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A Hybrid Architecture for VANET Safety Message Dissemination by Detecting Derogatory Vehicle

Karra Vineela¹, Dr. Katta Rama Linga Reddy²,

Department of Electronics and Telematics, G. Narayanamma Institute of Technology and Science (for women)
Shaikpet, Hyderabad, Telangana State, India

Professor and HOD, Department of Electronics and Telematics, G. Narayanamma Institute of Technology and Science
(for women) Shaikpet, Hyderabad, Telangana State, India

ABSTRACT: The main objective of this system is to efficiently forward the packets from one entity to others over a geographical region with minimum amount of delay as well as high percentage of vehicles successfully receiving packets. As well as, the entire study clearly examines the issues over the past system implementations and to improve the network performance by identifying the Derogatory vehicle. For enhancing the proposed system approach efficiency, the execution process is handled by discarding only Derogatory vehicles rather than choosing every dependable vehicle. In industry, many Vehicular AdHoc Network [VANET] schemes are available and all are worked under the consortium called IEEE802.11 only, but the issues handled by the system are different and varied according to the user needs. In this proposed approach, a new hybrid system architecture is designed to intelligently transfer the data from one region to other region without any security issues as well as data losses with minimum delay and maximized throughput, which is done by means of identifying the derogatory vehicles (nodes) in the VANET environment. This framework proposes a half breed engineering, in particular VMaSC-LTE, joining IEEE 802.11p based multi-jump grouping and the fourth era cell framework, Long Term Evolution (LTE), with the objective of accomplishing high information parcel conveyance proportion and low deferral while keeping the utilization of the cell design at least level. For all the entire system is used to perform the best ever data transmission over different region vehicles and improving the security by means of identifying the false/attacking nodes.

KEYWORDS: Vehicular AdHoc Network, VANET, Long Term Evolution, LTE, Cluster Regions, VMaSC-LTE, IEEE802.11, Message Transmission and Security.

I. INTRODUCTION

Vehicular AdHoc Network [VANET] is required to altogether enhance the security of our transportation frameworks by giving auspicious and proficient information scattering about occasions like mischance, street conditions and roads turned parking lots past the driver's-learning. Driver conduct, imperatives on versatility and high speeds make one of a kind attributes, for example, quick yet to some degree unsurprising topology changes, uneven system thickness and visit fracture for VANET. Meeting the strict deferral furthermore, a parcel conveyance necessity of well-being applications in such a dynamic system decides the practicality of the organization of such applications.

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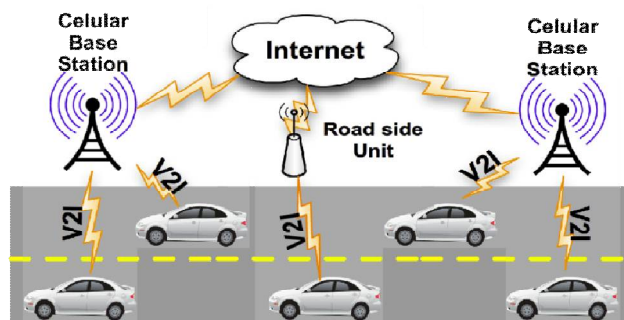
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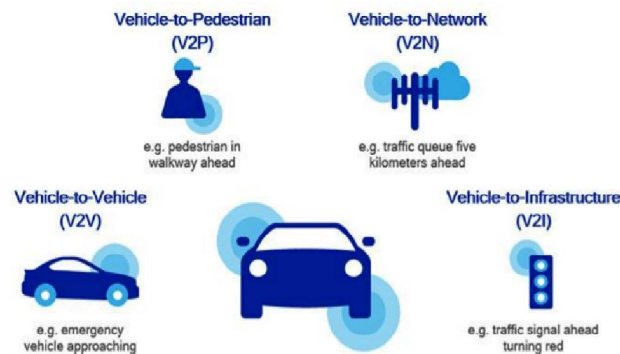
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(a)



(b)



(c)

Fig.1 Vehicular Communications. (a) V2V, (b) V2I and (c) V2X.

