IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# DRIVE ASSIST IN VANET

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***Abstract:*** An Intelligent Transportation System (ITS) is an advanced application which aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. To Improve road safety and make possible the future in VANET, a model is proposed where there is a balance between the technology and the existing system. In the existing system of traffic, informative alerts like crash detection and avoidance is not present. In this proposed system, an alert message is sent to the vehicles in the VANET while there is a possibility of crash , thereby, alerting the drivers in the proximity about the hurdle ahead , allowing them to divert their vehicles to a more smoother passage route . Road Side Units(RSU) helps in the communication between multiple clusters, which enables a wider communication of the information. The cluster heads for the multi hop communication is selected using a dynamic mobility based multi hop clustering algorithm. The cars in the Multi hop are displayed as nodes.

**Keywords:** Traffic Sign Recognition, Convolutional Neural Network, You Only Look Once.

## I. Introduction

In recent years there has been a drastic in the number of vehicles. Due to the high mass of vehicles on road, it leads to increased traffic. An Intelligent Transport System (ITS) is an advanced application which aims to provide innovative services relating to different modes of transport and traffic management and enable users to be better informed and make safer, more coordinated and smarter use of transport network. The research field of Vehicular Adhoc Network (VANET) have developed over the years with the development of Internet of Things(IoT) and ITS .Here, the main objective is the communication of alert message to the vehicles, through multiple clusters in a VANET. The data is transferred in the form of packets. In order to transfer packets effectively, it is important to find a reliable vehicular communication route. VANETs involves communication from vehicle-to-vehicle (V2V) and Vehicle-to-RSU (V2R). The Road Side Unit (RSU) is involved in the cluster formation and group leader selection. It also plays an important role in the transmission of messages and alerts between the clusters, thus, enabling a multihop communication and message dissemination in a very large area.

## II. RELATED WORK

As there is a high potential and big room for improving road safety and efficiency, a lot of data dissemination and collision detection schemes have been suggested before, in the context of VANET and has opened doors for new and better solutions in the field of transport and communication. Here, we review several cluster-based data dissemination protocols and various crash detection and avoidance systems.

### 2.1 CLUSTERING SCHEMES AND TECHNIQUES:

Jin, Dongxu & Shi, Fei & Song, J.S., in their paper "Cluster based emergency message dissemination scheme for vehicular Ad Hoc networks" [1], proposed a novel clustering algorithm is that guarantees efficient clustering to overcome the issue of Broadcast storm problem in VANETs as it lack a central management system. Here, descriptions and calculations of the three parameters are proposed. The AHP is used to determine the weight value for each node based on three metrics: relative speed, distance-considered connectedness, and reciprocal mean predicted transmission count. In each neighbourhood, the node with the minimum weight value is voted as the CH. As a result, mechanisms for cluster formation and maintenance are proposed. Following that, it demonstrates how messages are conveyed in the proposed cluster structure using an emergency message that is triggered by a specific event, such as airbag inflation, tyre blowout, or rapid braking. Finally, the simulation analysis supports the suggested clustering algorithm's availability and efficiency.

The paper titled "Multihop-Cluster-Based IEEE 802.11p and LTE Hybrid Architecture for VANET Safety Message Dissemination" by S. Ucar, S. C. Ergen and O. Ozkasap [2] offers insight on VMaSC-LTE, a hybrid architecture that combines IEEE 802.11p multi-hop clustering and the fourth generation cellular technology, Long Term Evolution, The goal was to achieve low transmission delay and high packet delivery ratio while also maintaining the minimum level usage of the cellular architecture. In VMaSC-LTE, vehicles are clustered based on a novel approach named VMaSC: Vehicular Multi-hop algorithm for Stable Clustering. Cluster head selection using the relative mobility metric calculated as the average relative speed with respect to neighbouring vehicles, cluster connection with minimal overhead by introducing direct connection to a neighbour who is already a head or member of a cluster instead of connecting to the cluster head in multiple hops, disseminating cluster member information within periodic hello packets, and reactive clustering to maintain cluster synchronisation are some of the features of VMaSC. These features reduce the number of cluster heads while boosting their stability, allowing the cellular design to be used more efficiently. To connect the VANET to the LTE network, elected cluster heads function as dual-interface nodes with IEEE 802.11p and LTE interface functionality in the clustered topology. They show higher performance of the proposed architecture compared to other hybrid designs proposed and other routing mechanisms such as cluster based routing and flooding, via extended simulations in ns-3, with some major parameters of relevance such as transmission delay, data packet delivery ratio, clustering stability, and overhead. Higher application dependability, as measured by the data packet delivery ratio, is achieved at the expense of increased LTE utilization, as measured by the number of cluster heads in the network, in the proposed design.

