

GPS Based Vehicular Monitoring and Tracking Using Arm

Sachin B. Ade
Dept of E&TC
Government college of Engg.
Jalgaon ,Maharashtra
sachin.ade24@gmail.com

Prof. Y. D. Kapse
Dept of E&TC
Government college of Engg.
Jalgaon, Maharashtra
yogitakapse2013@gmail.com

Abstract—This paper presents an efficient system which is not only smarter but economical. It provides proper solution against theft of vehicle, accidents of vehicles etc. It includes ARM7 LPC2148 processor, GSM/GPRS, GPS, MEMS, temperature sensor etc. The whole system is controlled by the ARM7 processor to provide exact location of the vehicle. It also monitors the vehicle parameters e.g. temperature. To manage and carry the proper operation, without any error, a precise program is stored into the ARM7 LPC2148 processor.

Nowadays, rush of vehicles is increasing with increasing population. As a result, the people have come across number of problems like heavy traffic of vehicles, accidents of vehicles etc. The system described in this paper is able to reduce these types of annoying problems to greater extend.

Keywords-LPC2148, GSM, GPRS, GPS, tracking system, monitoring system, accelerometer.

I. INTRODUCTION

We, the human beings, are most creative creatures in the world. We have created number of things to make our lives better. There are plenty of things which are discovered, created and developed by us. One of the most important things is Communication. We all know the transportation is one of the ways of communication. As the growth rate of population is increasing year by year, the need of transportation medium is also increasing. This leads to increase in on-road vehicles. As a result accidents of vehicles, traffic jams, theft of vehicles and number of similar problems related to the rush of vehicles are increasing day by day.

According to Road Transport Yearbook 2011-2012 published by Ministry of Road Transport and Highways, Government of India, the registration of vehicle per 1000 people is reached up to 702. This is the big reason behind increasing road accidents. According to a survey the India has got 64th rank in road accidents occurred per year. This is a huge reason to worry about growing road accident rate. The information which we have stated here is only about accidents. If we think about other problems related to this thing, a terrible picture of current situation will suddenly come in front of us.

By observing all these things and the situation of our country, we often think that there should be a system which will solve all these problems related to growth of the rush of vehicles. Therefore we have designed a system which will restrain the current situation.

The system consists of two parts. One of those is Tracking System and another one is Monitoring System. The tracking system consists of GSM module, GPS module, Accelerometer, temperature sensor, LCD, power supply unit and most importantly ARM7 based LPC2148 processor. The monitoring system consists of a computer and a GSM/GPRS module. The brief information of the system is mentioned in the related paper.

II. SYSTEM COMPONENTS

This section gives knowledge about various components related to the system. Some of the important components are given below.

- ARM7 (Advanced RISC Machine)
- LPC2148 (PROCESSOR)
- GSM/GPRS (MODULE/MODEM)
- GLOBAL POSITIONING SYSTEM (MODULE)
- ACCELEROMETER (VIBRATION DETECTOR)

A. ARM7

The ARM7 is part of family of the Advanced RISC Machines (ARM). It is a low power 32-bit RISC (Reduced Instruction Set Computer) microprocessor. It can be used in application or customer specific ICs. The original ARM7 was based on ARM6 design. It has very simple, fine and fully static design. It is particularly suitable for cost and power-sensitive applications.

Following are the features of the ARM7:

- It has 32-bit data & address bus
- It has Low power consumption 0.6mA/MHz at 3V fabricated in .8µm CMOS
- Its fully static operation ideal for power-sensitive applications
- It has very fast interrupt response for real-time applications
- It has virtual Memory System Support
- It has excellent high-level language support
- It has simple but powerful instruction set

The ARM7 is used in field of:

- Telecom
- Portable computing
- Portable Instrument
- Automotive
- Imaging

The following figure shows basic architecture of ARM7.

devices use serial communication to interface with and need Hayes compatible AT commands for communication with the computer or any microprocessor or microcontroller system.

GSM/GPRS MODEM is a class of wireless MODEM devices. Those are designed for communication of a computer with the GSM and GPRS network. It requires a SIM card just like mobile phones to activate communication with the network. Also they have IMEI i.e. International Mobile Equipment Identity number similar to mobile phones for their identification. A GSM/GPRS MODEM can do the following tasks:

- i) Receive/send/delete SMS messages in a SIM.
- ii) Read/add/search entries of phonebook the SIM.
- iii) Make/Receive/reject a voice call.

We know that, the MODEM requires AT commands, for interacting with processor/controller, which are communicated through serial communication. These commands are sent by the controller/processor/controlling device. The MODEM sends back a result after receiving a command. Different AT commands supported by the MODEM can be sent by the processor/controller/computer to communicate with the GSM and GPRS cellular network.

