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An approach for Vehicular Ad-Hoc Network

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Abstract:

Due to unique characteristics like high dynamic topology and predictable mobility, vehicular networks have been quite a hot research area which attracts attention of both academics and industry. The vehicular network will not only provide lifesaving and safety applications but also will become an effective communication tool between vehicles and road side units . So here we present a paper on vehicular networks comprising of vehicle-to-vehicle and vehicle-to-road side unit communication.

Keywords **- G.P.S., vehicle-to-vehicle, VANET.**

I. INTRODUCTION

With the rapid increase of vehicular traffic and congestion on the highways began hampering the safe and efficient movement of traffic.

Consequently, year after year, we see the ascending rate of car accidents and casualties in most of the countries. Therefore, exploring the new technologies, e.g. wireless sensor network, is required as a solution for reduction of these saddening and reprehensible statistics.

We come across the vehicular network employing wireless sensor network as Vehicular Ad-Hoc and sensor network in short. The proposed project which is a self-organizing Ad-Hoc and sensor network,is particularly for highway traffic and is comprised of a large number of sensor nodes. In VANET, there are two kinds of sensor nodes, some are embedded on the vehicle's vehicular nodes and others are deployed in predetermined distances besides the highway road, known as Road Side Sensor (R.S.S) nodes.

The rapid increase number of vehicles which is equipped with wireless transceivers to communicate with other vehicles and RSUs to form a special class of wireless networks. (VANET) which will provide capability of communication between vehicular nodes and stationary nodes, to increase safety and comfort for vehicles on the highway roads. Recently, with the development of vehicle industry and wireless communication technology, vehicular ad hoc networks are becoming one of the most promising research fields. This concept of leveraging wireless communication in vehicles has fascinated researchers since the 1980s.

However, VANETs also come with several challenging characteristics, such as potentially large scale and high mobility. Number of different parts in the vehicular network are much more dynamic because most cars usually are at a very high speed and change their position continuously. The high mobility also leads to a dynamic network topology, while the links between nodes connect and disconnect very often. Besides, VANETs have a potentially large scale which can include many participant extend over the entire road network. Also, vehicles will not be affected by the addition of extra weight for antennas and additional hardware. It is precisely because of all of these unique attractive features and challenging characteristics that VANETs could draw the attention from both industry and academics.

Several articles have tried to summarise the issues about vehicular networks. In this paper, we provide an overview of the technologies and ongoing research areas related to VANET. We also provide

a more comprehensive analysis on VANETs research challenges, problem definition, working of the system, applications and future trends which are beneficial for further research.

VANET Characteristics

VANET has its own unique characteristics which include-

1) Predictable mobility:

As the road layouts are fixed, the network nodes of VANET moves in a predefined way due to which, vehicles have to obey and follow road signs, traffic signals and respond to other vehicles as well.

2) High mobility and rapid changing topology:

High speed of vehicles especially on roads and highways, results into a very short time communication as the link establishes and breaks quickly leading to rapid changes in network topology. This affects the network diameter or range to be small, while many paths may disconnect before been used.

3) Geographic Position:

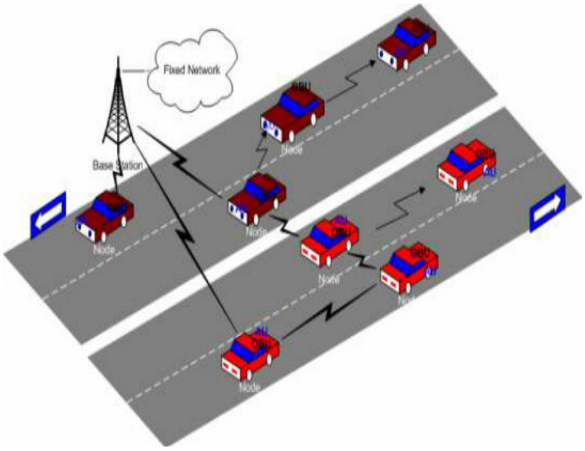
Equipping vehicles with modern, accurate positioning systems integrated by electronic maps, for e.g. Global Positioning System (GPS) receivers help to provide location information for routing purposes.

4) Variable network density:

In VANET, network density may vary depending on the traffic load. It can be very large in case of a traffic jam or very small as in suburban areas.

