Implementation Of Vehicular Monitoring And Tracking Based On Lpc 2148

[1] D.Prasad

[1]*Professor, Department of ECE, Ramanandatirtha Engineering College, Nalgonda, India*

***ABSTRACT**:-* Design of Vehicular monitoring and tracking system based on ARM using GSM and GPM is proposed. The vehicular module is used to track, monitor, and surveillance and finds the accident spot and intimate to the monitoring station. Also this paper presents that while wesend a predefined message to hardware kit which isplaced in the vehicle, it replies to the same number bysending a message which contains the vehicle longitudeand latitude details of the vehicles.The executive results of laboratory tests show that thesystem fulfils real time control and functional parametermonitoring of a vehicle.

Keywords:- ARM7 TMI-S, MEMS Accelerometer, GPS, GSM, LPC2148.

I. INTRODUCTION

Public's life is merely dependent on the transport industry[1]. The advancement and increase in the vehicle publicare forced to undergo some of the major problem such asaccident, traffic jam, vehicle theft etc. Hence there is theneed to monitor and track the vehicle continuously. Thetrucks carrying dangerous chemicals may damage if thetemperature exceeds above its limit. Hence it is necessaryto continuously monitor the temperature of the chemicals[3]. It is also necessary to know the location of the vehiclein case of vehicle theft.The project aims at providing information to themonitoring station such as Police station or Hospitals andto the owner of the vehicle in case of accidents and vehicletheft. This is achieved by using ARM controller with GSMand GPS. The programming is done through Kiel μvision4 IDE.

Intelligent transportation system is a crucial part ofChina's information construction. With the increasingcity holdings of cars, there are more and more trafficjams, so requirements are that IntelligentTransportation needs more improvement. The keytechnology of Intelligent Transportation is Vehiclepositioning system, while the key of which ispositioning system. Nowadays the most widely usedpositioning system is a system consisting 24 satelliteswhose searching area embrace the globe. It can ensurethat more than 4 satellites will be observed at one time,that they can collect the longitude and latitude of theview point, and furthermore realizing the function ofnavigation, positioning, and time service.Thiscontains the information regarding Vehicle velocity,position, identity and temperature in two fashions. Theinformation given to monitoring station is in continuousmanner and when the accident occurs. The development ofvehicular design brings public many convenience in life butalso brings many problems at the same time, for example,traffic congestion, difficulty in monitoring dispersivevehicle, theft and other series of problems[4].

The VehicleMonitoring and Security System is a GPS based vehicletracking system that is used for security applications aswell. The project uses two main underlying concepts. Theseare GPS (Global Positioning System) and GSM (GlobalSystem for Mobile Communication). The main applicationof this system in this context is tracking the vehicle towhich the GPS is connected, giving the information aboutits position whenever required. This is done with the help ofthe GPS satellite and the GPS module attached to thevehicle which needs to be tracked. The GPS antenna presentin the GPS module receives the information from the GPSsatellite in NMEA (National Marine ElectronicsAssociation) format and thus it reveals the positioninformation. This information got from the GPS antennahas to be sent to the Base station wherein it is decoded. Forthis we use GSM module which has an antenna too. Thuswe have at the Base station; the complete data about thevehicle. For real time monitoring an automatic monitoringsystem can be established with GSM, in this vehicleautomatically identify and upload critical data about thevehicle and operating conditions.

Key feature of this design include:

a. Vehicle real-time monitoring by sending "its"information regarding velocity, Position (longitude,latitude) to the monitoring station and to theuser/owners mobile that should help them to getmedical help if accident or the theft.

b. Display that information on GUI and also at thesame time these information are stored in thedatabase if needed.

c. User/owner has an access to get real-time positionof a vehicle in real time.

d. Also in case of theft vehicle should be stop at thesame time where this system is ported on themobile vehicle.
e. It includes a temperature sensor that givestemperature in degree Celsius for monitoring theenvironmental conditions around the goods orother stuff in the transport vehicle.

II.   RELATED WORKS

In this chapter, we will discuss about the information foundby study and research that is critical and have an importantvalue in the contribution of the whole project. It also givessome basic knowledge or theoretical base and is used as afoundation to successfully achieve the main objectives. Mostof the literatures are from the related articles, journals, booksand previous works of the same fields. These literatures arethen compiled and use as a guidance to the work of thisproject. GSM and GPS based vehicle location and trackingsystem will provide effective, real time vehicle location,mapping and reporting this information value and ads byimproving the level of service provided.

