Development of a Priority based System for Emergency Vehicles to Reduce Accidents in VANETs

K.Narasimha Raju, Dekka Satish, G.Sita Ratnam, G.Ravindranath, T.M.L Prasanna

Abstract*: Due to tremendous increase of vehicles in number leads to excessive congestion of vehicles at intersection of roads. It causing inconvenience to emergency vehicles like Ambulance and Fire brigade etc, ultimately which is the cost of human life To avoid this, Emergency Vehicles will have to give high priority to overcome from the congestion. Vehicular Ad-Hoc Networks (VANETs) is a network which is used to create a temporary communication among the vehicles. In this paper, priority based vehicle movement system is proposed to give high priority to emergency vehicles and establishing communication among the vehicles through VANET. Due to this high priority, there is no necessity to wait for the emergency vehicles at the traffic signals to get the green signal while communicating with traffic controller. In this paper, SUMO simulator is used for experimental analysis. The result indicates that the proposed methodology reduces the waiting time when compared to the existing system.

Keywords: Emergency vehicles, Priority, VANET.

I. INTRODUCTION

VANET technology consists of nodes as vehicles which communicate with other vehicles or with the roadside Unit.VANETs support a huge number of services in providing aid to intelligent transport system the vehicles are a mixture of emergency vehicles (EVs) such as Ambulance and other vehicles. One of the problems of modern life in recent years is the rapid growth of urban traffic. Therefore, Emergency vehicles suffer from lot of congestion and sometime it may lead to the death cases. In order to solve this problem, a dynamic system based on priority of the vehicles is proposed to reduce the delay of emergency vehicles.

II. RELATED WORK

Earlier many researchers have proposed different systems to solve the problem of emergency vehicle in many different ways. Mohamed Akram Ameddah, Et.al [1] described about the existing management of traffic at intersection points do not offer a solution that meets the requirements of public. Shaikh Sharique Ahmad and Prof. Hiralal Solunke [2] discussed on Priority to control the traffic. Muhammad Rizwan Ghori et.al [3] presented a review about the issues that occur in the. Seyed Vorya hosseini et.al [4] presented a supportive priority strategy for emergency vehicle which are been operated in urban areas based on Vehicular Ad hoc Networks. PATIL V.P. [5] tells that new initiatives are required to design to solve the problem of traffic cognition using (VANET). Shruti Kamatekar, Prof. Balachandra [6] explains about the importance of VANETS. Sameer Sheikh and Jun Liang [7] discussed architecture, security, and challenges. D. Kalaivani, Rajkumar S [8] explains about an intelligent transport model which is developed to enhance the road safety and navigation process.

III. METHODOLOGY

As the real world today's major problem is a huge traffic. In recent years, there is a rapid growth of urban traffic, so congestion which are occurred at intersections of road is been seen as most common among prevalent transport problems in large urban. The Intersections are been the key areas of traffic where the emergency vehicle can face a huge waiting time. Many algorithms are been suggested of solving these problem. The proposed Priority Based Vehicle Movement System in VANETs is for Emergency Vehicles is used to give high priority to Emergency Vehicles in the passage and as well as at signalized intersections to reduce congestion for high priority vehicles. In the passage, the Emergency Vehicle will get a way by other vehicles to reduce the time of travelling. At Signalized Intersections, the Emergency Vehicle will be getting a green path as Emergency Vehicles are high priority vehicles which will avoid congestions of vehicles at intersections.

3.1 ALGORITHM:

1: BEGIN

2: Let us take vehicle as V1,V2…..,Vi ; emergency vehicle as E1,E2……,Ei and normal vehicle as N1,N2,……,Ni ; traffic signals as S1,S2,……,Si

3: If (Vi == Ei): // If vehicle is an Emergency Vehicle

4: If (Ei is at Si): // If Emergency is at traffic signal

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5: Getgreen ( ) // Green signal is given
6: else if (Si = {N1, N2, N3…., E1}): //If traffic signal as congestion
7: ClearCongestion ( ) //Congestion is cleared by the time E1 reaches
8: else:
9: Move ( ) // Vehicle will move to designated place
10: else:
11: Move ( ) // Vehicle will move to designated place
12: END

In our system, this V2V communication will be established to give high priority to emergency vehicles on the roads to reduce the delay of time by which the risk losing can be reduced.

By using this V2I communication, the traffic lights will be given a green path for high priority vehicle by stopping the rest paths with a red signal which clear the path for Emergency vehicle at intersection to avoid congestion of traffic at traffic signals. The RSU will be placed in particular ranges so that all vehicles can be connected and vehicle data can be maintained easy.

The working process of Priority Based Vehicle Movement Algorithm is explained through the flow chart presented here.

