International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 22 (2018) pp. 16015-16020

Trust Aware Management Reputations Based Information Security for VANET

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Abstract

Vehicular Ad Hoc Networks (VANETs) Vehicular Ad-hoc Networks are self-organizing networks established among vehicles equipped with communication facilities. Promising goal of these networks is providing safety and comfort for drivers and passengers. Between the road side Promising goal of these networks is providing safety and comfort for drivers and passengers. Between the road side equipment and vehicles, between provides a wireless communication. For the successful implementing a vehicular network is designed a suitable routing protocol according to the network. Application is one of the essential requirements Intelligent Transportation Systems. VANETs provide many new exciting applications and opportunities albeit transportation protection and facilitation applications for the core drivers. The nodes are having some challenging individuality of VANET which result in significant loss rates and very short communication times. In addition the proposed method is classification of the various VANET attacks based on the communication system layers is provided. In addition, the different types of VANET adversaries and attackers are presented here. In general, this paper aims to provide a good piece of information about VANET safety and privacy in order to be used as a tool to help researchers for rising secure privacy-preserving approaches for VANET.

Keywords: VANET, Intelligent Transportation Systems, Safety and Facilitation Applications, Trust Management.

1. INTRODUCTION

Vehicular Ad hoc Networks (VANETs) are emerging as the preferred network design for Intelligent Transportation Systems (ITS), providing inter-vehicular short range communications, for the support of Internet access and safety applications. VANETs are a particular class of Mobile Ad-hoc Networks (MANETs), showing typical characteristics. Indeed, VANETs consist of mostly highly mobile nodes moving along the same or opposite directions forming clusters. Meeting this requirement becomes very difficult as nodes in a VANET are highly mobile and thus the network topology is highly dynamic. This work aims to achieve a better vehicle to infrastructure communication. Vehicle-to-vehicle (V2V) communications are supported due to “smart” vehicles, equipped with On-Board Unit with multi-Network Interface Cards (NICs), such as IEEE 802.11p, WiMax, Long Term Evolution, and also Global Navigation Satellite System (GNSS) receiver. There is a potential for the vehicles to travel at high speeds. Therefore, the period of communication between them can be very short. Since vehicles have the characteristic of high mobility, the topology of the network changes so quickly and unexpectedly, which leads to the frequent and unpredictable break down of the wireless links [5]. Another feature of VANETs is that the network topology is highly dynamic [8]. For example, in late night hours or the rural freeways, the traffic density is in a very low level; on the other hand, in huge highways or at midday hours, a very dense network can be experienced. Accordingly, in the communication range, the number of neighbor vehicles may differ from zero up to hundreds. Inter-vehicle communications are expected to significantly improve transportation safety and mobility on the road. Several applications of inter-vehicle communications have been identified, from safety and warning applications, up to traffic control and driver assistance applications.

The convenience and efficiency of the driver are improved by the non safety applications. As discussed above, safety applications do not deal with a lot of data volumes, but here, non safety applications need to take care of a higher volume of information [15]. The travel time is minimized by the driving efficiency applications.

They distribute the information about the roads and the condition of the traffic on the roads so that the driver can avoid the high traffic density roads or even the roads with a traffic jam. Suppose that a driver needs to go on the road. If he has information about the roads which lead to his destination, he can greatly save his time by choosing the best route (by the application of the car navigation system), on which the traffic is not high. There are many situations such as merging into the flow traffic or finding free spot for parking that comfort applications, like the applications for the driver efficiency, which can help the driver. The information is periodically exchanged by non safety applications. Then they are aggregated with the information sensed by own sensors and obtained from the neighbor vehicles and, after all these processing stages, the information is distributed to the other vehicles.

