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VANET System for Traffic Management

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ABSTRACT: There are relevant increments in vehicle numbers, vehicular traffic congestion, and carbon emissions that cause significant issues around the world. These issues incorporate direct impacts on individuals' wellbeing, unfavourable monetary impacts, negative social effects, neighbourhood natural harm, and danger of disastrous worldwide environmental change. This paper describes the vehicle-to-vehicle-to-infrastructure (V2V2I) architecture, which is a hybrid of the vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) architectures. The V2V2I architecture leverages the benefits of fast queries and responses from the V2I architecture, but with the advantage of a distributed architecture not having a single point-of-failure from the V2V architecture. The vehicles exchange messages related to traffic and road conditions, such as average speed on the road, road gradient, and surface condition. This information is used to build a fuel efficiency model of the routes, based on which the vehicles are prescribed to take more efficient routes. By routing vehicles more efficiently, the greenhouse emissions are diminished while also keeping up low traffic congestion levels.

KEYWORDS: Ad hoc networks, routing, vehicle communications, wireless LAN, road traffic.

I.INTRODUCTION

Using the V2V2I architecture over the V2V and V2I architectures provides many benefits, including reducing the bandwidth requirement for the roadway infrastructure (which includes the central server), and allowing fault tolerance in the event of a hardware failure of one of the centralized components. However, reducing the bandwidth needed by the central server means that less data is being transmitted to it. In fact, instead of every vehicle transmitting its speed and location to the central server (as is the case with the V2I architecture), in the V2V2I architecture, only one vehicle per zone will transmit speed and location data. Even though the Super Vehicle in each zone can run its own aggregation algorithm. Vehicular Ad-Hoc Networks (VANETs) are a one of a kind sort of MANET. A Mobile Ad-Hoc Network (MANET) is a network system of wireless nodes with no fixed infrastructure. Each of the nodes is mobile and the network must self-configure. Messages are routed dynamically and are passed by multi-hop communication. The medium is most usually broadband wireless networks (e.g. Wi-Fi), however could likewise be satellite, cellular or combination of all of these. In VANETs individual vehicles work as nodes. This network self-configures and messages are passed by multi-hop communication.VANETs require a unique Wi-Fi protocol IEEE 802.11p as they are highly mobile, for example the differential speed between two nodes could be as high as 240 kmph. VANETs are not true MANETs as they depend on some infrastructure. The infrastructure consists of Road Side Units (RSUs), which interface the network to the internet and databases containing traffic information, and help overcome network partitions. Dissimilar to MANET nodes which move at random, VANET vehicles have generally predictable mobility. They should stick to roads, obey speed limits, stop at traffic lights etc. One new range of research which incorporates VANETs is Smart Cities. The thought behind Smart urban areas is to utilize advanced correspondences to all the more successfully disperse assets, making the city more aggressive contrasted and different urban communities. One key segment of Smart Cities is Smart transportation. VANET-based rerouting is one method for enhancing transportation in Smart Cities. A delineation of VANETs in a urban situation is appeared in Figure1.

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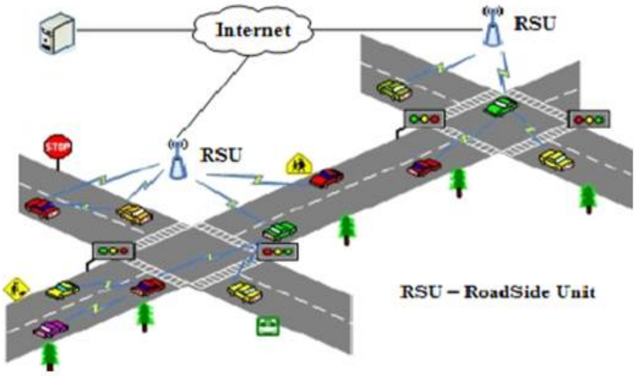

Fig. 1 VANET communications in an urban environment.

The V2I architecture enables vehicles to speak with some roadway framework to allow the speed and location of the vehicle to be transmitted to a central server. This server will keep up the speed and location of all vehicles and will aggregate this data for ITS applications, for example, deciding the quickest way from a vehicle's current location to its destination or recognizing the location of an incident, among other applications. This is a substantial amount of information which is not currently capable of being transmitted based on current wireless bandwidth limitations.

There many negative economic effects associated with traffic congestion; one example is the downtime for trucks and other commercial vehicles. By applying VANET-based solutions to traffic management systems traffic congestion could be reduced, thereby reducing pollution and enhancing public health and economic productivity. Therefore, the rest of the paper is organized as follows. In Section III, we present the Proposed Methodology. Section IV gives information about V2V2I Architecture. And finally Section V gives the conclusion.

