THE CLUSTERING DATA TRANSMISSION METHOD BASED ON DRIVER'S BEHAVIOR PATTERNS ANALYSIS FOR VEHICLE AD-HOC NETWORKS (VANETS)

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Abstract- Vehicle Ad-hoc networks (VANET) requires secure-communication methods for the high-speed vehicle movement. VANET would be not easy to configure network topology because network configuration time is so short. That means that it is impossible to predict vehicle network topology changing. VANET requires stable network configuration considering above condition. Therefore, to solve the vehicle network challenges, we propose a transmission method to maintain stable clustering by categorizing behavior patterns into high and low risk group.

Keywords- Directional antenna, Clustering, Driver's Behavior Pattern, VANETs

I. INTRODUCTION

National Highway Traffic Safety Administrations (NHTSA) under the United States Department of transportation has released a report on "Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application" of Vehicle-to-Vehicle (V2V) communication technology. According to the contents of the report, the largest object of V2V technology is to increase road safety and prevent accident through communications between vehicles. Above a mentioned report, it has been described bill for the V2V featured mandatory. Thus, Vehicle Ad-hoc NETworks (VANETs) become more issue in routing method for more secure deliver and accurate information in V2V communication environment. However, VANETs' routing protocols have some unique characteristics. It is driver's driving habits, mobility constraints according to road environment, complex environment, and vehicles mobility. These characteristics affect determining VANETs design. In detail, these characteristics are as follows: Frequent topology configuration, Easy to change network density, and Driver types.

Thus to maintain network topology by cluster algorithms, it have to expect the area where it can be formed in clusters. It is important thing because it can reduce the number of clustering reconfiguration counts. To achieve this, we have to know vehicle's mobility, which vehicles are stable status in a local cluster. Therefore, in VANETs, maintaining network topology using by cluster methods has many challenges. To reduce the number of clustering reconfiguration counts by expected area for deformed clustering using road characteristic or detect vehicles able to departure in cluster by expected to vehicles mobility. In this paper, to solve this challenges, we propose transmission methods of secure cluster formation. It is classified by vehicles without causing a change in vehicles communication network topology from analyzing characteristic for driving types of drivers, and the others. If some road networks are able to predict vehicle network topology based on methods as classification depending on vehicle communication network topology, we could solve challenges of cluster routing methods in VANETs because the number of vehicle communication topology changes & clustering counts are reduced.

And in this paper, we propose cluster based cluster routing methods by driver pattern analysis for low data communication collision, and it could predict vehicle communication network topology in VANETs.

II. RELATED WORKS

The main requirement of routing protocols is the least consumption of network resources, and reaches the least communication time. VANETs also have to be same requirement of normal routing protocol. In VANETs, finding route and maintaining network topology, however, are challenges for vehicles dynamic environments. Therefore, in order to solve challenges, VANETs have been studied various routing methods. We classified into 5 routing methods in VANETs. Exiting routing algorithms are Ad-hoc, geographic, broadcast, geo-cast, and clustering based routing. Because a cluster based data forwarding scheme has hierarchical structure for each nodes based on clustering communications, if one node (cluster header) is able to forward data unilaterally for each nodes, it is reduced data collision at data communication. However a cluster based routing protocol also have drawbacks. As Clusters in member nodes have merge to another node or separate other area, they make more the number of counts for cluster reconfigurations. If they increase counts of

reconfiguration, it is able to take many waste time for network collision and data transmission. Reconfiguration ratio of vehicle clustering is lower because vehicles keep speed on the route. So, it is not occurred overhead. Because cluster which is driving vehicles make clustering configuration for normally driving drivers is not occurred overhead. Due to some vehicles mobility which is relatively high speed or low speed driving or frequently changing the line of road such like driver of violence driving, vehicle clustering increase the number of times to reconfiguration and occurs overhead.

Table 1. Routing protocol types

Routing type	Characteristics
Ad-hoc routing	Without using access point (AP) o r base station, to build a network only vehicles, it is possible the con struction of high-speed network n etworks.
Geographic based routing	After obtaining location information of vehicle via a GPS, and transfers the data to destination of vehicle.
Broadcast routing	Used to provide an emergency message in all vehicles.
Geo-cast routing	By transferring data only vehicles in some area, it able to reduce network collision.
Cluster based routing	A cluster header of cluster based routing is sent data to member nodes, to reduce network collision.

To solve the above problems, we select violence driver and exception violence driver. And then we collect normal driver and make cluster. It will be reduced reconfiguration clustering steps.