The advances in mobile and the modern communication patterns in specially appointed systems permit extraordinary sending designs for vehicular systems in expressways, urban and provincial situations to bolster numerous applications with various QoS prerequisites. The objective of a VANET design is to allow the communication among near-by vehicles and amongst vehicles and also settled roadside units types of gear instantaneous three conceivable outcomes:

- [a] Vehicle-to-Vehicle (V2V) communication
- [b] Vehicle-to-Infrastructure (V2I) communication
- [c] Vehicle-to-X Communication (V2X)

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II. CHARACTERISTICS OF VANET

VANETs characteristics are portrayed by their novel attributes that recognize them from MANET. These unique qualities can be outlined as takes after:

(a) **High Mobility:** VANET vehicles are described by their high relative speed which makes VANET condition high unique.

(b) **Predictable and limited mobility Models:** Unlike the irregular versatility of MANET, VANET vehicle developments are administered by limited guidelines (movement stream hypothesis rules), which make them forecast in any event on the short run.

(c) **Swift Topology:** VANET vehicles are described by their rapid. This instantaneous visit arranges topology changes, which presents high correspondence overhead to exchange new topology data.

(d) **No Power Limitations:** Each vehicle is furnished with a battery that is utilized as a boundless control supply for all correspondences and calculation assignments.

(e) **Limited Area:** Vehicles can utilize the Global Positioning System (GPS) to recognize their areas with high precision.

(f) **Ample of System Vehicles:** Unlike MANETs that are portrayed by a little system sizes, VANET systems can be extensive because of high thickness of the vehicles.

(g) **Hard Delay Requirements:** Safety messages are the fundamental objective of VANETs. In this way, safety messages have to be given highly importance and should be conveyed on time.

The above one of a kind attributes make new difficulties that should be settled in the vehicular system conditions.

Challenges over Vehicular Communications

The difficulties of the vehicular systems can be compressed as takes after:

- ✓ Frequent neighborhood change because of high versatility.
- ✓ Increasing channel stack (high density condition).
- ✓ Irregular availability because of the variety of the flag control.
- ✓ Packet adversity because of uncovered and masked terminal issues.

Nonetheless, plenty of actions have been made to determine these issues. The writing contains a colossal measure of studies tending to these difficulties in all perspectives. The investigations attempted to address all layers related issues running from bring down layers (physical and MAC layers) improvement to upper layers (application) advancements.

III. LITERATURE SURVEY

In the year of 2014, the authors "Seyhan Ucar, Sinem Coleri Ergen and Oznur Ozkasap" proposed a paper titled "VeSCA: Vehicular Stable Cluster-based Data Aggregation", in that they described such as: in-network data aggregation is a promising technique to reduce data transmission that contributes the effective usage of bandwidth and co-existence of different applications in vehicular ad-hoc networks (VANET). Early aggregation schemes in VANET are grouped into two categories; structure free and structure based data aggregation. In structure-free data aggregation, vehicles apply pre-defined delay value before forwarding a data packet to the next hop. On the contrary, structure-based data aggregation uses a hierarchical structure, based on either road information or vehicles, to perform data aggregation. To provide efficient and scalable VANET communication, data aggregation is essential for reducing per vehicle bandwidth requirements. In this paper, we propose a multi-hop structure based data aggregation method namely VeSCA where mobile nodes are grouped based on relative mobility with minimum-overhead cluster construction and cluster members apply data aggregation before forwarding data packet to the parent node. Using various key metrics including data aggregation ratio, delay and aggregated data delivery ratio, we demonstrate superior performance VeSCA compared both previous cluster based data aggregation and alternative aggregation mechanism via extensive simulations in ns-3 with the vehicle mobility input from the Simulation of Urban Mobility (SUMO). VeSCA achieves over 70% aggregated data packet delivery ratio with aggregation ratio 40%.

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In the year of 2010, the authors "R. Chen, W.-L. Jin, and A. Regan" proposed a paper titled "Broadcasting safety information in vehicular networks: issues and approaches", in that they described such as: a primary goal of intelligent transportation systems is to improve road safety.

The ability of vehicles to communicate is a promising way to alleviate traffic accidents by reducing the response time associated with human reaction to nearby drivers. Vehicle mobility patterns caused by varying traffic dynamics and travel behavior lead to considerable complexity in the efficiency and reliability of vehicular communication networks. This causes two major routing issues: the broadcast storm problem and the network disconnection problem. In this article we review broadcast communication in vehicular communication networks and mechanisms to alleviate the broadcast storm problem. Moreover, we introduce vehicular safety applications, discuss network design considerations, and characterize broadcast protocols in vehicular networks.