II.LITERATURE SURVEY

Presents EcoTrec, a novel eco-friendly routing algorithm for vehicular traffic which considers road characteristics for example, surface conditions and gradients, and additionally existing traffic conditions to enhance the fuel funds of vehicles and decrease gas emissions. EcoTrec makes utilization of the Vehicular Ad-hoc Networks (VANET) both for gathering data from conveyed vehicles and to disseminate information in aid of the routing algorithm [1]. The algorithm calculates the fuel proficiency of different routes and then directs the vehicle to a fuel efficient route, while likewise avoiding flash crowding. Simulation based tests demonstrated that by utilizing EcoTrec, fuel emissions were fundamentally lessened, when contrasted with existing state-of-the art vehicular routing algorithms. Here showed that eco-friendly routes could very possibly be not the same as the shortest distance and shortest duration routes. This issue should be considered and tended in future work [2]. The proposed Time-Ants a VANET-based ant- colony optimization algorithm which utilizes historical traffic data to enhance traffic flows; this is a ne of a kind way to deal with managing traffic congestion. The simulation-based testing performed has compared Time-Ants against a number of other VANET-based routing techniques. Time-Ants outperformed the next best approach by 19% after four days of running the algorithm [3].

The receiving information on traffic over FM radio and examined existing flaws in navigation frameworks and methods for addressing them. They discussed issues such as gullibility errors where the driver follows the automotive navigation's directions even when they don't make sense. The paper suggests giving the driver a various decisions and indicating the advantages of each choice. [4]. The Vehicle to Vehicle (V2V) is a combination of three networks: an inter-vehicle network, an intra-vehicle network, and vehicular ad-hoc network. In view of this concept of three networks combined to form one, we define Vehicle-to-Vehicle as a large-scale distributed system for wireless communication and information exchange between surrounding vehicles according to agreed communication protocols and data interaction standards. It is an integrated network for supporting intelligent traffic management, intelligent

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information service, and intelligent vehicle control, representing a typical application of Internet of Things (IoT) technology in intelligent transportation system (ITS)[5].

III.METHODOLOGY

A. Block Diagram Description

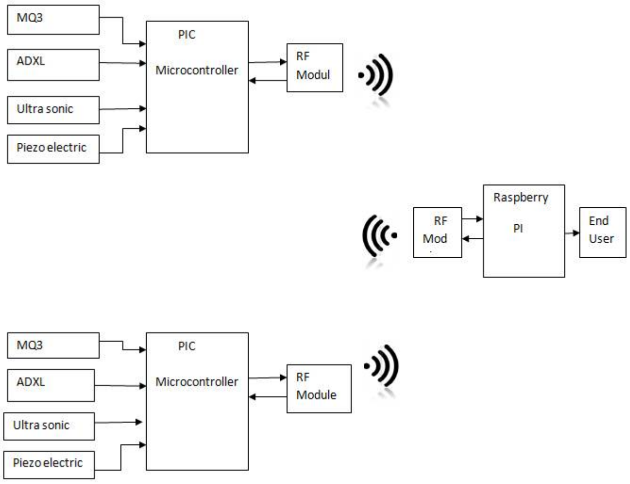

Fig. 2 Block Diagram of Transmitter and Receiver

The system has an "On-Board Module" which resides in the vehicle to be tracked and a "Base Station" that monitors data from the various vehicles. A server computer at the (remote) monitoring station, which is continuously waiting for data from the system, should record the actions of the vehicle into a database. This contains the information regarding Vehicle velocity, position, identity and temperature in two fashions. The information given to monitoring station is in continuous manner and when the accident occurs. Raspberry pi acts as a base station and server which connects to external network (internet etc.). The data collected or detected by sensor node sends to the base station and inserts the data received from sensor nodes into database of raspberry pi. Multiple users can access the raspberry pi through Ethernet or Wi-Fi connection within local area network or from anywhere on the internet. In this system MQ2 sensor is used for sensing the outer carbon dioxide gas in car as a pollution control applications and then vibration sensor used for measuring the density(Road damage). ADXL used for detection of accident. Ultrasonic sensor make accurate measurements in many difficult environments and main application is traffic control. Here PIC Microcontroller takes input from sensor and process on it. PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, serial programming, and re-programmable. This user takes all information from vehicles and based station i.e road condition road gradient, traffic information, normal speed on the road.

B. Hardware Used

- PIC Microcontroller 18F4520

The hardware abilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 100-pin SMD chips, with discrete I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types. The manufacturer supplies computer software for development known as MPLAB, assemblers and C/C++ compilers, and programmer/debugger hardware under the MPLAB and PICKit series.