A GSM/GPRS module assembles a GSM/GPRS modem with standard communication interfaces like RS-232, USB etc., so that it can be easily interfaced with a computer/a microprocessor/microcontroller based system.

D.GPS

GPS i.e. global positioning system technology became a reality through the efforts of the American military. It established a satellite-based navigation system consisting of a network of 24 satellites orbiting the earth. GPS is also known as the NAVSTAR i.e. Navigation System for Timing and Ranging.

GPS operates all across the world. It works in all weather conditions. It help users to track locations and objects. By using GPS technology we can track each individual having GPS receiver thus we can say that the GPS technology can be used by any person having GPS receiver.

Initially, this technique was developed for military applications. During 1980, it was decided to make it available for the civilian use as well by the government. GPS has become an efficient and powerful tool in the field of scientific use, commerce, surveillance and tracking. There are some exceptions for the GPS system. It is used except in locations where it is difficult to detect the signal e.g. underwater, subterranean location, inside the building and caves.

It is used in military applications like navigation, search and rescue, target tracking. It can also be used in Civilian Applications like navigation, geo-tagging, surveying, map making.

The GPS system consists of three parts: Space segment, User segment and Control segment. GPS Receiver MT3318 Module is used in the system that has an active patch antenna. This GPS receiver gives data output in

standard NMEA. NMEA is nothing but National marine electronics association format. The GPS receiver gives -157dBm tracking sensitivity. The module is configured at 9600 baud rate bits per second. The GPS module requires a 5V supply. It can be interfaced with the 5V TTL / CMOS logic.

E.ACCELEROMETER

Acceleration is measured by accelerometer. Acceleration defines a measure of how quickly speed changes. Accelerometer sensor is used to measure static (earth Gravity) or dynamic acceleration. It measures acceleration in all (three) axes. Those three axes are forward/backward, left/right and up/down. The output of accelerometer provides 1.65V to 3.3V in positive direction. The output can also be measured in negative direction in terms of the voltage drop from 1.65V to 0V. The output of accelerometer is in analogue form. It is along with three different output voltages each representing X, Y and Z direction of motion. These (three) voltage signal are processed through ADC0. These signals are processed on three different Channels available on ARM. ADC0 is configured at 4.5MHz clock from system peripheral clock. The 8 bit digital output from ADC0 is fed to UART1 of ARM. Accelerometer is used in this design for the collision detection or accident. The maximum output voltage of accelerometer module is 3.3V. It is a CMOS voltage of the processor.

IV.HARDWARE ARCHITECTURE

The system block diagram consists of ARM7 LPC2148 processor, GPS Module, GSM Module, Temperature Sensor (Thermistor), MEMS Accelerometer, Monitoring System.

The whole operation is controlled by the ARM7 LPC2148 processor. ARM7 is one of the widely used microcontroller family in embedded system application. The MEMS sensor is used to detect the accidents. The LM35 temperature sensor is used to monitor the temperature continuously. GPS module is used to track the vehicle continuously. GSM modem is used to send the SMS to the registered numbers like hospital etc.

The system is used to detect the accidents. It is also used to monitor and tracking of vehicles. System block diagram is shown in figure 3 given below.

Main purpose of the system is to detect the accident and provide emergency services to the accident victims. The accident detection can be done by the system using MEMS sensor. First of all wait for signal from MEMS accelerometer. As mentioned above it will sense the collision. If collision detected the signal from MEMS sensor will be sent to the controller unit. ARM will process this signal and send to GSM. At the same time the processor will make GPS module to track the location of the vehicle. Now GSM will collect all the information which is needed and it will be sent to the registered numbers. And in this way the emergency service will be called and we can save the lives

of accident victims. The system can be used for vehicle identity. Basically system monitors following parameters:

- 1) Temperature monitoring
- 2) Location of vehicle
- 3) Vehicle identity

The block diagram of system is given in figure 3.