In the year of 2011, the authors "Z. Zhang, A. Boukerche, and R. Pazzi" proposed a paper titled "A novel multi-hop clustering scheme for vehicular ad-hoc networks", in that they described such as: Vast applications introduced by Vehicular Ad-Hoc Networks (VANETs), such as intelligent transportation, roadside advertisement, make VANETs become an important component of metropolitan area networks.

In VANETs, mobile nodes are vehicles which are equipped with wireless antennas; and they can communicate with each others by wireless communication on ad-hoc mode or infrastructure mode. Compared with Mobile Ad-Hoc Networks, VANETs have some inherent characteristic, such as high speed, sufficient energy, etc. According to previous research, clustering vehicles into different groups can introduce many advantages for VANETs. However, because a VANET is a high dynamic scenario, it is hard to find a solution to divide vehicles into stable clusters. In this paper, a novel multi-hop clustering scheme is presented to establish stable vehicle groups. To construct multi-hop clusters, a new mobility metric is introduced to represent relative mobility between vehicles in multi-hop distance. Extensive simulation experiments are run using ns2 to demonstrate the performance of our clustering scheme. To test the clustering scheme under different scenarios, both the Manhattan mobility model and the freeway mobility model are used to generate the movement paths for vehicles.

Problem Analysis

With regards to VANET, its requires diverse communication standard which approaches security, wellbeing and unwired communication. The quantity of mischance happening expanding raises the load on Vehicular Network. Unique misconduct detection plans have been proposed by specialists so as to recognize the attacker in charge of illegal behavior in VANETs. Location of such malignant vehicles and irregular behavior in the system is extremely huge which directs to develop cautious steps for it.

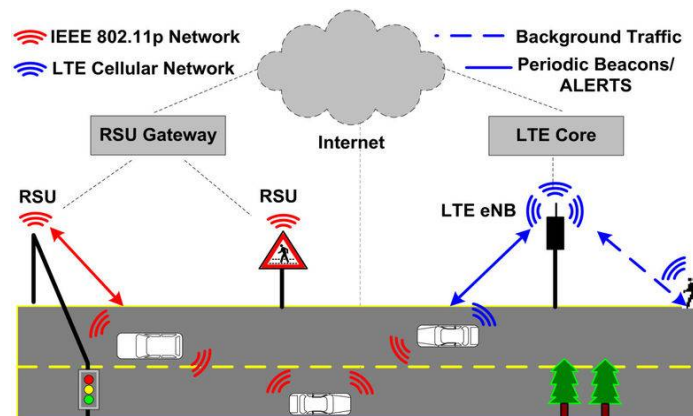


Fig.2 Vehicular networking scenario using IEEE 802.11p and LTE

This system proposes vehicles driven identification called DDV (Detection of Derogatory Vehicle) which successfully identifies malignant vehicles that drop and copy packet in the system utilizing observing methodology. Vehicles are

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being observed by the verifiers which qualify the choice limit. In this manner, rather than choosing all the dependable vehicles, appropriately which is for the most part disregarded by the analysts in their identification plans. This thus enhances the system execution which is one of the real necessities of security plans for complex systems like VANETs.

Long Term Evolution [LTE]

Long Term Evolution (LTE) was proposed by David Martín-Sacristán, Jose F. Monserrat, Email creator, Jorge Cabrejas-Peñuelas Daniel Calabuig ,Salvador Garrigas, Narcís Cardona, is a 4G unwired broadband development made by the Third Generation Partnership Project (3GPP), an industry trade exchanging gathering. LTE (Long Term Evolution) is the endeavor name given to change of a tip top air interface for cell compact correspondence arrange. It is the last walk toward the fourth period (4G) of radio advances expected to construct the point of confinement and speed of mobile phone frameworks. While the past period of adaptable media transmission frameworks are all around known as 2G or 3G,LTE is promoted as 4G.

