

ARM based Advanced Vehicle Monitoring System with Accidental Alert

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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. The proposed design provides information regarding vehicle Identity, speed, and position on real time basis. This information are collected by the ARM7 TDMI-S core processor LPC2148 by using different module and dispatch it to the monitoring station where it stores the information in database and display it on graphical user interface (GUI) that is user friendly. GUI is built on Microsoft Visual Studio 2010. This design provides information in real time using $\mu\text{C}/\text{OS-II}$.

Key words: ARM7 TMI-S, MEMS Accelerometer, GPS, GSM, LPC2148, Wireless monitoring station, $\mu\text{C}/\text{OS-II}$.

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 ife 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 [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. This contains the information regarding Vehicle velocity, position, identity 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 operating system $\mu\text{C}/\text{OS-II}$.

PROPOSED HARDWARE SYSTEM

Position (longitude, latitude) identity and temperature to the monitoring station and to the user/owners mobile that should help them to get medical help if accident or the theft. We are intended to make this monitoring wireless using ARM7 hardware platform. In today's world accidental deaths are increasing day by day in all most all accidents the death caused due to lack of treatments in time, because of not getting information to the nearest hospitals and police station immediately due to the present existing method of calling any person to the hospital and police station.

THE HARDWARE SYSTEM

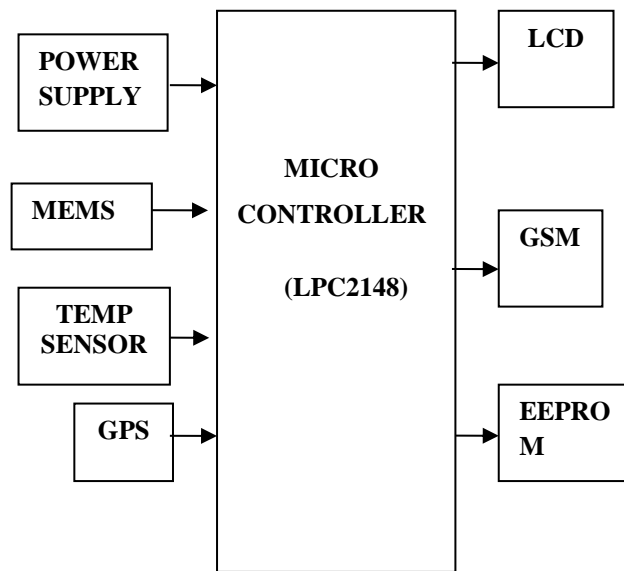


Fig.1.Block diagram

Micro controller:

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI:

ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display:

LCD is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

BOARD HARDWARE RESOURCES**GSM Module**

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in many parts of the world. The mobile communications has become one of the driving forces of the digital revolution. Every day, millions of people are making phone calls by pressing a few buttons. Little is known about how one person's voice reaches the other person's phone that is thousands of miles away. Even less is known about the security measures and protection behind the system. The complexity of the cell phone is increasing as people begin sending text messages and digital pictures to their friends and family. The cell phone is slowly turning into a handheld computer. All the features and advancements in cell phone technology require a backbone to support it. The system has to provide security and the capability for growth to accommodate future enhancements. General System for Mobile Communications, GSM, is one of the many solutions out there. GSM has been dubbed the "Wireless Revolution" and it doesn't take much to realize why GSM provides a secure and confidential method of communication.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in many parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. GSM operates in the 900MHz, 1800MHz, or 1900 MHz frequency bands. GSM has been the backbone of the phenomenal success in mobile telecoms over the last decade. Now, at the dawn of the era of true broadband services, GSM continues to evolve to meet new demands. One of GSM's great strengths is its international roaming capability, giving consumers a seamless service. This has been a vital driver in growth, with around 300 million. In the Americas, today's 7 million subscribers are set to grow rapidly, with market potential of 500 million in population, due to the introduction of GSM 800, which allows operators using the 800 MHz band to have access to GSM technology too.

GSM together with other technologies is part of an evolution of wireless mobile telecommunication that includes High-Speed Circuit-Switched Data (HSCSD), General Packet Radio System (GPRS), Enhanced Data GSM Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS). GSM security issues such as theft of service, privacy, and legal interception continue to raise significant interest in the GSM community. The purpose of this portal is to raise awareness of these issues with GSM security. The mobile communications has become one of the driving forces of the digital revolution. Every day, millions of people are making phone calls by pressing a few buttons. Little is known about how one person's voice reaches the other person's phone that is thousands of

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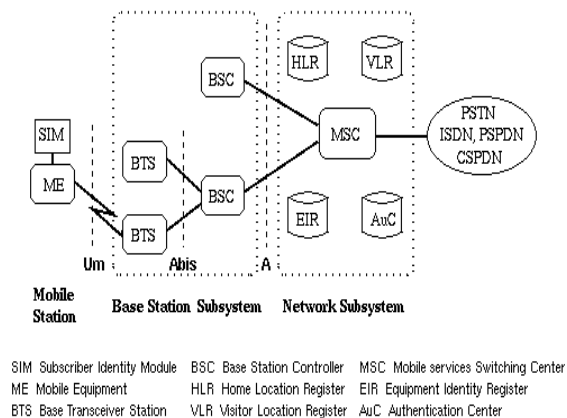


Fig.2. General Architecture of a GSM network

MEMS

Micro electro mechanical systems (MEMS) are small integrated devices or systems that combine electrical and mechanical components. Their size range from the sub micrometer (or sub micron) level to the millimeter level and there can be any number, from a few to millions, in a particular system. MEMS extend the fabrication techniques developed for the integrated circuit industry to add mechanical elements such as beams, gears, diaphragms, and springs to devices.

