RSU Message Updating and Broadcasting Using TLB Algorithms with Secure Navigation in VANET

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Abstract--- VANET (Vehicular Ad hoc Networks) is one of the dynamic domains to enhance the research issues. VANETs regard vehicles are considered as mobile nodes and give the way for driving securely by conveying information between vehicles. In VANET, the vehicles are consider as mobile nodes should have been designed with an On Board Unit (OBU) and on the road (stationary) there are Road Side Units (RSUs-Infrastructure Based) embedded. In general there are two ways of communications are taken places in VANET: One is between the vehicles of data propagation from source node to destination node were both nodes are in mobile. The second way of communication is through RSU i.e. the RSU is importunate the data transfer to the vehicles. Here either source or destination node is mobile the RSU is immobile; Vehicle-to-RSU communication (V2R.). Often the links disconnects due to high mobility of the vehicles hence the communication path needs to be modify and reestablish very frequently. As a result to provide routing protocols in VANET is become bottleneck with low delay and low overhead. By considering the issue we proposed TLB (Teacher-Learner based) optimization algorithm through which updating the routing information in RSU recurrently and broadcasting the information among the mobile node. Here RSU consider as teacher phase and vehicles consider as learner phase. TLB algorithm replicate the consequence of teacher's influence on the output of learners in a class also it is a population based algorithm.

Keywords: -- VANET, OBU, RSU, Broadcasting and TLB

I. INTRODUCTION

The main objective of VANET is improving the safety on the road. It also functions as autonomous zone where the traffic is heavy and accident prone area. These autonomous zones can be interconnected through infrastructure based communication. The RSUs here acts as an access point, are placed at certain distance on the road to decimate the critical alert to the vehicles. Also RSUs create the infrastructure support for autonomous VANET to setup the complete communications over different areas. Since mobility in nature the vehicles as neighborhood of other mobile nodes may get in to the network membership and leaving from the network membership is highly unstable on the road.

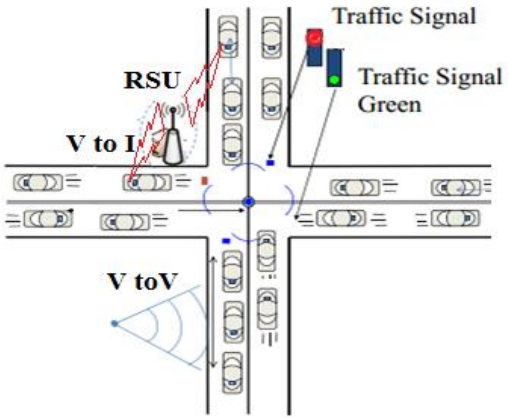

Fig.1 VANET Basic Architecture

The design of the On Board Unit (mobile node) placed in all registered vehiclesshould havethe minimum requirement of hardware component such as GPS module, IR sensors, forward and backward radars, event data recorder, computing processor and wireless interface card etc.. [1]. All the vehicle involved in the autonomous network will get the unique network membership identity also gets periodical updation of information either through RSU or through neighbor vehicles. This information generally consist of different requirements needs for the traveler like, traveler information, transit, traffic management and public safety. We normally consider in every 3 kilometer an RSU is placed, average speed of the vehicles 20 ms^{-1} and crosses the area within 5 to 6 min and an average of 40-50 vehicle across one RSU area. Every few second a tiny size of authentication message is needed to be forwarded by utilizing very small bandwidth and time for non failure communication link.This requires an authentication message every few milliseconds. The size of authentication messages should be small and the process must consume little time to given enough bandwidth and time for useful communication. Generally few main confront being considered. Those are,

Environment Condition: Most of the optimization algorithm involved in VANET is projected to predefine the routes to forward the packets because of the mobility and high speed of vehicles. To avoid the circle we concentrate on frequent update and forwarding of information.

Radio Channel Character: The average quality of the received signal through radio channel may decrees due to local territory and objects presence on the road. Also we need to consider the fading effect due to mobility of the neighborhood vehicles.

Safety and Confidentiality: The Private information about the traveler has to be maintained confidently and the

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correspondent of the autonomous network has to create its authorization and trust about the technology implemented hence it has to be believed by the mobile nodes.

Centralized Administration and Harmonization: An entity has been placed to filter and decode the received message. So the Driver may receive the general road condition and sever traffic accident through broadcasting from RSU.

To minimize these issues RSU need to updated the information of vehicle nodes and broadcast it frequently. To update RSU, the Teacher Learner Based optimization (TLB) algorithm has been introduced for the efficient updating. The TLB algorithm is the population based algorithm and it need not to have any algorithm specific parameters. This algorithm requires population size and the number of updation with respect to time, hence which can be more competent to update the RSU [2]. In the current work, the performance of TLB algorithm examined for various no of vehicle (population sizes) under one RSU and number of updation per minute is being considered for various constraints. The algorithm can be executed with two different phases: (i) Teacher's phase i.e. the information updation through RSU and (ii) Learner phase; the information updation through interaction among the vehicles.

