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MOBILITY PREDICTION AND NODE PREDICTION BASED LIGHT-WEIGHT RELIABLE BROADCAST MESSAGE DELIVERY IN VEHICULAR AD-HOC NETWORKS

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Abstract: VANET is a Vehicular Ad hoc-Network; it can able to communicate between the moving vehicles. The Reliability as well as Efficiency of Transmissions is of a paramount issue for the safety critical services of VANET due to the urgency and/or significance of the messages. The main problem in VANET is data transmission cannot be done in cross street due to some obstacles. To overcome this, existing work proposed 'Light Weight Reliable Broadcast Message Delivery' mechanism is not effective but, in LWRBMD mechanisms broadcast the Message delivery could be difficult at the intersection zone due to choosing the wrong node and the node will be moving out of zone, which results in packet loss occur. While rebroadcasting is done the Bandwidth will be increased. Thus in our proposed work, we introduce two methods in order to predict the node and mobility. Based on these prediction methods we can improve the energy efficient. Which will decrease the Bandwidth for Packet Forwarding? In Intersection Zone the Packet will be forwarded, which decreases the packet loss and low data rate. Time Complexity Simulation results show that the proposed mechanism can provide similar or better reliability while incurring prominently less overheads than the existing approaches.

Keywords— Energy efficient, Mobility prediction, Node prediction and Intersection zone.

I. INTRODUCTION

VANET (Vehicular Ad-hoc Network). The number of vehicles has been raising significantly, and the traffic related issues have dramatically increased (e.g. traffic accidents and congestion) in the mean while. Thus governments throughout the world have been interested in obtaining effective solutions for traffic management. A variety of applications could be implemented to improve the traffic managements, such as enhancing driving safety, avoiding traffic accidents and easing traffic jam. Vehicular Ad-Hoc Network (VANET) is the primary solution, utilized by those applications communicating between vehicles and roadside infrastructures. Vehicle-to-Vehicle (V2V) and Vehicle-to-road side units (V2R), where the RSUs might be cellular base station for example.

Further, this area of research has become increasingly popular and a number of projects are currently with the adoption of Wireless Access in Vehicular Environments (WAVEs).However, finding a suitable mechanism for routing during multi-hop forwarding in urban areas is still an unresolved challenge, the reason of which can be summarized in three folds.

The VANET communication can be of two types.

- Vehicle-to-Vehicular (V-V) or Inter-Vehicular Communication
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- Vehicle-to-Infrastructure (V-I) or Vehicle-to-Roadside Communication.

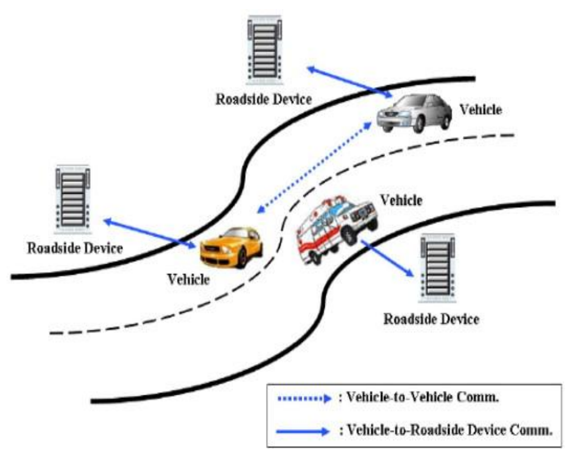

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Fig1. VANET architecture

Vehicle-to-Vehicle (V2V) and Vehicle-to-road side units (V2R), where the RSUs might be cellular base station for example. From the concept of VANET, a salient challenge is mandatory. Suppose at the mid-night in some rural area, a vehicle has a very important data packet (i.e. detection of an accident) which should be forwarded to the following vehicles immediately. The probability of low density of vehicles in the rural areas at mid-night is very high. So, in this situation the packet will be lost due to lack of presence of other vehicles or lack of presence of RSUs to receive and forward it, and arrival of the coming vehicles in the accident area is unavoidable.

The applications of VANETs are as follows:

- Traffic Signal
- Vision Enhancement
- Weather Conditions
- Driver Assistance
- Automatic Parking
- Safety
- Searching Roadside Locations and vehicle's Direction
- Entertainment

VANETs Characteristics

In the following, we summarize the unique characteristics of VANETs compared with MANETs.

