

Vehicular Monitoring and Tracking Using RASPBERRY PI

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ABSTRACT: Design of Vehicular monitoring and tracking system using RASPBERRY PI 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 RASPBERRY PI 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: RASPBERRY PI, GPS, GSM, Wireless monitoring station, $\mu\text{C}/\text{OS-II}$.

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 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 RASPBERRY PI hardware platform ported with real time operating system $\mu\text{C}/\text{OS-II}$.

II. THE HARDWARE SYSTEM

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.

III. RASPBERRY PI

The Broadcom SoC used in the Raspberry Pi is equivalent to a chip used in an old smart phone (Android or iPhone). While operating at 700 MHz by default, the Raspberry Pi provides a real world performance roughly equivalent to the 0.041 GFLOPS On the CPU level the performance is similar to a 300 MHz Pentium II of 1997-1999. The GPU provides 1 Gpixel/s or 1.5 of graphics processing or 24 GFLOPS of general purpose computing performance. The graphics capabilities of the Raspberry Pi are roughly equivalent to the level of performance of the Xbox of 2001. The Raspberry Pi chip, operating at 700 MHz by default, will not become hot enough to need a heat sink or special cooling. The SoC is stacked underneath the RAM chip, so only its edge is visible. On the older beta

model B boards, 128 MB was allocated by default to the GPU, leaving 128 MB for the CPU. On the first 256 MB release model B (and Model A), three different splits were possible. The default split was 192 MB (CPU RAM), which should be sufficient for standalone 1080p video decoding, or for simple 3D, but probably not for both together. 224 MB was for Linux only, with just a 1080p frame buffer, and was likely to fail for any video or 3D. 128 MB was for heavy 3D, possibly also with video decoding (e.g. XBMC).

GSM MODEM SECTION: This section consists of a GSM modem. The modem will communicate with microcontroller using serial communication. The modem is interfaced to microcontroller using MAX 232, a serial driver..

EEPROM: This section acts as a backend database for the project. This section is realized using an EEPROM integrated circuit chip.

THERMISTOR: Thermistors are a temperature sensing device. It is used to sense the temperature. In this project by depends on the value of temperature the exhaust fan will run.

GPS MODEM: A GPS modem is used to get the signals and receive the signals from the satellites. In this project, GPS modem get the signals from the satellites and those are given to the microcontroller. The signals may be in the form of the coordinates; these are represented in form of the latitudes, longitudes and altitudes. 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 RASPBERRY PI 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

SHOCK SENSOR: Pressure sensor is used to convert pressure as physical Quantity into electrical impulses. The pressure sensor used here is piezoelectric sensor.

GAS SENSOR: A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

IV. THE SOFTWARE SYSTEM

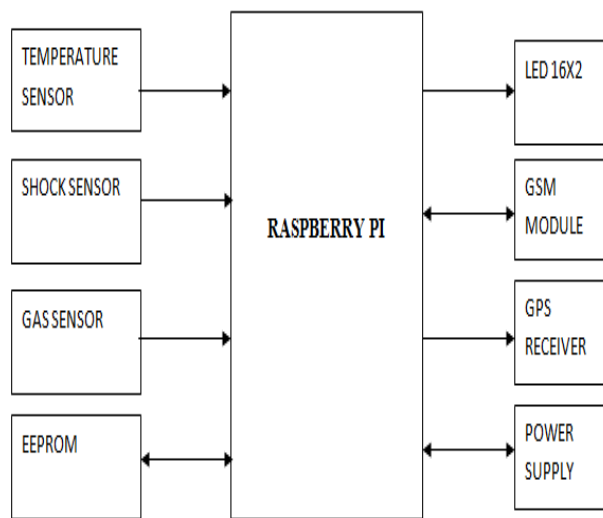
RASPIAN OS:

The Raspberry Pi primarily uses Linux kernel-based operating systems. The ARM11 chip at the heart of the Pi is based on version 6 of the ARM. The current releases of several popular versions of Linux, including Ubuntu. will not run on the ARM11. It is not possible to run Windows on the Raspberry Pi. Raspbian (recommended) – Maintained independently of the Foundation; based on the ARM hard-float (armhf) Debian 7 'Wheezy' architecture port originally designed for ARMv7 and later processors (with Jazelle RCT/ThumbEE, VFPv3, and NEON SIMD extensions), compiled for the more limited ARMv6 instruction set of the Raspberry Pi. A minimum size of 4 GB SD card is required. There is a Pi Store for exchanging programs.

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible.