In a traditional MANET environment, multiple solutions have been proposed in order to alleviate the broadcast storm effect, but only a few solutions have been addressed to the VANET context. Most of recent research works have focused on analyzing VANETs as well-connected networks, providing high vehicular traffic density. As vehicles in close proximity detect the same dangerous situation, they will inevitably broadcast messages relating to the same event, leading to a dramatically excessive message redundancy. In such scenarios, broadcast suppression solutions have to be considered . In contrast, in low vehicular traffic density environments, with a sparse Road Side Units (RSUs) settling and a low market penetration rate, vehicular connectivity results intermittent, poor, and short-lived . In this context, the design of reliable and efficient routing protocols for supporting highly diverse, and mainly intermittently connected vehicular network topologies, is still a challenge. Hybrid solutions based on both V2V, and vehicle-to-infrastructure (V2I) communications, result as a viable alternative to routing protocols that exploit the V2V paradigm only.

In this paper, we present a cluster-based broadcast technique for safety applications in VANETs. Our approach is called Selective Reliable Broadcast (SRB), and relies on the opportunistic cluster selection in order to reduce the broadcast storm effect: SRB selects only one vehicle within a cluster namely, a cluster-head in order to efficiently rebroadcast emergency and control messages. SRB technique is then able to detect the well-known car platoons, which cause traffic congestions and delays, in a fast way and with low overhead, in order to eventually recommend alternative paths to other vehicles. As a result, SRB limits the number of transmissions but preserves good network performance.

2. RELATED WORK

In this section an overview of previous assistance in broadcast protocols for VANETs particularly focusing on cluster-based approaches. Within the discussion, we clarify the paper objective and then introduce our proposed approach.

Reliable protocols use three methods i.e.,(i) rebroadcasting when the transmitter node retransmits the same message for many times, (ii) selective ACK, where the transmitter requires ACK from a small set of the neighbors and (iii) changing parameters where the transmitter changes transmission parameters according to the expected state of the network.

The problem statement for reliable protocols is to design a protocol that can deliver a message from a single source to every node in the own transmission range with the highest possible reliability and minimum delay. Successful message dissemination in VANETs needs an efficient decision mechanism in order to maximize reliability, and keep the overhead low. The decision criterion about when and how a safety message should be delivered or repeated is an open issue.

Given the requirements of safety applications (i.e., low delay and effective reliability), and the limitations of vehicular communications (i.e., short-lived connectivity links), selective broadcast or multicast strategies seem more applicable than either unicast routing or flooding. In fact, the latter generates a high overhead without increasing the success rate substantially (Chen et al., 2008). Several solutions have been made to introduce intelligence to the basic broadcast concept, and make it more selective and, thus, more efficient in its resource usage.

A largely common assumption in connectivity models for VANETs is that a vehicular network is partitioned into a number of clusters (Little and Agarwal, 2005); vehicles within a partition can communicate either directly or through multiple hops among each other, but no direct connection exists between partitions, as well depicted in. A particular class of routing protocols namely, the cluster-based approaches uses this assumption by exploiting clusters formation (Kakarla et al., 2011).

Based on geographical locations, directions of movement, speed and many other metrics, vehicles can group into different clusters. This is due since links among vehicles within the same cluster tend to be more stable, although dynamic topology changes can occur. Clustering enhances effective broadcasting and relaying of messages, while reducing the overhead associated with signaling and the number of unnecessary message replica. Leveraging on this issue, an efficient clustering should be based on adequate metrics and should take into account the frequent topology changes. The formation of clusters and the selection of the cluster-head (i.e., a vehicle leader within the cluster responsible for intra and inter-cluster communications) are strongly precious by the high mobility dynamic cluster configuration process.

Ni et al. (1999) consider each cluster comprised of three node types i.e., head, gateway and member. The gateway nodes are those who connect to the gateway nodes in other clusters, while the cluster-head is a node whose transmission radius can reach

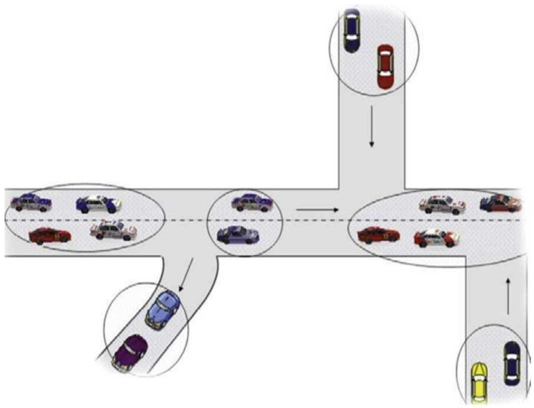

Fig. 1. Schematic of several vehicle clusters.