Unlimited transmission power**:** Mobile device power issues are not a significant constraint in vehicular Networks. Since the vehicle itself can provide continuous power to computing and communication devices.

High computational capability: Operating vehicles can afford significant computing, communication and sensing capabilities.

Highly dynamic topology: Vehicular network scenarios are very different from classic ad hoc networks. In VANETs, vehicles can move fast. It can join and leave the network much more frequently than MANETs. Since the radio range is small compared with the high speed of vehicles (typically, the radio range is only 250 meters while the speed for vehicles in freeway will be 30m/s). This indicates the topology in VANETs changes much more frequently.

Predicable Mobility: Unlike classic mobile ad hoc networks, where it is hard to predict the nodes' mobility, vehicles tend to have very predictable movements that are (usually) limited to roadways. The movement of nodes in VANETs is constrained by the layout of roads. Roadway information is often available from positioning systems and map based technologies such as GPS. Each pair of nodes can communicate directly when they are within the radio range.

Potentially large scale: Unlike most ad hoc networks studied in the literature that usually assume a limited network size, vehicular networks can is extended over the entire road network and include many participants.

Partitioned network: Vehicular networks will be frequently partitioned. The dynamic nature of traffic may result in large inter-vehicle gaps in sparsely populated scenarios and hence in several isolated clusters of nodes.

Network connectivity: The degree to which the network is connected is highly dependent on two factors: the range of wireless links and the fraction of participant vehicles, where only a fraction of vehicles on the road could be equipped with wireless interfaces.

In section II, the previous work can be explained in detail and section III can be explained in different Broadcasting methods in vanet. In section IV can be explained with an illustration on the inefficiency and/or the Ineffectiveness of the existing mechanisms with respect to the delivery of the broadcast messages over the intersection zone. In section V the performance of proposed mechanism is compared with the performance of existing mechanisms through a simulation. In section VI, VII implementation can be explained. Finally, concluding remarks are given in section VIII.

II.PREVIOUS WORK

Several researchers studied for energy efficient challenges related to VANETs. In this section, we conduct a brief study of recent and relevant works. Generally packet delivery of the broadcast message over the crossing streets at the intersections is critical. A prediction method provided for maximum bandwidth to the packet delivery and decreases the bandwidth for packet loss does not happen.

1) Yoonyoung Sung in Light -Weight Reliable Broadcast Message Delivery for Vehicular Ad-hoc Networks for mainly used for broadcast message at the centre of intersection zone. LW-RMBD, we take the approach that Avoids the cross-streets intersection problem. While making the rebroadcast can be done Bandwidth usage is increased. Then the method rebroadcasting perform at the timer expired problem.

2) Jian-Ming Chang Chin-Feng Lai, proposed work provides hoe to communicate at the intersection zone. It determines how data can be delivered from one vehicle to another vehicle in the network. In this paper, we present a new solution that provides a stable routing protocol to support intelligent transport systems (ITS) services in VANET

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environments. In VANETs, our solution offers a steady route, and reduces the average end-to-end delay and packet loss rate compared to other VANET routing protocols. Another key idea behind the scheme is to group vehicles according to their packet header and packet forwarding.

3) Mehdi Khabazian, given an idea from this paper provides a communication at the intersection zone. In vehicular ad hoc networks (VANETs), because all vehicles in range are shown as destination nodes and less time is spent for the medium access process, broadcast communication is considered a highly appropriate technique for the dissemination of safety messages in such networks. In this paper, we present an analytical model for the performance evaluation of safety message dissemination in vehicular ad hoc networks with two priority classes. In particular, considering the IEEE 802.11 broadcast protocol and using 2-D Markov modelling, we derive the joint distribution of the numbers of low-priority periodic messages, which are in transmission mode and in a back-off process in a highway. Then, the result is used to derive the average dissemination delay of high-priority event-driven messages in the presence of the low-priority traffic in the network. The results are helpful in determining a good trade-off between network parameters such as vehicles' transmission range, safety traffic generation rate, and medium access control (MAC) parameters to satisfy the required delay bounds for the critical high-priority traffic.

