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# An efficient energy-aware predictive clustering approach for vehicular ad hoc networks

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SUMMARY

With an emergence of information and communication technologies, there is an increase in the demands of providing safety and comfort to the passengers during their mobility on the road. These demands can be fulfilled by one of the most popular networks of its type—vehicular adhoc networks (VANETs). As vehicles in VANETs are constrained with respect to the available resources such as computation and storage, lot of energy is consumed to perform a number of complex operations, which may lead to the emission of harmful $CO_2$ emission that effect the global warming system. Moreover, because of high velocity led by constant topological changes, it is a challenging task to maintain quality of service with respect to parameters such as high throughput, and minimum end-to-end delay. Hence, an intelligent approach is required to optimize the various complex operations in this environment, which may led to the minimum emission of $CO_2$ and other gasses. To address these issues, this paper proposes an efficient energy-aware predictive clustering scheme for vehicles. Efficient algorithms are designed for future mobility predictions and average variations of vehicles on the road. The algorithms estimate the clustering duration and total vehicles in the cluster. The performance of the designed algorithms is studied using extensive simulations by varying the number of vehicles and cluster durations in comparison with existing benchmarked scheme in the literature. The results obtained show that the proposed scheme is superior in comparison with the existing scheme of its category.


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KEY WORDS: VANETs; clustering; energy efficiency; mobility prediction; cluster-head

## 1. INTRODUCTION

With an aim to provide safety and comfort to the passengers, vehicular ad hoc networks (VANETs) are supposed to become one of the leading technologies in the coming years. Vehicles in VANETs may communicate with one another either through vehicle-to-vehicle (V2V) or vehicle-to-infrastructure (V2I) so as to generate the safety and alerts messages to the passengers. V2V communication is one of the most important features for future intelligent transportation systems [1–4]. From the past few decades, there has been growing interest of the research community in developing efficient and convenient driving conditions for passengers in VANETs [5, 6]. VANETs play an important role in wireless communication among vehicles, which emphasizes driver's safety on the road. Because of vehicles' high mobility, VANETs have high topological changes, which results in network disconnection in some part. So, to keep the connectivity at high rate among the vehicles, these are grouped together based upon some predefined criteria, which is called as clustering. Clustering in VANETs is importance for addressing the scalability problems also. The

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