In paper “Clustering in vehicular ad hoc networks: Taxonomy, challenges and solutions” [3], they examined numerous issues and existing methods for clustering in VANETs. Firstly, a complete taxonomy on clustering in VANETs has been provided based upon various parameters. A full assessment of difficulties, present solutions, and future perspectives is offered for each category of clustering based on this categorization. Finally, a comprehensive analysis of all existing proposals in the literature is provided in terms of a number of parameters, including topology chosen, additional infrastructure requirements, road scenario, node mobility, data handled, and relative direction, node density, relative speed, communication mode, and communication overhead.

The paper titled "A mobility based metric for clustering in mobile ad hoc networks" by P. Basu, N. Khan and T. D. C. Little [4], presents a novel relative mobility metric for mobile ad hoc networks (MANETs). It is based on the ratio of power levels as a result of excessive receptions from neighbors at each node. They suggest MOBIC, a distributed clustering algorithm based on the use of this mobility metric for cluster head selection, and show that it leads to more stable cluster formation than the /well-known Lowest-ID clustering method 131's "least cluster head change" version. It indicates a reduction of up to 33% in the rate of cluster head changes when the proposed technique is used. Network performance parameters such as throughput and delay are intimately related with the frequency of cluster reorganization in a MANET that uses scalable cluster-based services. So, they believe that using MOBIC can result in a more stable configuration, and thus yield better performance.

In the paper “A mobility-based framework for adaptive clustering in wireless ad hoc networks" [5], A. B. McDonald and T. F. Znati presents a framework for dynamically organizing mobile nodes in wireless ad hoc networks into clusters in which the probability of path availability can be bounded. The purpose of the (a; t ) cluster is to help minimize the far-reaching effects of topological changes while balancing the need to support more optimal routing. In this paper, they proposed a mobility model for ad hoc networks and utilize it to derive equations for the probability of path availability as a function of time. This model is used to show how an effective distributed clustering method can be used to dynamically group nodes into clusters. The structure of the cluster topology is flexible in terms of node mobility because the requirements for cluster organization are directly dependent on path availability. As a result, this paradigm encourages the use of an adaptive hybrid routing architecture that is more responsive and effective when mobility rates are low and more efficient when mobility rates are high.

**2.2 CRASH DETECTION AND AVOIDANCE :**

In the paper "A Robust Broadcast Scheme for VANET One-Hop Emergency Services" [6], X. Ma, X. Yin and K. Trivedi propose and justify a distributive robust scheme for DSRC one-hop safety-critical services. The new technique proposes employing dynamic receiver-oriented packet repeats and mini-slot within DIFS in IEEE 802.11 for one-hop emergency warning message dissemination to improve broadcast reliability. The ROR technique for designing DSRC control channels for possible safety critical services is presented in this research. It is believed that each vehicle has a Global Positioning System (GPS) or Inertial Navigation System installed that provides information on its location, speed, and direction of travel. Each node in the network maintains a list and mobility information of all one-hop surrounding nodes by exchanging periodic beacon messages, which contains identification number, position, speed, and movement direction. The receiver will be able to simply compute its distance from the sender in this manner. Furthermore, a 12-bit sequence number of the received message in the IEEE 802.11 MAC header allows each receiving node to differentiate copies of the broadcast packet from newly created packets. A one-hop multi-cycle broadcast is used to send an emergency message in this technique. This one-hop communication helps to alert or warn all nearby motorists in order to prevent further damage or accidents. Several key criteria for evaluating and comparing the performance and reliability of various broadcast services will be specified and determined analytically. A One-Hop Performance Broadcasting in a single cycle If the channel is perceived idle, an emergency message will be sent immediately; if the channel is sensed busy, it will be sent once the current beacon transmission is completed. Furthermore, they analysed and simulated the reliability and performance of the suggested broadcast system for DSRC VANET safety-related services on highway. The analytic model accounts for the impact of the beacon message broadcast and the fading channel conditions on the reliability and performance.