Vehicles belonging to the same cluster can communicate each other, while due to the gaps among consecutive clusters, no inter-cluster communications are available.

Everyone in the same cluster. Finally, members are those who do not belong in either head or gateway group. When a gateway node receives a message from other clusters, it will rebroadcast the message that will be received, and then further retransmitted, by the cluster-head. Although this cluster architecture is correct (Ni et al., 1999), the authors did not specify the procedure for the cluster-head election.

Fasolo et al. (2006) propose a Smart Broadcast protocol, which exploits vehicles' positions. The proposed technique assumes that the vehicular network is partitioned in adjacent sectors and that vehicles are able to estimate their own position and, therefore, the sector they belong to. Their approach is a cluster-based routing protocol and the basic idea is to divide the geographic area into foursquare grids, where a vehicle is elected as the cluster-head to route data packets across nearby grids. Also this technique needs to be validated via simulation results. Finally, in Sun et al. (2012) propose an RSU-assisted cluster head selection, by exploiting V2I connectivity, whenever inter-vehicle communications are not available. The Smart Broadcast technique considers a contention resolution procedure to elect the relay nodes. Although this technique seems very efficient, it has not been validated in terms of network performance and system overhead. Another work that considers both information on vehicles' position, and the cluster formation, is presented by Luo et al. (2010).

In all the previous works, mobility aspects have not been considered, while it is noticeable that the cluster selection process is particularly affected by vehicle mobility and cluster stability. Benslimane et al. (2011) consider the cluster formation on the basis of the direction of vehicles movement, the Received Signal Strength (RSS), and the inter-vehicular distance. In this envision, the directional antenna-based Medium Access Control (MAC) protocols are exploited to accurately group vehicles on the basis of the direction of their movements and the transmission angles. Gunter et al. (2007) take into account mobility during cluster collision, and a cluster-head vehicle is that one with the lowest relative mobility and closest proximity to its neighbors.

Khaleel Marshad [5], vehicles in a groups, and messages are forwarded to all group members by the group leader. Hence, the privacy of all group members is secured by privacy of the group leader. Furthermore, if group leader is selected malicious vehicle, total group member's privacy may be leaked. So this problem overcome by a used group signature which is using a secure scheme in which unique group public key is related with multiple group private keys. Even though an eavesdropper can know that a message is sent by the group, it cannot recognize the sender of the message pseudonym is joined with a group signature to avoid storage pseudonyms and licenses in vehicles.

In J.M.d. Fuentes, A.I. Gonzalez-Tablas, A. Ribagorda, they talked about overview of the security issues with a cryptography point of view details or some presenting solutions. The security of vehicular networks focused on a specific issue on includes key management, privacy, anonymity, reputation, and location. In Raya and Hubaux [7], they discussed the security weaknesses and challenges in vehicular ad hoc networks if Vehicular Ad hoc Network users use the same Identity Document (ID) whenever sends a message, a malicious node could hack to their message and construct a profile of their positions, which exposes their privacy. It's planned to deceive attackers. Pseudonyms preserve the location privacy of a user by breaking the likability between two locations. A vehicle can from time to time update its pseudonym. The powerful enemy may still link new and old pseudonyms by monitoring the spatial and temporary relations between both new and old locations. It's were posed the three techniques namely mix zones, silent period, and vehicular ad hoc anonymity. The previous related works aware situation of VANETs security. In the following sections, we aim to highlight security requirements in Vehicular ad hoc network, then introduce in the possible attacks and solution in vehicular communication. The consequently section will represent the different advances of characteristics and features

3. PROPOSED WORK

A selective reliable broadcast protocol (SRB) is expect to minimize the number of rebroadcast message by limit the number of packet transmission. Through an opportunistic vehicle selection, packets are retransmitted towards an next hop, in order to strongly reduce the number of forwarder vehicles.