III. PROPOSED MODEL

To classify into a stable communication vehicle for secured communication clustering, we need to classify the vehicle into risk group or not. Because we can't forecast driver's driving pattern. In this paper, we classified and measured the vehicle risk used by classification of driver type traffic accident vehicle as shown in table 2. (Traffic accident data is based on 2013 traffic accident data in Republic of Korea police department database.) The reason of measuring the risk is low level risk of vehicle is not high rate of vehicle accident in vehicle topology. On the other hand, high level risk of vehicle affects to vehicle network topology because it has high ratio of vehicle accident and dynamic moving in road. On the above mentioned example, some violence driver's driving style has frequently rapid over speed or deceleration. It will be complicated to configure vehicle topology on road and made high ratio of vehicle accident. And vehicle network topology also make complicated due to this violence driver's dynamic moving.

To understand the risk, in this paper, we converted to formalize value for probability of vehicle driver type by vehicle accident, as shown in table 2. And the applied highest value is set in table 2, and we set to level of risk groups. Vehicle accidents by driver type are classified by sex, duration date of the driver's license acquisition (for year), and Driving purpose. And formalized value of vehicle accidents by driver type could be calculated by the number of all driver comparison using by the number of vehicle accident ratio. So based on formalized value, we could describe risk group when there is a value of standard 0.2 point difference.

Table 2. Dangerous patterns by driver features

sex	License year	Driving purpose	total	Risk group
Male (0.59)	Over 15years (0.34)	Not commercial (0.55)	1.48	Dangerous area
Male (0.59)	Under 5years (0.12)	Not commercial (0.55)	1.26	Boundary area
Male (0.59)	10~15 years (0.11)	Not commercial (0.55)	1.25	Boundary area
Male (0.59)	5~10 years (0.10)	Not commercial (0.55)	1.24	Boundary area
Male (0.59)	Over 15years (0.34)	Metro (0.11)	1.04	Boundary area
Female (0.12)	Over 15years (0.34)	Not commercial (0.55)	1.01	Boundary area
Male (0.59)	Over 15years (0.34)	Delivery (0.05)	0.98	Boundary area
Male (0.59)	Under 5years (0.12)	Metro (0.11)	0.82	Standard area
Male (0.59)	10~15 years (0.11)	Metro (0.11)	0.81	Standard area
Male (0.59)	5~10 years (0.10)	Metro (0.11)	0.80	Standard area
Female (0.12)	Under 5years (0.12)	Not commercial (0.55)	0.79	Standard area
Female (0.12)	10~15 years (0.11)	Not commercial (0.55)	0.78	Standard area
Female (0.12)	5~10 years (0.10)	Not commercial (0.55)	0.77	Standard area
Male (0.59)	Under 5years (0.12)	Delivery (0.05)	0.76	Standard area
Male (0.59)	10~15 years (0.11)	Delivery (0.05)	0.75	Standard area
Male (0.59)	5~10 years (0.10)	Delivery (0.05)	0.74	Standard area
Female (0.12)	Over 15years (0.34)	Metro (0.11)	0.57	Fine area
Female (0.12)	Over 15years (0.34)	Delivery (0.05)	0.51	Fine area
Female (0.12)	Under 5years (0.12)	Metro (0.11)	0.35	Priority area
Female (0.12)	10~15 years (0.11)	Metro (0.11)	0.34	Priority area

Female (0.12)	5~10 years (0.10)	Metro (0.11)	0.33	Priority area
Female (0.12)	Under 5years (0.12)	Delivery (0.05)	0.29	Priority area
Female (0.12)	10~15 years (0.11)	Delivery (0.05)	0.28	Priority area
Female (0.12)	5~10 years (0.10)	Delivery (0.05)	0.27	Priority area

Example of vehicle accident of driver type, sex is man (0.59point), and duration date of the driver's license acquisition is 15 years over (0.34point), and driving purpose is private driving job group (0.55point), its total points are 1.48point. In table 2, we defined a total 5 risk group of each part highest scores difference by total points. Risk groups are as follows: Dangerous, boundary, standard, fine, and priority group. Most high total point is a high dangerous type, defined as a dangerous group, sequentially boundary group, standard group, fine group, and priority group as lowest total point. And a method for classifying into vehicle by data transmission based on vehicle risk group has many advantages, it can predict vehicle network topology changes, and securely maintain due to be shortened by vehicle network topology configuration time.