According to a paper titled "Multi-hop safety message broadcasting in VANET: A distributed medium access mechanism with a relaying metric,"[7] by Y. Pekşen and T. Acarman, active safety related data dissemination in vehicle-to-vehicle (V2V) communication requires reliable and real-time transmission. Also, broadcasting and relaying safety messages to alert the surrounding vehicles about critical driving situations is considered to be timely reaction. The purpose of this study was to improve real-time, collision-free, and cooperative media access control (MAC) protocols in vehicle networks to ensure single and multi-hop data dissemination. A media access strategy for effective multihop broadcasting was given in the paper. The vehicular nodes have a relaying metric that ensures a self-organizing, fast-reacting, and collision-free medium access mechanism. Two distinct MAC protocols are investigated in this paper. The first protocol requires periodic beaconing messages to be transmitted between individual nodes, but the second protocol does not. The distributed relay-competition and adaptive back-off systems are both simulated on multi-lane busy traffic in both scenarios. The findings of the Network Simulator (ns-3) simulation are used to compare the success rates and network connectivity of the two protocols with and without beaconing messages. To make the protocols more applicable, the vehicular nodes' positions are assumed to be subject to GPS drift, and sector value is used instead of accurate location information.

T. Taleb, A. Benslimane, and K. Ben Letaief in their paper “Toward an effective risk-conscious and collaborative vehicular collision avoidance system,” studies the use of VANET for traffic safety. VANET can use a clustering structure to anticipate vehicular collisions. C-RACCA integrates an estimate of a vehicle's estimated braking time and matching collision-avoidance potential into its CH selection process, ensuring that each node has adequate space from the car in front to brake and avoid a collision [8]. When an emergency situation is detected, a warning is broadcast through the cluster, and recipient vehicles respond appropriately – either by automatically activating vehicle controls or by providing an emergency warning to the driver – depending on the type of event specified in the warning message.[8].

In paper “An Accident Detection System for a Single VANET at Low Cost Module”[9], a low cost accident detection platform is proposed for the vehicles which can intelligently detect an accident in a single VANET controlled area and sends reports to the nearby metropolitan authority. When an accident is detected, the client Arduino communicates the information to the server Arduino through the nRF (transceiver) module. The Arduino server provides the complete information to the metropolitan server agent after processing it. The server is equipped with a wireless USB nRF medium, which eliminates the major drawbacks of GSM repeaters. The Arduino server mostly delivers information to the traffic server agent (e.g., vehicle ID, area ID, etc.). The process continues until authority arrives at the accident site and the metropolitan server agent's file input and output operations are regenerated.

K. A. Khaliq, A. Qayyum and J. Pannek in their paper titled "Prototype of automatic accident detection and management in vehicular environment using VANET and IoT"[10], studied design prototypes to develop a system that can fulfill their application’s requirement with reduced hardware, deployment and service cost. Because new cars are equipped with wireless connections, opting for VANET is a practical answer to this pressing issue. They picked VANET as a communication system for V2V (vehicle-to-vehicle) and V2I (vehicle-to-infrastructure) communications because of the vehicular environment and cost savings (vehicle to service unit installed in control room or hospital). VANETs are a subset of ad-hoc networks that are meant to operate in a vehicle context with the lowest possible deployment costs. They employed this technology for message distribution in the network when it was necessary to send an alarm to surrounding nodes, such as to inform accidents and use an alternate way, or to clear the path for an ambulance in the event of an accident. They employed IoT on small sensors and other OBUs because it provides efficient connectivity on low-power devices.

