

Fingerprint Based Vehicle Security Monitoring and Tracking Using GSM & GPS Technology

P. NAJINI¹, S. SARATH CHANDRA²

¹PG Scholar, Dept of ECE, QIS Institute of Technology, Ongole, JNTUK, A.P, India, Email: rajini445@gmail.com.

²Assoc Prof, Dept of ECE, QIS Institute of Technology, Ongole, JNTUK, AP, India, Email: ssschandra@gmail.com.

Abstract: Design of Finger print based secured vehicular monitoring and tracking system using GSM and GPS is proposed. This vehicular module provides information about the accident to the hospital and police station. As a result sudden help public life may save and the traffic jams are reduced. To improve the level of supervision and management for cargo transport vehicles, especially trucks carrying coal it is important to develop transport vehicles remote monitoring module. A SD card storage at the (remote) monitoring station, this contains the information regarding Vehicle velocity, position, temperature using MEMS, GPS, temperature sensor values. The information given to monitoring station is in continuous manner and when the accident occurs. The development of vehicular design brings public many conveniences in life but also brings many problems at the same time, for example, traffic congestion, difficulty in monitoring dispersive vehicle, theft and other series of problems.

Keywords: Finger print, MEMS, Temperature Sensor, GSM, GPS, SD Card.

I. INTRODUCTION

In today's world as the population increases day by day the numbers of vehicles also increases on the roads and highways. This result in more accident that interns leads to the traffic jams and public get help instantaneously. This module provides information about the accident to the hospital and police station. As a result sudden help public life may save and the traffic jams are reduced [6]. To improve the level of supervision and management for cargo transport vehicles, especially trucks carrying coal it is important to develop transport vehicles remote monitoring module [2]. A server computer at the (remote) monitoring station that is continuously waiting for data from the system, should record the actions of the vehicle into a database [3]. This contains the information regarding Vehicle velocity, position and temperature in two fashions. The information given to monitoring station is in continuous manner and when the accident occurs. The development of vehicular design brings public many convenience in life but also brings many problems at the same time, for example, traffic congestion, difficulty in monitoring dispersive vehicle, theft and other series of problems [4]. We are intended to made this monitoring wireless using ARM7 hardware platform ported with real time environment.

A. Key feature of this design include:

- Finger print module is used to access the car authentication.
- Vehicle real-time monitoring by sending "its" information regarding velocity, Position (longitude, latitude) to the monitoring station and to the user/owners

mobile that should help them to get medical help if accident or the theft.

- User/owner has an access to get real-time position of a vehicle in real time.
- Also in case of theft vehicle should be stop at the same time where this system is ported on the mobile vehicle.
- It includes a temperature sensor that gives temperature in degree Celsius for monitoring the environmental conditions around the goods or other stuff in the transport vehicle.
- It includes a Acceleration sensor that gives acceleration of vehicle for monitoring the accident occurrence.
- Display that information on LCD and also at the same time these information are stored in the SD card.

II. HARDWARE OF VEHICULAR SYSTEM

The automatic Vehicular Monitoring and Tracking device is comprised of a controller, MEMS sensor, Temperature sensor modules, a GPS module, a GSM module, Fingerprint module. The controller obtains acceleration data from the MEMS sensor. The temperature sensor senses the temperature of the vehicle. If there accident occurs the system sends the message to the control station and hospital by GSM module. The contents of a message include the latitude and longitude of the location of the current vehicle, temperature. If the vehicle theft the message will be sent to the owner mobile simultaneously by using finger print module. With this message we can monitoring and track the vehicle. Even if the driver loses consciousness in an accident, the driver can also be rescued in time and status will be displayed in LCD. The main aim of this project is that traces

the vehicle and provides the security from the engine overheating. And every time the SD card in the vehicle stores the information about the engine temperature and GPS values along with the time. This information will be used for future reference to know the time and the cause of the accident of the vehicle occurred.

