

## ENHANCED VANET ROUTING PROTOCOLS FOR DYNAMIC MAPPING IN REAL TIME TRAFFIC

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**Abstract:** The developments in the means of transportation along with the communication advancements has made the automotives to step into its next level of innovation by providing a safe, convenient and well-timed transportation. This is made possible by the introduction of the frame work that is particularly designed to establish connectivity between vehicles on road without any previous structure to support with. This paradigm formed particularly in organizing communication between vehicles is the vehicular Adhoc network (VANET) that causes a vehicles to vehicle connection for proper managing of the traffic flow to make the travel more safe and comfortable. The paper proposes a dynamic mapping of real time traffic with the acquisition of digital map by crowd mapping with clustering to offer path optimization to minimize the delay in the responses, for having an efficient traffic managing. The evaluation of the proposed methodology ensures the minimization of the delay in the communication and the improved delivery ratio incurred, when compared with the carry-forward based routings methods that cause more delay resulting in imperfect traffic management.

**Keywords:** VANET, vehicle to vehicle connection, digital map, crowd mapping, clustering, minimized delay, improved delivery ratio

### Introduction

The advancements in the means of transportation is one of the technological innovations. The implementation of new ideas in the transport system enabled humans to traverse more stretching out connectivity to afar distance. The initial mode of transport that started by travelling on foot, by human carried palanquins, bulla cart and even more, traversed through many progresses leading to human operated motor vehicles or automobiles. The progressing in the

aids of transportation have not ended but has reached to inventing of vehicles that operate without human assistance. Human beings whose mental attitude always aims for having a highly developed innovatory also fixes on luxurious things that afford to offer comfortability. In the world's population that is exceeding beyond seven billion, more than half of the population use motor vehicle that bring comfort, as their transportation aid, which causes the roads to be over crowded with vehicles. This over crowdedness leads to pollution emission causing health problems, increased waiting time and also undesired event to occur causing quietus and impairments. So the human nature that always strives to have improved luxuries aspires for a comfortable modes and means of transports to have a safe, dirt-free, organized and well-timed travelling. The technological extension of communication in transportation has made possible a safe, convenient and well-timed traversing by introducing vehicular adhoc networks. The VANET that are closely related to the wireless communication network takes care in providing a desirable, sturdy, and energy efficient way of handling transports to give a secured and contended assistance on the roadways. These frameless network that are formed by the automotives on the roadway uses the vehicles as communicators and broadcasters of information between them and are assisted by the devices present inside the vehicle and on the sides of the road that extend support for this information sharing. Possessing certain similarities such as re-crafting and renovating on their own as of the wireless adhoc network these vehicular network come with even higher mobility causing dynamic changes in the structure of the paradigm. These networks are found assisting in applications on real time such as traffic jam detections, notification of the conditions of the road, information about the trailing of exigent vehicles, the speed breakers, the toll booths that are coming forth, spot light assisting and rerouting to reach appropriate destination. The few characteristics variations of VANET from WANET make the traditional routing technologies used in the wireless adhoc network unsuitable for the vehicular adhoc network. So this entails the VANET to be provided with enhanced routing protocols that support in the dynamic mapping of real time traffic.

The proposed VANET routing protocols offers a dynamic mapping of real time traffic by timely distribution of the contents using internet of vehicle systems. The routing affords to offer digital map that is produced as a result of crowd mapping in combination with geographical information's followed by a clustering to find an optimized path for traversing of the information.

The paper is constructed with 2 related work on the VANET, 3, the proposed work on crowd mapping and clustering 4, the result evaluation and 5 the conclusion.

## **Related works**

Ullah et al [1] shows the fog involved architecture of VANET using position based routing protocol including the junction of the road for selecting the pathway and parked vehicles for the data transmission stopping the diverse carry forward methods by employing the position based routing protocol in the city environments. Sommer et al [2] uses a bidirectional coupling of two simulators of network and the road traffic with the mobility models to have a validated output at a greater extent to provide an accident warning system for the vehicular Adhoc network using the frame work with hybrid simulators. Jerbi et al [3] gives a greedy routing protocol for city environments using dynamic properties for the junction selection and greedy nature for transmitting the data packets supporting the swift changes in the topology for this instantaneously formed network. Eze et al [4] the improvement in the road safety and the proper traffic controlling using the wireless access of vehicular networks on the city roads by the development of intelligent transport system with an overview of the challenges faced and the potentials of the VANET. Trivedi et al [5] the cross layer structure scheme used instead of the traditional methods of routing help in the improvisation of the stableness of the link , by giving perfect global view of the paradigm and architecture affording the random changes in the network . Kumar et al [6] the diverse routing techniques available and its nature of support extended to the vehicular network are discussed and validated by tracking and evaluation to afford a smart intelligence transport systems essential in the smart cities. Nzouonta [7] uses a real time traffic information for the forming a route based on the road intersection and packet forwarding using a geographical forwarding method adapting a reactive routing protocol method and reduce the path sensitiveness for the individual mobility of the nodes. Multi criteria optimization is involved in the dense networks with high contention to increase the delivery rate and decrease average delay. Bilal et al [8] the enhanced routing is established by Gy-tar routing determining the directional density and the velocity of the vehicle to have predictable mobility patterns for the high speed vehicles in the city environment. Seif et al [9] the high definition map and the autonomous car introduction using sensor and robotics technology along with data management and cloud computation enables to have a necessary insights of the technology trending towards the future. Ahmed et al [10] the challenges faced in the vehicular network during packet delivery due to the local maximum problem is addressed by using routing protocol converging the distance and the traffic sensible routing to provide with a best optimized routing delivery for the smart transportation in the smart cities. Abbasi et al [11] shows up with the routing ability caused by the multi junction mechanisms and the greedy packet forwarding technology to have high stableness in the route established supporting the dynamic nature of the VANET to have improved safety and employ convenience for the public. Mohammed et al [12] considering the reliability and the robustness as the design metrics to have improved driving assistance as well as the autonomous vehicle system involving the impact of IOT in the automotive world. To have a better quality of service in the vehicular adhoc networks.