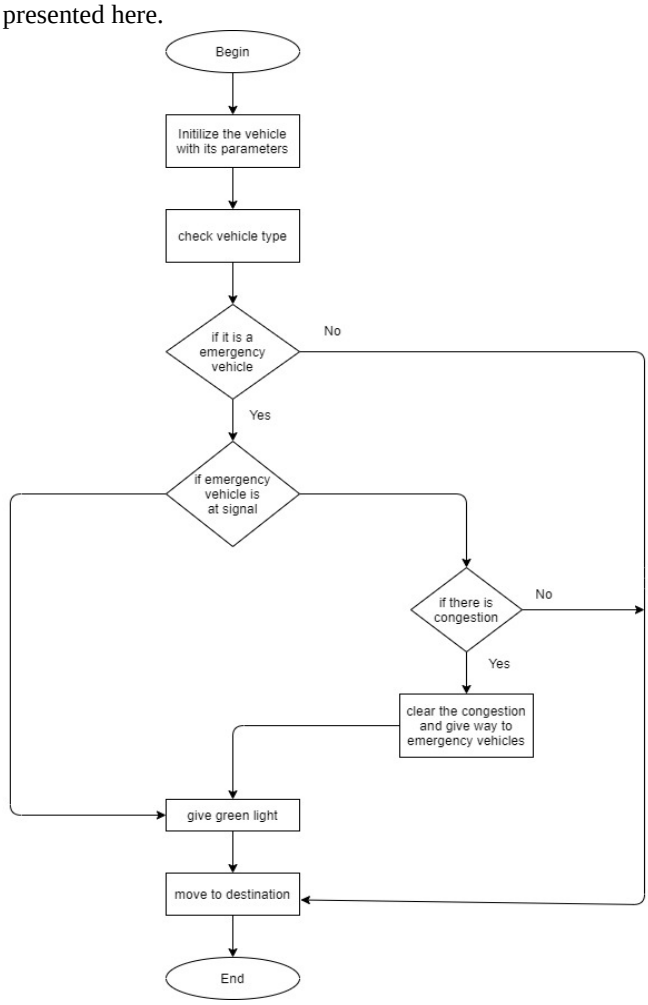

Figure 1 Flow Diagram

IV. RESULTS

"SUMO" is an acronym for "Simulation of Urban Mobility" for the development of the open source traffic simulation package. For an efficient simulation of simple to very large scenarios, it is also possible to run SUMO as a microscopic simulation. Fig 2 this is the sumo window of an intersection with traffic lights which is used in simulating of real world traffic on road is represented.

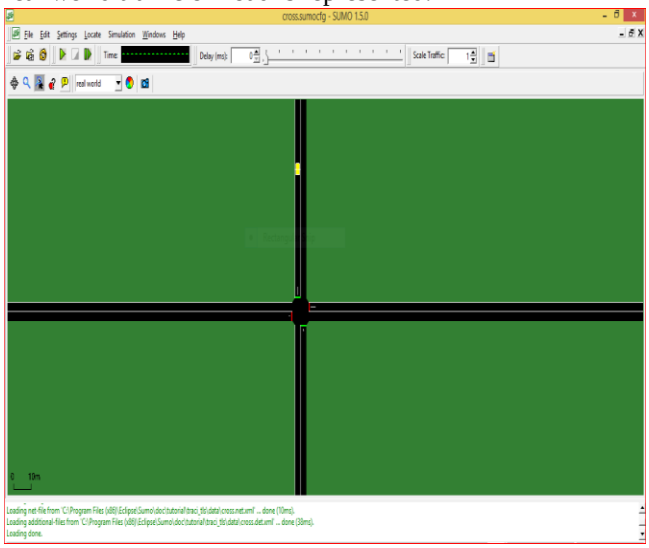

Figure 2 SUMO Window

Congestions are mainly occurred at busy areas, lack of space like single paths but due to these congestions they will be high delay time. So to reduce delay of time, intersection management systems are required. Fig 3, 4, 5 are the congestions which are generally occur in the real world traffic. These images are taken form SUMO simulator where the real world traffic can be simulated. Here, Red color vehicles are emergency vehicles and rest of the vehicles which are colored with yellow, blue, green are normal vehicles.