In this project the fingerprint module is used to check the authorized person entrance into the vehicle. In this module we have two steps first one is to enroll our fingerprint and it can stored, configure it in 1:1 or 1: N mode for identifying the person. Whenever you place your fingerprint it can check the enrolled one and accessed if it is matched. MEMS sensor is used to monitor the moment of the vehicle. If this sensor value goes beyond some particular value, it means the vehicle met with an accident, the information was received by the owner of the vehicle and his friends about the accident and the GPS values. Three numbers are stored by default by using the code. By using a message we can change those numbers in future. If the temperature goes beyond particular value, then the engine of the vehicle stops immediately and alerts the user by SMS along with the GPS values [8]. Every time the sensor activates, the system gives the buzzer. The LCD display was used to display the GPS values and the sensor values. For every 10 seconds the sensors data and GPS values are gets stored in the SD card in .xls format. You can read the SD card by using the card reader. The coding was written in embedded C language and compile using keil compiler. The relevant hex file was dumped into the microcontroller using FLASH MAGIC software.

A. Block diagram of proposed system

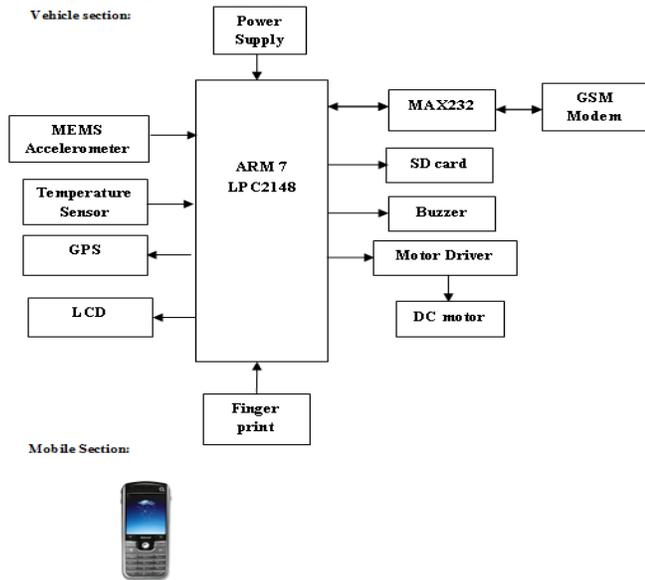


Figure1: Fingerprint based vehicle security Monitoring and Tracking system block diagram.

A. GSM Module

Global System for Mobile communications (GSM) is the almost popular wireless standard for mobile phones in the world. GSM module allows transmission of Short message

service (SMS) in TEXT mode and PDU mode. The proposed design uses SIM 300 GSM module in text mode. This design uses SIM300 GSM module that provide 900/1800/1900MHz Tri-band for VOICE, SMS, DATA, and FAX. This module

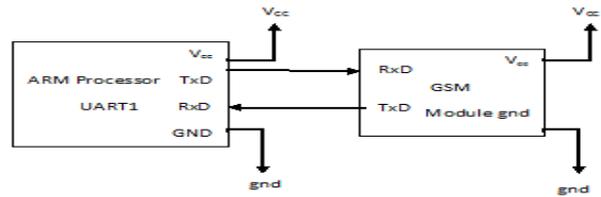


Figure2: Interfacing of GSM module with ARM Processor on UART1.

operates on AT command over TTL interface. AT command is an abbreviation for Attention command that is recognized by GSM Module [9]. This abbreviation is always used to start a command line to be send from TE (Terminal Equipment) to TA (Terminal Adaptor).The information contains information speed, position (longitude, latitude), identity and temperature of a vehicle that is transmitted to the monitoring station by the SMS through the GSM network.. SIM 300 Module works on 12V, 2A power supply. The module is configured at 9600 baud rate.

B. GPS Module

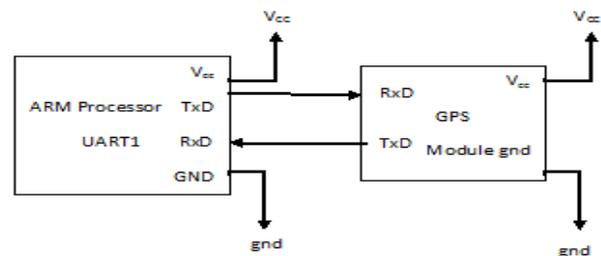


Figure3: Interfacing of GPS module with ARM Processor on UART1.