Tracking systems were first developed for the shippingindustry because they wanted to determine where eachvehicle was at any given time. Passive systems weredeveloped in the beginning to fulfil these requirements. Forthe applications which require real time locationinformation of the vehicle, these systems can't be employedbecause they save the location information in the internalstorage and location information can only be accessed whenvehicle is available. To achieve Automatic VehicleLocation system that can transmit the location informationin real time, Active systems are developed. Real timevehicular tracking system incorporates a hardware deviceinstalled in the vehicle (In-Vehicle Unit) and a remoteTracking server. The information is transmitted to Trackingserver using GSM/GPRS modem on GSM network by usingSMS or using direct TCP/IP connection with Trackingserver through GPRS. Tracking server also has GSM/GPRSmodem that receives vehicle location information via GSMnetwork and stores this information in database. Thisinformation is available to authorized users of the systemvia website over the internet.

In 1976 GM introduced SDMmodule (Sensing and Diagnostic Module), which wasimproved to so called DERM (Diagnostic and EnergyReserve Module) in 1990. The main target of this moduleconsists of recording and saving data from measuringsensors including error messages at the time when theairbag is activated.

In 1990 GM installed the firstsophisticated electronic accident data recorder in F1 cars.Firstly the mentioned units were designed as a diagnostictool for a determination of the reasons for the airbagactivation. Later, units were used for accidentreconstructions. It was asked by insurance companies andpolice.

In 2005, thanks to the co-operation of Great Britain,the Netherlands and Belgium the European project calledSAMOVAR (Safety Assessment Monitoring on Vehiclewith Automatic Recording) came into existence.

Thisproject is targeted on motor cars monitoring by black boxesand its possibilities to improve road – traffic safety. Duringyears, there were more attempts of some alternatives of theblack box but it was not widespread used.

III.   PROPOSED SCHEME

The proposed design provides information regarding vehicle Identity, speed, and positionon real time basis. This information is collected by the ARM7 TDMI-S core processor (LPC2148) by using different module and dispatches it to the monitoring station.The complete block diagram is as shows in fig.1.Thevehicular system [VS] includes hardware that consists of anARM 7 TDMI core processr, Accelerometer, GPS module,GSM module, SD memory card, l6x2 LCD, and temperaturesensor. The whole Unit works on a 5V or 9V dc regulatedpower supply. The GPS receiver module interfaced withUART1 of ARM processor provides speed and locationinformation. The identity of a vehicle is fixed that is saved ina flash memory of a processor. The temperature sensorprovides temperature per degree Celsius to an ARMprocessor.

The temperature sensor is interfaced to an ADC1of ARM processor. All this information are shown on LCD that isinterfaced with a GPIO0 and send it to a monitoring station(receiver side) by GSM module wirelessly that is interfacedwith UART0 of ARM processor. Also the same informationis given to a concern person to get that information anywhereanytime. The module requires GSM SIM (Subscriber IdentityModule). As per the definite event stored in a program andwhen collision/accident occurs that is sense by anAccelerometer which is interfaced to ADC0 of ARMprocessor. The detail descriptions of all modules are asfollows.

A. Sensor: A sensor is a device used for the detection of changes in quantities and it provides a corresponding output, generally asan electrical or optical signal.
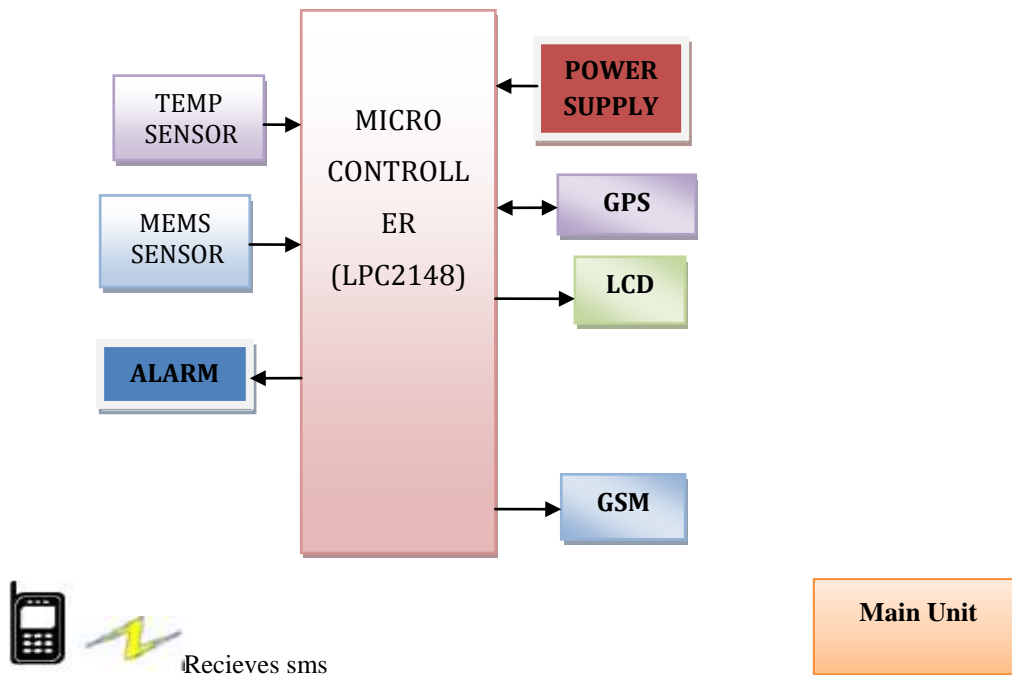
1). Temperature Sensor (LM35): The Temperature- LM35sensor continuously monitors the temperature of surface atwhich it is mounted, generally vehicle engine and body. Ifthe Temperature exceeds predefined value, themicrocontroller will send alert to the driver by means ofbuzzer usually fixed near to Dash board.

