Providing Vehicle Safety and Fastest Accidental Aid using Wireless Sensor Network

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ABSTRACT
This Paper focused on vehicle safety and fast accidental aid. In road safety we see drunk driver detection using alcohol sensor and also detect if the driver feeling sleepy using eye blink sensor. Our system will detect these things and if driver found to be drunken and sleepy our system will stop the ignition of engine and inform to the vehicle owner. Even after that much of security the accident occurs so we implement and IVIS (Intelligent vehicle information system) that provide fastest aid. We have seen a tremendous increase in road accident due to which lot of human life effected and loss of communication especially in hilly area during the night time when the accident occur or car fall down from the hill then there is no one to call ambulance because some time the passing cars doesn’t even know that there is an accident occur because they don’t find any such evidence of accident. To give people an early aid as possible we have introduce IVIS (Intelligent vehicle information system). We give information about accident itself the accidental vehicle will inform to base station for its accident and some information about the damage that occurs inside the car for e.g No of passenger in the car and the exact location of car using GPS (Global Positioning System) and google maps so that the coming ambulance will have sufficient medical help for every passenger using the sensors so it also send signal to traffic system to provide smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The base station identifies the location where the accident occur then send the exact coordinates to the nearest ambulance available. Also sends a signal to all the traffic control station to clear the route for the ambulance to pass.

Keywords------- GSM(Global System for Mobile Communications) ,GPRS (General Packet Radio Services), WSN(Wireless Sensor Networks ) GPS (Global Positioning System), NMEA (National Marine Electronics Association)

I. INTRODUCTION

Nowadays Wireless Sensor Networks (WSN) has been applied in various domains like weather monitoring, military, home automation, health care monitoring, security and safety etc. or in a nutshell one can say wireless sensor network can be applied in most of the domains [1], [7]. Traffic Signal System or traffic monitoring is a vast domain where WSN can be applied to gather information about the incoming flow of traffic, traffic load on a particular road, traffic load at particular period of time (peak hours) and in vehicle prioritization. WSN installed along a road can be utilized to control the traffic load on roads and at traffic intersections [5], [9]. The sensor nodes that are to be deployed along the road are small in size and have low energy consumption [2], [3]. These sensors run on both battery power as well as solar energy. They have the capability to draw solar energy so that they can use sunlight for functioning in bright and sunny condition and the battery power for functioning at night or in cloudy or foggy condition. Sensors used in the Wireless Sensor Network for traffic signal systems are mainly of two types: i) Intrusive type and ii) Non-Intrusive type [4], [8]. i) Intrusive types of sensor are kept under the road and sense the traffic waiting at the signal. This type of sensor has the same working principle as that of a metal detector. ii) Non-Intrusive types of sensor is fitted on the road. The installation of this type of sensor is easy as no cutting of road is needed to be done. Non-intrusive sensor includes acoustic sensors or video image processors to detect the presence of vehicles waiting at the traffic intersection. Although Intrusive sensors are very effective still Non-intrusive sensors are preferred over Intrusive sensors as they are cost-effective, easy to install, immune to natural corrosion and degradation [6],[10].

Today the electronic world gaining a lot more importance in our day to day life technology makes an
impact on our life very easy but when there is something right happens there is also something wrong waiting. In computer world which providing much more facilities to us but there is also a bad face of it i.e. security. So there security becomes the basic need for computer industry. When a company employee travels for money transactions. What if the person is being tracked by some attacker, while in that case the company has to have full information in case of any emergency. The system that work as a tracking and a security system. It is an IVIS (Intelligent vehicle information system). The system dealing with both location tracking and security. We make a GPS based vehicle tracking system that is used for location tracking and security as well. The system make use of two concepts. These are GPS (Global Positioning System) and GSM (Global System for Mobile Communication). It gives the information of the vehicle to the base station about its position whenever required and it is decoded there. For real time monitoring an automatic monitoring system can be established with GSM. In this system vehicle identified automatically and upload critical data about the vehicle and operating conditions. The monitoring device can send modified control parameters and information to the vehicle driver. These parameters are temperature, alcohol detection, gas leakage detection, stirring grip checking, etc.

