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An Energy Efficient and Reliable Routing Scheme for enhancing the CommunicationPerformance in IoT-Based Agriculture

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Abstract : ***A wireless sensor networks (WSN) play an important role in the development and growth of IoT applications across various industries. As IoT continues to expand, the interconnectedness of devices and system allows for the development of various smart application. One of the challenges in implementing wireless based sensor network is maximizing their lifetime. However, sensor nodes of a WSN-based IoT network are constraining with the energy resources. A clusteringbased optimized protocol will provide an efficient solution to ensure energy saving of nodes and prolong the network lifetime by organizing nodes into clusters to reduce the transmission distance between the sensor nodes and base station (BS). However, existing clustering protocols suffer from issues concerning the clustering structure that adversely affects the performance of these protocols. In this system, an improvedenergy efficient clustering protocol (IEECP) is used to prolong the lifetime of the WSN-based IoT. The proposed IEECP consistsof three sequential parts***

IndexTerms - Wireless sensor networks, Internet of Things, clustering protocol, energy consumption, network lifetime.

I.INTRODUCTION

Wireless Sensor Networks (WSNs) represent a revolutionary paradigm in the field of communication and sensing sensor nodes equipped with sensing, computing, andwireless communication capabilities. The integration of thesenodes forms a distributed network that collaboratively monitors and collects data from the environment. WSNs findapplications in diverse fields such as environmental monitoring, healthcare, agriculture, industrial automation, and smart cities. Wireless Sensor Networks have emerged asa transformative technology with diverse applications acrossvarious domains.

The integration of tiny, energy-efficient sensor nodes enables the collection of real time data, leading to more informed decision making and improved efficiency in a widerange of fields. While challenges such as limited energy, security concerns, and scalability persist, ongoing research and technological advancements continue to address these issues. The future of WSNs holds exciting possibilities, withthe integration of emerging technologies like 5G, machine learning, and blockchain, paving the way for more intelligent,secure, and efficient sensor networks. As WSNs continue to evolve, their impact on shaping the landscape of smart and connected systems is undeniable. Internet of Things (IoT) is a significant source of technological solutions in several applications. The IoT is pillared by a wireless sensor network(WSN) which decreases the cost of the new technology.

Wireless Sensor Networks (WSNs) are like the buildingblocks of the Internet of Things (IoT), using small smart devices called sensor nodes to collect information in varioussettings. However, ensuring the security of these devices is challenging due to their limited power and capabilities, making them susceptible to potential interference in communication. WSNs find applications in both attended andunattended environments, ranging from air pollution monitoring to smart cities.

An essential focus in this context is on conservingenergy to ensure the longevity of these devices and reliable data transmission. To enhance efficiency, the concept of clustering is introduced, where devices form groups with a leader node responsible for collecting and forwarding information to a central station. The selection of these leadernodes can be done

randomly or based on specific factors, with the latter generally proving more effective. In essence, while WSNs play a crucial role in IoT, ongoing efforts are required to address security concerns, improve energy efficiency, and overcome dynamic challenges in data transmission..

II. PROPOSED SYSTEM

The proposed system for enhancing communication performance in IoT-based agriculture revolves around a cluster-based approach with a focus on energy efficiency. Inessence, while WSNs play a crucial role in IoT, ongoing efforts are required to address security concerns, improve energy efficiency, and overcome dynamic challenges in datatransmission. By employing low-power, long-range communication protocols like LoRaWAN and implementing adaptive data rate control, the system aims to optimize the energy consumption of sensor nodes. Intelligent cluster headselection algorithms help manage data aggregation and forwarding efficiently, reducing unnecessary long-distance transmissions. The proposed work includes the following tasks:

- Implement a cluster-based network architecture to organize sensor nodes into clusters, reducing longdistance transmissions and promoting localized dataaggregation.
- Utilize energy-efficient communication protocols like LoRaWAN to enable long range data transmission whileminimizing power consumption.
- Incorporate mechanisms for dynamically adjusting datatransmission rates based on network conditions, ensuring optimal energy usage.
- Implement efficient data aggregation techniques at the cluster heads to reduce the number of transmissions andconserve energy.
- Utilize predictive analytics to anticipate agricultural needs based on historical and real time data, optimizingresource usage and minimizing unnecessary communication.
- Develop the system to adapt to changing environmentalconditions, allowing for dynamic adjustments in communication strategies and resource management.

III. METHODOLOGY

To identify the specific requirements and constraints of IoT applications that must be addressed by the improved clustering protocol.

Develop a new clustering protocol tailored to IoT applications within WSNs. The protocol design should incorporate the following elements:

1. Low-power communication strategies.
2. Adaptive clustering mechanisms.
3. Load balancing algorithms.
4. Self-healing features..

i. Enhance existing clustering protocols by integrating energy-efficient mechanisms and adapting them to IoT requirements.

ii. Utilize simulation tools (e.g., NS-3, MATLAB, or custom simulations)to model the behavior of the proposed clustering protocol.

iii. Create realistic IoT deployment scenarios and WSN topologies for testing and evaluation.

iv. Generate performance metrics related to energy consumption, network lifetime and data reliability.