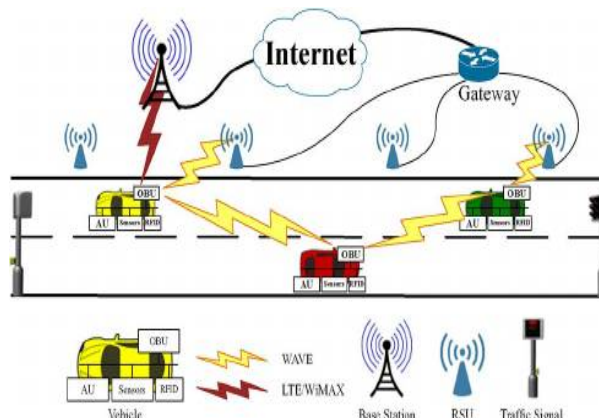


Fig:3 VMASC-LTE System

According to 3GPP, a game plan of front line necessities was recognized:

- ✓ Lessened cost per bit.
- ✓ Expanded administration provisioning – more administrations at bring down cost with better client encounter
- ✓ Adaptability of utilization of existing and new recurrence groups
- ✓ Streamlined engineering, Open interfaces
- ✓ Take into account sensible terminal power utilization

Detection of Derogatory Vehicle (DDV) Algorithm

VANET comprises of vehicles and Road Side Units (RSUs) that speak with each other utilizing short range radio correspondence. For VANETs to give verification and security, there are outsiders in VANETs called Authentication Authorities (AAs). AAs are in charge of administration of personalities of the vehicles in the system and confirming the trouble making reports sent by the verifier vehicles and if discovered genuine, altering the doubt estimation of vehicles in like manner. Every vehicle has a white rundown gave by its individual bunch head and a boycott containing rundown of malevolent vehicles sent by AA.

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Algorithm: DDV

The Detection of Derogatory Vehicle (DDV) calculation depends on the accompanying three essential ideas:

- (a) A vehicle is considered to demonstrate an irregular conduct in the event that it drops or copy the bundles got to it in order to make clog in the system, mislead other vehicular vehicles or devastate vital messages for their childish thought processes.
- (b) A legitimate vehicle advances the messages got to it accurately to different vehicles in the system or makes right messages for transmission.
- (c) A vehicle will be labelled as a malignant vehicle, if the vehicle rehashes unusual conduct with the end goal that its Mistrust, MT (Mistrust) surpasses the edge esteem TMD (Threshold value).

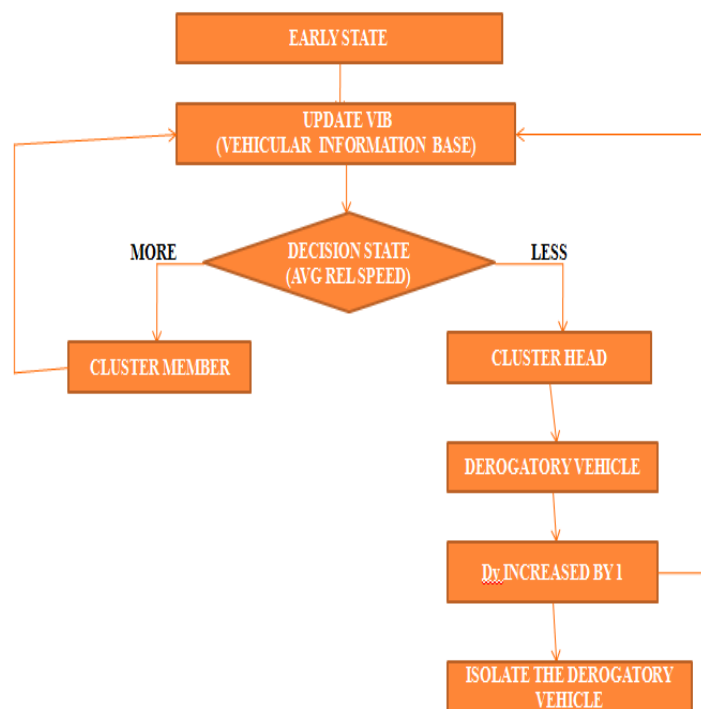


Fig.4 Detection of Derogatory Vehicle (DDV)

IV. EXPERIMENTAL RESULTS

There are five clusters (group of vehicles within the range) in the below figure, colored as Green, Orange, Blue, Violet and light Green in which one of the vehicle is selected as the Cluster Head depending on the metric (i.e., Average Relative Speed).