4) Kamran Manzoor, In this paper they increase the performance of VANET in-order to get efficient and reliable communication in VANET by using MTS (Maritime Two State) routing protocol .It is based on two states beaconing state and Prediction state. In the Beaconing state each ship exchanges routing information with immediate neighbours. In Prediction state the future location of each ship in the routing table is predicted and link breakages are posited in advance. During the prediction state a ship does not send any updates to its neighbours, so that communication overhead is greatly reduced.

III.BROADCASTING METHODS IN VANET

Designing vanet communication is based on Broadcasting, then the vehicles can be packet forwarded to other neighbor vehicles .They are different type of broadcasting in VANETs [6].

- Weighted p-Persistence Broadcasting
- Slotted 1-Persistence Broadcasting
- p-Persistence Broadcasting

The broadcast techniques generally follow either a 1-persistence or a p-persistence rule. Despite the excessive overhead, most of the routing protocols designed for multi-hop ad hoc wireless networks follow the brute-force 1-persistence flooding rule which essentially requires that all nodes rebroadcast the packet with probability 1 because of the low complexity and high packet penetration rate. Gossip-based approach follows the p-persistence rule which requires that each node re-forwards with a pre-determined probability p. This principle is sometimes called as probabilistic flooding. The slotted p-persistence scheme can reduce the packet loss ratio at the expense of a slight increase in total delay and reduced penetration rate.

Duo to the high mobility of vehicles, the distribution of nodes within the network changes rapidly and unexpectedly that wireless links initialize and break down frequently and unpredictably. Therefore, broadcasting of messages in VANETs plays a crucial rule in almost every application and requires novel solutions that are different from any other form of ad hoc networks. Broadcasting of messages in VANETs is still an open research challenge and needs some efforts to reach an optimum solution. Broadcasting requirements are: high reliability and high dissemination speed with short latency in single-hop as well as multi-hop communications. Problems associated with regular broadcasting algorithms are: the high probability of collision in the broadcasted messages, the lack of feedback and the hidden node problem.

Basically, blocking line-of-sight by the leading vehicles is one of the main factors of an accident. In case there is a collision accident on the road, if the drivers of the vehicles that are moving toward the accident place cannot make a decision on the suitable actions in time, it can lead to a chain collision or a secondary accident. However, it is possible to decrease the risk of such an accident by providing the necessary information about the accident that just happened to those vehicles and their drivers. The alarm message broadcasting application can be applied to the situation of such an accident, when the vehicle located in the middle of the figure has an accident and identifies itself as crashed by using some sensors that detect events like airbag ignition, this vehicle will start to broadcast the information about its accident to nearby vehicles. It will be possible for the drivers of other vehicles to take suitable actions to avoid the secondary accident by using this information. However, in order to guarantee safety, the following two factors have to be considered.

In this paper, the broadcast message at the intersection zone and efficacious delivered, using the method prediction then the method vehicles to vehicles message will forwarded successfully and any of the broadcast cannot be occur.

IV. EXISTING LW-RBMD MECHANISMS IN VANET

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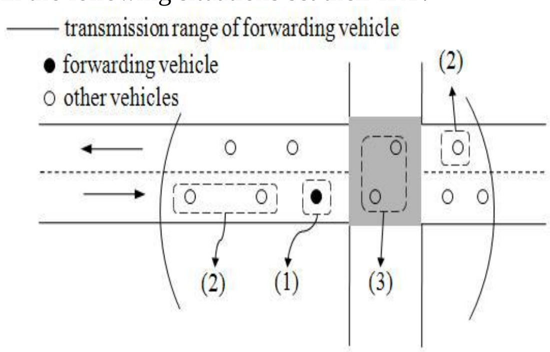
In the existing work [12], using Light-Weight Reliable Broadcast Message Delivery Mechanisms packets are forwarded at the center of intersection zone successfully. The packets are forwarded in the intersection zone choosing high priority of vehicles. In our existing system we have to avoid cross–streets intersection problem. They choose high priority vehicles by the center of intersection zone using the method LW-RBMD mechanisms. The vehicles packets cannot be forwarded at the center of intersection zone due to timer problem.

In LW-RBMD methods vehicles are packet transmit one vehicle to vehicle information can be exchanged. Then the information vehicle will be forward center of intersection zone due to the destination. Vehicles are rebroadcasting at the intersection zone by a timer can be expired. Due to Bandwidth consumption is higher for rebroadcasting that lot of time performed and packet loss will occur. The vehicles packet forwarded should be inside the intersection some of the problem occurs. Then the problem is vehicle moving out of the zone and wrong vehicle to choose by packet forwarding and can implemented the existing work efficient proposed mechanisms.

