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Time and Location-Critical Emergency Message Dissemination for Vehicular Ad-Hoc Network

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***Abstract*: This paper, proposes a time/location critical(TLC) framework for EM dissemination and use V2X Algorithm to achieve the goal. In specific, vehicles near the accident site (or the point-of-interest location) receive guaranteed, detailed messages to take proper reaction immediately (e.g., slow down or change lanes), and vehicle further away have a high probability to be informed and make location-aware decisions accordingly (e.g., detour or reroute), with the assistance of reverse traffic when possible and necessary. The efficacy of the proposed framework is analyzed and validated by extensive numerical and simulation results. The TLC framework and the use of the V2X algorithm are shown to be able to disseminate Ems effectively and efficiently by taking both the time and location criticality into account, while simplifying the design of radio transceivers and media access control protocols for VANET.**

***Keywords*: Vehicles, Modulation, Delay, Road transportation, Encoding, Ad–hoc networks, Interference.**

1. Introduction

Vehicular Ad-hoc Network(VANET) to considerably increase road safety, travel comfort and traffic control, which is also an important part for future Intelligent Transportation System(ITS). It is expected that ITS will bring huge economic and social impact to our more and more connected lifestyles and activities, by enabling inter-vehicle communications with or without the assistance of roadside infrastructures. When an accident happens or a certain road condition is observed(POI), the vehicle nearby need detailed information immediately to react properly, due to the short distance to the POI and thus short reaction time. At the same time such information, likely with different levels of detail, needs to be disseminated further to allow following vehicles at different distance to make location-aware decisions accordingly. It is obvious that the time and location critically of EM dissemination should be taken in to account at the same time.

2. Element Depiction of the Proposed

A. Beacon message

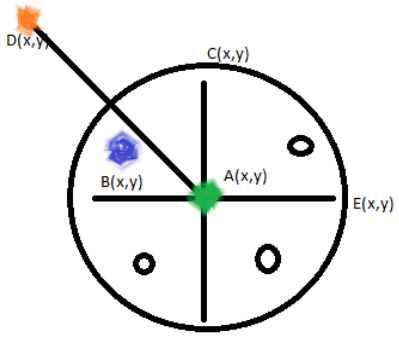
It is vehicular broadcasting messaging services, which happens periodically to obtain information about neighboring vehicles. These messaging services include position, velocity and direction of vehicle.

A table list will be created about neighbouring vehicle and its position and distance with moving direction. Assume that each vehicle can judge whether they are at intersection, it will be capable of broadcasting a beacon message to inform neighbour vehicle.

B. Straight Road

In this paper, the greedy forward routing protocol applied to choose the accurate location of the next vehicle. The vehicle takes itself at center co-ordinates of X and Y axis in terms of vector from its destination. The vehicle starts calculating the transmission range of another nodes or destination vehicle.

Our proposed greedy forwarding and GPSR greedy forwarding is that we use the concept of vector to choose the next hop so that the accuracy can be improved.



C. Intersection

In our research we assume that the vehicle can judge whether the co-ordinator by beacon message can be shared in the common region of two vehicle communication distance. i.e., If a vehicle ‘A’ wants to communicate vehicle ‘C’ which is away from A’s communication distance can be reached by an intermediate vehicle ‘B’ in between A & C. The message from ‘A’ can delivered through intersecting points of ‘B’ to intersecting point of ‘C’.

D. Recovery Strategy

The proposed algorithm may to complete the communication for vehicle away from the source vehicle. We adapt V2X protocol algorithm for communicating vehicle to cloud server.

These technologies can help recover the emergency situation

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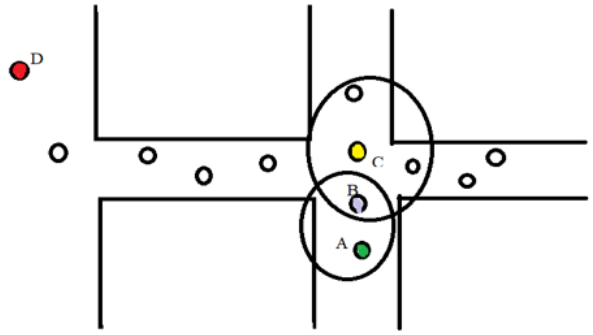
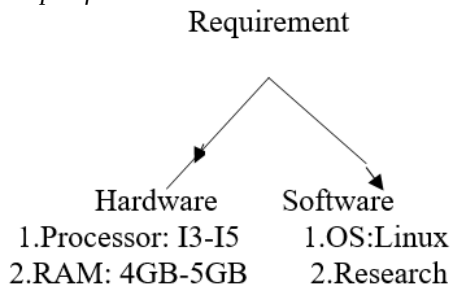
using vehicle from accident or breakdown in any remote location.

Message transmission in help condition. Road accident data communication traffic redirection.



System Specification:



Tool:
NS2
TCL (Tool Command Language)
Memory: 1TB
Display: Intel 810E
VGA (14-17inch (LED Monitor))

3. Methodology

- TLC Framework
- SINR
- EM broadcast
- GPSR
- V2X Algorithm

A. TLC framework: (Time and Location Critical)

Time/Location based planning. It is sensitivity analysis to identity critical factor. It affecting road construction (accident or breakdown of vehicle).

If the client has trouble in a particular location, by using TLC framework we able to find the exact location/time where the trouble has begin.

B. SINR (Signal to Interference and Noise Ratio)

It is a quantity used to give theoretical upper bounds on channel capacity (or the rate of information transfer) in wireless communication systems such as network.

