Intelligent Interacting Vehicle Systems

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Abstract — **In this paper, We suggest a method to intelligently connect vehicles and make them to interact themselves to establish a better and safety vehicular network across the globe. It is the system which can be placed in any vehicle uses the necessary information to exchange between them. The entire system is monitored and processed by the PIC16F877A microcontroller. The microcontroller gets data from the internal sensors and controls information exchange between the vehicles. By Interacting vehicles them self with advanced technology it is possible to discuss a lot of useful information with neighboring vehicles, and possible to let the passenger to know more details about the circumstances. It will be an alternative communication or control channel for the oncoming vehicle ahead the road.**

Keywords-component; Vehicle - Vehicle Interact, Gathering Valuable datas , Information Sharing, Zigbe, Wireless transmission, Sensors

I. INTRODUCTION

Advanced Technologies such as Internet and wireless communications have seen an enormous amount of growth over the past two decades. Now days, in the field of wireless sensors and sensor networks have become a great interest to research, scientific and technological community. Though sensor networks have been in place for more than a few decades now, the wireless domain has opened up a whole new application space of sensors. Wireless communication technologies are made possible to transfer of information between two or more points that are not physically connected. Recent developments in Wireless technologies are increasing distance range between two communication points. Meanwhile much research in vehicular technology focuses on energy safety and security.

Population level all around the globe is consistently increasing. Designing of Transportation system, need to be revised and have to make it best to overcome major risk, which is possible in future. At present situation, different ways such as public transportation and use-based taxation have been reasonable to encourage/discourage the use of roadways. In this situation, the new idea is what all are the benefits if vehicles discuss themselves and interact with all vehicles.

Among all the vehicles, discussing information and knowledge will be result in increase the awareness of the road side beyond the view of site. Vehicles can inter communicate themselves about, the recent updates of road maps, nearest check post and other details. It can be followed into Police vehicles, Fire vehicles, and rescue departments for a quick and instantaneous response, organized and well established rescue procedures.

Other instances of essential safety information are:

- Hospital and other emergency requirement details
- Helpline and Police vehicle interaction
- Instantaneous accident intimation to the helpline

Fig.1 shows the communication model between the vehicles in the junction of roads.

Fig.1 Illustration of communication between all vehicles in the road

II. MOTIVATION

Although different governmental and non-governmental organizations all round the world carry out workshops and other training programs to make people aware of careless driving, yet this whole process has not been very successful till date. The statistics included that the road accidents last year caused death of more than 130,000 and it clearly indicates that it is set to jump to 150,000 by 2015. India has just 1 % of the world's vehicles, but accounts for 10% of world's total accidents. Mortality rate per 10,000 vehicles is 14, not only in India but also in other countries too (less than two for developed countries).

Having known about such threatening statistics, we aimed at implementing a system which could give enough information to a driver about the status of road and climate and traffic condition, alternate route in advance. It is the system, which is developed not only for driver but also for the service provider (Ex: Police can easily identify the location of stolen vehicles, Ambulance can reach the accident spot much quicker).

III. SYSTEM OVERVIEW

Fig. 2 shows the Structure map of the system hardware. The system has designed to take several inputs to measure vehicle speed, loaded weight, location, environmental condition. The inputs from the sensors are integrated and processed. The results will be stored in the main memory and it will be send through the Zigbee module to other vehicles. The values can then be stored in the temporary memory and it will be cross checked with the information which provides by the police vehicle.

Stolen vehicles data and other roadblock information will be transfer by the police vehicle to all other vehicles. If the data matches, then the information will be stored in separate and it will transmit to all the police vehicles which are available in junctions. The design is modular which makes it rather easy and straight forward to add extra sensors for measuring and monitoring other parameters.

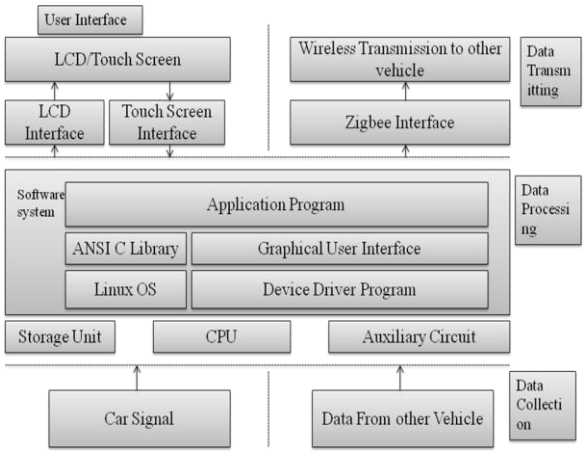

Fig 2. Structure map of the system Hardware

IV. HARDWARE SYSTEM DESIGN

(i) *Data collection Layer:* Primarily, the data collection layer is responsible for collecting various parameters (Ex: Speed, Loaded weight, etc) from vehicle and Data from other vehicles through wireless transmission. It collects all the data and stores in the memory. Vehicle information will be stored in the main memory and it will keep on updating with the help of sensors. Data which is received through wireless will be stored in temporary memory.

(ii) *Data Processing Layer:* It is the main portion of the system, which contain three varieties of data. First

section of data only forwarded by service provider (Ex: Police, Ambulance). Second section of data contains the information about the vehicle. Third section of data contains received data.

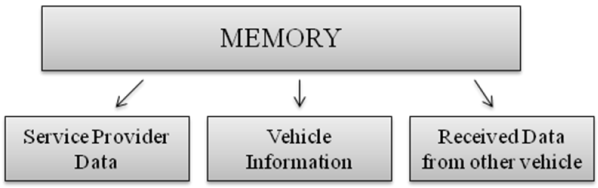

Fig. 3 Organized Data in Memory Section

Data received from other vehicles stored in stack memory and the old information will be deleted from the memory by the method of First in Last Out. Received data from other vehicles will be compared with the service provider data and vehicle information data. If it matches, then the time and location information will be added with the received data and again the updated information will be started to transmit to all the vehicles. If the received data not match, the same information will be broadcast without any changes.