To these objectives, an additional rebroadcast timer, Intersection rebroadcast timer (IRT) is defined. The vehicles in the following situations set their IRT:



- ➢ A forwarding vehicle that is moving toward the intersection zone with the intersection zone being within its transmission range.
- ➢ A vehicle that receives a new broadcast message while it is moving toward the intersection zone with the intersection zone being within its transmission range.
- ➢ An intersection vehicle receiving a new broadcast message. Figure 2 shows these three cases. Note, together with IRT, the ordinary rebroadcast timer (in case 1)), and the forwarding timer (in cases 2) and 3)) are also set and utilized independently.

The Drawbacks of Existing systems are,

- ➢ The wrong node to choose at the intersection zone packet cannot be forwarded.
- ➢ The node can moved at the out of zone packet loss will occur. While rebroadcasting done.
- ➢ Time complexity.

V.PROPOSED WORK

In our proposed work, the vehicle should be forwarded packets at the intersection zone using Prediction, Beaconing methods. We have to propose prediction method then the vehicles can be forward the packets should be easily. While the prediction have two methods,

- ➢ Node Prediction
- ➢ Mobility Prediction

The Proposed algorithm using two states are prediction state, Beaconing state. The packets are forwarded at the intersection zone using two methods node prediction and mobility prediction. In node prediction checks the vehicle/node packet transmits or not using the parameters such as Average speed. Calculate the bandwidth for vehicle packet forwarded or not using these parameters. Whether the vehicle packet cannot be forwarded node prediction can be performed and vehicle should be predicted. In Mobility prediction before it reach the intersection zone then the node will be predicted after to reach the intersection zone and packets are forwarded around intersection zone, the above diagram, the source node the packets will be forwarded to the intersection zone based on two methods Mobility prediction and Node Prediction thus the route will be created on the intersection zone. Now the message will be forwarded to the destination. If the link failure occurs then retransmission will occur.

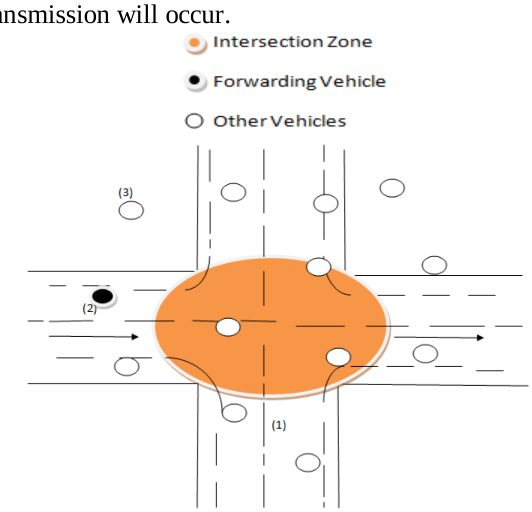


Fig 1.Vehicles can be packets are forwarded in the Intersection Zone.

DATAFLOW DIAGRAM:

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A vehicle should be packets are forwarded at the intersection zone. They have chosen the vehicle and vehicles are already packet forwarded or not for finding and then node prediction can be performed. The above figure [1], intersection zone will defined meeting at four side junction and outside intersection zone any one vehicle by choosing node prediction wise predicted. When the mobility prediction allocate the time/seconds, within a given time vehicle will packets must be forwarded. Due to the Existing drawbacks are avoided.