II. WORKING PRINCIPLE OF ROAD SIDE UNIT

RSU is a brain of vehicular communication. The major responsibility of RSU are (i) broadcasting the necessity information to the mobile nodes available in prescribed zone, (ii) promoting the received messages to absolute recipients and (iii) making available of wireless radio channel to vehicles. Overall, RSU is the one who organize the extend vehicle exposure and to enhance the custom of VANET [3]. The design of RSU is embedded with DSRC Radio link to communicate with infrastructural network. The steps for the working procedure of RSU with other component involved in VANET are as follows:

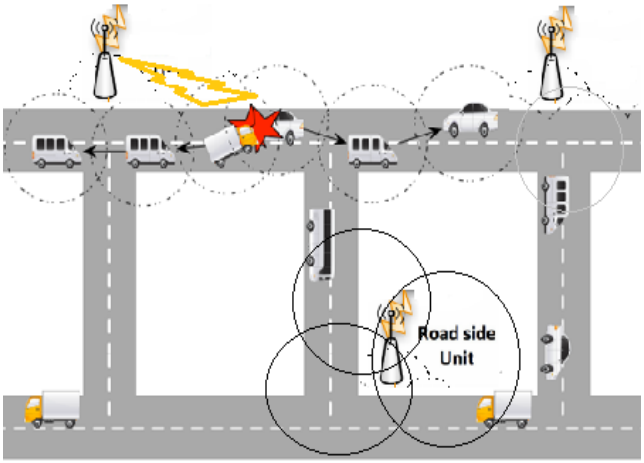

Fig.2.RSU Broadcast Architecture

1. The RSU extend the communication range in order to broadcasting the information to all other OBUs existing in ad hoc network zone and also it can receive the data from the other vehicles to get update the latest information.

2. The responsibility of RSU is not only delivering the information about the vehicles but also it has fed by some safety information about the area like low bridge notice, accident prone zone or work zone as an information source.

3. Providing Internet connectivity to OBUs.

III. COMPOSITE DELIBERATED OBU

In vehicular network generally the vehicles are known as mobile nodes. Hence the vehicles are need to be equipped with complex designed OBU, it should consist of forward and backward radars, necessity sensors, memory unit, GPS, computational processor and wireless antennas etc. These kinds of entities are enhancing the capacity of the vehicles on the road and ensure the reliable communication towards RSUs and other vehicles. So as to the driver will easily acquire accurate information regarding vehicle's current position, speed direction [4] and surrounding traffic conditions.

IV. TEACHER LEARNER BASED ALGORITHM

The working of TLB is divided into two parts,Phase one is Teacher phase: Updating information through RSU. Phase two is Learner phase: Updating information through interaction between the other Vehicles.

A. Teacher Phase

It is the phase one of the algorithm where the Vehicles are considers as learners, acquires information through the RSU (teacher). The RSU tries to update very latest information of the environment by considering different information parameters (Design parameter) of the vehicles like distance from RSU, vehicle speed, density of vehicles….etc.. In the calculation 'i' is iteration number, 'm' is the number of design parameters, 'n' is the number of vehicles at present in the zone (i.e. population size, k=1,2,…,n) and '$M_{j,i}$' is the mean result of the Vehicle's information for a particular design parameter 'j' (j=1,2,…,m) The best overall result $\boldsymbol{X_r}$-k_{best},i considering all the design parameters together obtained in the entire population of vehicle can be considered as theresult of best vehicle $\boldsymbol{k_{best}}$. However, as the RSU is usually considered as a highly informative who broadcast all information so that they can have better results.

B. Learner phase

It is the second part of the algorithm where vehicles increase their knowledge by interaction among themselves. A vehicle interacts randomly with other vehicle for enhancing the latest information. Vehicle gets new information of the other vehicles has latest than theirs. Considering a population size of 'n', randomly select two learners P and Q such that X'_{new}-P,i $\neq$ X'_{new}-Q,i(where, X'_{new}-P,i and X'_{new}-Q,i are the updated function values of X_{new}-P,i and X_{new}-Q,iof P and Q respectively at the end of teacher phase)