Fig. 1. LM35

2). MEMS Accelerometers (ADXL335): The ADXL335 is a low power, thin, small, complete 3-axis accelerometer with signal conditioned voltage outputs. Product processes acceleration with a minimum full-scale range of ±3 g. They can measure the static acceleration of gravity in tilt-sensing device, as well as dynamic acceleration resulting from vibration, shock, or motion. X-axis is connected with controller and continuously checks that "g" value change.The output of accelerometer provides 1.65V to3.3V in positive direction and in negative direction thevoltage drop from 1.65V to 0V. The output of accelerometeris in analogue form with three different output voltages eachrepresenting X, Y and Z direction of motion. These threevoltage signal are processed through ADC0 on three differentChannels available on ARM. ADC0 is configured at 4.5MHzclock from system peripheral clock. The 8 bit digital outputfrom ADC0 is fed to UART1 of ARM. Accelerometer is usedin this design for the collision detection. The maximumoutput voltage of accelerator module is 3.3V that is a CMOSvoltage of the processor.

B. LPC 2148 Microcontroller: This is a 32-bit ARM7-TDMI-S microcontroller with 32kB of on-chip static RAM and 512 KB of on-chip flash memory. It has 128-bit wide interface/accelerator that permits 60MHz of operation. Also it has In-System Programming using on-chip boot loader software, 400ms of full chip erase and 256 B of programming in 1ms. For interfacing of sensors, it has 10-bit ADC with 8 analog inputs and a conversion time as low as 2.44μs per channel. CPU operating voltage is 3V to 3.6V so that the proposed system requires only lower power consumption as the same mentioned before. The Architecture is based on RISC principles and its simplicity yields in a high instruction throughput and real-time interrupt response form a small and cost effective processor core. It also has another architectural approach such as 16-bit Thumb instruction along with 32-bit ARM instruction set which will enhance the code density in restricted memory conditions while recurring most of the ARM's performance.

Recieves sms

Fig.2.Block diagram of system

C. Global system for mobile communication (GSM) :GSM is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM Time Division Multiple Access (TDMA) is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA) and operates in the 900 MHz, 1800 MHz, or 1900 MHz frequency bands.

It is composed of following information:
1. An international mobile subscriber identity (IMSI), that uniquely identifies a
subscriber within GSM.
2. A secret subscriber authentication key (Ki).
3. A cryptographic algorithm A3, which provide security functions for authenticating the SIM.
4. Temporary network related data: temporary mobile subscriber identity (TMSI), Location Area Identity (LAI) and Kc.

D. GPS Modem:A GPS modem is used to get the signalsand receive the signals from the satellites. In thisproject, GPS modem get the signals from the satellitesand those are given to the microcontroller. The signalsmay be in the form of the coordinates; these arerepresented in form of the latitudes, longitudes andaltitudes.Position (longitude, latitude) identity and temperature to themonitoring station and to the user/owners mobile that shouldhelp them to get medical help if accident or the theft. We areintended to make this monitoring wireless using ARM7hardware platform.

Fig.3. GPS module.

In today's world accidental deaths areincreasing day by day in all most all accidents the death causeddue to lack of treatments in time, because of not gettinginformation to the nearest hospitals and police stationimmediately due to the present existing method of calling anyperson to the hospital and police station.

