communication and intra cluster communication for sending and receiving the data packets.

Fig. 1 shows the overall view of the proposed clustering based LEACH. The network is grouped into clusters and each cluster has cluster head. The data from the sensor nodes are transmitted to the cluster heads. The selection of cluster head is done randomly. In leach algorithm let p be the probability of the random selection of cluster head. Once the cluster head for the current round is selected, the cluster head sends an acknowledgment signal to the member node for transmitting the data. The cluster head communicates with the each node of the cluster called member node. Each member node is assigned to collect the sensed data.

The cluster head assigns time slot for each cluster to collect the data. Time slot is introduced in the member node to avoid the data collision. The member node or sensor node can send the data at the allotted time slot. On transmitting the data only the transmitting node will be active and the other nodes becomes idle. Once all the nodes in the cluster finished transmitting the data. The cluster head will start processing the data. The data is checked for its redundancy before transmitting to the final

destination. The cluster head directly communicate with the base station.

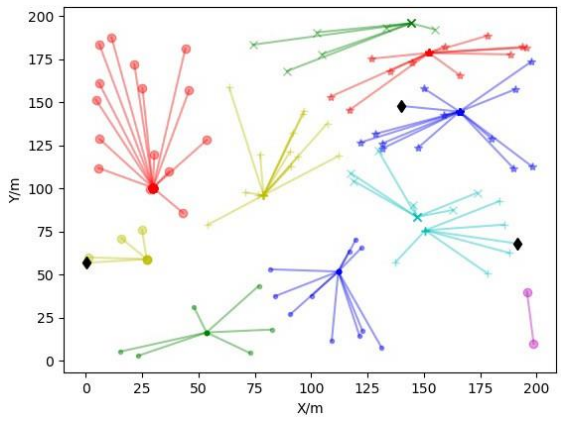

Figure. 1 Results obtained using the Clustering based Leach Algorithm

The cluster head finally transmit the data in single hop or multi hop communication. So that the energy efficiency of the network is improved and the lifetime of the network is enhanced. To improve the selection of cluster head, time based cluster head selection is used. When time slot cluster head selection is done the efficiency is improved from 20% to 30%, throughput by 60%, lifetime by 66%, and residual energy by 64%.

III.RESULTS AND DISCUSSION

This section discusses about the results obtained by the proposed method. Here we will be also discussing about the performance metric of the proposed model. Figure shows the throughput rate achieved using the proposed method. Fig. 3 – 7 shows the performance metrics of the proposed model.