### 3. Proposed Work

The interconnection of vehicles for the purpose of comfortable journey that is also safe has to be supported by a proper routing methodologies for the timely delivery of responses. The VA-network that possess dissimilarities with the WA-network, makes it difficult to adapt to the routing methodologies that are conventional in the wireless adhoc network. So the paper proposes a crowd mapping with the clustering based routing to have a dynamic mapping of the real-time traffic that over comes the failure in the proper and timely delivery of the information's

The purpose of the proposed is to capture the present sequence of events by the vehicle that is passing along the way and convey into the cloud architecture of vehicles and the cloud architecture comes up with the timely response for the handling of the current situation. So the structured designed uses the clustering methodology in which the vehicles are counted to be the co-workers in the cluster. The events mapped by the co-workers of the cluster are transmitted to the cloud with the help of the cluster head and the response is sent back from the cloud with the detailed digital map of the possible alternate ways to be taken on the cases of traffic jam, emergency and natural incidents affecting the road condition.

### 3.1 Clustering for VANET

As the Vehicular network is frame work formed by instantaneously available vehicles the vehicles here are considered as nodes for communication. The clustering based routing for VANET considers the vehicles as its co-workers of the cluster and the cluster is formed by the reception of response from the cluster heads for the greeting message conveyed by the co-worker in the cluster. The cluster head selection for this high mobile network is selected by determining the speed of the vehicle and the distance it has travelled. The vehicle that has covered a longer distance, with moderate speed variations is selected as the group head. The vehicles in the cluster should fall within the transmission range of the cluster

```
Input Vehicles (Vi)
if (event occurred) then
  begin
    capture events
    transmit to cluster head
    cluster head waits for all co-workers response
    if (received) then
      begin
        for each neighbor vehicle/on road circuitry
          compute current distance Di
          compute next distance Ni
          if (Di<Ni) then
            begin
              use current distance
            else
              distance Ni
            next vehicle
          end
        transmit information
      end
    end
  end
```



Fig 2 Algorithm for Clustering in VANET

and the connections established will be full duplex. On detecting a traffic jam or an emergency situation or bad road conditions the software enabled in the cluster co-workers capture them and transmits the information to its cluster head. The cluster head waits for the information from all its co-workers to have a detailed report of the particular incident and then transmits accumulated information to the cloud of vehicle using the on road circuitry or the neighboring vehicle by calculating the shortest path using the SPF algorithm. The cloud of vehicles on receiving the information process with the affordable roads that can be taken to avoid the traffic congestion or the bad condition roads and extends help during exigent situations by providing a complete digital map with the help of crowd mapping. The algorithm shown in the figure 2 helps in the event detection and information transmitting between the VANET using clustering.

### 3.2 Optimization of Alternate way using Crowd Mapping

The crowd mapping are used to give a clear picturing of the present situation with the help of geographical information or the data obtained from any other sources. This involves the image processing technologies and extricate the images by separating them into blocks. The separate frames are then analyzed using the object detection algorithm to detect with the objects present in the image and are stored and the final information is produced in the form of digital map with the possible alternate ways that could be taken in the travelling.

```
Input image (I) or video (v)
Output digital map (M)
Collect information (I or V)
if (I or V received) then
begin
extricate features
divide into blocks
for each block (bi)
compute polarity  $\sum \frac{P(\text{rowindex}-1)-p(\text{rowindex})}{\text{column index}}$ 
perform shape and edge detection
next bi
end
return detected object
plot digital map
end
```

Fig 3 Crowd Mapping Algorithm

The image or the video gathered from the vehicles are send to the cloud architecture for finding the possible paths the crowd mapping shown in fig 3 uses the process of image segmentation and object detection to gather the information and plots the digital map including the possible alternate ways that can be taken with the help of the geographical data's that are accompanied in the message. The digital map is send back to the vehicles with the help of cloud and enables them to decide with the possible alternatives in the case of emergency situations, traffic congestion and potholes on the road due to natural incidents.