5) High computational ability:

Vehicles are nothing but nodes in VANET and hence they can hold a sufficient number of sensors as well as enough communication equipments like high speed processors, large memory size, advanced antenna technology and modern GPS. These resources help to create reliable wireless communication, collect accurate information of node's current position, speed and direction and most importantly, increasethe computational power of the nodes.



Surprisingly, little is known about the fundamental limitations and opportunities of VANETs communication from a more theoretical perspective. We believe that avoiding accidents and minimizing resource usage are both important theoretical research challenges.

Fundamental limits and opportunities-

A. **Connectivity-**

The management and control of network connections among vehicles and between vehicles and network infrastructures is the most important issue of VANETs communication. Primary challenge in designing vehicular communication is to provide good delay performance under the constraints of vehicular speeds, high dynamic topology and channel bandwidths.

B. **Security and Privacy-**

Reference presents many solutions that come at significant drawbacks and the mainstream solution still relies on 'key pair/certificate/signature'.

C. **Validation-**

It is necessary not only to check the performance of VANETs in a real world scenario but also to find previously unknown and critical system properties. Besides, validation has become more and more difficult under the wider range of scenarios.

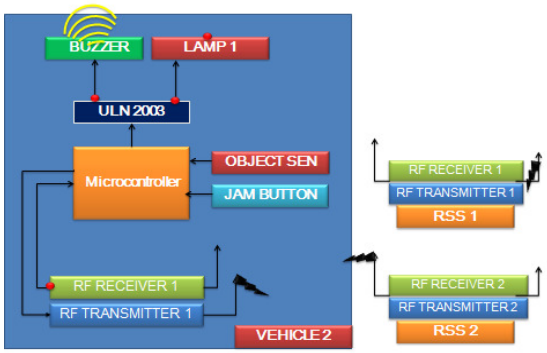
Working of System

D. In the given block diagram, we are using sensors which are present at the nodes in the highway. The sensor nodes collect measurement data such as jam data, obstacle sensor, and windy speed which are important factors. The two sensors are connected to the transmitters as shown in fig.

E. When sensor senses the jam data and obstacle data, it transmits RF signal to the RSS1. From the RSS1, the sensor transmits the RF signal to the next vehicle, as well as next RSS2.

F. The RF receiver of the second vehicle gives the signal to the microcontroller. The microcontroller generates the particular logic and gives it to the ULN2003.The ULN2003 drives the relay circuit so that it glows the lamp and also the buzzer.

SYSTEM BLOCK DIAGRAM



of vehicular traffic for efficient road systems in cities, also reduce journey times, emissions and save energy.

Applications

Traffic management:

- Traffic monitoring- To calculate the speed of the vehicles which transit over a roadway by taking the time mark at two different points.
- Flow and congestion control- Understand the flow and congestion of vehicular traffic for efficient road systems in cities, also reduce journey times, emissions and save energy.

Disaster relief operations:

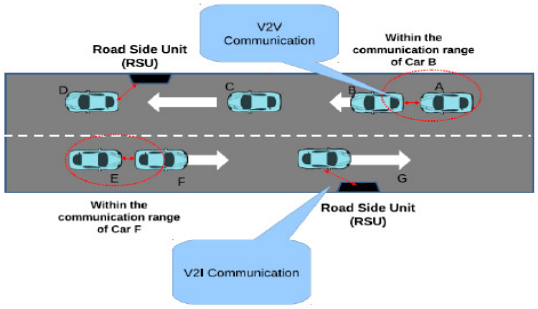
a. Each node measures temperature.
b. Derive a 'temperature map'.
c. Biodiversity mapping.
d. Use sensor nodes to observe wildlife.

Machine surveillance and preventive maintenance:

[1] Embedded sensing/control functions into places no cable has gone before e.g. tire pressure monitoring.

[2] Precision Agriculture- Bring out fertilizer/pesticides/irrigation only when and where needed medicine and health care, post operative or intensive care, long-term surveillance of chronically ill patients or the elderly.

[3] If an accident occurs at a secluded spot, one can be helped or saved by the other vehicles passing by and taking other road due to the signal being transmitted because many a time, people lose their lives by not getting help immediately.



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