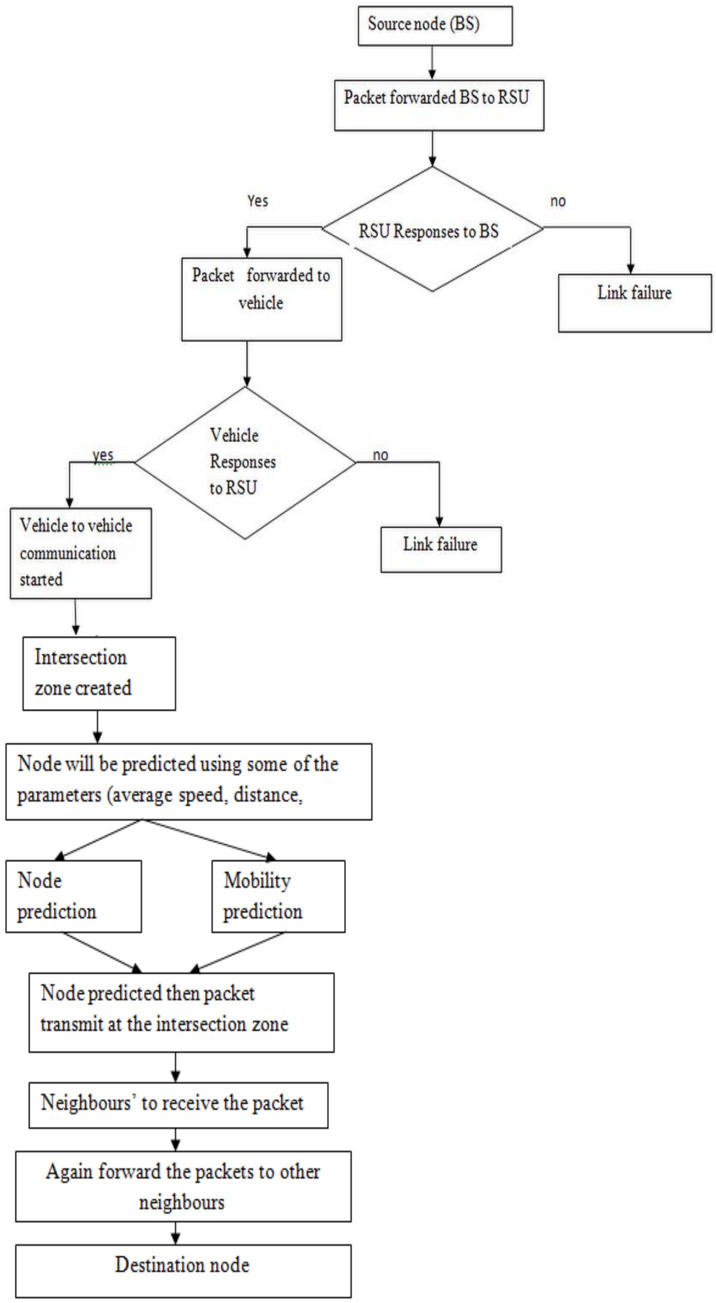

FIGURE: DATAFLOW DIAGRAM

ALGORITHM:

The algorithms used in the proposed system are as follows.

ALGORITHM 1**:**

1. Initially each vehicle n is the beaconing state, do
2. for each vehicle n at location (x_n,y_n) do

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3. Update the routing table using Algorithm 2.
4. if (routing table of vehilce n is matured) then
5. Set the node to prediction state
6. Update the routing table using Algorithm 3.
7. for i←1 to total number of rows in routing table do
8. Take current location ($x_{b,i}$,$y_{b,i}$) for each row i.
9. Calculate Euclidean distance E between (x_n,y_n) and ($x_{b,i}$,$y_{b,i}$)
10. if (E>breakdown distance ⍳) then
11. Go back to beaconing state (step3).
12. else
13. Go to step 6.
14. end if
15. end for
16. end if
17. end for

ALGORITHM 2: **BEACONING STATE**

1. for each vertex v € V[G] do
2. d[v] ← inf
3. p[v] ←nil
4. end for
5. d[s]←0
6. for i←1 to |V[G]| do
7. for each edge (u,v) € E[G] do
8. if d[v]>d[u] + w(u,v) then9. d[v]←d[u]+w(u,v)
10. p[v]←u
11. end if
12. end for
13. end for

ALGORITHM 3: **PREDICTION STATE**

1. Initially for each vehicle n in the prediction state does
2. for i←1 to number of rows in the routing table
3. Calculate next location ($x_{c,i}$,$y_{c,i}$) using (5) and (8)
4. $x_{a,i}$=$x_{b,i}$;$y_{a,i}$=$y_{b,i}$
5. $x_{b,i}$=$x_{c,i}$;$y_{b,i}$=$y_{c,i}$
6. end for

A.NODE PREDICTION

In Node Prediction packet can be forwarded at one vehicle to another vehicles. In order to achieve node prediction the vehicles can be predicted using the parameter is Average speed. Another method for predict the vehicle is Outside intersection zone five vehicles are available but choose the one vehicle by following one method is transmission rate. In which node will predicted based on average speed. Then the Average speed will be calculating distance from source to destination.
In which node prediction the node will be predicted using some of the parameters then parameters are.

