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Improving Performance in Vehicle Adhoc Network- Proposal

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Abstract: There are many safety related application developed based on VANET technology to fulfill the requirements of users on drive and make them comfortable in their journey. DSRC is used as a communication medium for sending and receiving messages between vehicle- to-vehicle and vehicle- to-infrastructure. The main advantage of this VANET is to provide traffic information in advance to driver, so that it helps them to take alternate route to reach the destination early. But the only concern is how fast this information could reach the on-board device. In the existing system all the traffic information is sent to all vehicles (all vehicles passing through specific source and destination) whether they need it or not. In this paper the data are split-up into smaller parts, reduce them and form a cluster for that reduced data. Hence the performance of overall traffic system of VANET will automatically be increased in terms of speed especially.

Key words: VANET · Routing · MANET

INTRODUCTION

A Vehicular Ad-Hoc Network, orVANET, is a form of Mobile ad-hoc network, to provide communications among nearby vehicles and between vehicles and nearby fixed equipment, usually described as roadside equipment. InVANET, or Intelligent Vehicular Ad-Hoc Networking [1], defines an Intelligent way of using Vehicular Networking. InVANET integrates on multiple ad-hoc networking technologies such as WiFi IEEE 802.11 b/g [2], WiMAX IEEE 802.16, Bluetooth, IRA, ZigBee for easy, accurate, effective and simple communication between vehicles on dynamic mobility. A vehicle in VANET is considered to be an intelligent mobile node capable of communicating with its neighbors and other vehicles in the network [3]. For configuring the vehicle with a unique address, there is a need for address reconfigurations depending on the mobility patterns [4].

The project aims to develop inter-vehicular networking, computing and sensing technologies for next generation smart vehicles. Such vehicles have embedded computers, GPS receivers, short-range wireless network interfaces and potentially access to in-car sensors and the Internet. Furthermore, they can interact with road-side wireless sensor networks on roads where these networks are deployed. These capabilities can be leveraged into distributed computing and sensing applications over vehicular networks for safer driving, dynamic route planning, mobile sensing, or in-vehicle entertainment [5]. To support a large spectrum of such applications with high mobility nodes, this research designs and implements vehicular-specific network protocols, middleware platforms and security mechanisms.

All the vehicles are equipped with onboard location, speed sensors and a wireless radio to communicate with the infrastructure thereby VANET is formed. Once the vehicles enter into the boundary of traffic area, they broadcast their positional information as data packet with their encapsulated ID in it. The controller at the intersection receives the transmitted packets from all the legs of intersection and then stores it in a temporary log file. Now the controller runs Platooning algorithm [6] to group the vehicles approximately in equal size of platoons.

VANET may also incorporate some data mining techniques [7] such as clustering but the major distinguishing factor between purely data mining approaches and VANET in traffic analysis is that in VANET the traffic analysis is done within a network of Vehicles that are connected in an adhoc fashion e.g. V-2-V (vehicle-to-vehicle) or V-2-I/I-2-V (infrastructure-to-vehicle) which connects vehicles to some controlling devices whilst in data mining approaches. The analysis is done remotely using any communication media that transfers data between the database servers and the vehicles.

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In this paper we are going to analyze the traffic intensity at each signal points, collect the data and then filter the data between the infrastructures. These data are effectively used based on the user analysis in order to reduce unwanted data transmission, congestion and on-time delivery [8] of resources.

Literature Review: There are multiple approaches that have been proposed to detect the congestion. They first analyze data obtained by vehicular communication to avoid the traffic and then include road side units i.e. towers. The system is capable of detecting traffic congestion areas in real-time with data collected and disseminated to vehicles using V2V communications [9].

The cooperative approach to traffic congestion detection with complex event processing and VANET are explained in [10]. The work focuses on an event-driven architecture (EDA) as a novel mechanism to get insight into VANET messages to detect different levels of traffic jams; furthermore, it also takes into account environmental data that come from external data sources, such as weather conditions.

After analyzing the obtained data it must be routed to the appropriate node using multicast routing protocols. VANET multicast protocols need to adapt to the characteristics of this kind of networks. They need to take into consideration high node mobility, the high speed of this movement and frequent topology changes and due to that constant delivery path updates. Flooding is the best routing protocol where all nodes will listen and reply between all nodes in the network that are in communication range. This reduces the data retransmission by using the combined method of location-based and time reservation-based with the aid of Global Positioning System (GPS) of neighboring nodes to minimize duplicate retransmissions in VANET [11] and opposite direction nodes are used to relay emergency packets to intended recipients by using multi-hop routing method. The routing algorithm is mathematically tested for packet forwarding between two nodes and results prove that the equation is reliable to help reduce redundancy hence lead to fast and assured message delivery.