With the help of mechanical and medical sensors installed in the vehicle, the programme may detect an accident and the severity of the emergency level. In the event of an emergency, the message is delivered through VANET to a hospital, where their central server can determine the location of the accident and the nearest medical facility. After recognizing basic information, it sends a message for an ambulance. The ambulance's client application sends out alert messages to clear the path on the approach to the accident site.

In the paper titled “Rsadp - Road Saftey Accident Detection and Prevention in Vehicular Adhoc Network”[11], by Saurabh Patil and Lata Ragha, a protocol is discussed, reviewed and studied about on-vehicle wireless communication capabilities in terms of handling accident alerts for road safety applications. Early discovery of an accident can save lives on the road and increase the likelihood of medical assistance. Providing exact accident time and location to oncoming motorists in order to prevent more mishaps on the road. This protocol is adaptable enough to real-time changes in the environment, such as road density and speed, traffic situation, and network dynamics.

**2.3 MESSAGE DISSEMINATION :**

The paper "A Probabilistic Protocol for Multi-Hop Routing in VANETs," by J. Fukuyama[12], presented the notion of a communication path and probability in a general framework that handles the nature of multi-hop routing in a VANET. This work proposes an algorithm to pre-compute the likelihood that communication between given source and destination in a VANET is viable under particular mathematical assumptions. This algorithm, STEADYTRAFFIC, has been shown to compute communication probability accurately. In a genuine VANET, this number can be utilized to choose a good packet forwarder. A lookup table containing pre-computed data is used in the proposed novel multi-hop communication protocol to swiftly determine a good packet forwarder. After the method is modified for practical issues, the simulated results demonstrate that the probabilistic protocol significantly improves performance in a particularly tough tested.

According to paper "How Do You Quickly Choreograph Inter-Vehicular Communications? A Fast Vehicle-to-Vehicle Multi-Hop Broadcast Algorithm, Explained," by C. E. Palazzi, S. Ferretti, M. Roccetti, G. Pau and M. Gerla[13], due to the high mobility and density of a car network scenario, specific solutions need to be devised to choreograph a fast-delivery multihop broadcast. To accomplish this, they devised a practical and efficient technique that allows cars to estimate their communication range using a very limited message exchange and then use that information to reduce the number of transmissions, as well as the number of hops to be traversed, and thus the time, required by a broadcast message to reach all cars following the sender within a certain distance. The number of hops to be traversed, as well as the number of message re transmissions, are minimized during the broadcast activity by dynamically computing cars' transmission ranges, whose estimated actual values are exploited to minimize the number of hops to be traversed and the number of message re transmissions. According to preliminary findings, transmitted messages reach the end of their region of interest with the fewest feasible transmissions, lowering the required delivery time.

In the paper “Cluster based emergency message dissemination scheme for vehicular Ad Hoc networks” by Jin, Dongxu & Shi, Fei & Song, J.S. [14] ,aims to guarantee the stable and reliable communication between nodes. They present a unique data dissemination scheme based on Clustering and Probabilistic Broadcasting in this paper (CPB). First, a clustering algorithm based on vehicle driving directions is provided, allowing cars to exchange data in a clustered manner with sufficient connection length. To distribute data among cars, the designed clustering structure offers probabilistic forwarding. Each cluster member delivers the received packet to the cluster head with a probability calculated by the number of times the same packet has been received in a given interval. When the chosen cluster header receives the provided packet, it distributes it in the transmission direction. According to simulation results, their proposed protocol CPB outperforms existing approaches in terms of information coverage, average message delay, and packet delivery ratio. However, data fusion and then forwarding by the cluster head, as well as direct forwarding by the cluster member, should both be considered for distinct applications with varying QoS needs. An accident notification, for example, necessitates rapid and long-range distribution, even if this causes the channel to become overloaded and many packets to be lost.