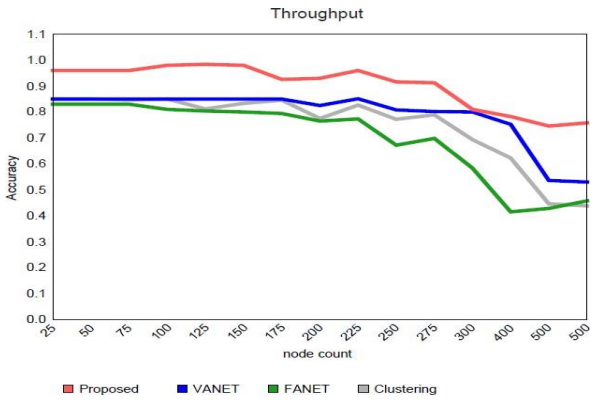

Figure. 3 Performance Metric – Throughput vs Accuracy

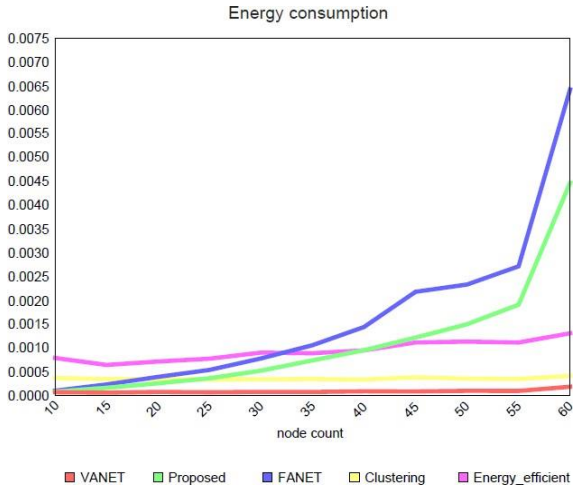

Figure 4 Performance Metric – Energy Consumption

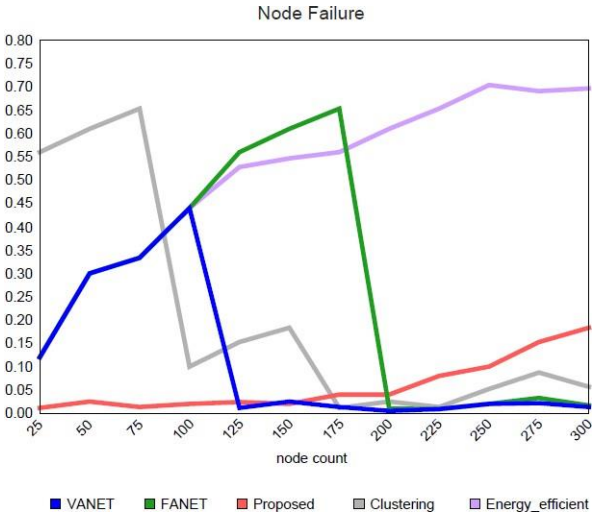

Figure. 5 Performance Metric – Node Failure Rate

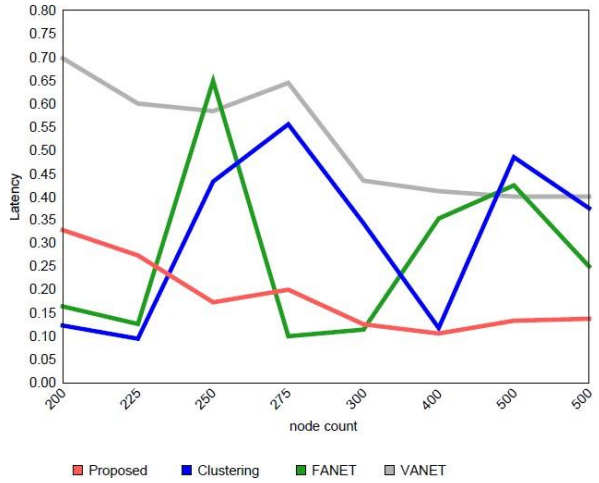

Figure. 6 Performance Metric – Latency

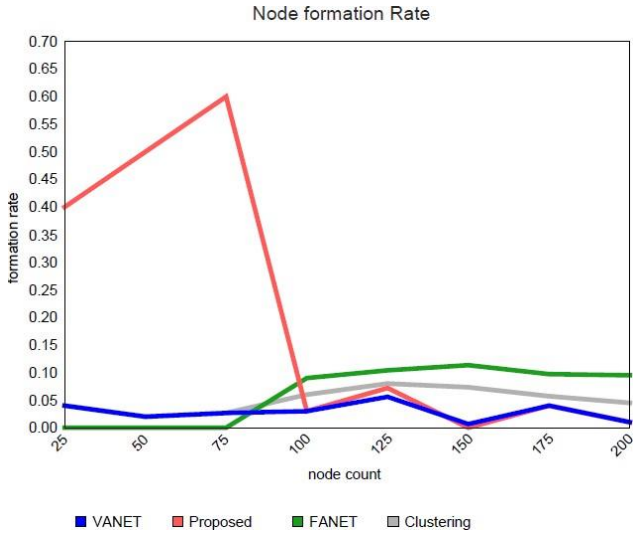

Figure. 7 Performance Metric – Node Formation Rate

IV. CONCLUSION

The paper concludes by proposing a novel energy-efficient WSN node sensor routing technique. The idea used here achieves greater accuracy compared to the current methods. Furthermore, the combination of a clustering approach and an energy-efficient protocol leads a constructive measure to the network and provides an optimal path. The proposed approach has been shown to be effective in terms of throughput and latency. It is intended to improve the same model for the ambitious Flying Adhoc Network in the future, where energy efficiency is the key criterion.

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