V. DESIGN OF PROPOSED HARDWARE SYSTEM

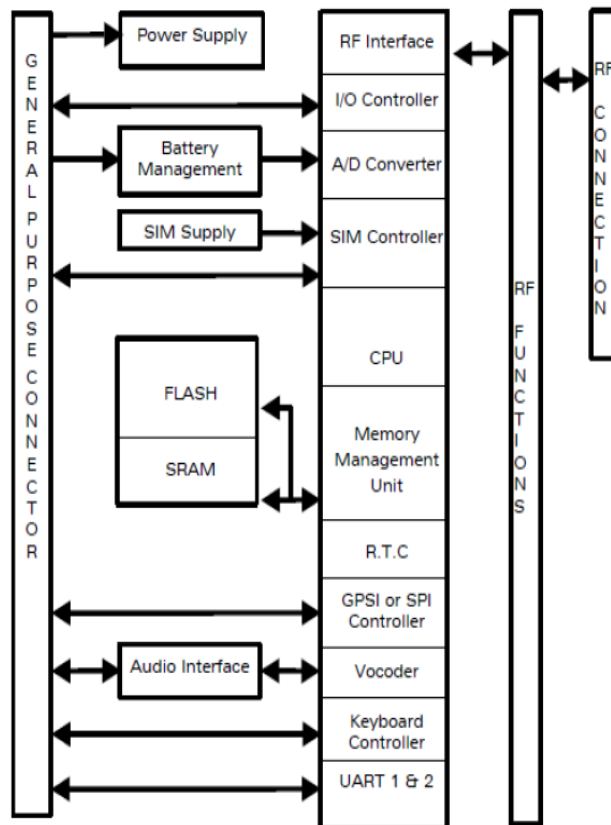


VI. BOARD HARDWARE RESOURCES FEATURES

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 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.



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 °C to 130 °C.

International Journal of Innovative Research in Science, Engineering and Technology*An ISO 3297: 2007 Certified Organization**Volume 4, Special Issue 2, February 2015***5th International Conference in Magna on Emerging Engineering Trends 2015 [ICMEET 2015]****On 27th & 28th February, 2015****Organized by****Department of Mechanical Engineering, Magna College of Engineering, Chennai-600055, India.****EEPROM**

EEPROM (also written E2PROM and pronounced eeprom 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 MODULE:

Global Position System (GPS) is a space-based satellite navigation that provides location and time information in all weather conditions, anywhere on or near the Earth. 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. The GPS receiver gives -157dBm.

SHOCK SENSOR:

A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, strain or force by converting them to an electrical charge. Based on piezoelectric technology various physical quantities can be measured; the most common are pressure and acceleration. For pressure sensors, a thin membrane and a massive base is used, ensuring that an applied pressure specifically loads the elements in one direction. For accelerometers, a seismic mass is attached to the crystal elements. When the accelerometer experiences a motion, the invariant seismic mass loads the elements according to Newton's second law of motion .

The main difference in the working principle between these two cases is the way forces are applied to the sensing elements. In a pressure sensor a thin membrane is used to transfer the force to the elements, while in accelerometers the forces are applied by an attached seismic mass. Sensors often tend to be sensitive to more than one physical quantity. Pressure sensors show false signal when they are exposed to vibrations. Sophisticated pressure sensors therefore use acceleration compensation elements in addition to the pressure sensing elements. By carefully matching those elements, the acceleration signal (released from the compensation element) is subtracted from the combined signal of pressure and acceleration to derive the true pressure information. Vibration sensors can also be used to harvest otherwise wasted energy from mechanical vibrations. This is accomplished by using piezoelectric materials to convert mechanical strain into usable electrical energy.

GAS SENSOR:

Gas detectors measure and indicate the concentration of certain gases in an air via different technologies. Typically employed to prevent toxic exposure and fire, gas detectors are often battery operated devices used for safety purposes. They are manufactured as portable or stationary (fixed) units and work by signifying high levels of gases through a series of audible or visible indicators, such as alarms, lights or a combination of signals. While many of the older, standard gas detector units were originally fabricated to detect one gas, modern multifunctional or multi-gas devices are capable of detecting several gases at once. Some detectors may be utilized as individual units to monitor small workspace areas, or units can be combined or linked together to create a protection system.

As detectors measure a specified gas concentration, the sensor response serves as the reference point or scale. When the sensors response surpasses a certain pre-set level, an alarm will activate to warn the user. There are various types of detectors available and the majority serves the same function: to monitor and warn of a dangerous gas level. However, when considering what type of detector to install, it is helpful to consider the different sensor technologies. Gas

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detectors are categorized by the type of gas they detect: combustible or toxic. Within this broad categorization, they are further defined by the technology they use: catalytic and infrared sensors detect combustible gases and electrochemical and metal oxide semiconductor technologies generally detect toxic gases.\

VII. 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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