Intelligent Vehicle Tracking System Based on Arm and Information Fusion

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Abstract- *The purpose of this system is to design and realize sophisticated embedded wireless system called intelligent vehicle control for critical remote location application using ARM 7 microcontroller from the hardware and software. The hardware module includes the connection of ARM embedded system, GPS module, obstacle testing module, different parameter monitoring sensor modules and the GSM module. The system can serve the purpose of long distance real time monitoring and control of vehicle. The results of laboratory tests show that the system fulfils real time control and functional parameter monitoring of a vehicle.*

Keywords- ARM, Intelligent Monitoring, GPS & GSM System, location information.

I. INTRODUCTION

In this modern, fast moving and insecure world, it becomes a basic necessity to be aware of one's safety. Maximum risks occur in situations where in an employee travels for money transactions. Also the Company to which he belongs should be aware if there is some problem. What if the person traveling can be tracked and also secured in the case of an emergency?! Here's a system that functions as a tracking and a security system and it can be employed in remote location applications for intelligent vehicle control. This system can deal with both pace and security. The Vehicle Monitoring System includes a GPS based vehicle tracking system that is used for security applications as well. The project uses two main underlying concepts called as GPS (Global Positioning System) and GSM (Global System for Mobile Communication). The purpose of this system is to track the vehicle to which the GPS is connected and to provide the information about its position as and when required. The GPS satellite and the GPS module attached to the vehicle are used to track the vehicle. The antenna present in the GPS module gets the information from the GPS satellite in NMEA (National Marine Electronics Association) format to reveal the position information. The base station receives information from the GPS antenna and decodes it for further processing. For this we use GSM module which has an antenna too. Thus the vehicle related data is completely available at the Base station. For real time applications an automatic tracking system can be established with GSM, in this vehicle will automatically identify and upload critical data about the vehicle and operating conditions. The monitoring device can send modified control parameters and guidelines to the vehicle driver**.** These parameters are temperature, alcohol detection, gas leakage detection, stirring grip checking, etc.

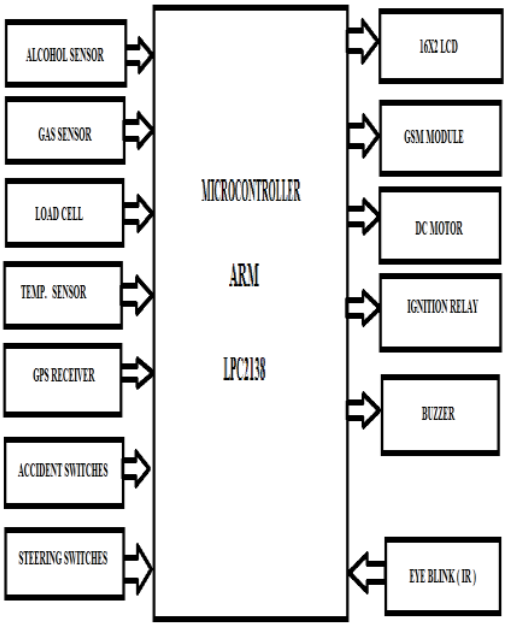
II. BRIEF HISTORY

Tracking systems were first developed for the shipping industry because they wanted to determine the location of ship at any given time. Passive systems were developed in the beginning to fulfill these requirements. The passive systems are not used in the applications requiring real time location information of the vehicle because they save the location information in the internal storage that can only be accessed when vehicle is available. Active systems are developed to transmit the location information in real time and these systems are called Automatic Vehicle Location system. The Real time vehicular tracking system consists of a hardware device installed in the vehicle and a remote Tracking server. The tracking server receives the information using GSM/GPRS modem on GSM network by using SMS or through direct TCP/IP connection using GPRS. Tracking server consists of GSM/GPRS modem to receive vehicle location information via GSM network and stores this information in database. The authorized users of the system can access this information via website over the internet. In 1976 SDM module (Sensing and Diagnostic Module) was introduced by GM, which was improved to so called DERM (Diagnostic and Energy Reserve Module) in 1990. The main objective of this module is to record and save the data from measuring sensors including error messages at the time when the airbag is activated. In 1990 the first sophisticated electronic accident data recorder was installed by GM in F1 cars. Firstly the mentioned units were designed as a diagnostic tool for a determination of the reasons for the airbag activation. Later, units were used for accident reconstructions. It was asked by insurance companies and police. In 2005, thanks to the co-operation of Great Britain, the Netherlands and Belgium the European project called SAMOVAR (Safety Assessment Monitoring on Vehicle with Automatic Recording) came into existence. This project is used to