II. TYPES OF SENSORS USED

1) Microcontroller: In this project, ARM-7 microcontroller acquires and stores different parameter of vehicle. The main block of Intelligent vehicle parameter monitoring system is ARM-7 micro controller which is heart of the system which provides monitoring and controlling actions. It senses signals from input blocks and processes output blocks. The software program is stored in ARM-7 microcontroller on chip memory, according to which it provides the controlling actions. The on chip ADC converts these parameters into digital form and gives to the ARM-7 microcontroller. The status of steering grip i.e. whether the steering is gripped or not is sensed by sensor gives the corresponding signal to microcontroller. With the help of different sensors various parameters are monitored. The LCD block is provided for visual display of the message. Also it continuously displays the measured parameters. The RTC provides real time clock depending on which the various events occur. Whenever accident takes place the accident interrupt block gives interrupt to the ARM-7 microcontroller. Through serial communication block the system is interfaced the PC. With this interfacing the stored data is transferred serially to PC, for the analysis purpose.

2) Alcohol Sensor: ARM-7 microcontroller first reads the value of alcohol sensor if any alcohol is detected in the driver’s cabin, the ignition is turned off.

3) LPG gas sensor: ARM-7 microcontroller also continuously scans for LPG gas leakage sensor. If any LPG gas leakage is detected then display the gas concentration on LCD and buzzer on for indicate or alert the driver to avoid an accident.

4) Temperature: It continuously monitors the temperature of engine as well as cabin & sends its value to microcontroller. If temperature of engine or cabin exceeds desire value then system alerts to driver.

5) Obstacle detection: To detect any obstacle, an optical sensor is used. If any obstacle is observed, an audio indication is given by the buzzer.

6) SMS Sending Mode: In this mode the system sends either SMS or directly dials calls to prerecorded numbers. The main blocks of this mode are microcontroller, mode interfacing unit and accident interrupts.

7) Eye blink sensor: The sensing element detects the optical muscle movement of eye continuously and amplifies to give a switching pulse output. The elastic strap holds the sensing element in place of vision muscle movements. It detects eye blink continuously to sense the drivers fatigue sleeping and alert the driver.
8) Load cell: The load cell is used to monitor the weight limit that the vehicle is carrying. The load cell will continuously give the weight readings in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then given to the µC. The µC then converts the analog signal to digital format. If the weight exceeds the set point then the buzzer is turned ON and the vehicle is stopped.

9) Steering switches: Here we are using µ switches to detect whether the driver has the grip on the steering or not. If the GRIP is absent then the buzzer is activated indicating the driver to regain the grip.

10) Accident switches: Here we are using µ switches that detect an accident. Whenever a switch is pressed the latitude and longitude of that location are recorded using GPS it also record vehicle activity such engine temperature, fuel level, speed etc. These information also sends to the base station via GPS.

11) DC motor unit: We are designing our own vehicle unit which consists of 2 DC motor based wheels. These wheels are operated using 12v DC motor. The µC works at 5v and the DC motors operate at 12V, so to match the voltages we are interfacing a DC motor driver circuit L293D which will in turn drive the DC motors.

12) GPS and GSM unit: The GPS system in the vehicle sends the co-ordinates to µC that will store it into its RAM memory. It also save some other parameter in µC. After some time µC sends data to the base station by using GSM module using AT commands.

13) Base unit: The base unit when receive the co-ordinates show them on pc on VB. Also the position of the vehicle is shown on the map. So that the owner get the correct reason for the accident. The owner also gets the detail of engine temperature, fuel, speed.

After getting the Location we know move on to Rescue system now proposing a system for ambulance rescue if the accident occur. In proposed system if a vehicle has met accidents, immediately an alert message with the location coordinates is sent to the Control center. From the control center, message is sent to the nearby ambulance. Also signal is transmitted to all the signals in provide RF communication between ambulance and traffic section. The vehicle accident observed using section it is received by the microcontroller and then the nearby ambulance is received the ambulance. The signal to Traffic signal section is transmitted through RF communication. Also if any fire occurs, it is detected using fire sensor and an alarm message is directly sent to the fire station.