According to the paper titled "Emergency Message Dissemination in Vehicular Ad-hoc Networks Using Vehicle Movement Prediction," by M. Mahajan and V. Vijayakumar[15], VANET emergency messages need to be communicated on priority and should have minimal delay. Infrastructure is not used optimally for emergency message communication in the existing system, and vehicle movement is not well explored. To address this issue, the proposed work prioritizes the dissemination of emergency messages by using vehicle to infrastructure communication as well as vehicle to vehicle communication. The delay in emergency message communication, as well as network availability, should be minimized, either through infrastructure such as Road Side Units (RSUs) or with the assistance of nearby vehicles. When sending messages to nearby vehicles, their function must be considered, as well as their desire to participate in the communication. For emergency messaging, vehicle movement prediction should be done so that cars approaching the accident site in the near future receive a message about the accident and are able to adjust their route to escape the traffic jam at the accident site. Because there are many aspects that cannot be addressed in only two states, true and false, fuzzy logic is used in this suggested study to anticipate vehicle movement.

The paper Fuzzy Logic-Based Multi-Hop Directional Location Routing in Vehicular Ad-hoc Network" by Rana, K.K., Sharma, V. & Tiwari, G. [16], acknowledges that due to certain reasons (i.e. mobility and limited communication range of the nodes in VANET based system) frequent breaking of the links occur, so delivery of data packets is a challenging task. To address this, the research proposes and implements the FLMDLR, a fuzzy logic-based innovative routing model that outperforms the LAR and D-LAR protocols. To select the best next-hop node towards the destination node, the fuzzy logic idea was applied. From the source S to the destination node D, the optimal next-hop node builds a stable path. The steady path transmits more data packets in less time. For all routing parameters, the proposed algorithm outperforms the LAR and D-LAR protocols. However, the following observations are noteworthy: connection duration in suggested methods is high for high node density, next-hop distance is larger in dense networks, average number of hops is lowest for dense networks, and finally, one hop delay is low for higher velocity and number of nodes. The proposed model FLMDLR eliminated one hop delay, allowing data packets to be sent in a short time interval.

In the paper[17], Hanaa Sami Basheer, Carole Bassil, Bilal Chebaro presented a novel model for trusting the safety message before disseminating it, through multi-hop V2V communication. It also ensured a high message delivery rate with little latency. They proposed partitioning the digital roadmap of the interested area into discrete fixed-size chunks to this purpose. They relied on pairs of concatenated information consisted of the beacon message and the safety message to communicate packets between vehicles, with the transmission time arranged according to the road density. The model is based on the idea of rebroadcasting the safety message between segments using a forwarder. The best forwarder is thus chosen based on a determined weight value for the vehicle links. Their contribution is made possible by the addition of two decentralised data trust stages: one to entrust safety message information in one hop, and another to disseminate it further via multi-hop. The model's efficiency was demonstrated by simulation results using NS2 and SUMO. The trust method's two stages are also checked.

In the paper "Broadcasting safety information in vehicular networks: issues and approaches," [18], R. Chen, W. Jin and A. Regan classify and survey broadcast protocols for vehicular communication networks. Many safety-related applications rely on vehicular networks, and reliability is critical. These techniques specifically address the broadcast storm problem by lowering packet redundancy, wireless contention, and network collisions. Each protocol has its own set of constraints and assumptions that can lead to problems. For example, while node selection for multihop relay based on node distance (MFR) reduces the total number of traveling hops, it comes at the cost of poorer packet reception rates due to the loss of radio power caused by longer propagation distances. Another flaw in some of the systems investigated is the assumption that GPS will be readily available to transmit location information to nearby automobiles. As a result, the viability of these vehicular communication network applications will be primarily determined by the acceptance of technology and the market penetration rates of automobiles equipped with capabilities, GPS devices, or both. This paper also suggests that decreasing message flooding is a critical step in resolving the broadcast storm problem and improving the consistency and efficiency with which safety messages are distributed to other vehicles.

## III. RESEARCH METHODOLOGY

We assume that all the vehicles in the VANET to have an OBU and be furnished with GPS or a navigation system to gather data about their current information. We also assume that there will be RSUs at constant intervals of 20km.

### 3.1. VEHICLE AND RSU REGISTRATION:

This is the initial state of a vehicular adhoc network. It is the registration of the vehicles and the RSU to the Centralized Authority (CA), to get a unique id after submitting their real id. Vehicles are registered to the RSUs in the form of clusters. Channel type, interface queues, radio type links etc are introduced on the registration modules for connection. A topography is created to show the relation between the links and the nodes. NAMTRACE is used to trace all the links in the network. The vehicle nodes are assigned with dynamic mobility in the ns2. The simulation of nodes is shown dependent upon the destination and co-ordinates.

