



# EC VRP METHODOLOGY TO CAST THE ATTENTIVE MESSAGE IN VANET FOR INTELLIGENT TRANSPORTATION USING EDGE COMPUTING AND NAVIC

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## Abstract

Nowadays, a massive volume of vehicles has been increased and leads to poor safety during traffic. An Intelligent Transportation System (ITS) plays an important role in VANET. Every city is converting into digital communities to make our life easy and smooth. If a person needs to go to school, college or office they use vehicle to reach the spot on time. To save human time, ITS has been included in VANET. The existing system raises an issue in late communication about the accidents and collisions to the hospital and nearby vehicles. The proposed work combines Edge computing and NaVIC technologies with EC VRP algorithm for smooth and safety transportation.

## 1. Introduction

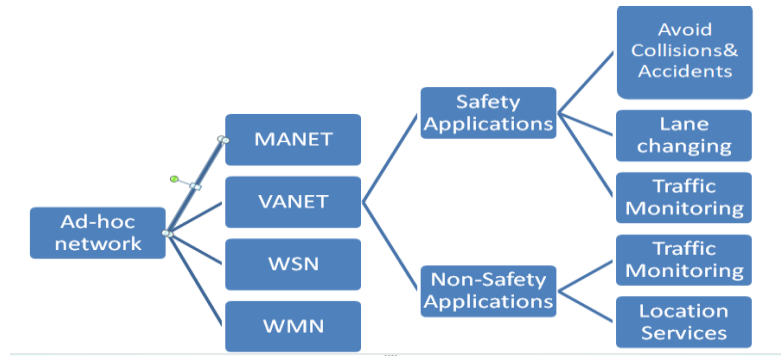
Ad hoc Network is a sort of MHWN (Multi-hop wireless network). One of the main and popular in ad-hoc network is VANET. VANET plays an important role in rescue a human life during accidents. The following figure shows the road map of the proposed work.

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**Figure 1.** Road map.

As stated in [1], about 4, 66,000 accidents have been recorded in 2018. Nearly 1, 51,477 people were died and at most 4, 69,418 were injured severely during the accidents. Most of the accidents were occurred on highways. In that 30.4% accidents occurred on national highways and 25% on state highways. As per the statistics India was the highest rate in road accidents.

The foremost work is to provide an emergency vehicle to reach the accident spot on time without any delay. Approximately 50% of the call will be given to the emergency vehicle and nearly 20% of the time, the ambulance will reach the spot on time. We can't expect the public to give information of the accident to the ambulance due to legal issues or time constraint as there is the possibility of delay in communication to the emergency vehicle. This issue can be solved if there is an efficient and automated system for smart and safe transportation. Another major problem is to pass the alert message to the other vehicles on a particular lane to avoid collisions and further accidents.

This research paper focuses on these issues and provides automated alert messages to the ambulance to reach the spot on time with minimum delay. The proposed work use two technologies Edge computing and NaVIC together to find the location even though there is less network connectivity. Also the system plays an important role in saving valuable human life in a precious time.

As per the report of the World Health Organization (WHO) accidents are the highest in the world. About 1, 35, 000 deaths occur every year due to traffic collisions [2]. The figure 2 shows the approximate death rate per

accident from the year 2016 to 2020. It shows the accident and death rate has been gradually decreased. This is due to the various technologies used for smooth transportation. The main reason for the human loss was the time delay of the emergency vehicle to reach the destination. The next issue was the passenger will hesitate to inform the hospital about the accidents, since they need to answer the police inquiry. Therefore, our research focuses on these issues and makes proper response and accurate information much better than the existing system.

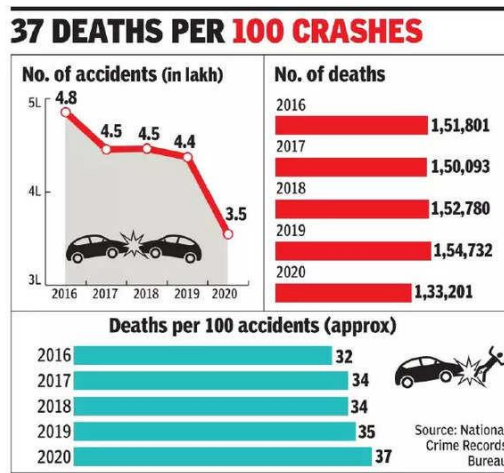


Figure 2. Sample death rate per crashes.