III. BLOCK DIAGRAMS

A. Block Diagram of Vehicle Unit: If the accident occurs vibration sensor or fire sensor send signal to microcontroller through signal conditioner. Then GPS provide the location coordinate of latitude and longitude through GSM. Along with this vehicle has ARM which has all the sensors that transmit all the useful information to the control center.
B. Block Diagram Of Ambulance/Control Unit: In control section GSM modem receives message about accident and send it to PC. PC identifies the nearest ambulance and ambulance is instructed to pick up the patient. The control unit send the signal to all the signals to ambulance.

C. Block Diagram Of Traffic Unit: The traffic signal made the signal green when it catches the signal from the ambulance through RF communication. So that ambulance reaches hospital as soon as possible.

IV. SYSTEM IMPLEMENTATION

Our system is divided into three units and all the unit communicated with each other and make a secure and hassle free path for the ambulance to reach hospital. Thus our system is divided into following three units,

- The Vehicle Unit
- The Ambulance/control Unit
- Traffic unit

a). Vehicle unit: The unit that is installed in the vehicle sense the accident and sends the appropriate information along with the location of the accident to the base station. All the vehicle should contain the vehicle unit. In vehicle unit we have vibration sensor, a user interface, siren, controller, GPS and GSM module. The vibration sensor continuously sense for any large vibration in the vehicle [1]. If sensed something then the data given to the controller GPS system. The GPS systems find the current location of the vehicle where the accident occur and give this data to GSM module. The GSM system sends the received data to control unit whose GSM no has already stored in the module.

b). Ambulance unit: The controller search for a nearest ambulance and also search the smallest way to the hospital. The controller then sends this path to the ambulance. With the help of this information the controller controls the traffic signals between the ambulance and hospital. At the same time, the ambulance unit turns ON the RF transmitter. This will lead to communicate with the traffic section.

C). Traffic unit: When the traffic signal section receives the information about accident, the RF receiver is turned ON and search the ambulance coming towards the traffic signal. When it finds the coming ambulance it made the signal to be green with the help of RF communication.

V. SIMULATION RESULTS

Automatic Ambulance call and managing traffic control system. We simulate this using Proteus Software
and presented the result. The model of the above is presented below and the output results.

A). Normal Condition
In normal condition the fire and vibration sensor shows the value that is less than the preset value.

B). Accident condition
In case of accident, the vibration sensor sends the electrical signal to the microcontroller. Then the GPS system will give the exact position or location of the vehicle(say longitude and latitude) to control section through GSM.

VI. APPLICATION & FUTURE SCOPE

A. Application
1) For Personal vehicle: The main application of IVIS is for personal vehicle use if anything unfortunate accident had occurred to a vehicle fitted with vehicle unit then immediate help can be provided to the victim vehicle on receiving SMS.
2) Insurance companies: Most of the time of accident is false so it help insurance companies to detect whether the information is true or not. The insurance company can easily analyze the data recorded. And they can find out whether the accident had made or occurred. And so the false claim is avoided.
3) Research and development of vehicle: In testing the vehicle in R and D sent an engineer’s required data at various speed and time. But this data is not available exactly as it is not possible to measure the data for every second and to measure the number of parameters at the same time. But if IVIS is used the data can be made available for each and every second with very high accuracy.
4) Military applications: Military vehicles carry ammunition from one place to other for e.g. in Kashmir military vehicles can has to be secured so if militants had attacked or damaged the vehicle immediate SMS is send to military based station and this ammunitions can be made save from wrong hands.

B. Future Scope
1) A Front Camera can be used for Lane Tracking purpose.
2) Long range IR sensors can be used in front to avoid Vehicle collision
3) A Camera can be used inside the car for vigilance purpose.

VII. CONCLUSION
We have proposed the system for securing and protecting the vehicle and human life from accident. We have used an ARM microcontroller for controlling and securing vehicle. With the use of this we have also add a feature of automatic calling of ambulance and making the traffic lane clear for our ambulance to reach its destination fast. If this system is implemented it will help not only an ambulance but also to other authorized vehicle and help producing better results and also in the hilly area like Uttarakhand where it is difficult to trace the accident. We make IVIS an accurate sytem that will do very less time delay. But as our technique is based on GSM message so there is a delay in delivering message as it is a queue based technique. We can reduced this also by making more priority to the messages communicated through controller.
REFERENCES