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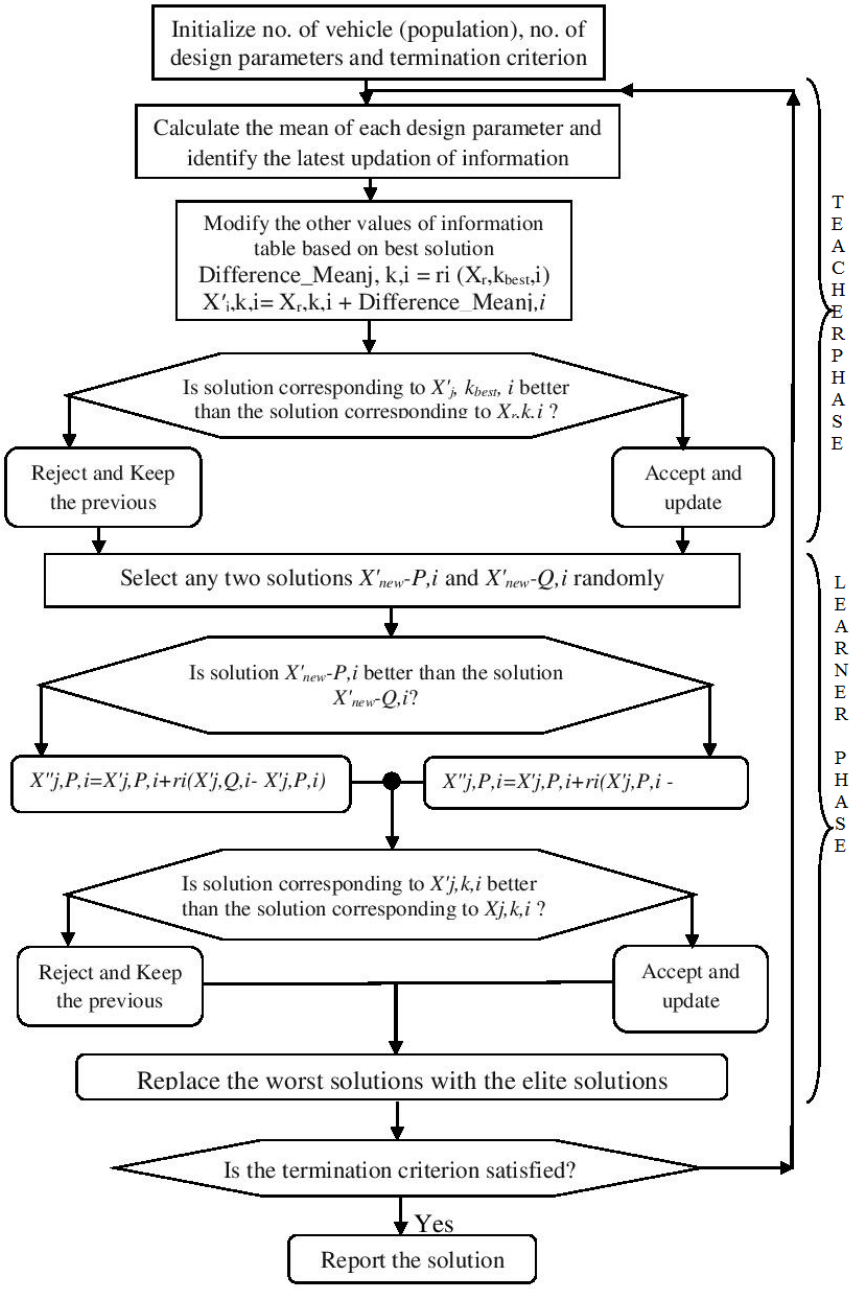
V. ALGORITHM FLOW

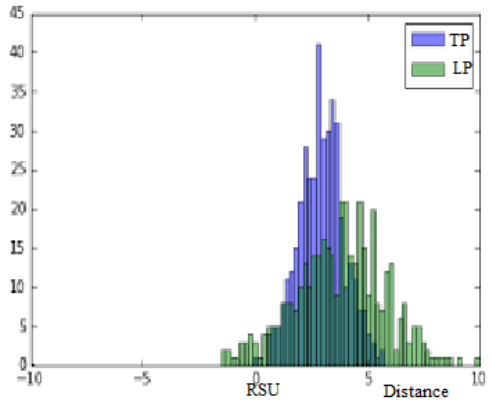


VI. SAMPLE OUTPUT AND RESULT

Table 1. Initial population

V.no	Distance RSU-V (km)	Authentication	Speed ofVeh, (km/min)	Direction of Travel	Interaction b/w Vs	Intial Rank	Application Examples
1	1.38	A	60	N	2,3,5	1	Collision alert; Intersection collision; pedestrian crossing warning; bike/motorbike; lane changing; Traffic flow; road condition; dangers on the road.
2	1.33	A	56	W	1,3	3	
3	0.56	A	40	N	1,2,4	5	
4	0.43	A	45	S	3,5	4	
5	0.22	A	80	W	1,4	2	

GNU Plot: Comparison of Teacher phase Leaner phase with collection of data



VII.CONCLUSION

VANET are expected to turn into the most significant grasp of ad hoc network. This research area is tending to involve innumerable applications on road traveler safety and pleasant, avoiding the traffic collisions, reducing the travel time through proper guidelines of routing, early information of road accident and road environmental condition and raising the road capacity. In this case, communication between the vehicles is very complex to due to the frequent path changes in the network and knowing the state of the system (even if only local) is also inefficient. Any probabilistic algorithm need to know information of the common controlling parameters such as population size and number of generations etc. For progression and cloud intellect based algorithms may necessitate appropriate regulation of algorithm specific constraints. But the proposed TLB algorithm may not have need of any such algorithm specific constraints, with the knowledge of common controlling parameters it performs efficiently. Results have shown the satisfactory performance of TLB algorithm to update the information about the unconstrained parameters of vehicles.

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