Global Position System (GPS) [1] is a space-based satellite navigation that provides location and time information in all weather conditions, anywhere on or near the Earth. GPS Receiver MT3318 Module is used that have a active patch antenna from Cirocomm. The GPS receiver tracks 51 satellites simultaneously. The module is mounted on the PCB along with the 3.3V low drop voltage regulator, transmit, receive and power indication LEDs, Schmitt trigger based buffer for 5V to 3.3V logic level conversion. This GPS receiver gives data output in standard National marine electronics association (NMEA) format [5]. The GPS receiver gives -157dBm tracking sensitivity. The module is configured at 9600 baud rate. Module requires a 5V supply and can be interfaced with the 5V TTL / CMOS logic.

The detail NMEA protocol:

1. GPGGA - Global Positioning System Fix Data
2. GPGSA - GPS DOP and active satellites
3. GPRSV - GPS Satellites in view
4. GPRMC: Recommended minimum specific GPS/Transit data Speed.

1. Features

- Calibrated directly in ° Celsius (Centigrade)
- Linear + 10.0 mV/°C scale factor.
- 0.5°C accuracy guaranteed (at +25°C)
- Rated for full -55° to +150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 µA current drain
- Low self-heating, 0.08°C in still air
- Nonlinearity only ±1/4°C typical
- Low impedance output, 0.1 W for 1 mA load

G. SD Card (or) Data Storage

The system includes memory card which is used to store data. The data contains vehicle 'ID', 'Position' (Longitude, 'Latitude'), date, time and velocity of a vehicle. The memory card can be expanded depending upon the purpose. The data storage provision is implemented using Serial Peripheral Interface (SPI) protocol supported by the LPC2148 ARM7processor. This stored data can be access any time for monitoring (speed of a vehicle, correct path, collision etc.), comparison, and traffic analysis purpose. By using memory card reader, we can get the stored data in PC.

III. FIRMWARE IMPLEMENTATION

A. Firmware Implementation

Firmware implementation deals in programming the microcontroller so that it can control the operation of the IC's used in the implementation. In the present work, we have used the Orcad design software for PCB circuit design, the Keil µv4 software development tool to write and compile the source code, which has been written in the C language. The Flash magic programmer has been used to write this compile code into the microcontroller.

Software Tools Required

- Orcad
- Keil µVision4
- Flash Magic

Orcad is used for drawing the schematic diagram, it is mentioned above. Keilµv4, Flash magic are the two software tools used to program microcontroller. The working of each software tool is explained below in detail.

1. Programming code description

A compiler for a high level language helps to reduce production time. To program the LPC2148 microcontroller the Keil µv4 is used. The programming is done in the embedded C language or Assembly language. Keil µv4 is a suite of executable, open source software development tools for the microcontrollers hosted on the Windows platform. One of the difficulties of programming microcontrollers is the limited amount of resources the programmer has to deal with. In personal computers resources such as RAM and processing speed are basically limitless when compared to microcontrollers. In contrast, the code on microcontrollers should be as low on resources as possible.

2. Keil Compiler

Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code. The compilation of the C program converts it into machine language file (.hex). This is the only language the microcontroller will understand, because it contains the original program code converted into a hexadecimal format. During this step there are some warnings about eventual errors in the program. If there are no errors and warnings then run the program, the system performs all the required tasks and behaves as expected the software developed. If not, the whole procedure will have to be repeated again. Below figures 6 and 7 shows the compilation of the program.