The rest of the paper is organized as follows:

- Literature review.
- Proposed Work.
- Results.
- Conclusions.
- Future works.

## 2. Literature Review

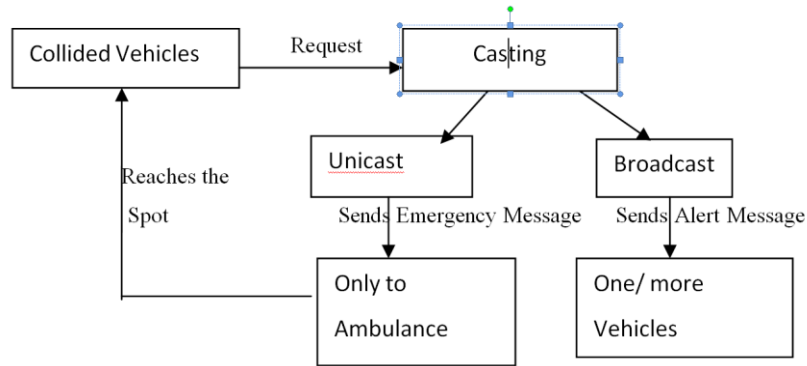
- Lucy Sumi and Virender Ranga gave a detailed description to provide a free path for an ambulance and reduce collision. The authors described two algorithms one is used for a single emergency vehicle in

a particular lane and the second is used for more than one emergency vehicle. Algorithm 1 and 2 compares the vehicle ID with ambulance ID and give priority for the emergency vehicle. Yet, it faces a delay to pass the message for emergency vehicles [2].

- Khatri, Vachhani, Shah, Bhatia, Chaturvedi, Tanwar, and Kumar proposed an algorithm to reduce road accidents and latency issues. By using, K-NN(K-Nearest neighbor) and CNN(convolutional Neural Network) algorithm controls the traffic and reduces the congestion among vehicular nodes. But in the future, it needs the best routing mechanism to find the optimal path to reach the destination [3].
- Agarwal, Jain and Karabasoglu focused on lane changing, collision avoidance, and time of arrival (TOA), broadcasting warning messages in VANET using TOA based localization algorithm. But, it fails to reduce the time delay while broadcasting the information between the vehicles and cloud server [4].
- Avoiding malicious vehicles and controlling the traffic during bus conditions by using Diffe-Hellman puzzle and hash collision puzzle algorithm. But, finding a collision is hard for a secure cryptographic hash function with long output [5].

### 3. Proposed Work

The main objective of a proposed system is to provide better transportation by providing timely medical support to save human lives. Also, it focuses to avoid collision by communicating with all the vehicles on the path. This goal can be reached only if the information has been passed on time without any delay. The research work designed a system to avoid the latency problem efficiently. The proposed work is divided into 2 phases as shown in the below figure.



**Figure 3.** Flow of a proposed work.

**(i) Unicast:**

• **One to One Communication:**

Communicating the information from RSU unit to the emergency vehicle about the road accident.

• **Reduces Latency:**

The existing system provides a free path for the ambulance and reduces collision. SEV algorithm is used for a single emergency vehicle in a particular lane and MEV is used for more than one emergency vehicle. There is a delay to pass the message to emergency vehicles since all information has been collected and transmitted by RSU. Also, it uses GPS for tracking the location. But in our proposed system we transmit messages by using Edge computing and NaVIC instead of GPS for avoiding time delay.

• **Providing timely rescue:**

The existing system uses the nearest RSU for communicating to the emergency vehicles. It leads to poor response. Therefore the system fails to rescue the victims on time. The proposed system uses NaVIC to locate the nearest ambulance and sends a timely communication to reach the destination.

**(ii) BroadCasting:**

Broadcasting passes the information to one or more vehicles.

- **One to many communication:**

The vehicles on the lane will send the message to all other nearest vehicles about the accident through the RSU unit. The proposed system communicates the information within a short period by using edge computing technology.

- **Avoid Collision:**

Each RSU unit act as a node and broadcasts the alert messages to the other nodes.

- **Providing timely warning:**

By using NavIC technology, the proposed system works effectively to pass the warning message.