#### 4. Result Analysis

The result evaluation of the proposed system is done on the network simulator under different traffic densities with number of vehicles ranging from 20 to 200 under the area of 1000m with the packet size of 80 bytes with the packet data rate of one packet/ second and found to be efficient. The crowd mapping integrated with clustering offers a digital map of the complete geographical area which is affected either by manmade or natural incidents and provides with the picture of better alternative roads that can be obtained within few seconds without incurring delay. The complete digital map obtained shows the timely and failure less delivery of the data to and from vehicles. The proposed method is evaluated on the grounds of delay in response reception and loss less delivery and compared with the existing methodologies FRP ,PRP and are found to be efficient and reputable.

##### a) Delay in response reception

The delay incurred in the response reception is the time difference between the transmission of the information and the reception of the information, is given by equation (1)

$$\text{Delay in response reception} = \text{Information}_{\text{transmitted time}} - \text{information}_{\text{reception time}} \quad (1)$$

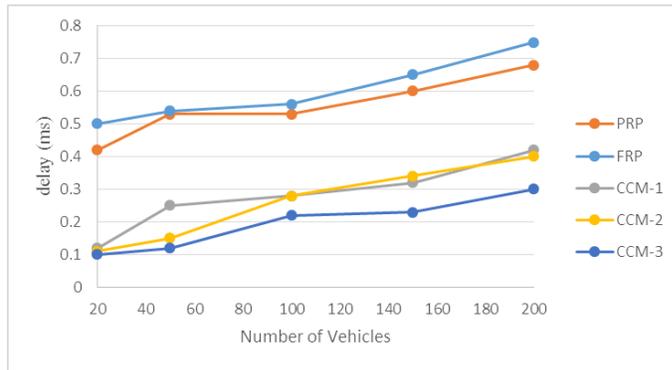


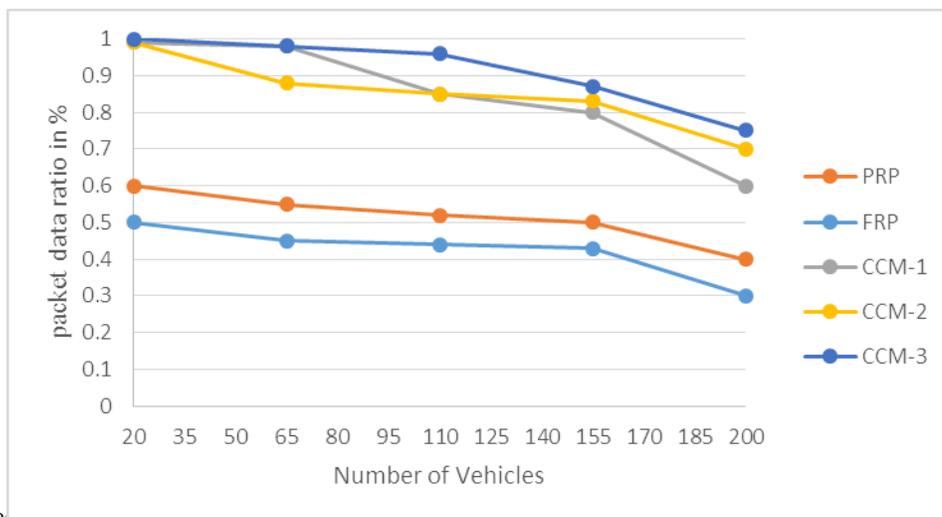
Fig 4 Delay in response reception

The graph obtained Fig 4 for the calculation of delay shows that the proposed methodology has incurred less delay on response reception compared to the carry forward methods that are used in the existing. The Cluster based enabled with SPF algorithm and integrated with crowd mapping enables us to have timely response reception and thus proving to be efficient under different traffic densities on different days.

### Packet Delivery Ratio

The Delivery ratio measures the losses that are been obtained by calculating the total amount of successful delivery for the total number of transmitted information is given in the equation (2)

$$\text{Packet Delivery Ratio} = \frac{\text{Total successful reception}}{\text{Total transmission}} \quad (2)$$



### **Fig 5 Packet Delivery Ratio**

The graph on the Fig 5 shows the maximum lossless delivery attained on the days of heavy traffic densities on different days. The comparison with the previously existing methods shows that the proposed methodology gives a perfect delivery without much losses than the carry-forward methods used. Thus the proposed Cluster based routing enabled with SPF algorithm and integrated with crowd mapping is a full duplex methodology that is dispersed widely with less flooding congestion on the process of progressive path discovery and the damaged paths being repaired locally without another path discovery process proves to be an efficient methodology incurring less delay and losses.

### **5. Conclusion**

The proposed methodology that produces the digital map for alternate roads to be taken with the help of crowd mapping and the clustering based routing enables the user with the better next option to be taken for having a comfortable and safe journey. The support extended by the clustering based routing whose cluster head is select based on the moderate speed variation and longer distance travelled ensure in taking care of the rapid mobility and the velocity variations of the vehicles. The evaluation carried out using the network simulator on the grounds of delay and the packet delivery ratio shows that the cluster integrated crowd mapping methodology low response time and less losses compared to the carry forward methods that are existing.

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