IV. RESULTS

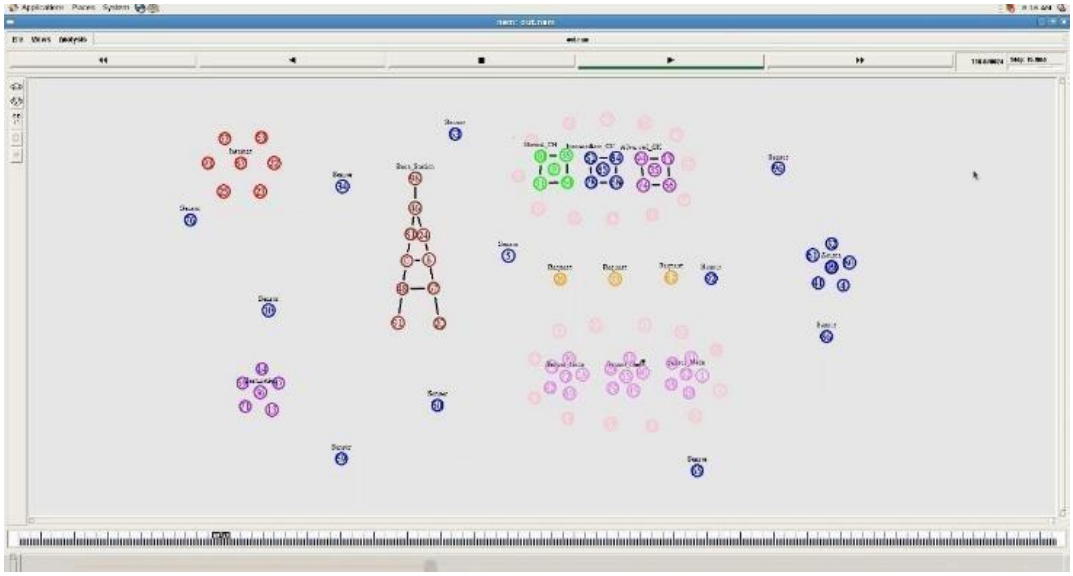

Fig 1. Request sent form source

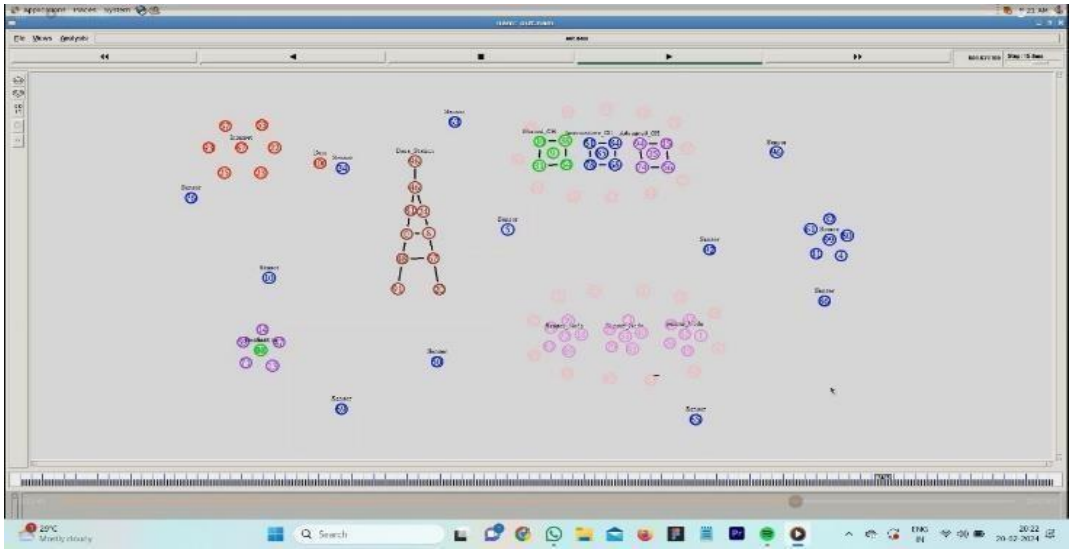

Fig 2. Data sent from base station to internet

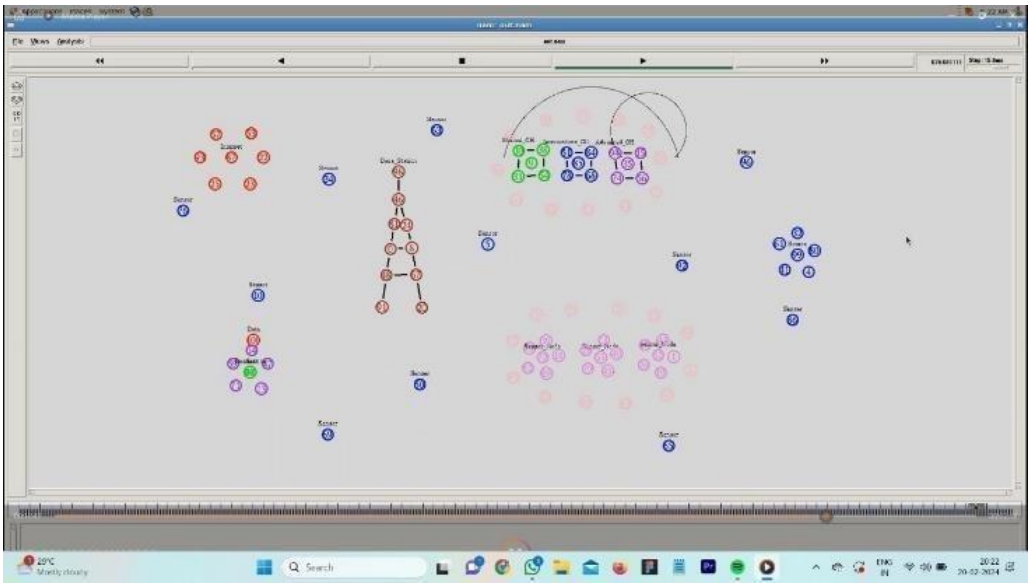

Fig 3. Data reaches the destination

GRAPH COMPARISON

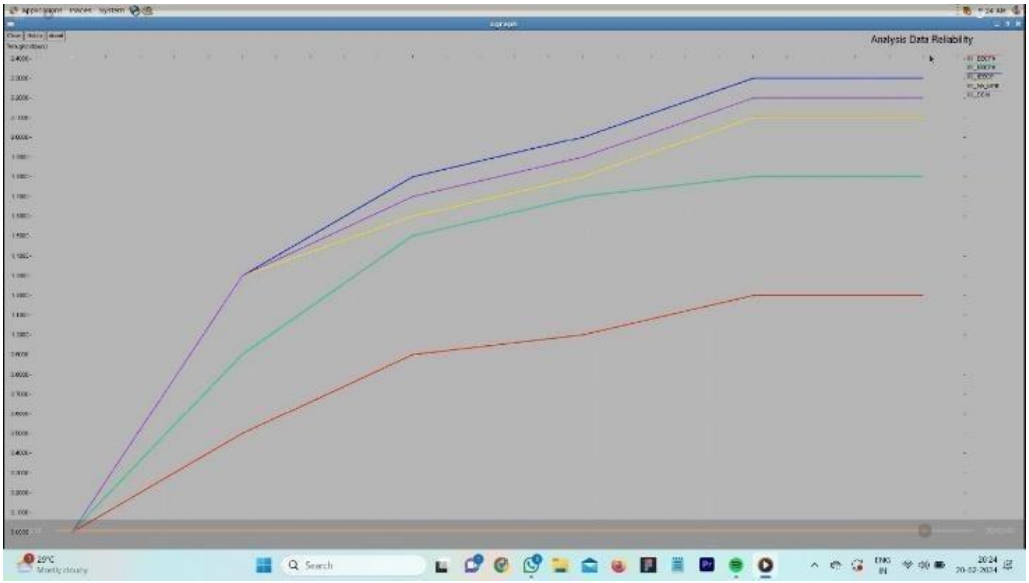

Fig 4. Data reliability analysis

V. CONCLUSION AND FUTUREWORK

In this significant work, we propose an improved energy efficient clustering protocol (IEECP) to prolong the lifetimeof WSN based IoT network through overcoming the problems of the clustering structure that adversely affect theprotocol performance. Evidently, the proposed protocol reduces and balances the energy consumption of nodes by improving the clustering structure. Hence, the IEECP is deemed suitable for networks that require a longer lifetime.

In general, the results yield that the IEECP performs better than the existing protocols. Our proposed protocol will be a beneficial contribution to the field that will enhance the dailyoperations in many areas of life, which utilize WSN in the IoT world. The energy consumption of the network is analyzed to compute the optimal number of clusters based onthe distance to the CH in the case of the overlapping clusters.Then, the modified FCM algorithm (M-FCM) is proposed bycombining it with a centralized mechanism to form static andbalanced clusters. Finally, a new CH selection-rotation algorithm (CHSRA) is presented by integrating the back offtimer mechanism for the CH selection with the rotation mechanism for CH rotation.

The CHSRA has relied on a new objective function for selecting CHs in optimal locations to balance the energy consumption among CHs for the clusters. Furthermore, it hasrelied on a new dynamic threshold for CH rotation within members of clusters to balance the energy consumption for the successive CHs in the cluster. In future work, we aim to enhance the protocol by improving the FCM algorithm concerning the random initial selection.

Moreover, we believe that improving the objective function of CH selection through the reliance on weighted energybased distance for adjacent CHs is also crucially significant. Improved Energy-Efficient Clustering Protocol to Prolong the Lifetime of the WSN-Based IoT clustering protocol can perform excellently when these limitations are taken into consideration

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