Abstract:
Efficient data dissemination is a big challenge in 5G network because of Medium Access Control (MAC) contentions problem and cellular vehicle-to-everything communications and limited bandwidth in the high dense network. In this work, a two-level clustering based routing scheme is proposed for efficient data dissemination in 5G V2X communications, which consists of two layers. First layer is done with the help of Fuzzy logic approach where well known three metrics like relative velocity factor, k-connectivity factor, and link reliability factor are passed to select stable and consistent cluster head (called as level-1 cluster heads (L1CHs)). In second layer, modified Improved Q-learning is used to reduce the number of iterations in the gateway selection to LTE base station even in high dense topology. The proposed protocol achieves good results compared to the existing schemes and also reduces cost in form of time complexity which is required in calculation of temporal connectivity and reliability.

Keywords: 5G network, V2X, Q Learning, and Routing algorithm.

I. INTRODUCTION

The rapid growth in computation and communication technologies changed the conventional vehicular ad-hoc networks (VANETs) to the Internet of Vehicles (IoVs). IoV provides V2V, V2I and V2P services. V2V faces many problems such as network connection, broadcast storm and MAC Content problem etc. For V2C, combination of V2V and V2I provides internet access to vehicle using RSU. But still faces limited band width in high dense area, Trade-off between IEEE 802.11p and cellular network creates difficulty to supports above all types of communications. To get control over the limitations of IEEE 802.11p with short coverage, non-supportability of highly dense vehicular network, signal congestion, erratic broadcast services, and connectivity interruptions, an emerging technology cellular vehicle-to-everything (C-V2X) communications have been introduced for vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and vehicle-to-pedestrian (V2P) services. The initial C-V2X technology has been done by the 3GPP group and addressed all the open challenges towards the V2X services in high mobility and dense environment. 3GPP group suggested the channel structure of the side link (SL) device-to-device (D2D) to overcome challenges and tend to 5G design. To addresses above all challenges, a new two level cluster based routingscheme is proposed for 5G V2X communications against an existing routing schemes, where cluster heads (CHs) in the first level aim to overcome V2V MAC layer contentions problem, and CHs within the second-level are accountable for providing an optimal gateway between V2V and LTE. The first and second level clustering were done by Fuzzy logic and Improved Q-learning algorithm respectively. The introduction of the two-level approach in clustering is useful to improve the performance of data dissemination.

II. LITERATURE SURVEY

1] Different routing schemes in VANETs are designed to cope with the problem of V2V communications such as opportunistic routing [6], QoS-aware routing [6], street-centric approach, RSU controlled approach, and clustering for content distributions.

2] Similarly, some hybrid architectures of cellular and IEEE 802.11p, are also proposed to cope with traditional routing schemes. In a high-density vehicular network, the performance of the schemes mentioned earlier are ignored and will be costly in case of cellular technology. In a high congested vehicular network, the intensity of channel contention increases significantly among vehicles which causes considerable degradation of the IEEE 802.11p performance, due to a high transmission collision rate and a large channel access delay.

3] To cope with MAC contention problem, the formation of manageable groups (clustering) is an excellent solution to reduce the contention among vehicles. In, a reliable and low latency clustering protocol called Multi-hop Moving Zone (MMZ) was proposed by combining 802.11p with cellular technology. In MMZ, nodes were grouped up-to 3-hops using DSRC based V2V communications aiming to reduce cellular hand-off cost. Whereas the cluster heads (CHs) were selected by C-V2X technology by multi-metrics, i.e. relative velocity, distance and link lifetime (LLT). The proposed MMZ formed stable clusters with high packet delivery and low latency.

4] A novel V2V-enabled resource allocation scheme [24] was proposed by Abbas et al. [25] based on C-V2X technology aiming to improve the reliability and latency of VANETs. The proposed scheme was hybrid, where the V2V communications were performed by eNodeB in the overlay scheme. Every vehicle in the scheme mentioned above periodically monitors its packet lifetime and requests the cellular Node B to control V2V links. Furthermore, cellular eNode B performed optimum resource allocation to assign optimal receiver vehicles to determine V2V links and allocate suitable channels to minimize the total latency. The authors proposed resource allocation problem is NP-hard and is similar to the maximum weighted independent set problem (MWIS-AW) with associated weights. The V2V-enabled resource allocation scheme significantly improved the latency, packet delivery, and throughput.

5] examined the integration of LTE with DSRC (Dedicated Short Range Communication) for content dissemination in VANETs and proposed a two-level clustering scheme, where cluster heads (CHs) in the first-level aim to overcome V2V

http://ijesc.org/
MAC layer contentions problem, and CHs within the second-level are accountable for providing an optimal gateway between V2V and LTE. The first and second level clusterings were done by Fuzzy logic and Classical Q-learning algorithm respectively. Apart from the CH selection parameters, the Classical Q-Learning (CQL) has a computational issue due to the excessive iterations in gateway selection. To cope with computation al issue, Improved Q-Learning (IQL) is an optimal choice to use as a substitute of CQL. Since in IQL, the Q-values are updated only in case of the best action availability. Therefore, the time and space complexity will reduce significantly. Vehicles position and strength of connectivity concerning cluster size and transmission ranges are essential arguments of vehicular connectivity. Since connectivity is a good factor, hence it can be used as an alternate to leadership factor. Connectivity not only considers the strength of trans-mission range and 02 neighborhood degree but also considers the direction of vehicles as well. Similarly, reliability [15] denotes the quality of link better [29] than signal quality factor, that’s why we used link reliability instead of signal quality.

**III. METHODOLOGY**

![Figure 1.2. Architecture](http://ijesc.org/)

**Figure 1.2. Architecture**

**IV. CONCLUSION**

In this paper, a two level cluster based routing scheme is proposed for efficient data dissemination in a vehicular network. The first layer is done with the help of Fuzzy logic approach, where three well-known metrics (Relative Velocity Factor (RVF), K-Connectivity Factor (KCF) and Link Reliability Factor (LRF)) are passed to select a stable and consistent cluster head. The connectivity factor selects a stronger connected node among the vehicular topology’s members. Similarly, the reliability factor selects a robust CH to the vehicle’s speed. Secondly, Modified Improved Q-Learning is used in the second layer clustering, which not only reduces the computational cost but also tunes the number of gateways to LTE BS to achieve good performance. Through simulations, we concluded that proposed clustering scheme achieves good performance than previous schemes in various scenarios, especially achieving good throughput in high-density vehicular network scenarios. The proposed scheme performed very well in many dimensions, but in case of high dense topology, there will be many agents and actions for IQL, which will lead to excessive iterations in gateway discovery. Secondly, we also paid a cost in the form of time complexity by calculating temporal connectivity, and reliability.

**IV. REFERENCES**