SINR is commonly used in wireless communication as a way to measure the quality of wireless connections. Typically, the energy of a signal fades with distance, which is referred to as a path loss in wireless networks. Conversely, in wired networks the existence of a wired path between the sender or transmitter and the receiver determines the correct reception of data. In a wireless network one has to take other factors into account (e.g. the background noise, interfering strength of other simultaneous transmission). The concept of SINR attempts to create a representation of this aspect.

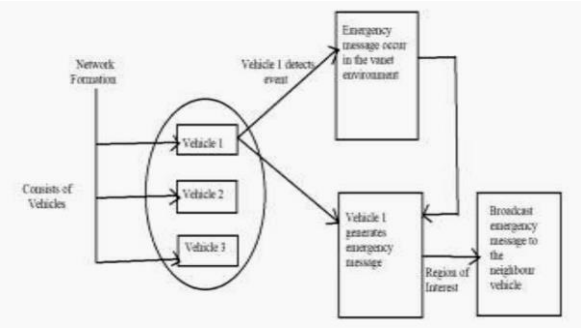
The definition of SINR is usually defined for a particular receiver (or user). In particular, for a receiver located at some point x in space (usually, on the plane), then its corresponding SINR given by,

$$SINR(x)=P/I+N$$

Where, P is the power of the incoming signal of interest, I is the interference power of the other (interfering) signals in the network, and N is some noise term, which may be a constant or random., the SINR is often expressed in decibels or dB.

Ratio value:
Min(10-15db)-unreliable connection
16-24db→poor
25-40db→good
41db→excellent 25-4Message)

C. EM broadcasting (Emergency Message)



A Vehicular Ad-hoc network can be used to broadcast the emergency messages in VANET environment. By broadcasting the messages in advance helps to avoid accidents.

Basically, Broadcasting is the simultaneously transmission of the same message to multiple recipients. In networking, broadcasting occurs when a transmitted data packet is received by all network devices. So, The EM broadcasting is also used to transmit the same message to multiple neighbor vehicle.

D. GPSR (Greedy Perimeter Stateless Protocol)

Greedy Perimeter Stateless Routing for Wireless Networks, GPSR allows nodes to figure out who its closest neighbors are (using beacons) that are also close to the final destination the information is supposed to travel to. To calculate a path, GPSR uses a greedy forwarding algorithm that will send the information to the final destination using the most efficient path possible.

GPSR will allow the building of networks that cannot scale using prior routing algorithms for wired and wireless networks. Such classes of networks include:

- Rooftop networks: fixed, dense deployment of vast numbers of nodes
- Ad-hoc networks: mobile, varying density, no fixed infrastructure
- Sensor networks: mobile, potentially great density, vast numbers of nodes, impoverished per-node resources
- Vehicular networks: mobile, non-power-constrained, widely varying density

E. V2X Algorithm (Vehicle-to-Everything)

Vehicle-to-everything(V2X) communication is the passing of information from a vehicle to any entity that may affect the vehicle, and vice versa. The main motivations for V2X are road safety, traffic efficiency, and energy savings.

1. V2V(Vehicle-to-Vehicle) communication
2. V2I (Vehicle-to-Infrastructure) communication

1) V2V communication

Vehicle-to-vehicle communication (V2V communication) is the wireless transmission of data between motor vehicles. The goal of V2V communication is to prevent accidents by allowing vehicles in transit to send position and speed data to one another over an ad hoc mesh network. Depending upon how the technology is implemented, the vehicle's driver may simply receive a warning should there be a risk of an accident or the vehicle itself may take preemptive actions such as braking to slow down.

V2V Multi-hop communication:

Safety,

Group Communication.

2) V2I Communication

Vehicle-to-Infrastructure (V2I) communication is the wireless exchange of data between vehicles and road infrastructure. V2I communication is typically wireless and bi-directional: infrastructure components such as lane markings, road signs, and traffic lights can wirelessly provide information to the vehicle, and vice versa.

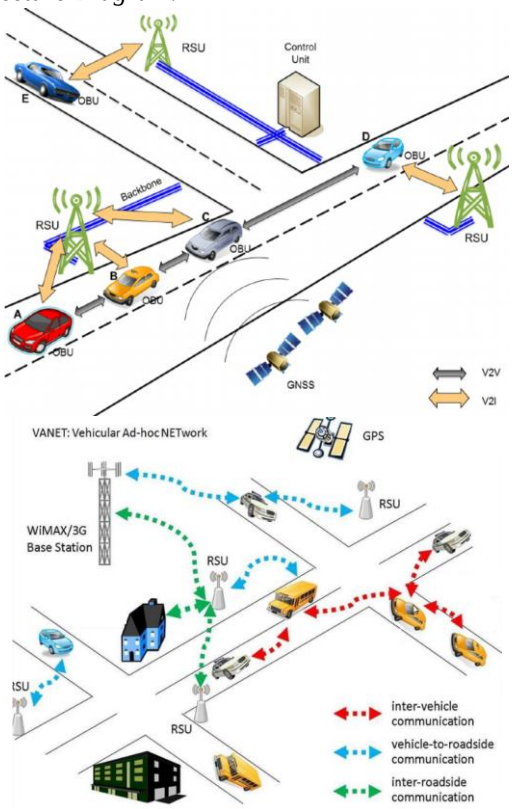
With so much data being captured and shared, rich, timely information can be used to enable a wide range of safety, mobility, and environmental benefits RSU (Road Side Unit).

The EM is passed on the RSU then it will be convey/transmission the message from another vehicle.

V2I Communication: Convergence, Infotainment Service

a. Safety: Anti-collision and safety service in intersection road.
b. Convergence: Vehicle management and related service.
c. Infotainment Service: Content download services such as movies and music.

Architecture Diagram:



4. Conclusion

The proposed V2X is the best by means of performance. Comparing to previous algorithm SMC scheme the proposed V2X is the best by giving detailed information about safety, avoid accident for safe travel and traffic control.

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