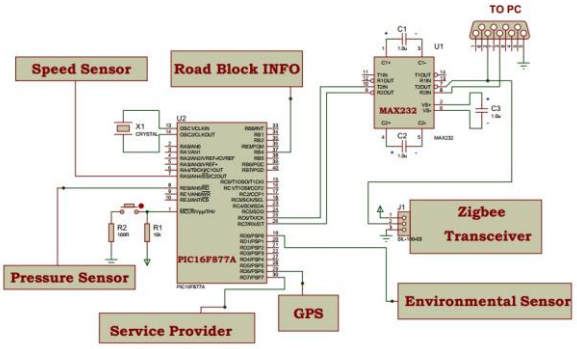

Fig. 4 The circuit schematic of the system

(iii)Data Transmitting Layer: It will act as the information broadcasting layer and also human computer interaction layer. Once the received data processed in processing layer, processed data will be transmitted to all other nearest vehicle by using transmitting layer. Human also can give the input incase if they want any emergency service (Ex: Ambulance, Police).

V. SOFTWARE STRUCTURE

After the completion of hardware design and debugging, the establishment of development environment and the development of device driver program, it comes to design of application program, which is multithread application programming based on mini GUI. Basically, users cannot access or modify any data which is available in the memory.

But it has designed with the possibility of user can contact the service provider. To avoid the conjunction in the data exchange we have included the stack memory system to automatically delete the expired information. In main memory threshold value will be saved (Maximum speed limit, Maximum carry over weight by commercial vehicles). Once the threshold value exceeds vehicle information will be passed to the police vehicle. It will make easy to identify the persons who all are breaking the rules easily.

(i) ZigBee Module: These modules provide a possibility to build an easy to configure network, with a high data rate up to 230400 Baud/s. They come in a preconfigured mode and establish the communication automatically. In addition, they are powered by 2.7–3.3 V and can be connected to the PIC16F877A without any additional power-supply circuit. To connect the XBee module to the Microcontroller is done using four wires. The Power-Supply (3.3 V), Ground and TX and RX of the Microcontroller are connected to VCC, GND, DIN and DOUT of the XBee module (Fig 4)

ii) Configuration and Setup: To configure the XBee Modules, the provided software X-CTU is used. To set up a network the following conditions have to be fulfilled.

• Each network needs one Coordinator and several End-Devices.

• All modules have to have the same firmware and PAN-ID.

If everything is setup correct, the coordinator establishes a connection to the End-Devices automatically.

VI. PROTOTYPE AND EXPRIMENTAL RESULTS

The analog processing circuitry was assembled in PCB. Instead of sensors, keys are assigned to provide the input. Fig.5 shows the prototype hardware. It shows both receiver and transmission module (both will be considered as a different vehicle). The prototype was powered off a 9V transformer. The RF transmission using Zigbee's has been tested to operate successfully at 30 meters range through obstacles such as walls and tress. When in operation, the Zigbee module connected to the micro controller consumes 40 mA during data transmission.

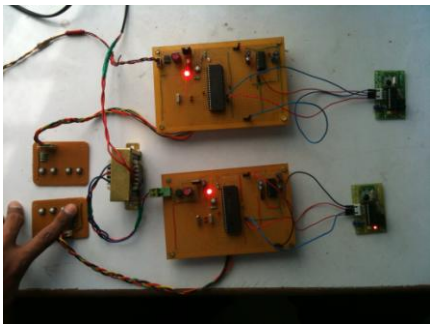

Fig.5 Developed prototype system

However the Zigbee module has the option of going in sleep mode while not transmitting. But, our Zigbee needs to transmit continuously to air. So, we are going to setup the Zigbee that makes it available all time for transmission. We are going to connect the entire module with vehicle battery in real time.

VII. CURRENT CHALLENGES

Between Mobile ad hoc networks and Vehicular ad hoc networks there is no much difference. We need very high profile architecture to develop interacting vehicle environment. Road side infrastructure is one of the essential elements to create and maintain the situation as we like. Access points and message distributing centers will be additional advantage in this connectivity.

In the city, traffic is the major factor and big problem too. The information's about the traffic condition inside the city have to be exchanged between the vehicles without any error. Important thing is the vehicle information has to be accurate and live values else it will lead to lot of troubles. Database will be maintained for all the city and it will be interacted between all vehicles even though vehicle didn't enter in to a particular city. Database maintenance has to be clear data and high accuracy among all vehicles.

Important challenge is the message have to be exchanged between the vehicles with full of accuracy and confidentially. Particularly, Accident avoidance systems have to be quick and without any propagation delayed. Assigning unique identity for all the vehicle is another one important factor to be considered. To increase the security of the data better encryption method need to use.

VIII. CONCLUSION & FUTURE WORK

Interacting vehicles are the next generation of vehicular development as a means to help the ever growth of population level and increasing of industrial nations. In this paper, we have given the overview of the initiatives to develop safety and increasing interaction of vehicles for the future. The recent study is to enhance real standards and list of protocols for interaction between vehicles and for their communication that will improve the real time safety and initialize new path for the future technology of vehicles.

The new applications are expected to add advantages to the people by reducing cost of fuel, emission and comfortable, technological vehicle journey around the globe. Future improvements will focus on to establish the GPRS facility to let the vehicles to export the recent data directly into the web. The addition of best algorithm for message handling would allow improving the quality of information exchange.

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