**Algorithm 1.** EC VRP

**Step 1.** Collect the information from RSU.

**Step 2.** Compute the distance between the source and destination of a vehicle.

**Step 3.** Choose the nearest node to pass the information.

**Step 4.** Check the availability of an emergency vehicle and communicate the message.

**Step 5.** If the emergency vehicle is available then it reaches the destination.

**Step 6.** Otherwise, it again process from step 1 to step 5.

**Step 7.** Terminate the process.

**Algorithm 2.** CPF

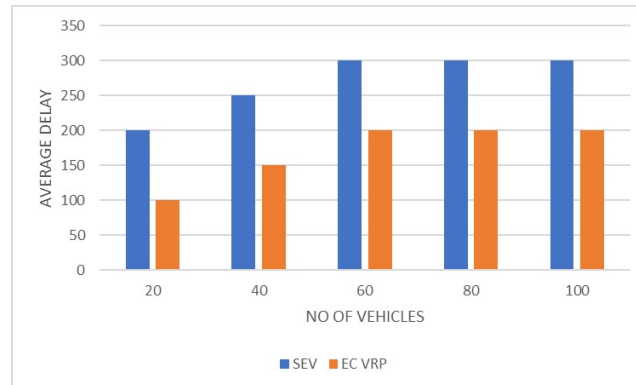
**Step 1.** Collect the information from RSU.

**Step 2.** Each node sends the alert message about the accident to the other vehicles through edge nodes(RSU).

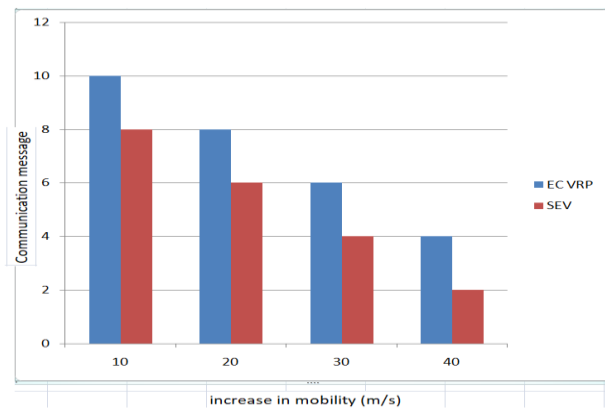
**Step 3.** Terminate the process.

### 4. Experimental Results

The communication of the vehicle to the nearest ambulance was designed and the result has been shown below. The Proposed algorithm EC-VRP has been designed to avoid delay to prevent road accidents in VANET by using Edge Computing and NavIC technology. It has been gradually decreased the delay time even though there was a high density of vehicles.



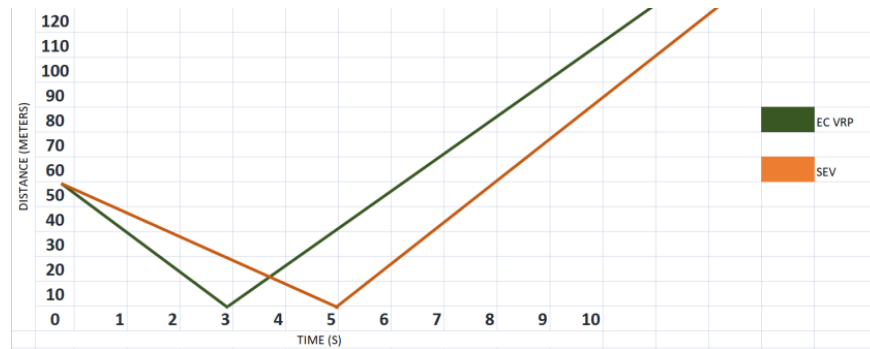
**Figure 4.** No. of vehicles Vs Average delay.



**Figure 5.** Mobility Vs Communication message.

The figure 4 shows the average delay in communication among the vehicles. The existing work shows a high delay in communicating the messages to the vehicles due to accessing the cloud frequently. But our proposed work sends the message among edge nodes to avoid the delay.

When the mobility increases the number of messages communication among all other vehicles are also increased, this is shown in the figure 5.



**Figure 6.** Time Vs Distance.

The figure 6 compares the proposed work with the existing work in terms of time and distance. The emergency vehicle starts from 55m distance and reaches the spot in lesser time than the existing system.

## 5. Conclusion and Future Work

In this paper, we discussed how the collision has been handled and communicated an alert message to the vehicles regarding the accident. The main work is to rescue human lives by sending the request on time to the emergency vehicles. The new technology NaVIC (Navigation with Indian Constellation) has been introduced in place of GPS to provide communication to the ambulance about the spot even though there was less network availability. By using Edge computing and NaVIC technology, the proposed algorithm reduces the time delay in communication among the nodes. In the future, we can use effective broadcasting techniques to avoid collisions.

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