BLOCK DIGRAM:

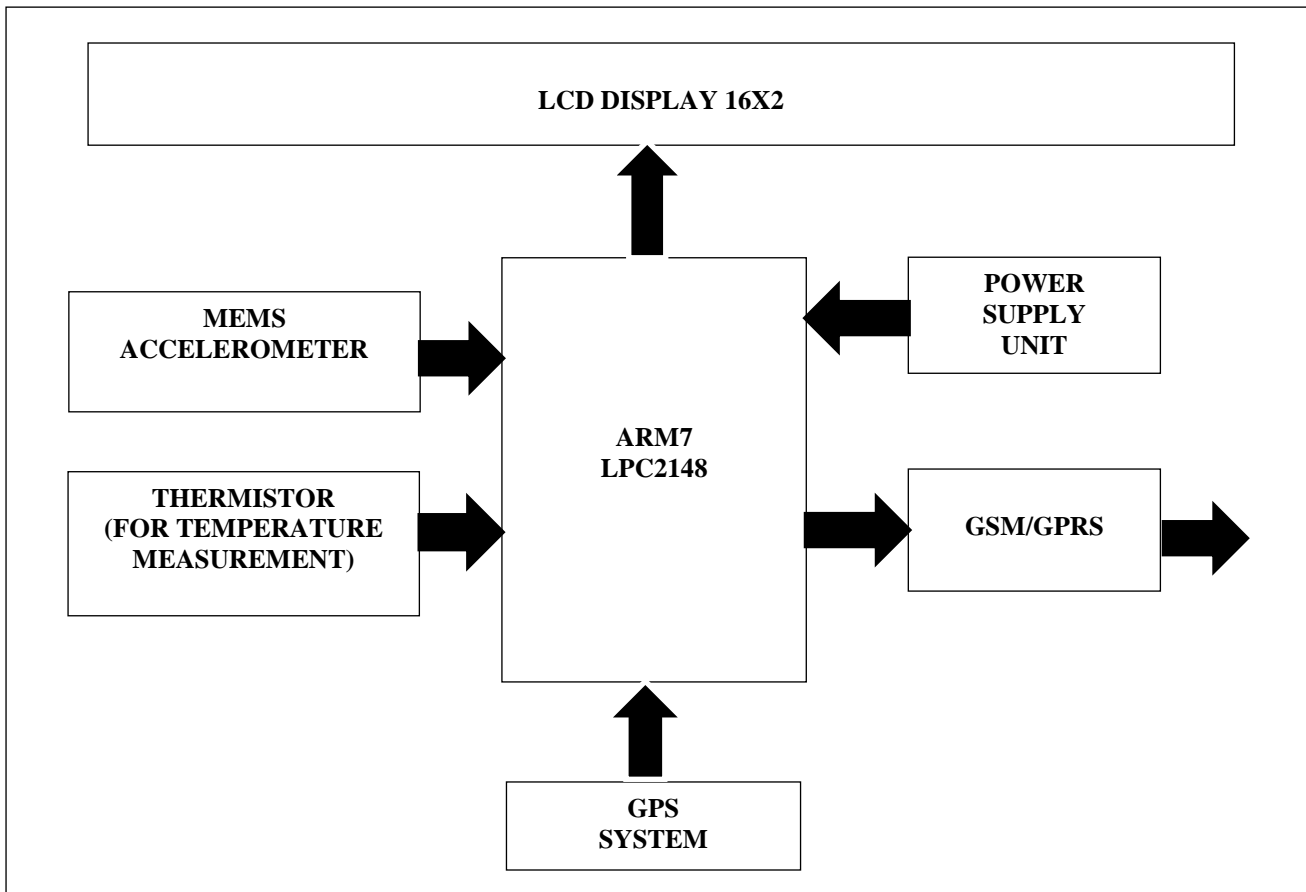


Figure 3. Block Diagram

IV. SOFTWARE REQUIREMENT

The Keil products from ARM include C/C++ compilers, debuggers. It also includes integrated development and simulation environments. It consists of RTOS and middleware libraries, and evaluation boards. This stuffs are used for ARM, Cortex-M, Cortex-R4, 8051, C166, and 251 processor families.

Standard libraries are altered or enhanced to address the peculiarities of an embedded target processor. The signal from accelerometer module is processed by the processor. The analog signal from this accelerometer is applied to the on-chip peripheral ADC0. This ADC0 is configured as a 10-bit output data which gives high precision compared to the 8-bit microprocessors. Here UART1 is used for transmission of digital data. The 8-bit data is transmitted at a time by the UART1. These digital values are transmitted to GSM module through UART1.

REFERENCES

1. "ARM HARDWARE PLATFORM FOR VEHICULAR MONITORING AND TRACKING" BY SAURABH S. CHAKOLE ;ASSTT. PROF. VIVEK R. KAPUR ; ASST. PROF. Y. A. SURYAWANSHI.
2. "Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS MODEM" BY C.PRABHA ;R.SUNITHA; R.ANITHA.
3. "ARM 7 Based Accident Alert and Vehicle Tracking System" by Salas K Jose; X. Anitha Mary; Namitha Mathew.
4. "Vehicle Accident Automatic Detection and Remote Alarm Device" by VarshaGoud; V.Padmaja.