In this work, we present SRB, a reliable cluster-based routing protocol that is expected to minimize the number of rebroadcast messages. SRB considers the cluster selection process, and the cluster-head election, by exploiting the inter-vehicle distance and the time delay. Via simulation results, SRB results in an efficient method to detect clusters and alleviate the broadcast storm problem. This can be done by detecting the cluster of vehicles in a fast and efficient way and elect one as CH vehicle for each cluster detected.

3.1.1 Mobility Model Generator

The most important parameters in simulating ad-hoc networks is the node mobility. It's important to use real world mobility model so that the results from the simulation correctly reflect the real-world performance of a VANET, example a vehicle node is typically constrained to streets which are separated by buildings, trees or other objects. Such obstructions often increase the average distance between nodes as compared to an open-field environment.

We will deploy a tool MOVE (Mobility Model Generator for Vehicular networks model mobility generator for vehicular networks (MOVE). The mobility generator is used for realistic vehicular movement generation in the urban environment. It is an open source micro-traffic time-discrete vehicular traffic generator package. MOVE has two modules for a vehicular environment called vehicle movement editor and road map editor. The road map editor gives essential features of roads such as number of lanes, roads, junctions, traffic lights setup. Vehicle editor is used to set the speed of vehicles, number of vehicles, probability of right or left turning, etc.

MOVE consists of two main components: the Map Editor and the Vehicle Movement Editor, The Map Editor is used to create the road topology. Currently we have implemented three different ways to create the roadmap– the map can be manually created by users, generated automatically, or imported from existing real world maps. The Vehicle Movement Editor allows user to specify the trips of vehicles and the route that each vehicle will take for one particular trip. The output of MOVE is a mobility trace, generated based on the information users input in the Map Editor and the Vehicle Movement Editor, which can be immediately used by a simulation tool such as ns-2 to simulate realistic vehicle movements.

MAP Editor: In MOVE, the road map can be generated manually, automatically or imported from a real world map. Manual generation of the map requires inputs of two types of information, nodes and edges. A"node" is one particular point on the map which can be either a junction or the dead end of the roads. Furthermore, the junction nodes can be either normal road junctions or traffic lights. The edge is the road that connects two points (nodes) on a map. The attributes associated with an edge include speed limit, number of lanes the road priority and the road length. The map can also be generated automatically without any user input. Three types of random maps are currently available: grid, spider and random networks. There are some parameters associated with different types of random maps such as number of grids and the number of spider arms and circles. Finally, one can also generate a realistic map by importing real world maps from publicly available database.

Vehicle Movement Editor: The movements of vehicles can be generated automatically or manually using the Vehicle Movement Editor. The Vehicle Movement Editor allows users to specify several properties of vehicle routes including number of vehicles in a particular route, vehicle departure time, origin and destination of the vehicle, duration of the trip, vehicle speed. The parameters of each flow consist of the starting road and destination of the flow, the time to start and end the flow, the number of vehicles in the flow and the inter departure time of the vehicle originating from the starting road. In addition, user can define the probability of turning to different directions at each junction (e.g. 0.5 to turn left, 0.3 to turn right and 0.2 to go straight) in the editor.

3.1.2 RTB and CTB clearance

Before sending Request-To-Broadcast (RTB) and Clear-To-Broadcast (CTB) message, network are partition into a sector through which the message are propagate along the transmission direction from the source vehicle and are identified as portion of a circle. The sector size varies as a dynamic process, iteratively hop by hop, depending on the transmission direction from each transmitting vehicle. The i_{th} sector is identified by an angle $\alpha_i(h)$, where h is the index of current hop. Initially, in the h=1 hop, there is a unique sector that includes the source vehicle's transmission range i.e., corresponding to an angle α(h)=360. On the next hops (i.e., when h=1), n sectors are identified, each one associated to the n_{th} forwarder vehicle, by the second hop (i.e., h>1) we consider that the i_{th} forwarder vehicle has an angle corresponding to its forward or backward transmission range, so that $\alpha_i(h>1)=180$. In Figure 3.1 depicts the sector identification in the first and second hops.