Examples of MEMS device applications include inkjet-printer cartridges, accelerometers, miniature robots, microengines, locks, inertial sensors, micro transmissions, micromirrors, micro actuators, optical scanners, fluid pumps, transducers and chemical, pressure and flow sensors. Many new applications are emerging as the existing technology is applied to the miniaturization and integration of conventional devices.

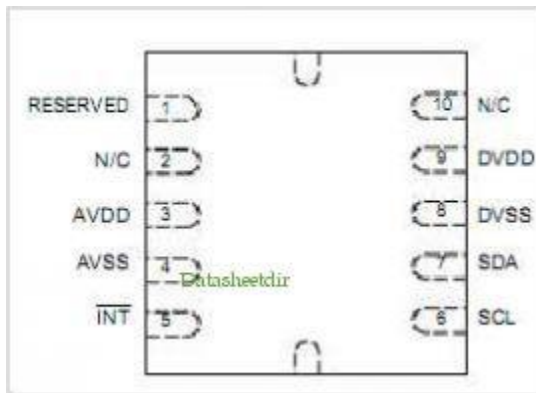


Fig.3: MEMS IC

These systems can sense, control and activate mechanical processes on the micro scale and function individually or in arrays to generate effects on the macro scale. The micro fabrication technology enables fabrication of large arrays of devices, which individually perform simple tasks, but in combination can accomplish complicated functions.

MEMS are not about any one application or device, or they are not defined by a single fabrication process or limited to a few materials. They are a fabrication approach that conveys the advantages of miniaturization, multiple components and microelectronics to the design and construction of integrated electromechanical systems. MEMS are not only about miniaturization of mechanical systems but

they are also a new pattern for designing mechanical devices and systems.

THERMISTOR

A **thermistor** is a type of resistor whose resistance varies significantly with temperature, more so than in standard resistors. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiters, temperature sensors, self-resetting overcurrent protectors, and self-regulating heating elements. Thermistors differ from resistance temperature detectors (RTD) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges, while thermistors typically achieve a higher precision within a limited temperature range, typically $-90\text{ }^{\circ}\text{C}$ to $130\text{ }^{\circ}\text{C}$.



Fig.4: Temperature sensor

EEPROM

EEPROM (also written E²PROM and pronounced e-e-prom or simply e-squared), which stands for Electrically Erasable Programmable Read-Only Memory, is a type of non-volatile memory used in computers and other electronic devices to store small amounts of data that must be saved when power is removed, e.g., calibration tables or device configuration. When larger amounts of more static data

are to be stored (such as in USB flash drives) other memory types like flash memory are more economical. EEPROMs are realized as arrays of floating-gate transistors. In 1983, Greek American George Perlegos at Intel developed the Intel 2816, which was built on earlier EPROM technology, but used a thin gate oxide layer so that the chip could erase its own bits without requiring a UV source. Perlegos and others later left Intel to form Seeq Technology, which used on-device charge pumps to supply the high voltages necessary for programming EEPROMs.

GPS:

Global Positioning System (GPS) technology is changing the way we work and play. You can use GPS technology when you are driving, flying, fishing, sailing, hiking, running, biking, working, or exploring. With a GPS receiver, you have an amazing amount of information at your fingertips. Here are just a few examples of how you can use GPS technology.

GPS technology requires the following three segments.

- Space segment.
- Control segment.
- User segment

Space Segment

At least 24 GPS satellites orbit the earth twice a day in a specific pattern. They travel at approximately 7,000 miles per hour about 12,000 miles above the earth's surface. These satellites are spaced so that a GPS receiver anywhere in the world can receive signals from at least four of them.

Control Segment

The control segment is responsible for constantly monitoring satellite health, signal integrity, and orbital

configuration from the ground control segment includes the following sections: Master control station, Monitor stations, and Ground antennas.

User Segment

The GPS user segment consists of your GPS receiver. Your receiver collects and processes signals from the GPS satellites that are in view and then uses that information to determine and display your location, speed, time, and so forth. Your GPS receiver does not transmit any information back to the satellites.

The following points provide a summary of the technology at work:

- The control segment constantly monitors the GPS constellation and uploads information to satellites to provide maximum user accuracy
- Your GPS receiver collects information from the GPS satellites that are in view.
- Your GPS receiver accounts for errors. For more information, refer to the Sources of Errors.
- Your GPS receiver determines your current location, velocity, and time.
- Your GPS receiver can calculate other information, such as bearing, track, trip distance, and distance to destination, sunrise and sunset time so forth.
- Your GPS receiver displays the applicable information on the screen.

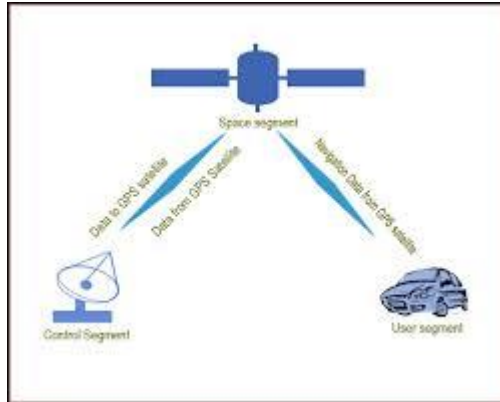


Fig.5: GPS Working

CONCLUSION

The Vehicular System provides information of a vehicle like velocity, position, 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. 760Accelerometer 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 GUI also stored these information in database 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.

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