ABSTRACT

In the era of autonomous vehicles, Vehicle-to-Vehicle (V2V) communication plays a crucial role in improving traffic efficiency. With the increasing number of vehicles, the demand for intelligent and efficient transportation systems is rising. V2V communication enables rapid and efficient information exchange between vehicles, requiring adaptive and precise radio resource allocation to achieve optimal performance. Key parameters such as data rate, spectral efficiency, and fairness in resource distribution are essential to ensure reliable and responsive communication between vehicles.

This research follows 3GPP standards TS 22.185, TS 22.186, TS 22.885, and TS 22.886 to support V2X communication scenarios in 5G networks. We implement and evaluate several resource allocation algorithms, namely FIFO (First In First Out), Greedy, and Genetic. The resource allocation algorithms are combined with clustering and non-clustering approaches to compare the performance in two scenarios. For the first scenario, the number of users changes with a fixed path distance, and the second scenario, the number of users remains fixed with a changing path distance.

The test results indicate that the clustering algorithm combined with Genetic provides more significant improvements compared to the Greedy and FIFO algorithms. In the comparison between clustering and non-clustering, the Genetic algorithm with clustering showed an increase in Total Data Rate by 11.57%, Average Data Rate by 12.73%, and Spectral Efficiency by 11.28% in the first scenario, and an increase in Total Data Rate by 15.00%, Average Data Rate by 12.58%, and Spectral Efficiency by 15.20% in the second scenario. Conversely, the Greedy algorithm, although better than FIFO, did not show significant improvements compared to Genetic. The recommendation from this research is to use the Genetic algorithm with the clustering approach for optimizing radio resource allocation performance in V2V communication, as it outperforms FIFO and shows significant and consistent performance improvements compared to the other two algorithms when using clustering over non-clustering.

Keywords: V2V, Radio resource allocation, FIFO, Greedy, Genetic, Clustering, Non clustering.