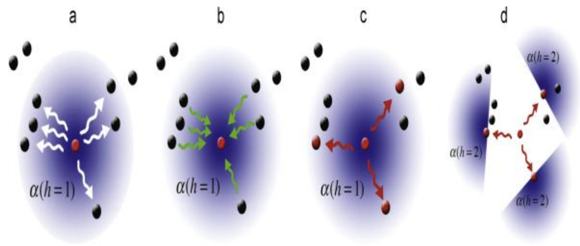

Figure 3.1. Sector Formation

The red and black points are respectively the source and neighboring vehicles, while the blue area represents the transmission range of one vehicle. In the first hop, during (a) RTB transmission, (b) CTB transmission, and (c) cluster-head selection, α(h=1)=360. By the second hop, (d) the message propagation is only backward or forward, and then α(h=2)=180.

$$\sum_{i}^{n} = T\alpha i\ (1) = 360^0$$

SRB consider a contention procedure and cluster detection mechanism as follows

A source vehicle transmits a RTB control message to all the neighboring vehicles in the transmission range. After receiving an RTB message, the vehicle compute their distance from the source vehicle Than the vehicle send back to the source as CTB packet, containing the vehicle ID and its distance from the source. After receiving a valid CTB packet, vehicle exit the contention phase.

3.1.3 Cluster detection and CH election

Once the source vehicle receives information on the ID and the distance from its nearby vehicles. By measuring the Direction of Arrival (DoA) of the CTB messages, the source vehicle is able to calculate all the mutual inter-vehicle distances between its nearby vehicles.

$$hop = N\sum_{i}^{n} = 1(2ni + 1)$$

If the distance between each couple of nearby vehicles is lower than a threshold value (i.e., D_{min}), the two vehicles will be considered belonging to the same cluster as shown in Figure 3.2. The choice of D_{min} influences the number of clusters identified: the higher the distance threshold, the higher the number of vehicles in each cluster.

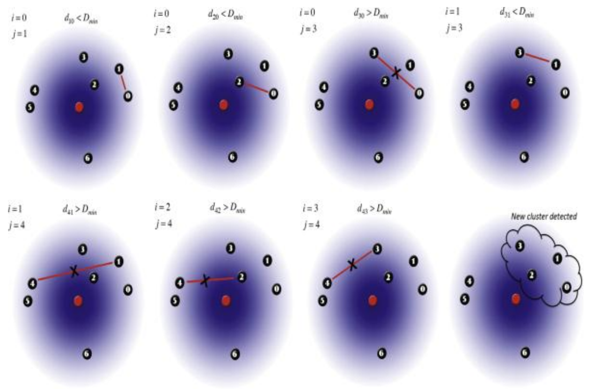

Figure 3.2 Cluster Detection Mechanism

After detecting multiple clusters, the source vehicle elects the furthest vehicle inside each cluster as the CH, and transmits a data message only to such vehicle. Upon receiving the data message, each CH will become the message source for the next contention phase, and the SRB method is repeated for the next hops. In Figure 3.3 depicts the main phases of SRB technique for a forward data transmission along the vehicular grid. Once the CH vehicles are identified, they will forward message according to SRB technique