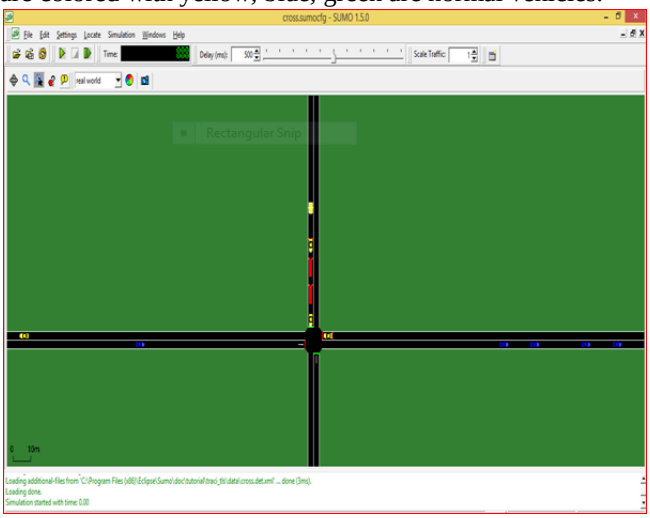

Figure 3 Simple Congestion

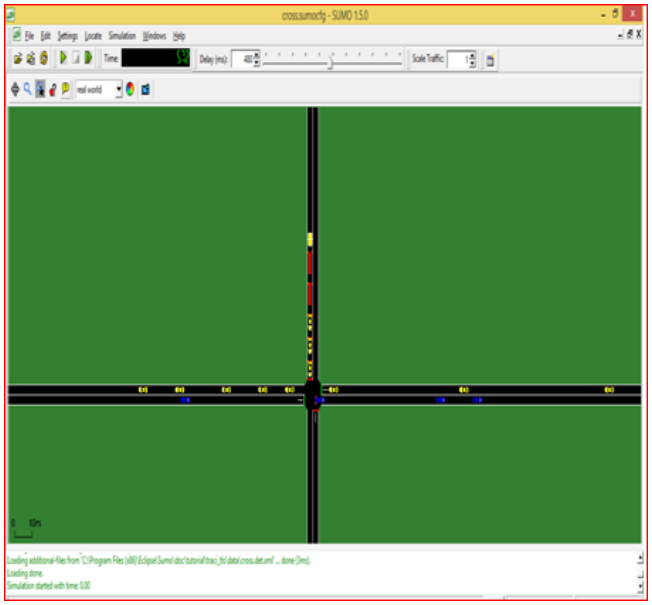

Figure 4 Congestion of high delay time

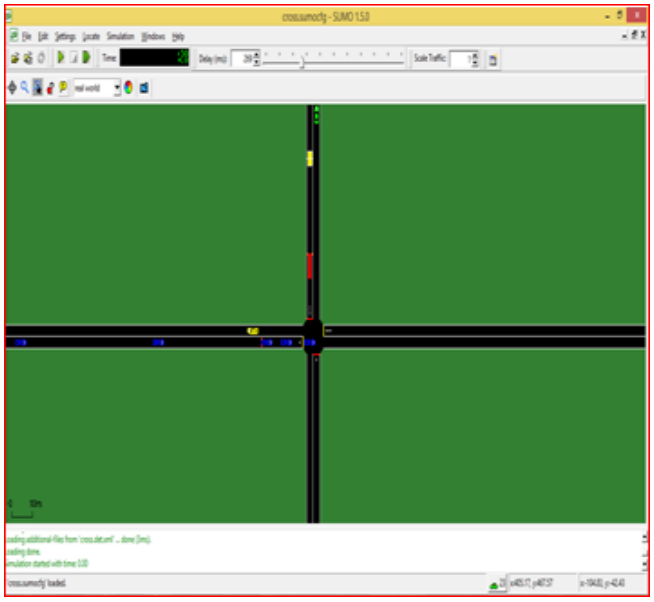

Figure 6 Emergency Vehicle approaching Red signal

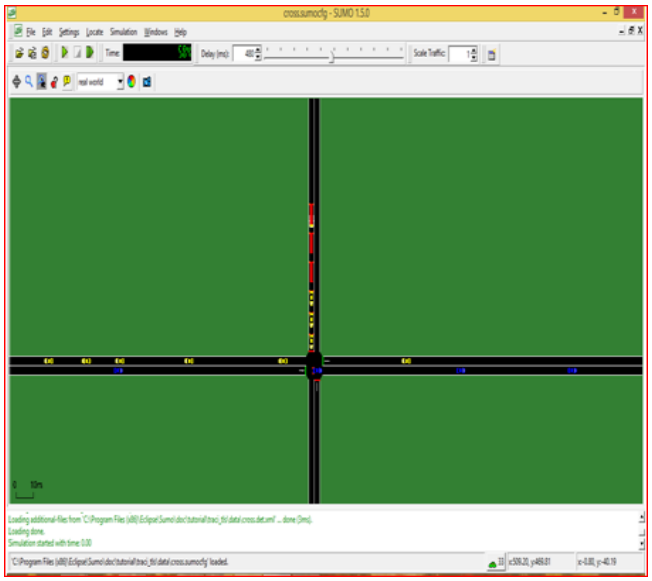

Figure 5 Three Emergency Vehicles are stacked in Congestion

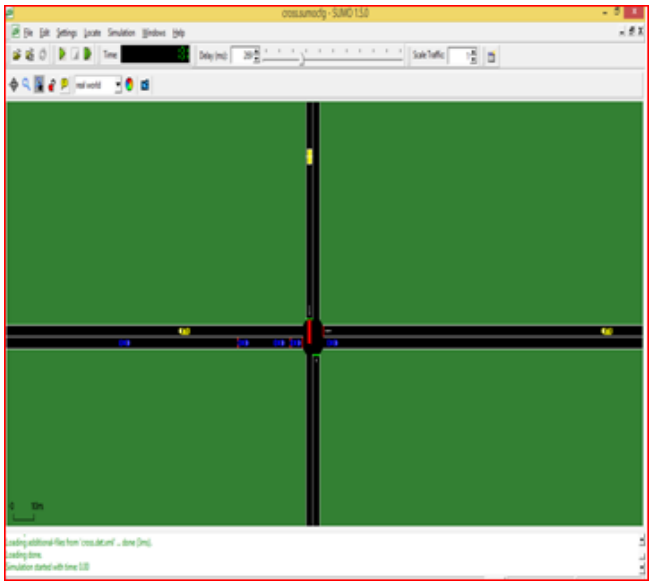

Figure 7 Red Signal turned to green signal

Priority Based Vehicle Movement working will show the results of emergency vehicle movement with high priority. By this high priority, the emergency vehicle will move with no delay time and reduce congestion. Fig 6 shows the emergency vehicle which is approaching the traffic signal which is having red light. Fig 7 shows the red signal light has been turned into green signal light as soon as the emergency vehicle reached the traffic signal. Fig 8 shows the emergency vehicle has moved with no delay time and reduced the congestion.

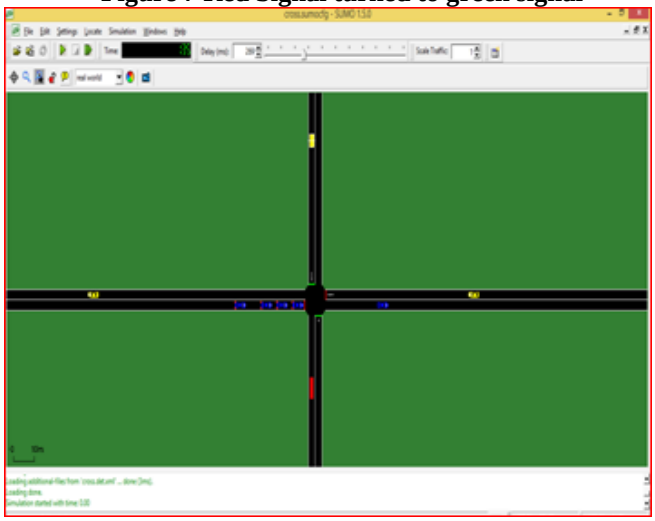