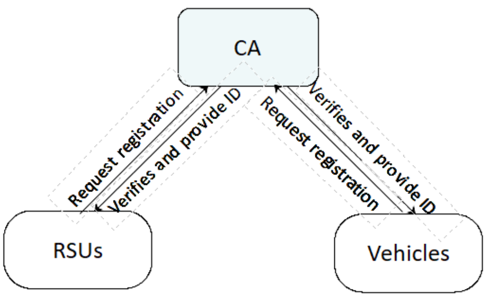


Fig 3.1 Vehicle and RSU Registration

ALGORITHM:
1. The registration is initiated by the vehicles and RSUs by sending a request for the registration process to the CA.
2. After receiving the request, CA requests for the real identity of the vehicle or RSU.
3. CA sends a unique identification to the vehicles and RSU after verifying their real identity.
4. Once the registration is done vehicles and RSUs can communicate.

### 3.2 CLUSTER FORMATION AND CLUSTER HEAD SELECTION:

Cluster (CH) selection can be done in several ways. Here, cluster head is picked with noteworthy cost strength. Dynamic Mobility based Multi-hop clustering algorithm is used for this system. It is done through three phases of Cluster Head determination, Group maintenance and square division of the cluster. Vehicles communicate for the CH Selection in the multi hop environment. Hello message broadcast method is used to decrease the overhead of clustering algorithm. We assume that all the vehicles are equipped with GPS and Navigation System (NS). A message Is send by every vehicles to its hub endeavour, which contains ID, vehicle speed, and position. The boundaries are placed into the network framework at that point and a cluster head is selected. Cluster maintenance phase with CN state transition algorithm is used for cluster up keeping. To characterize Cluster Head for correspondence, each group parts into squares by K-bordering.

### 3.3 ACCIDENT DETECTION AND AVOIDANCE:

The vehicles are detected for possible crashes by calculating its distance and position. Vehicle within coverage area receives the Message and sends a response back to that transmitter With its current position. If the position parsed in the Received message from approaching vehicles toward Accident vehicle need processing for distance Calculation. The distance calculation derives whether a Vehicle is quite adjacent, and may get affected by Accident, or else vehicle distance is sufficient to avoid Collision area. This result is used to produce the alert in the network. The critical reasons for the accident/congestion on The road or junction are because vehicle nodes were having less information about movements. Even if RSU or V2V communication depend on the position of the accident, the direction added a vital role. Vehicles in both directions receives the message on the road. If a crash happened on a road moving towards a direction, opposite direction vehicles need to ignore message helps in congestion avoidance.

### 3.4 ALERT MESSAGE DISSEMINATION:

A node in accident starts disseminating accident messages to nearby vehicles and following vehicles so that they can start performing the re-routing process to avoid congestion. The message dissemination takes place in the clusters and in the nearby clusters by Multi-hop communication. The following immediate vehicle after receiving accident alert initiates calculation and controls the accidents with the sensors support. The sensors transmitters are used to convey out the wireless message along with its position.

## IV. RESULTS AND DISCUSSION

NS-2 is used for the simulation of the system. The system was run for different number of nodes i.e., 4, 9, 16 and 24. The nodes communicate and cluster head is selected.
Below shows the simulation of the system:

