



**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY**

Vehicular Warning System Using ARM-9 & 802.15.4

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Abstract

This paper gives the idea of novel vehicular driving navigation system based on Vehicular communication. The system consist of ARM-9 embedded with GPS, 802.15.4 wireless communication module i.e. ZigBee and human machine interface (HMI). The HMI displays the driving states of the adjacent vehicles and the emergency road information to remind the driver of safety driving. Different sensors can also be used to monitor some important parameters of vehicle. In this system we can also propose safety distance measurement mechanism between two vehicles to increase the efficiency of the system.

Keywords: Vanet, HMI, ZigBee module, Inter vehicular distance mesurement

Introduction

Due to the fact that number of vehicles increasing in all countries, the number of accidents also increasing. Technologies, like airbags and safety belts, are usually implemented so as to reduce the number of accidents. These measures alone may not be effective enough to overcome the problem due to high number of vehicles but limited number of roads and highways. Intelligent Transportation System (ITS) has been implemented in several countries to incorporate novel safety applications that have capability of significantly decreasing critical traffic events. Inter-Vehicle Communication (IVC) becomes one possible solutions for safety application development. Accident notification generated by an accident vehicle can be transmit to surrounding vehicles for traffic congestion warning and traffic congestion avoidance.

In our proposed system we decide to apply wireless communication, positioning system, and microcontroller technologies to invent inter-vehicle communication system for safe driving called vehicular warning system. The system will help to warn drivers that they might face with an accident and also inform other drivers that there is an accident occurs closely. The warning will give the drivers adequate time to decide what they should do or which way they should drive through in order to avoid the accident and terrible traffic jam. Furthermore, the system is capable of sending accident information to driver's relatives, insurances and polices to give him/her a help as soon as the accident occurs. The

proposed system integrates dedicated short range communication (DSRC)/ GSM and global position

system (GPS) with embedded system into a powerful remote warning system to transmit the vehicular information and broadcast vehicle position; DSRC/GSM communication technology is adopted as the bridge. The proposed system is divided into two parts of the positioning and vehicular units in a vehicle. The positioning unit is used to provide the position and heading information from GPS module, and furthermore the vehicular unit is used to receive the break and other signals. In this paper section-II explains proposed warning system for vehicles. Proposed working system of system is explained in section-III. Section-IV explains related work of given project and papers and section-V explains expected experimental arrangement.

Proposed Operational Details

The major part of this project is establishing communication between two communicating entities (ZigBee modules) placed in two vehicles. Initially we establish the communication using wired network hardware and protocols. After successful completion of wired communication we replace wired link by wireless communication using ZigBee module interfaced with ARM-9 processor and another ZigBee module interfaced to PC.

ARM microcontroller is a heart of system where all the input/output signals are provided. The combined GSM-GPS module is used for position finding & messaging purpose. For sensing safety distance

Ultrasonic sensor will be used. Inter-vehicle communication will done by ZigBee.

Global Positioning System (GPS) is one of the most well-known positioning systems that is capable of locating and tracking any objects on the earth's surface. GPS receiver can precisely calculate location of any object by timing signal sent from several GPS satellites above the earth. Due to the fact that GPS is recognized as the best outdoor location tracking system, we decide to apply the GPS technology with our vehicular warning system in order to define position of a vehicle facing with an accident. This position information will be transmitted as warning message to other surrounding vehicles such as Geographic Coordinate System, Universal Transverse Mercator Coordinate System, and etc. However, in the implementation of our vehicular warning system, we deploy geographic coordinate system to represent a car's coordinate. The geographic coordinate system is a coordinate system that enables every position on Earth to be located in terms of latitude and longitude. Latitude is the angle north or south of a reference of the equator. To configure ZigBee AT-Commands are required which are useful to labeling node & determine whether given system is connected with ZigBee or not. Simple VB based program of Trans-ceive installed in both the modules once the connection is formed there is no need to configure ZigBee every time when you are going to use it. As per application point of view the emergency vehicle approach is achieved by just communication between two Modules for that purpose consider one emergency When Vehicle approaches towards another vehicle it continuously broadcasting message regarding give him sufficient route. At this application we are considering that Emergency vehicle is transmitter and other vehicles in the range are receiver so as soon as the message is received driver took his vehicle at the one end of road and gives route to emergency vehicle to pass as early as possible. This is a very novel application of this system. As per the diagram shows ARM-9 system also connected with different sensors which are regarding different parameters of vehicle e.g. engine temperature and speed etc .