improve road traffic safety targeting on motor cars monitoring by black boxes . During years, there were more attempts of some alternatives of the black box but it was not widespread used.

III. THE WHOLE ARCHITECTURE OF THE SYSTEM

A. *Block Diagram*



B. *Block diagram description*

1) Microcontroller-

The ARM-7 microcontroller acquires, processes and stores different parameter of vehicle. The system is built around microcontroller unit ARM LPC2138 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 inbuilt ADC converts the analog signals into digital form and gives it to the ARM-7 microcontroller. The status of steering grip is detected by sensor and the corresponding signalis given 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. When an accident occurs the accident interrupt block generates interrupt to the ARM 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

The microcontroller unit reads the value of alcohol sensor and if any alcohol is detected in the driver's cabin, the ignition is turned off.

3) LPG gas sensor

The LPG gas leakage sensor is continuously scanned by the microcontroller. If any LPG gas leakage is detected then the gas concentration gets displayed on LCD and buzzer becomes on to indicate or alert the driver to avoid an accident.

4) Temperature

It monitors the temperature of engine and cabin and then it is sent to the microcontroller. If temperature of engine or cabin exceeds desire value then system alerts to driver.

5) Obstacle detection

The optical sensors are used to detect the obstacles. 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

By default the vehicle will be in running condition. During this time if the person closes his eyes automatically the vehicle will come to halt condition and a buzzer is operated .here we are using an IR based sensor which counts gives a high pulse to the µC whenever the eye is shut and open .

8) Load cell

The weights that the vehicle can handle are continuously given by Load cell in voltage format, which is then given to a signal conditioning unit which amplifies the voltage and is then give 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

*W*eather the driver has the grip on the steering or not is detected by micro switches called steering switches. If he is not having grip then the buzzer is activated indicating the driver to regain the grip.

10) Accident switches:

In this block the μ switches are used to detect any accident. when the switches are pressed the latitude and the longitude of that place are recorded (with the help of GPS),also we are recording various vehicle parameters such as engine temperature, fuel level ,speed etc…..These parameters are then sent to the base unit via the GSM modem.

11) DC motor unit:

The vehicle unit is designed consisting of 2 DC motor based wheels. These wheels are operated using 12v DC motor.To match the voltages of microcontroller and the DC motor we are interfacing a DC motor driver circuit L293D which will in turn drive the DC motors.

12) GPS and GSM unit:

The GPS unit sends the information to the microcontroller which stores these co-ordinates in its ram location. Also various other parameters are also stored in microcontroller which in turn sends this data to the base unit (surveillance unit) with the help of on board GSM modem using AT commands

13) Base unit:

The base unit after receiving the co-ordinates displays them on the visual basic software on board the pc. The position of the vehicle is then displayed on the map of VB s/w. Thus the the vehiclecan be tracked and also know the reasons of accident by analyzing various parameters of engine such as temperature, fuel level, speed etc.

IV. ALGORITHM AND WORKFLOW OF THE SYSTEM

A. Algorithm of System Work

1)Start
2) Sense the parameter from various parts of the vehicle.
3)Send the collected information to the ADC
4)Then ARM process the data
5) If sensed parameters exceed their limit then ARM LPC2138 send command to relay to stop the ignition.
6)Send the data over GPS and GSM
7) If the parameter does not exceeds the limit it will continued.
8)Exit