A fully distributed grouping approach is used for density estimation in [12] where group leader computes vehicle density and disseminates this information among other members of the group. In [13], a relationship between speed, flow and density is used to estimate local density using traffic flow model.In [14], vehicles are uniformly sampled from a road section and their neighbor information is then used to estimate the density. Fluid dynamics and car follow models are utilized to estimate the vehicle density in [15].

The communication overhead of data centralization and the impact on sparse data for clustering accuracy is considered by combining the MCR-ACA [16] method that contains three stages. They are Map operation, Combine operation and Reduce operation. Both the computation tasks with the heaviest burden are conducted and their results are combined in parallel on data source nodes. The combined result is transmitted to the central node and new cluster centers are generated adaptively. The presented method avoids the communication overhead of big data migration, improves the clustering efficiency and guarantees the accuracy of the global cluster among distributed nodes.

Proposed Work: As known VANET uses DSRC as a wireless communication channel that have high data rate transfer in communication link and relatively have small communication zones. There are different types of standards like the data standard which is used for vehicle, traffic data standard dictionaries and interface standard to access the data. During data transmission the communication exist only for a short amount of time with a wireless connectivity between vehicles and vehicles to RSU devices. With all these characteristics it is very crucial to attain our proposed work.

In this initially we are going to punch the destination from which all the nodes that start traversing from source can be identified. Now we can get all possible routes or even alternate routes from that source to destination will be obtained with the help of GPS. Based on the strategy like speed, location, distance, velocity etc. are required for the estimation of traffic among vehicles. Then the distance between the vehicles can be calculated. If the distance is greater then there is less traffic, else if the distance is shorter then there is heavy traffic.

With this we have source and destination points. It is necessary to generate a shortest path between source and destination and also all possible routes that can be utilized during other traffic design criteria. The traffic at any point between them is updated on all GPS users. All traffic information is collected from each infrastructure present between each point to a distance and all together is recorded on a server.In a general system this recorded data is send to all nodes passing through that points which may or may not need this data entirely. Hence there is a need in splittingthe data to provide user with the required useful information.

Each vehicle is associated with a unique id, location or position of the vehicle, speed of the vehicle, destination of a vehicle and the node indicating source, intermediate or destination node. If require, authentication of the vehicle can be done to ensure whether the node in network is an authorized one or not.

Consider a case if a node started it communication in a network with a specific destination and then there are some other nodes in the network that may or may not be passing the same destination. So the traffic data relayed to such nodes must be analyzed clearly before routing it to appropriate nodes. Hence a cluster is formed based on the characteristics of the node that depicts which cluster need which traffic data. This is mainly designed to reduce retransmission and congestion of data packet which almost affects the various aspects of network performance.

As discussed earlier we have also a design constraint that the nodes that travel through particular signals i.e. here upto three signals which is nothing but an infrastructure that holds traffic information between two consecutive signals. This traffic data is limited because many of us do not need all traffic information of all signals which is not in the path they traverse. This leads to overhead of data reception and unnecessary usage of data bandwidth. In order to overcome this scenario the traffic data is limited to limited nodes.

Since it is difficult to send all these collected information to each node, we are creating a cluster. Each cluster has some nodes that follow same path upto three signals. So the splitted data is shared among different clusters that have different nodes passing through the same destination till those three consecutive signals.

Once a perfect path obtained by identifying all nodes including intermediate node for communication,the traffic data is collected which is taken as input, splits into smaller parts; execute the code to map data against three signals. These reduced data are then merged based on the nature of path chosen by the nodes which would help the system to place in appropriate cluster.

The clusters are formed based on the destination it wanted to reach and also based on traffic data that can make use of alternate routes to reach the destination. The cluster will change accordingly to the movement of each node.