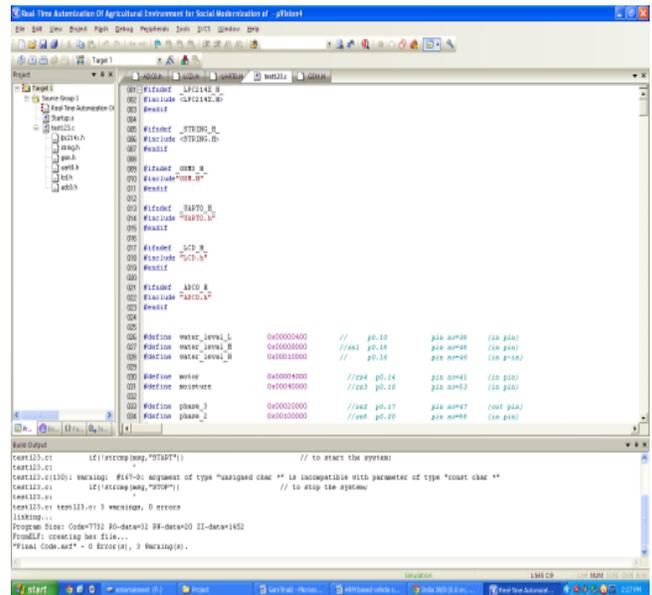


Figure 6: Compilation of source Code.

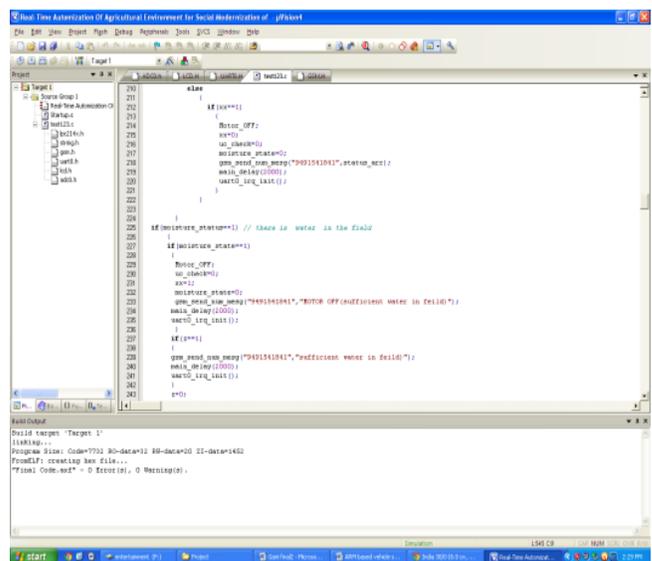


Figure 7: Run process of compiled Code.

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B. Flash magic

Flash Magic is a PC tool for programming flash based microcontrollers from NXP using a serial or Ethernet protocol while in the target hardware. The figures 8 and 9 below show how the baud rate is selected for the microcontroller, how are the registers erased before the device is programmed.

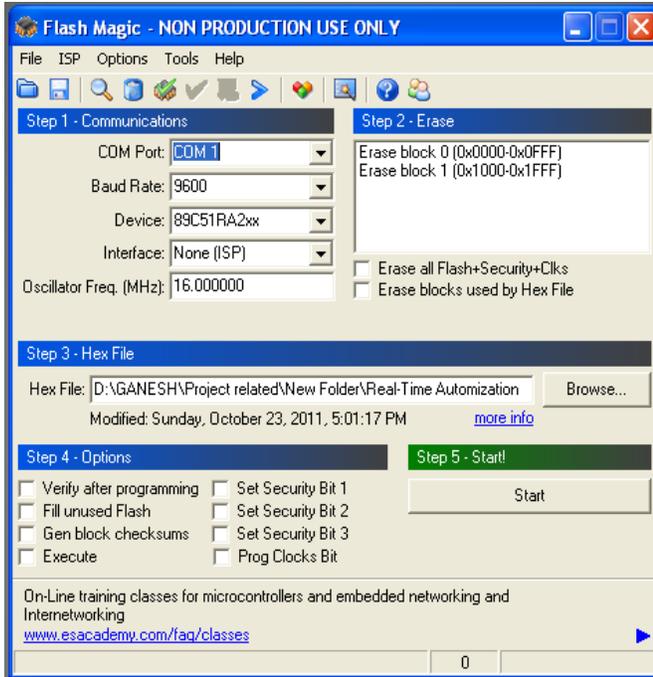


Figure 8: Dumping of the code into Microcontroller.