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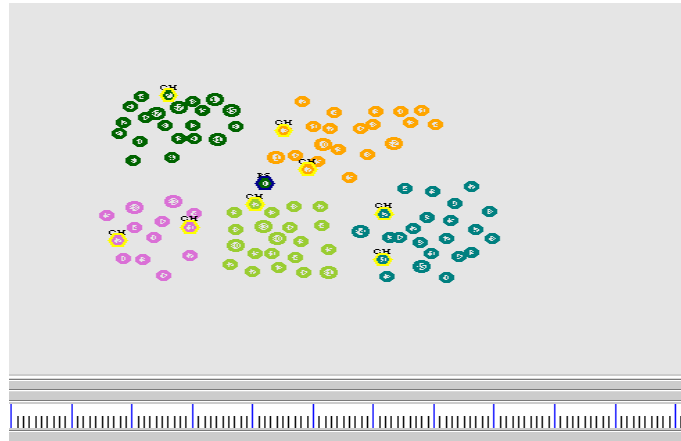


Fig.5 Network Scenario

The following figure illustrates the Vehicles communicate with each other and exchange the vehicle details like speed, distance, Average Relative Speed and forth on. All the heads of the clusters connect to the base station.

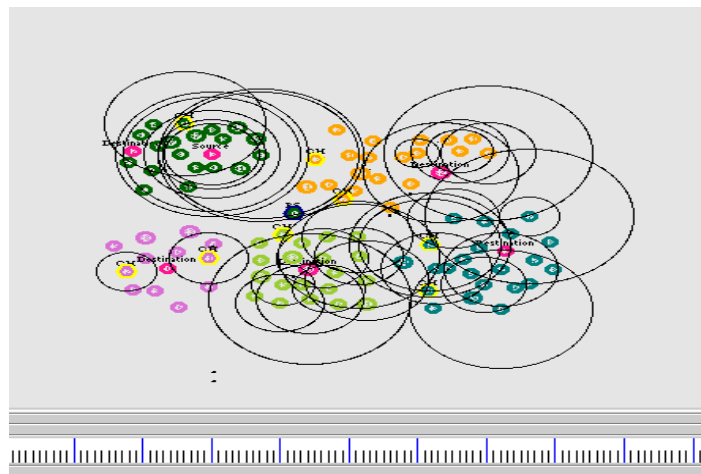


Fig.6 Vehicular Communication Scenario

The following figure illustrates while exchanging packets of data among and between vehicles the data packets are dropped, Due to which the details of vehicles may not be updated by every vehicle.

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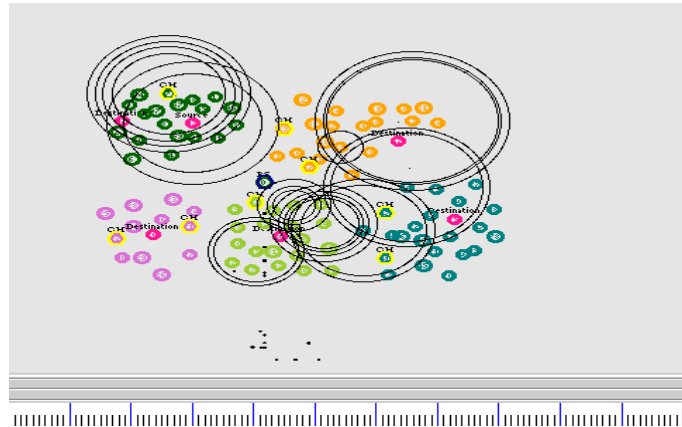


Fig.7 Packets Dropping Scenario

Average Throughput: The amount of data transferred per unit time or average rate of successful message transmissions per sec over a communication channel is known as throughput. It is generally measured in bits per second (bits/s or bps).

$$\text{Throughput} = \frac{\text{Total Received Packets}}{\text{Stop Time} \pm \text{Start Time}}$$



Fig.8 Throughput Analysis

Packet Delivery Ratio (PDR): Packet delivery ratio is the metrics that calculates the ratio of data packets received by the destination nodes to those produced by the source nodes.