Specification:

- 40-pin Low Power Microcontroller.
- Flash Program Memory: 32 kbytes.

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- EEPROM Data Memory: 256 bytes.
- SRAM Data Memory: 1536 bytes.
- I/O Pins: 36.

- Raspberry-Pi-Technology

The raspberry pi comes in two models; they are model A and model B. The main difference between model A and model B is USB port. Model A board will consume less power and that does not include an Ethernet port. In any case, the model B board incorporates an Ethernet port and designed in china. The raspberry pi comes with a set of open source technologies, i.e. communication and multimedia web technologies.

Fig.3 Raspberry Pi

The raspberry pi board includes a program memory (RAM), processor and graphics chip, CPU, GPU, Ethernet port, GPIO pins, Xbee socket, UART, power source connector. It also requires mass storage, for that we utilize an SD flash memory card. So that raspberry pi board will boot from this SD card similarly as a PC boots up into windows from its hard disk. Fundamental hardware specifications of raspberry pi board mainly include SD card containing Linux OS, US keyboard, monitor, power supply and video cable. Optional hardware specifications include USB mouse, powered USB hub, case, internet connection, the Model A or B: USB Wi-Fi adaptor is utilized and internet connection to Model B is LAN cable.

IV. V2V2I ARCHITECTURE

Vehicle Vehicle Architecture (V2V2I) combines the advantages of vehicle-vehicle (V2V) and vehicle-infrastructure (V2I) architectures, particularly tolerant V2V architecture fault and quick and accurate V2I architecture consultation. In any intelligent transport systems (ITS) architecture, it must support two types of applications: (1) data collection speed and location, and (2) consultations on these data. V2I and V2V V2V2I architectures, the transport network is indicated by a graph. The weight of a border in the graph represents the amount of time to cross the border at current speeds. Algorithms for updating edge weights dynamics to enable quick consultation in the chart were proposed by Demetrescu and Italian and Miller and Horowitz. Costs and positions to gather in pure V2V architecture, all vehicles report their information to other vehicles that are "close" to them, and these vehicles may choose to disseminate this information to other vehicles. Vehicles that are "close" to another vehicle will receive a message sent by a wireless link to that vehicle. Searching more quickly in view of current speeds would be widespread through the network system for all vehicles along any fastest possible way, which would require a considerable amount of information. The number of vehicles that should send a faster path query on a V2V network to ensure accurate routing may sometimes be unsuccessful 716.

This problem can be improved V2I pure design, where larger vehicles report their speed and position through some road infrastructure to a central server that adds all the speeds for each board so you can answer questions about the edges of an afternoon. When a vehicle has to decide the fastest route from its current location to a desired destination, it queries the central server, which must have an exact representation of the transport structure at all times. However, a closure with the V2I architecture is that it contains a single point of failure, which means that if the central

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server fails or the connection to the server fails, there is no way to retrieve any information. In addition, there are many details that need to be obtained from the server when all vehicles are sending speed and position data, and require the fastest routes (or other information). The V2V2I architecture attempts to reduce these constraints by exploiting the advantages of V2V and V2I structures.

V2V2I architecture, the system transport network is divided into zones, each of which consists of one or more edges. The zones are pre-designed so that each vehicle as well as the central server knows which edges are in which sectors. Every area has a vehicle, said excellent vehicle, which is responsible for speed data speed communication to the central server, and also transmits this information to Super vehicles in adjacent areas. The amplitude of the area should be small enough for two vehicles in the remote pockets between them within the area can now talk to each other. This is necessary if any of these vehicles are Super Vehicle Requirements for data of all vehicles in the area. In addition, the areas need to be small enough so super-adjacent vehicles to communicate. This architecture allows the return to a V2V structure in case of a failure with centralized components. Most vehicles within an area send their speed and position via a Super Vehicle Wireless Link in the area. Super total carries these data and sends the added speed and position to the central server. Note that the Super vehicle does not need to send just one speed and position to the central server. The information sent to the server, and the frequency of the data sent, can be arranged by considering the application that requires the data. The aggregation algorithm used determines the accuracy of data in the central server over the V2I architecture, which means that each vehicle is transmitting its speed and position to the central server.

V. CONCLUSION

The new integrated communication technologies in the automotive sector provide an opportunity to better care for people injured in traffic accidents, reducing the response times of emergency services and increasing the information they have about the accident. Incident just before the start of the savings process. To this end, we have designed and implemented a prototype for the automatic notification of accidents and assistance based on V2V and V2I communications. However, the effectiveness of this technology can be improved with the support of intelligent systems that can automate the decision-making process associated with an accident. Existing mining activity focused more on traffic accidents is based on the data set in which a pre-processing and a very limited transformation were carried out.

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