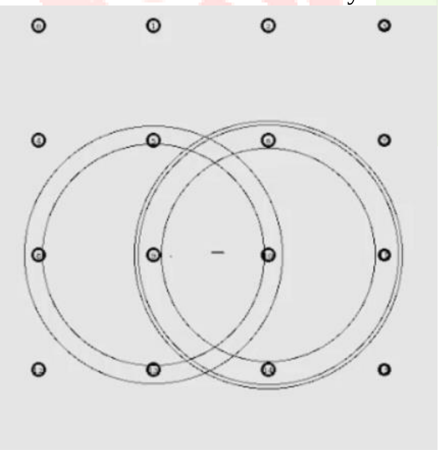

Fig 4.1 Communication between 16 nodes to determine CH

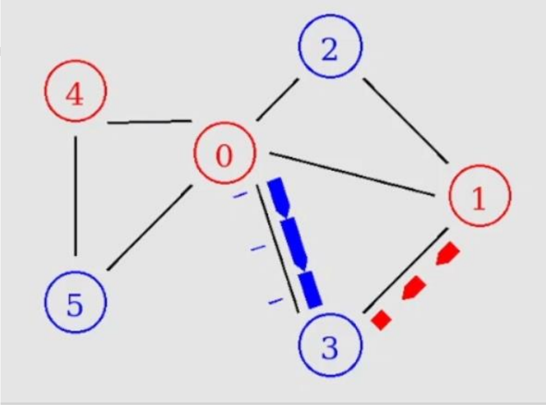


Fig 4.2 Movement of vehicles and data between clusters

To evaluate the output of the application, we tested the communication delay and data loss rate. The aim was to validate and conclude the data transfer rate against the time required to deliver the packets and intimate for accident avoidance.

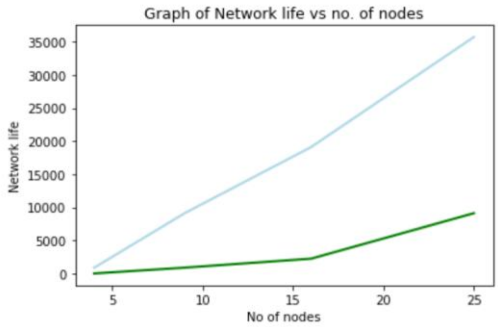


Fig 4.3 Variation of network life with number of nodes where blue line indicates d=100 and green line indicates d=200

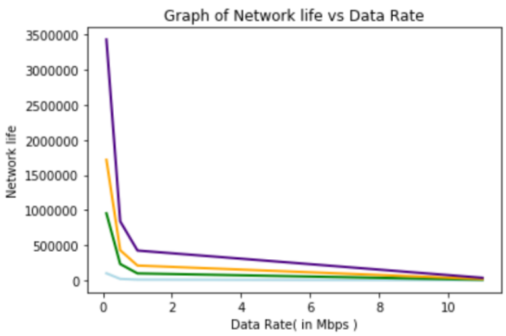


Fig 4.4 Variation of network life with data rate where indigo line indicates N=25, orange line indicates N=16, green line indicates N=9 and blue line indicates N=4

The graph shows that the network life is plummeted along 1 Mbps data rate and then follows a linear decline with increased data rate. From the graph we can also state that network life increases proportionally to the no of nodes present in the system.

## V. CONCLUSION AND FUTURE WORK:

IoV can play an important role in maintaining traffic safety and avoiding traffic congestions by enabling the drivers to avoid collision by obtaining timely precaution. In this paper, a crash detection and re-routing for the crash avoidance is presented in a multi-hop VANET scenario. The vehicles were grouped into notable VANET hops for environment was The crash detection is carried out in the RSU with the data updated by the vehicles in it. The accident alert message is generated and transmitted to the vehicles in the cluster and to other clusters via the RSUs. The message is broadcast to the cluster members by the cluster head(CH) of each cluster. The CH is selected in such a way that it will have maximum CH lifetime from the communicating node. Advanced technologies like AI, cloud computing automatic driving will broaden and provide safer and effective crash avoidance system in the future.

## VI. ACKNOWLEDGMENT:

We utilize this opportunity to convey our gratitude towards all those who have helped us directly or indirectly for the completion of our work. We deeply and wholeheartedly thank Dr. Sreeraj R -HOD, Computer Science and Engineering for his extreme valuable advice and encouragement. We especially thankful to our guide and supervisor Ms. Nitha C Velayudhan - Associate Professor ,Computer Science and Engineering for giving me valuable suggestions and critical inputs in the preparation of this paper. We would like to extend our sincere gratitude to all faculty of Computer Science and Engineering department for the support and suggestions that helped us in the development of our work to what it is now. We thank our parents and friends for the mental support provided during the course of our work at the times when our energies were the lowest

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