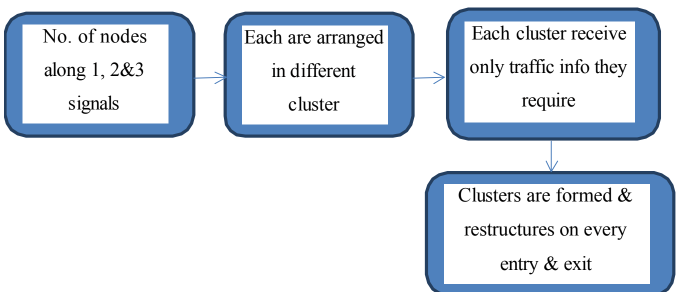

Fig. 3.1: Clusters formation against signals

Normally all traffic related data will be given to a node passing through those signals. So instead of sending all these information to the user we are going to limit the data transfer up to three consecutive infrastructures. This case can be depicted through the below diagram.

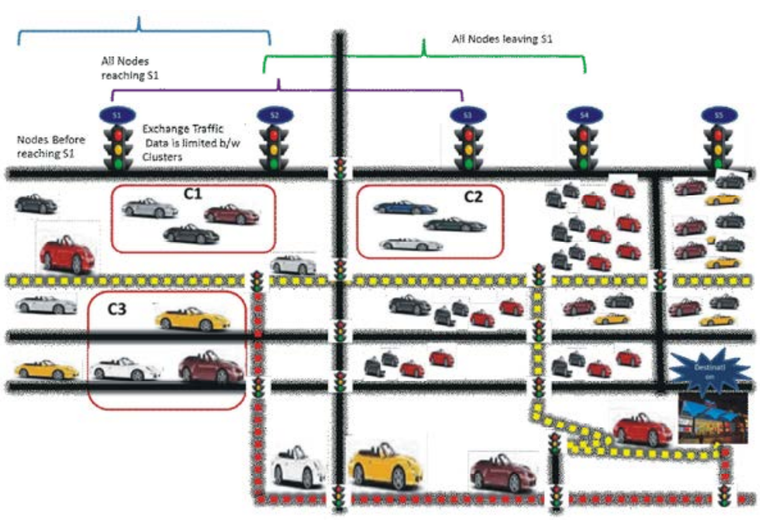

Fig. 3.2: Traffic analysis upto three consecutive signals.

Consider S1, S2, S3,….,Sn are signals which is nothing but the infrastructure that holds traffic information between each signal. C1, C2, C3, are clusters that are formed based on the nature of travel of vehicles. (i.e., the vehicles that passes through same destination upto three consecutive signals.)

When the nodes reaches S1, all traffic information among three consecutive signals from S1,S2,S3 are shared. Also at the same time all nodes will delete the previous traffic information after reaching S1. Similarly the nodes on leaving the S1 will now share traffic information between S2, S3 and s4. Then the traffic data of S1 will automatically get deleted. This manages data being overloaded and results in fast transmission. This is very helpful for users in making their decisions very clear.

Indeed, some nodes may pass through all of these three continuous signals but few are not part of these signals may not require one or two of the signals information due to many intersections lane on the roads. Thus the clusters are formed to transfer the filtered data to specific clusters. The role of the clusters here are to combine the nodes or vehicles that passes through the same three consecutive signals. This is because instead of sending all information to all the nodes, give data to the cluster which require S1, S2, S3 or the combination of thesignals.

So the nodes that travel along this path may get only their traffic data but others won't. This method is employed because sometimes there is a possibility that traffic has to be removed or cleared after few minutes. The clusters are formed on each signal to signal entry and exit. A cluster changes its structure between one signal to another and traffic data between them for effective use of alternate routes.

CONCLUSION

The traffic data in transportation have been exploding rapidly with the characteristics of heterogeneity, autonomous sources and complex and evolving associations. The big data generated by the Intelligent Transportation Systems (ITS) are worth further exploring to bring all their full potential for more proactive traffic management. The ability to accurately predict the evolution of traffic in an online and real-time manner that plays a crucial role in traffic management and control applications is particularly important. Data-driven intelligent transportation has drawn significant attention in recent years. In this paper, we have analyzed such a system where traffic information are gathered and effectively distributed to users based on the analysis of the clusters they traverse through different intermediate nodes. This has solved the problems of network congestion by reducing unnecessary data transmission to the participating nodes that are in active communication around certain distance. As the mobility of the nodes is higher, organizing and de-organizing the clusteris a tedious job. Hence our future work is to fine tune the clustering algorithm for achieving better more performance.

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