ABSTRACT

This study addresses the challenges faced in communication systems due to the development of the Internet of Things (IoT), which causes high traffic load on Base Stations (BS) and inter-network interference, leading to a decrease in energy efficiency and data rate. To overcome this issue, a scheme using a two-hop method with relay is introduced to control interference, increase network capacity, and coverage area.

The aim of this study is to design a system model using clustering and relay positioning methods, and to allocate resource blocks with four algorithms: greedy, round robin, auction, and genetic in the K-Means clustering and hard clustering models. Additionally, this study aims to compare the performance of K-Means clustering and hard clustering in improving Energy Efficiency (EE) and Quality of Service (QoS).

This study evaluates the performance of the greedy algorithm using two clustering methods, namely K-Means clustering and hard clustering, in scenarios of varying numbers of users and cell radius. The results show that the greedy algorithm with the K-Means clustering method achieves the best performance with a sum rate of 5.97x10^8 bps and an average user capacity of $2{,}56x10^{6}$ bps in the scenario of varying user numbers, as well as a sum rate of $6{,}41x10^{8}$ bps and an average user capacity of $2{,}56x10^{6}$ bps n the scenario of varying cell radius. Although the hard clustering method also demonstrates good performance, its results are still below those of the K-Means clustering method. Overall, K-Means clustering provides better performance in terms of sum rate and fairness compared to hard clustering, particularly in the management of resource distribution in scenarios involving changes in the number of users and cell radius.

Keywords: Base Station, Resource Block, Relay Positioning, K-Means Clustering