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

The work flow of the project is discussed in the flow chart that makes us understand the complete working of vechiler system.
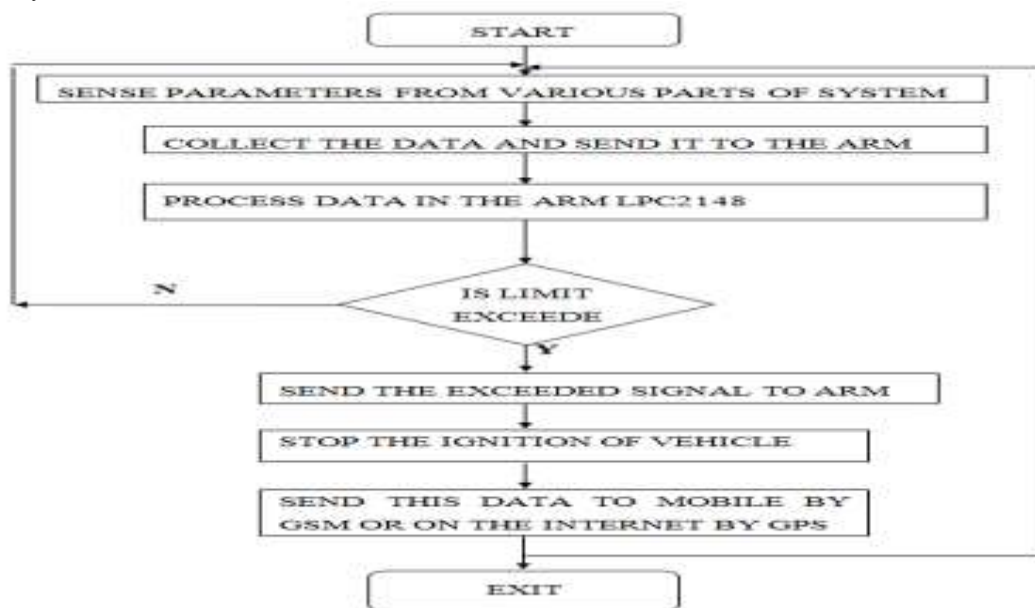

Fig.4 Flow Chart

V. EXPIRIMENTAL RESULTS

Fig.3shows snapshot of hardware unitthat contains all the sensors and GPS,GSM and Prototype Car.
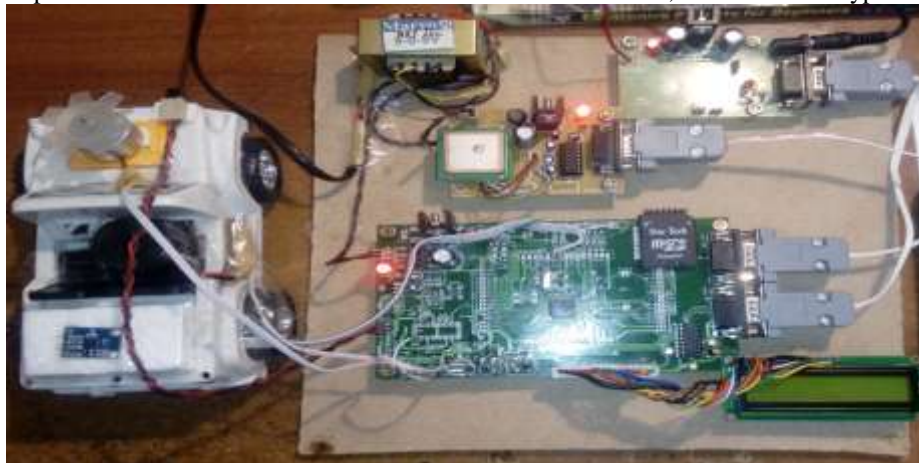

Fig.5 Experimental Setup

VI.   CONCLUSION

The Vehicular System provides information of a vehicle likevelocity, position, through a GPS module and identity of avehicle to a monitoring station and to a mobile phone accordingto a definite event stored in a program or a query from amonitoring station. Accelerometer senses the collision of thevehicle and sends this information in real time to ahospital/police station.The system isuseful in much application such as surveillance, security,tracking, which may be installed in cargo trucks, cars,motorcycle, and boat.

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BIODATA
Author

D.Prasad completed his B.E in Electronics & Communication Engineering and M.E in the stream of Electronic Instrumentatic in the year of 2001 & 2005 from Madras University & Andhra University respectively. He is having teaching experience of more than 13 years in various Under Graduate and Post Graduate courses. He has guided lots of students in various Under Graduate and Post Graduate Research Projects. At Present, he is working as Professor & Vice-Principal in Ramanandatirtha Engineering College, Nalgonda, India.