Based on the vehicle risk, Methods for classifying into the vehicle by data transmission are shown in Fig. 1. The risk vehicle pattern classified in Fig. 1-(a). 1 is like this: dangerous group vehicle is red, boundary group is orange, standard group is yellow, fine group is green, and priority group is blue. Fig. 1 describes that vehicles can transmit data to neighbor vehicles except dangerous group vehicle and boundary group vehicle. However this formation has possibility on collision of network communication. If vehicles communicate with each vehicles, they should make multicast manner. And data transmission of each vehicle is disadvantage, which network communication time can be longer due to transmitting duplicate data. To achieve this, we propose cluster based data transmission method for reducing the network collision and duplicated data. Because the classification method of the proposed method for risk groups is able to predict topology change of vehicle communication networks, we can detects clustering changing in network topology and also occur the lower number of times of change in topology to decompose or reconfigure reduction cluster.

Therefore we propose the clustering method for classifying the vehicle data transmission, as shown in Fig. 2.. As shown in following Fig. 2, to transfer data based on cluster is also divide each vehicle for risk groups. In this time, cluster communication method is End-to-End (E2E) based communication methods. Each cluster defined interface node and header node, and Inter-cluster communicates only between interface node and header node. Other vehicle can just receive the data from them. Therefore, as in the classification for data transmission based on vehicle risk, it is possible to make detect time when they will change network topology. And it is possible to reduce collision of communication through cluster based data method, and it is available for high speed data transmission by E2E communication method.

The necessary technology of cluster data transmission method based on vehicle risk could select (optional) data transmission, in other words, it needs directional antenna.

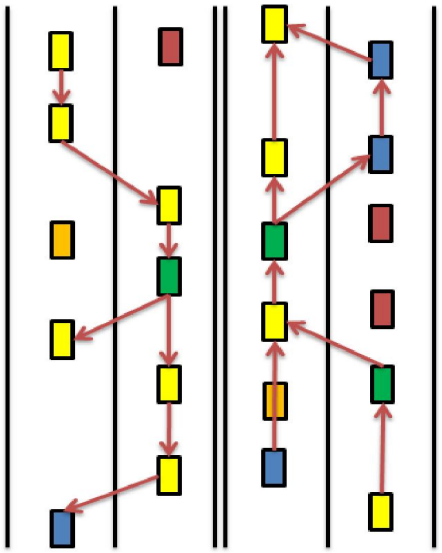


Fig. 1. Risk pattern by data transmission of vehicles,

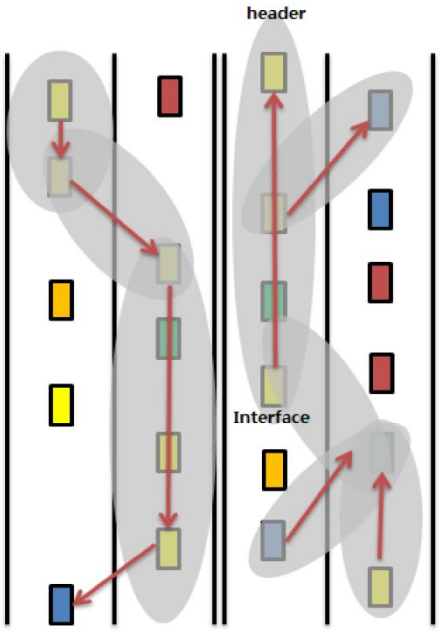


Fig. 2. Risk pattern based Clustering transmission algorithm

As shown in following Fig. 2, to transfer data based on cluster is also divide each vehicle for risk groups. In this time, cluster communication method is End-to-End (E2E) based communication methods. Each cluster defined interfacenode and header node, and Inter-cluster communicates only between interface node and header node. Other vehicle can just receive the data from them. Therefore, as in the classification for data transmission based on vehicle risk, it is possible to make detect time when they will change network topology. And it is possible to reduce collision of communication through cluster based data method, and it is available for high speed data transmission by E2E communication method.

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CONCLUSION

In this paper, we select vehicles to maintain network topology based on driver of driving type to solve vehicles mobility in VANETs. Therefore, to solve the vehicle network challenges, we propose transmission methods to maintain stable clustering by categorizing behavior patterns into high and low risk group. Through the cluster data forwarding, proposed methods are possible to forward fast data to destination nodes and reduce communication collision. Therefore, this paper we propose a cluster-based routing method through analysis of driver's behavior pattern for predictable network topology changing and low data communication collision in vehicular ad-hoc networks.

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