# RSSI-Guided Cluster Head Selection for Optimal Optimization in IoT-Enabled WSNs

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***Abstract*—The Internet of Things (IoT) relies on Wireless Sensor Networks (WSN) to collect physical data from the environment. Sensor nodes in WSN have limited resources such as memory, energy, and processing power, and data transmission consumes the most energy. Therefore, clustering and data aggregation techniques are designed to achieve energy efficiency in WSN. This research paper proposes a new method, called Energy Efficient of Cluster Head and Relay Node (EECR), which selects Cluster Heads (CH) based on residual energy, distance to the Base Station (BS), and Received Signal Strength Indicator (RSSI). The EECR technique, which uses fuzzy logic for cluster head selection. The aggregated data of the cluster head is then transmitted to the BS to achieve energy efficiency. The EECR technique was tested under three different scenarios and achieved better results in terms of energy efficiency and network lifetime compared to SEP, MAP and EECR 1.**

***Keywords—cluster head, RSSI, IoT, WSNs***

## I. INTRODUCTION

With the rapid expansion of Internet of Things (IoT) applications, wireless sensor networks (WSNs) have emerged as a crucial component in facilitating data collection and communication [1]. In IoT-enabled WSNs, efficient clustering techniques play a vital role in managing network resources, optimizing energy consumption, and ensuring reliable data transmission. One key aspect of improving clustering efficiency lies in the selection of appropriate cluster heads, as they significantly impact network performance. In this era of massive data influx, the traditional approach of randomly selecting cluster heads in WSNs no longer meets the demands of IoT applications [2]. Researchers and practitioners have turned their attention towards developing intelligent cluster head selection mechanisms to enhance the overall network performance. In line with this trend, this paper presents a novel approach to enhance clustering efficiency in IoT-enabled WSNs through the use of RSSI-guided cluster head selection.

The proposed approach capitalizes on the RSSI, a metric that characterizes the signal strength between sensor nodes, to guide the selection of cluster heads [3]. By considering the RSSI values, we can identify nodes with stronger communication links and designate them as cluster heads. This selection process aims to optimize network performance in terms of improved data aggregation, reduced energy consumption, and enhanced scalability. Our research addresses the challenges associated with clustering efficiency in IoT-enabled WSNs by proposing a comprehensive framework for RSSI-guided cluster head selection. We investigate the impact of various parameters, such as RSSI threshold values and network density, on the selection process. Furthermore, we evaluate the performance of the proposed approach through extensive simulations and comparative analyses against existing clustering algorithms commonly used in WSNs. The results obtained from our experiments demonstrate the effectiveness of the RSSI-guided cluster head selection approach in optimizing network performance. By leveraging the inherent characteristics of RSSI values, our method achieves improved data transmission, efficient resource utilization, and enhanced network scalability. These findings contribute to the growing body of research in IoT-enabled WSNs, paving the way for more intelligent and efficient clustering techniques.

This paper proposes an innovative approach to enhance clustering efficiency in IoT-enabled WSNs by utilizing RSSI-guided cluster head selection. The results obtained from our research provide valuable insights into optimizing network performance, addressing the challenges of data aggregation, energy consumption, and scalability in IoT applications. This work contributes to the ongoing efforts in developing efficient and intelligent clustering mechanisms for WSNs, and lays the foundation for further advancements in this field.

## II. RELATED WORKS

Wireless Sensor Networks (WSNs) have become an integral part of the Internet of Things (IoT) infrastructure, enabling the seamless integration of various smart devices and applications. In WSNs, clustering techniques are essential for efficient data management, improved energy utilization, and reliable communication. However, traditional clustering algorithms often fail to address the challenges posed by IoT-enabled WSNs, where large-scale deployments and dynamic network conditions require novel approaches to enhance clustering efficiency. To address these challenges, recent research has focused on developing intelligent cluster head selection mechanisms. One promising approach is the utilization of Received Signal Strength Indicator (RSSI) as a metric for cluster head selection. RSSI reflects the signal strength between sensor nodes and can be leveraged to identify nodes with stronger communication links, which can serve as efficient cluster heads [4]. This approach offers the potential for optimizing network performance, energy consumption, and scalability in IoT-enabled WSNs.

Numerous investigations have focused on the application of RSSI-based cluster head selection in wireless sensor networks (WSNs). In previous research conducted in [5][6], the selection of CHs was based on residual energy and RSSI. However, these studies did not incorporate the path loss model when calculating RSSI. It is crucial to consider RSSI as it