$$\text{packet Delivery Ratio} = \frac{\text{Data Packet Received By the Destination}}{\text{Data Packet Generated by the Sources}}$$

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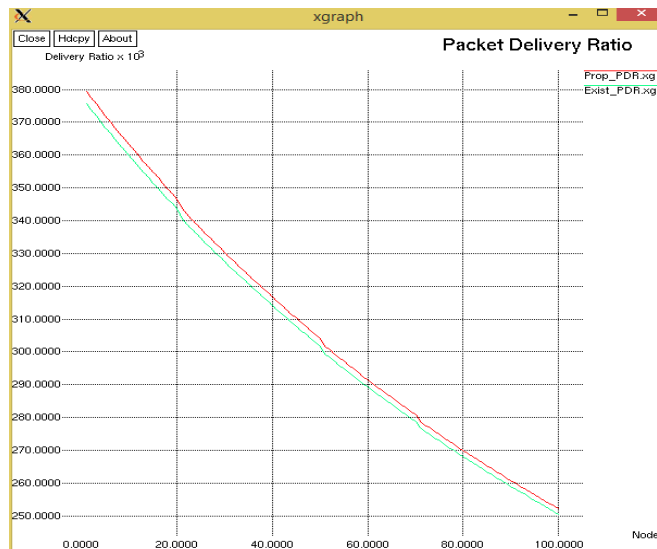


Fig.9 Packet Delivery Ratio (PDR)

End to End Delay: It is the time between the origination of packet at the source and packet delivery time at the destination. If any data packet is lost or dropped during the transmission, then it will not be considered for the metrics calculation.

$$\text{End to End Delay} = \text{Delivery Time At Destination} - \text{Origination time at source}$$

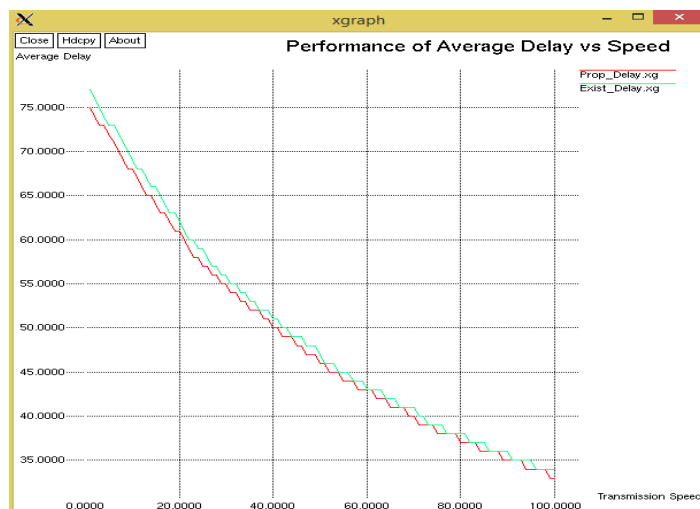


Fig.10 Performance of Average Delay

From the results obtained, it can be shown that DDV improves network performance by optimizing the selection of verifier vehicles. It shows better results than the existing system, in terms of Average Throughput, Packet Delivery Ratio and End to End Delay.

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V. CONCLUSION

To adequately distinguish misbehaviors and pernicious vehicular vehicles in VANETs, this system has proposed a novel calculation called DDV (Detection of Derogatory Vehicles in VANETs). DDV calculation is intended to confine the vehicles indicating unusual conduct and in addition improving the system execution. The pre-existing techniques calculate and choose every one of the vehicles as verifiers which have doubt esteem not as much as the vehicle to be checked. It has been enhanced by proposed DDV calculations considering over three parameters for picking suitable verifiers that are load, separation and Mistrust. In view of these parameters, a choice esteem is assessed and contrasted with verifier choice edge. In this manner, ideal verifier determination enhances the system usage and thus enhances arrange execution. The re-enactment comes about demonstrates that DDV gives higher throughput, better Packet Delivery Ratio and diminishes the conclusion to end delay. In request to additionally upgrade the proposed DDV approach, will consider other improvement methods to select verifiers in the calculation. The proposed work can be reached out with a counteractive action method for the noxious vehicles. Likewise sending the proposed technique continuously will test and investigate its execution under sensible conditions.

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