By using different serial ports of ARM-9 processor we can connect different sensors to this module at the same time we so that driver can monitor the condition of vehicle during driving car. Measure role of communication is to send vehicle speed per kilometer to other approaching vehicles and inform them current location of the vehicle. This application requires GPS module who gives us instantaneous changing location at every moment.GPS module also configures with using AT-commands.GPS provides location in NMEA (National Marine Electronic

Association) format in terms of longitude and latitude value and direction position. This actual position and speed can be sending as message to the all vehicles in the network so that all the vehicles can know exact position of the vehicle and driver also know it. We can also use Google maps that give us familiar locations nearby area. Using such kind of application we can identify the possible passing roads to your destination that can help driver to avoid traffic jams or if any road is blocked.

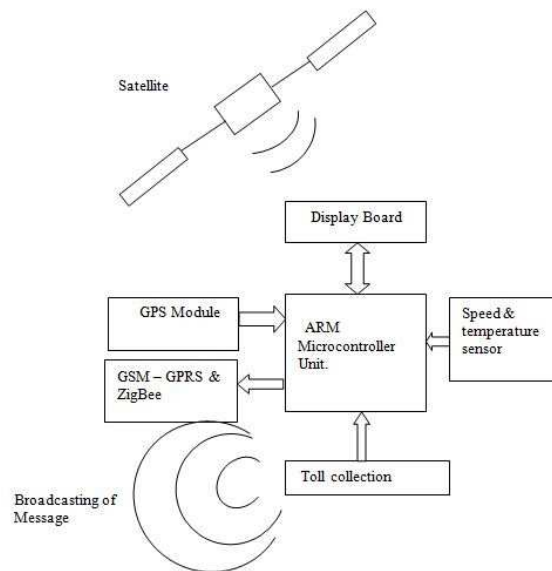


Fig: Proposed Vehicular System

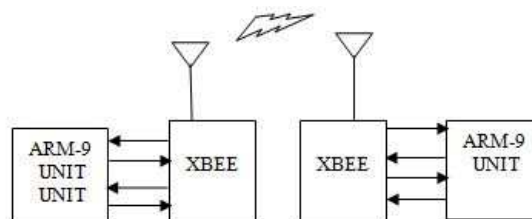


Fig: ZigBee communication diagram

Related Work

Data transmission and messaging is continuously required in vehicular network also some safety based applications also required [1] [2]. The wireless access in vehicular environments (WAVE) is significantly different from the Wi-Fi and cellular wireless networking environments. The specification defined by IEEE802.11P represents the most mature set of standards for DSRC/WAVE networks [5]. A novel vehicular driving navigation system based on VANET is presented. The hardware of the system is an ARM9 embedded device with GPS, 802.11 communication module and human machine interface (HMI) [1][3]. Due to the high mobility and the large variations of distances between neighboring vehicles,

statically finding an appropriate fixed transmission power for VANET nodes to enable real-time and robust message delivery will be extremely difficult, if not impossible.

Research Method

This system can test by using PC/Laptop and one ARM-9 module. ARM-9 COM port connection with ZigBee and another with serial port of PC/Laptop will be used. That is first actual connection where u can see the exact wireless communication. We can use Ultrasonic or laser sensors for the distance measurement as per requirement. Once this experimental setup gives proposed output same setup can be used in different vehicles for calculation of efficiency of system.

Results And Analysis

As this is proposed methodology we are expecting that when ZigBee communication is form with installation of ARM-9 kit our almost work is done. After this we can find out present location in terms of Longitude and Latitude and send this information to corresponding vehicles who are in communication range. Most important analysis is to perform ZigBee communication and utilize it in crowded area where it come across more and more obstacles. So the analysis of performance of ZigBee in plane area and crowded is required analysis.

Conclusion

As this is proposed methodology we have seen that ARM-9 can be interfaced with ZigBee and further evaluating of its performance we are going to use this system as intelligent vehicular driving system.

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