Figure 8 Emergency vehicle moved with no delay time

The Comparison is done on the bases of the waiting time of an emergency vehicle and by this the delay of time difference is seen.

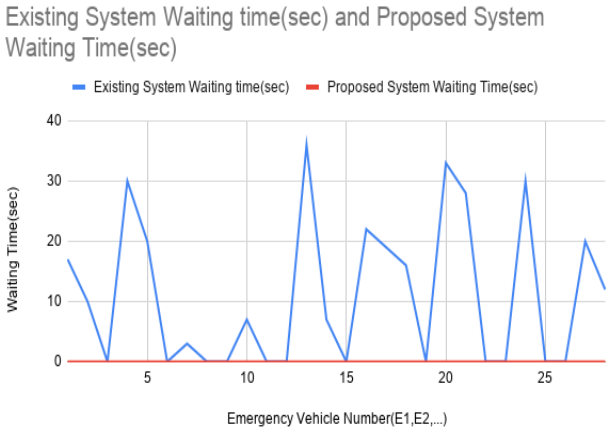

Figure 9 Comparison of Existing system and proposed system waiting time (sec)

V. CONCLUSION AND FUTURE SCOPE

The growth of traffic on the roads leads to Traffic Congestion. It leads the main problem for the emergency vehicles as they are been get blocked in the traffic by other vehicles which cause a high delay time for emergency vehicles. A High Priority assignment to the emergency vehicles is proposed at the Traffic Signals and to reduce the delay time. In this Traffic Signals at junctions are controlled so that emergency vehicles can able to reach their destination with no delay time. The proposed system reduces more accidents by reducing the delay. In future artificial intelligence techniques can be deployed to solve the problem in a more efficient manner.

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