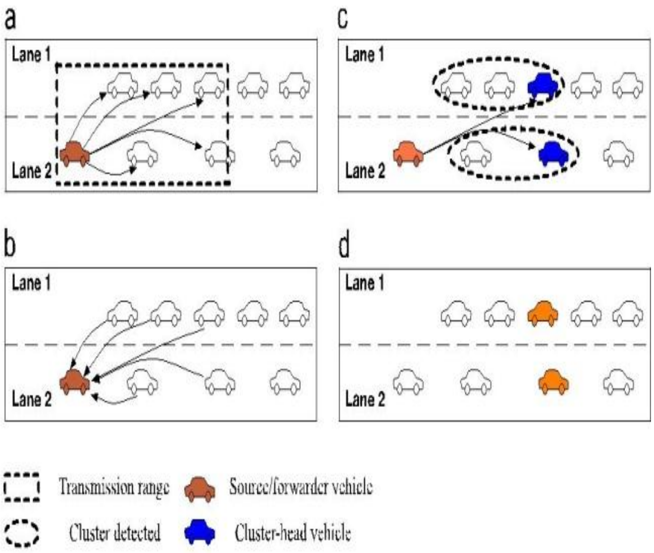

Figure 3.3 Main phases of SRB technique: (a) RTB transmission, (b) CTB transmission, (c) Cluster detection and CH election, and (d) message propagation.

4. PERFORMANCE ANALYSIS

4.1 Simulation Environment

The simulation environment used for the proposed work is given in the following Table 4.1. It describes the various parameters used for the simulation.

Table 4.1 Simulation parameters and values

PARAMETERS	VALUE
1. Channel	Wireless channel
2. Antenna	Omni/Directional Antenna
3. MAC Protocol	IEEE 802.11
4. Routing Protocol	AODV
5. No. of Nodes	100

4.2 Performance Parameters

The performance analysis of the VANET based on Selective reliable broadcast (SRB) is done with the help of the parameter. A vehicle coming from the free area should be able to fast detect the traffic congestion.

- Throughput
- Packet Delivery Ratio

4.2.1 Throughput

Throughput denotes that the correct cluster detection has occurred if the amount of packet exchange has increased significantly. In Figure 4.1 shows throughput experienced by vehicles moving in highway scenario. The throughput of SRB approach increases by 17.28% when compare to CDP approach.

Traffic load between other sources to destination may reduce this maximum network path throughput. Alternatively, a large number of sources and sinks may be modeled with or without flow control and the aggregate maximum network throughput measured (the sum of traffic reaching its destinations). In a network simulation model with infinite packet queues, the asymptotic throughput of the latency method.

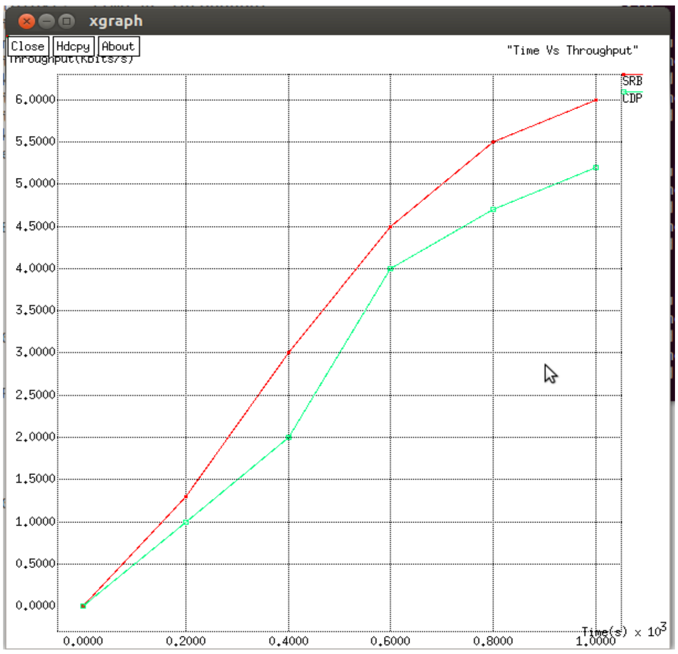

Figure 4.1 Throughput

4.2.2 Packet Delivery Ratio

Packet Delivery Ratio is defined as the ratio of number of packets effectively received and number of packets transmitted. In Figure 4.2 shows that the SRB approach are increases by 17.85% when compared to CDP approach. . It increases due to successful transmission of packets by the intermediate nodes.