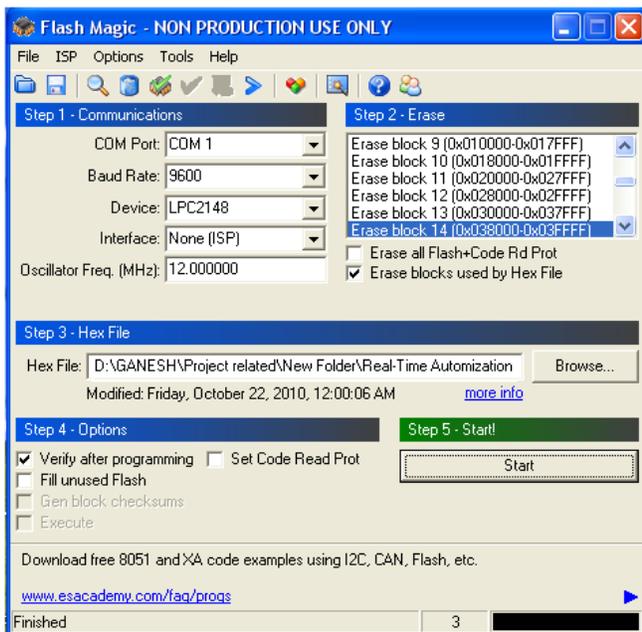


Figure 9: Dump process finished.

If dumping process of the hex file is completed, then the controller will work as per our requirement.

IV.RESULTS

The proposed system using ARM7 controller was designed and checked successfully the results are shown below.



Figure 10: Proposed system.



Figure 11: Indicating enrolling switching.



Figure 12: Identification of finger print.



Figure 13: When accident occurred display.



Figure 14: Message sending in abnormal condition of sensors



Figure 15: date and time display in ON condition of vehicle.



Figure 16: Temperature and MEMS values display to monitor vehicle condition.



Figure 17: Display GPS values in abnormal condition.

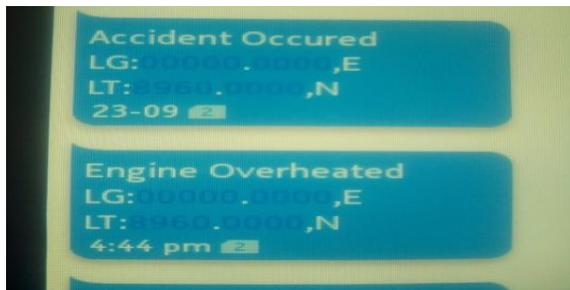


Figure 18: User get message of vehicle position when accident and over temp occurred.

V. CONCLUSION

The Fingerprint based vehicle security Monitoring and Tracking system provides authentication using fingerprint module; information of a vehicle like velocity, position and temperature through a GPS module and identity of a vehicle to a monitoring station and to a mobile phone according to a definite event stored in a program or a query from a monitoring station. Accelerometer senses the collision of the vehicle and sends this information in real time to a hospital/police station. The monitoring station display these information on LCD also stored these information in memory card for further process according to a program. The system is useful in much application such as surveillance, security, tracking, which may be installed in cargo trucks, cars, motorcycle, and boat. The system can be used in many applications.

VI. REFERENCES

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Author's Profile:



Ms. PAKALA NAJINI has completed her B.Tech in ECE Department from Pace Institute of Technology and Sciences, Valluru, JNTUK. Presently she is pursuing her Masters in VLSI & Embedded Systems from QIS Institute of Technology, Ongole, JNTUK, A.P, India.



Mr. S. SARATH CHANDRA completed his B. E. from Anna University, Chennai, received his M. Tech from JNTU Hyderabad and presently he is pursuing Ph. D. in the field of Embedded Systems from K L University. He is having 9 years of experience in teaching, presently working in QIS Institute of

Technology, Ongole as an Associate Professor in the Department of Electronics & Communication Engineering.