- Average speed
- Transmission range

AVERAGE SPEED:

The average speed can be used to check whether the node packet transmitted or not. Average speed means node bandwidth speed, then node time (T1), time (T2) can be added and divided by two. If the energy will be high the node to be packet transmitted otherwise the node cannot be packet transmitted.

AVERAGE SPEED=T1+T2/2

TRANSMISSION RANGE:

Transmission range means if there are three nodes are presented at the same place, then transmission range based the node will be choose. The two conditions are satisfied node will be predicted and the second method can be continued.

B.MOBILITY PERDICTION

In Mobility Prediction of a node is “the estimation of their future locations”. The definition of “location” depends on the kind of wireless network. In infrastructure networks, location means the access point to which the mobile terminal is connected. Many location prediction methods are proposed. The main advantage of location prediction is to allocate, in advance, the convenient next access point before the mobile terminal leaves its current one, in order to reduce the interruption in communication between terminal mobiles.

In which Mobility prediction the node will be predicted using some of the parameter then the parameters are,

- Current location
- Previous location
- Distance
- Speed

These parameters based the node will be predicted and then the mobility prediction timer will be setting to the node. The node within the three minutes packet can be forwarded at the intersection zone. They can be find the node of next location is calculated using this formula.

NEXT LOCATION=CURRENT LOCATION –PREVIOUS LOCATION

The main Advantages of prediction method for less Bandwidth usage in VANETs,

- The packets are forwarded within the predicted time. Hence the packet loss decreased.
- Hence the bandwidth usage will be decreased
- Less time complexity.
- Decreased packet loss then the Bandwidth usage is less.

VI. ENVIRONMENTAL SETUP

NS2 is an Network Simulator A package of tools that simulates behavior of networks Create Network Topologies Log events that happen under any load Analyze events to understand the network behavior.NAM is an Network Animator.A visual aid showing how packets flow along the network. Network Simualtor-2 (NS-2), is chosen for the simulation of sensor network withNS-2.35 as the version. NS-2 is an object-oriented discrete time event simulator written in C++, with an OTcl object interpreter .and its modular design made it to be extensible++ is the predominant programming language in NS-2. It is the language used for all the small programs that make up the ns-2 hierarchy. C++, being one of the most common programming languages and specially designed for object-oriented coding, was therefore a logical choice what language to be used. This helps when the user wants to either understand the code or do some alterations to the code. Object Tcl (OTcl) is an object oriented version of the command and syntax driven programming language Tool Command Language (Tcl). The front-end interpreter in NS-2 is OTcl which link the script type language of Tcl to the C++ which is the backbone of NS-2. Together these two deferent languages create a script controlled C++ environment. This helps when creating a simulation, simply writing a script that will be carried out when running the simulation. NS uses two languages because simulator has required two deferent kinds of issues. First, detailed simulation of protocols requires a systems programming language which can efficiently manipulate bytes, packet headers, and implement algorithms that run over large data sets. For these tasks run-time speed is important and turn-around time is less important.

VII. IMPLEMENTATION AND RESULT

In this paper we implement our proposed work by using the tool as Ns2. In our proposed work the vehicles are predicted then packet will be forwarded in the intersection zone by using two methods node prediction and mobility prediction. In which the Node prediction to check whether the vehicles packet transmit or not by using the methods average speed , transmission range then node will predicted and the second method mobility prediction by using the methods such as speed, distance, current location, previous location calculated to predict the node. In order to achieve the mobility prediction and node prediction vehicles forward the packets at the intersection zone successfully.

VIII. CONCLUSION

VANET communication among two vehicles. The problem of our paper is packet/data forwarded over the cross streets is difficult. The existing work packet cannot be forwarded at the intersection zone. In this paper, we proposed prediction based packet transmit at the intersection zone. The two predictions are node prediction and mobility prediction. Vehicles should be Packet or data which can be forwarded successfully by means of predicting nodes in the network. While the prediction can be used successful delivery of data at the intersection zone then the Bandwidth usage is less and decreased Bandwidth. In future we would like to implement our research work in the tool Ns2.

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