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# An Intelligent Vehicle Control and Monitoring Using Arm

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***Abstract*—Unifying the Global Positioning system technology this article designs and realizes one kind of embedded wireless system named intelligent vehicle control for critical remote location application using ARM 7 microcontroller from the hardware and software. In terms of the hardware completed the design and connection of ARM embedded system, GPS module, obstacle testing module, different parameter monitoring sensor modules and the GSM module. The system can achieve the purpose of long distance real time monitoring and control of vehicle. The executive results of laboratory tests show that the system fulfils real time control and functional parameter monitoring of a vehicle.***

***Keywords*- ARM, Intelligent Vehicle, GPS & GSM System,Parameter Monitoring.**

## I. INTRODUCTION

In this modern, fast moving and insecure world, it is become 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. It's the intelligent vehicle control for critical remote location application. This system can deal with both pace and security. The Vehicle Monitoring and Security System is a GPS based vehicle tracking system that is used for security applications as well. The project uses two main underlying concepts. These are GPS (Global Positioning System) and GSM (Global System for Mobile Communication). The main application of this system in this context is tracking the vehicle to which the GPS is connected, giving the information about its position whenever required. This is done with the help of the GPS satellite and the GPS module attached to the vehicle which needs to be tracked. The GPS antenna present in the GPS module receives the information from the GPS satellite in NMEA (National Marine Electronics Association) format and thus it reveals the position information. This information got from the GPS antenna has to be sent to the Base station wherein it is decoded. For this we use GSM module which has an antenna too. Thus we have at the Base station; the complete data about the vehicle. For real time monitoring an automatic monitoring system can be established with GSM, in this vehicle 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 where each vehicle was at any given time. Passive systems were developed in the beginning to fulfil these requirements. For the applications which require real time location information of the vehicle, these systems can't be employed because they save the location information in the internal storage and location information can only be accessed when vehicle is available. To achieve Automatic Vehicle Location system that can transmit the location information in real time, Active systems are developed. Real time vehicular tracking system incorporates a hardware device installed in the vehicle (In-Vehicle Unit) and a remote Tracking server. The information is transmitted to Tracking server using GSM/GPRS modem on GSM network by using SMS or using direct TCP/IP connection with Tracking server through GPRS. Tracking server also has GSM/GPRS modem that receives vehicle location information via GSM network and stores this information in database. This information is available to authorized users of the system via website over the internet. In 1976 GM introduced SDM module (Sensing and Diagnostic Module), which was improved to so called DERM (Diagnostic and Energy Reserve Module) in 1990. The main target of this module consists of recording and saving data from measuring sensors including error messages at the time when the airbag is activated. In 1990 GM installed the first sophisticated electronic accident data recorder 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 targeted on motor cars monitoring by black boxes and its possibilities to improve road – traffic safety. 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*

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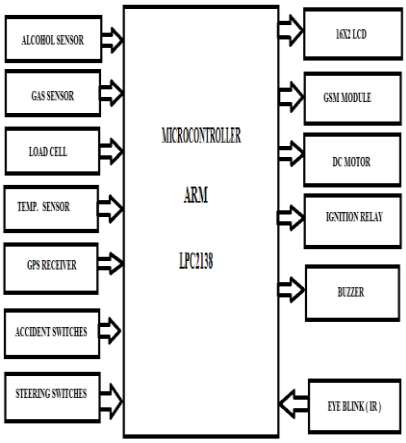


**Fig1. Block Diagram of System**

*B.* ***Block diagram description***

***1) Microcontroller-***

In this project, ARM-7 microcontroller acquires and stores different parameter of vehicle. The main block of Intilligent 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 sterring grip i.e. whether the sterring 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***

An eye blink sensor ,continuously monitors the no of times the eye blinks .if the eye blink count decreases that means the driver is sleepy .in that case 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 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 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***

Here we are using µ switches to detect weather 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 µswitches to detect any accident. As soon as any of 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:***

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 unit sends the co-ordinates to the µC which stores these co-ordinates in its ram location. Also various other parameters are also stored in µC. Then after a specific time µC sends this data to the base unit (surveillance unit) with the help of on board GSM modem with help of 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 owner can not only track the vehicle but also know the reasons of accident by analyzing various parameters of engine such as temperature, fuel level, speed etc.

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## 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*

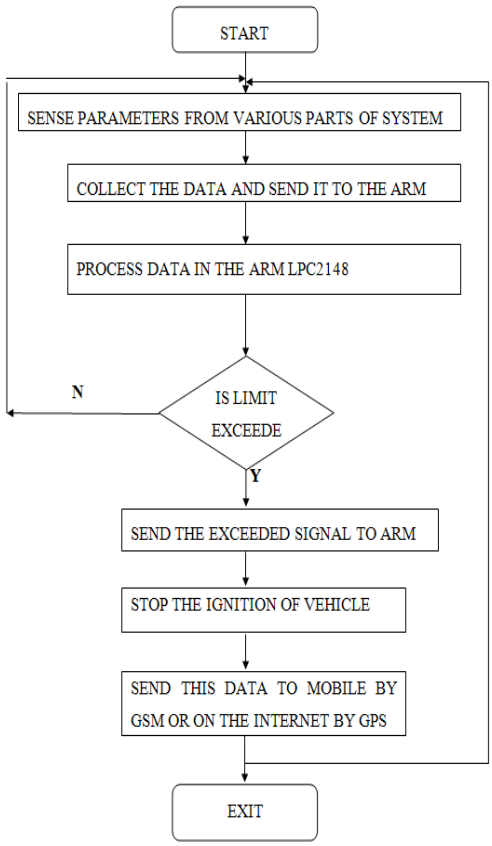


**Fig 2. Flowchart of System Working**

## 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 *Personal vehicle***

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. in Kashmir military 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) 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.
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 below

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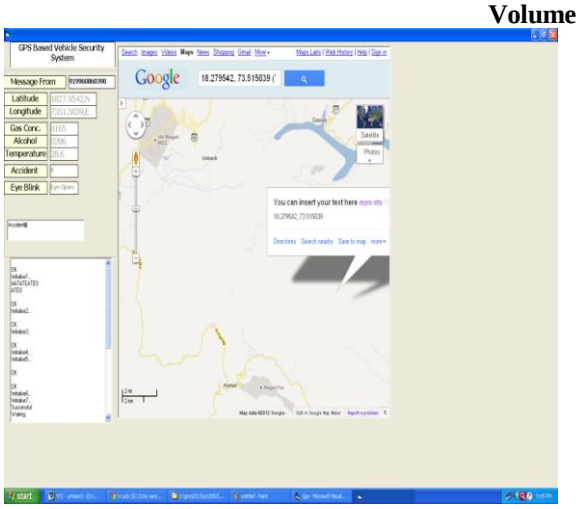


**Fig 2.VB Output Window**

## 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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