B. Work flow of the system

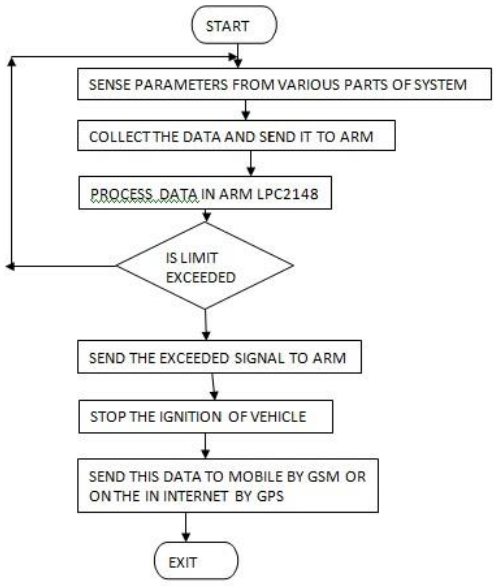


Fig 2. Flowchart of System Working

V. ADVANTAGES AND DISADVANTAGES

A. Advantages

1) Security of vehicle.
2) Record driving data, collision data and position data.
3) Analyze the accidents detail.
4) Send location of car and its maintenance to base station through GPS & GSM technique.
5) Sense gas & fuel leakage and display its status on car monitoring system.
6) Detect if the driver is drunk or not.
7) Detect if the driver is feeling sleepy.
8) Shows engine temperature.
9) Remote place data can be acquiescing.
10) Various difficult data like vibration can be measured.
11) Data acquiesced is placed on internet.
12) Due data present on internet can be acquiesced at any time.
13) This data acquiesced from one country to another country by use of internet.

B. Disadvantages

1) Damage of sensor cannot be detected.

VI. APPLICATION & FUTURE SCOPE

A. Application

1) For V*ehicle safety* The main application of black box is for personal vehicle use if any unfortunate accident had occurred to a vehicle fitted with black box then immediate help can be provided to the victimized car on receiving SMS.

2) Insurance companies Most of the time of accident is false .so insurance companies can implement this car black box in the insured vehicle and as a data before and at the time of accident is locked into black box. 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 black box is used the data can be made available for each and every second with very high accuracy. Black box not only makes the data available but with the help of LABVIEW software the data can be plotted in graphical form that is speed Vs time, engine temp Vs time

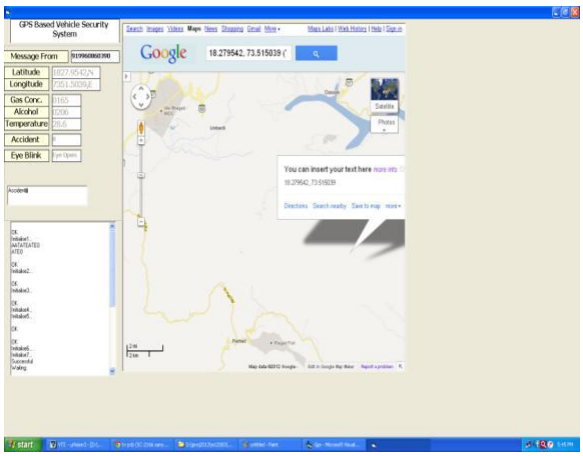
4) Military applications Military vehicles carry ammunition from one place to other for e.g. the vehicles can be fitted with car black box so if militants had attacked or damaged the vehicle immediate SMS is send to military based station and this ammunitions can be made save from wrong hands.

B. Future Scope

1) A Front Camera can be used for Lane Tracking purpose.
2) To prevent vehicle collision Long range IR sensors can be used in front
3) For vigilance purpose a Camera can be used inside the car .
4) Instead of a Microcontroller we can use a CPLD chip since the CPLD incorporates many more features than a Microcontroller. VLSI/VHDL can be used for CPLD programming.

VII .RESULTS

1) VB Window showing results is given



V. CONCLUSION

An effective solution is provided to develop the intelligent vehicle which will monitor various parameters of vehicle in-between constant time period and will send this data to the base unit is explained in this paper. By using hardware platform who's Core is ARM7, GPS & GSM module. The designed system could finish the function of communicating with the base station via GPS, obstacle Avoidance testing and control of various parameters. The whole Control system has the advantage of small volume and high reliability. Future scope of that is to control the accidents and positioning the accidental vehicle.

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