Figure 4.2 Packet Delivery Ratios

5. CONCLUSION AND FUTURE WORK

In SRB, aims to improve the broadcast storm problem by selectively broadcast the message within their own transmission range that will reduce the network overload and limit the message duplication SRB is particularly effective for safety applications: it relies on cluster-based routing protocols, as well as exploits the vehicles positions, in order to detect traffic congestions in a fast way and with low overhead. For a rich set of applications implementing Intelligent Highways, like application related to road safety, traffic monitoring and management, road disaster mitigation etc. the road side infrastructure plays a vital role for any VANET. This is the reason that efficient communication between the vehicles and the road side infrastructure is required. Only a limited number of vehicles are elected as cluster-heads to forward messages. SRB has been validated through the simulation, of highway scenarios it works efficiently by means of a faster detection of congested area. In future it can be extended for urban scenarios.

REFERENCES

[1] Basu P, Khan N, Little TDC. A mobility based metric for clustering in mobile ad hoc networks. In: Proceedings on international conference on distributed comput-ing systems workshop; 2001. p. 413–418.

[2] Benslimane A, Taleb T, Sivaraj R. Dynamic clustering-based adaptive mobile gate- way management in integrated VANET-3G heterogeneous wireless networks. IEEE J Sel Areas Commun 2011;29(3):559–70.

[3] Chen W, Guha RK, Kwon TJ, Lee J, Hsu IY. A survey and challenges in routing and data dissemination in vehicular ad-hoc networks. In: Proceedings on IEEE international conference on vehicular electronics and safety, Columbus, OH, USA; 2008. p. 328–333.

[4] Fasolo E, Zanella A, Zorzi M. An effective broadcast scheme for alert message propagation in vehicular ad hoc networks. In: Proceedings on IEEE interna-tional conference on communications (ICC), vol. 9; 2006. p. 3960–3965.

[5] Gunter Y, Wiegel B, Grossmann H. Cluster-based medium access scheme for VANETs. In: Proceedings on intelligent transportation systems conference; 2007.

[6] Hafeez KA, Zhao L, Liao Z, Ma BN-W. A Fuzzy-logic-based cluster head selection algorithm in VANETs. In: Proceedings on IEEE international conference on communications (ICC); 2012. p. 203–207.

[7] Kakarla J, Sathya S, Laxmiand GB, Babu RB. A survey on routing protocols and its issues in VANET. Int J Comput Appl 2011;28(4):38–44.

[8] Kayis O, Acarman T. Clustering formation for inter-vehicle communication. In: Proceedings on IEEE intelligent transportation systems conference (ITST); 2007. p. 636–641.

[9] Koyamparambil Mammu AS, Hernandez-Jayo U, Sainz N. Cluster-based MAC in VANETs for safety applications. In: Proceedings on international conference on advances in computing, communications and informatics (ICACCI); 2013. p. 1424–1429.

[10] Little TDC, Agarwal A. An information propagation scheme for vehicular networks. In: Proceedings on IEEE intelligent transportation systems conference, Vienna, Austria; 2005. p. 155–160.

[11] Luo Y, Zhang W, Hu Y. A new cluster based routing protocol for VANET. In: Proceedings on second international conference on networks security wireless communications and trusted computing (NSWCTC), vol. 1; 2010. p. 176–180.

[12] Ni S, Tseng Y, Chen Y, Sheu J. The broadcast storm problem in a mobile ad hoc network. In: Proceedings on the fifth annual ACM/IEEE international confer-ence on mobile computing and networking (MobiCom); 1999. p. 151–162.

[13] Sun L, Wu Y, Xu J, Xu Y. An RSU-assisted cluster head selection and backup protocol. In: Proceedings on 26th international conference on advanced information networking and applications workshops (WAINA); 2012. p. 581–587.