

ARM BASED VEHICLE MONITORING SYSTEM

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ABSTRACT

This Project presents an automotive localization system using GPS and GSM-SMS services with vehicle monitoring. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. The system can be interconnected with the car alarm system and alert the owner on his mobile phone. This tracking system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. This system monitors temperature of the engine. If the temperature increases it automatically send alerts to authorized person and ignition turn off for protection of engine. The presented application is a low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time.

Keywords: GSM, GPS, ARM-7, LCD, Vibration switch, Buzzer.

1. INTRODUCTION

The major death rates in the world are due to the road accidents. India faces the highest death rate in the world. Reasons for the accident are speed driving, lacking sufficient sleep, drink and drive. Automatic accident detection helps to recognize the location of the accident and to find the location of the accident. For an ambulance vehicle, every second is important. If there is a delay in the arrival of ambulance, there will be a loss of life. Delay is caused mainly because of the traffic signals. Therefore, time factor is an important task. Radio Frequency module is

Used to control the traffic signals automatically. Therefore, the ambulance vehicle will reach the hospital in exact time to save the human. In addition, the main goals for the automatic accident detection techniques are to detect the accident and to send the message automatically to the emergency contacts along with the location. Emergency contacts include family members, friends, hospitals, police station etc. The incidents of accidental deaths have shown increasing trend during the year 2000-2015 with an increase of 50 percent in the year 2010 as compared to the year 2000. According to Planning Commission of India, the total annual economic loss is 2.5% of India's GDP due to rising number of road

fatalities. Another important reason can be improper medical help. Survey shows that each minute that an injured crash victim does not receive emergency medical care can cause into fatality. Most victims lose their lives due to such reasons. Therefore, this idea of saving lives by curing the problem comes into existence. Real-time position of the vehicles is informed by the system using the pre-install smart sensing accelerometer equipment. This data is recorded and all the information can be observed by remote location to provide the required services to the victims. Tracking of the vehicle can be done in all-weather condition. GPS and GSM technologies are used in this system to provide all the data to the remote server which is then processed and the extracted information is used to provide the services to the individual at the time of emergency. The main contributions of this paper are: (a) Vehicle registration and preparation, (b) Passengers 'registration, (c) Monitoring accidents through a web interface located in the PSO headquarter. An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result. The **“ARM-7 based Vehicle Monitoring system”** using ARM-7 microcontroller is an exclusive project which is used to designing a completely automated security access system for vehicles.

2. RELATEDWORK

Due to higher accident rates vehicle tracking is very important now days. This can be done easily by the use of the GPS technology. Various other applications can also be used to do so [1]. These applications are also used in fleet management, anti-theft vehicle systems and accident recovery [2]. Vehicle Tracking: The vehicle tracking technology uses the GPS systems via many applications. These applications are very helpful as the track the vehicles and their partner web applications also monitor the vehicles continuously [1]. There are various ways to track a vehicle. Larger organizations use web services to tract large number of vehicles whereas small scale industries can use various mobile apps. To find exact location, distance and estimating time to reach particular destination an android app is developed [3]. Theoretical it is easy to say we can get the exact location of a vehicle, but practically sometimes it is next to impossible. Even though we have advanced technology it is very difficult to actually obtain the geographical coordinates correct all the time. Use Kalman filter can be done, to get an exact longitude and latitude position [9]. Location Identifier and immediate recovery of accident: As we already know there are numerous ways to track the location of a vehicle which has already met with an accident. We also know that there are ways where we can notify the authorized person about the mishap that has happened. When accidents happen it becomes very difficult to send help to the victims as no notification the accident has the reached the hospitals, police or the family members of the victim. Thus resulting in a huge loss of life. To avoid such situations we can send an automated SMS to the predefined numbers in the system. Bluetooth Technology is used as a medium to activate the GPS by the sensors. It

is an intermediate between the sensors and the GPS. But now not only Bluetooth technology can be used but also MESA technology can be used to activate GPS and send the location coordinates to the predefined numbers [10].

3. EXISTING SYSTEM

In existing system vehicle monitoring and tracking system no automated accident alerts provided user need to update manually to authorized people it increases the damage rate high. No auto update of vehicle smart features monitoring in the existing system to avoid all here author integrates ARM based vehicle monitoring system.

4. PROPOSED SYSTEM

This system can monitor the vehicle, prevent, as well as get auto location when accident occur and prevents accidents when any vehicle came near to this vehicle through ir sensor. In this Project it is proposed to design an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). In this project 8052 microcontroller is used for interfacing to various hardware peripherals. The current design is an embedded application, which will continuously monitor a moving Vehicle and report the status of the Vehicle on demand. For doing so an ARM-7 microcontroller is interfaced serially to a GSM Modem and GPS Receiver.

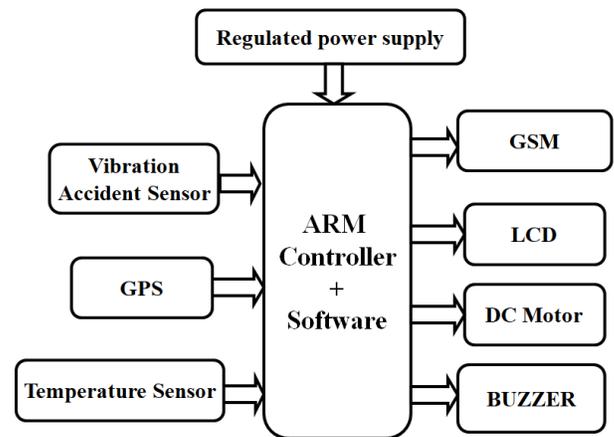


Fig.1. Block diagram

A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. An EEPROM is used to store the data received by GPS receiver. The hardware interfaces to microcontroller are LCD display, GSM modem and GPS Receiver. In order to interface GSM modem and GPS Receiver to the controller, a MUX is used. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels. Different types or sensors such as infrared sensors and fire detector are used for detecting different types of problem encountered in the vehicle such as theft, accident, fire warning etc. In any of these cases messages will be automatically send to the intended receiver. When a request by user is sent to the number at the modem, the system automatically sends a return reply to that particular mobile indicating the position of the

vehicle in terms of latitude and longitude. A Program has been developed which is used to locate the exact position of the vehicle and also to navigated track of the moving vehicle on Google Map.

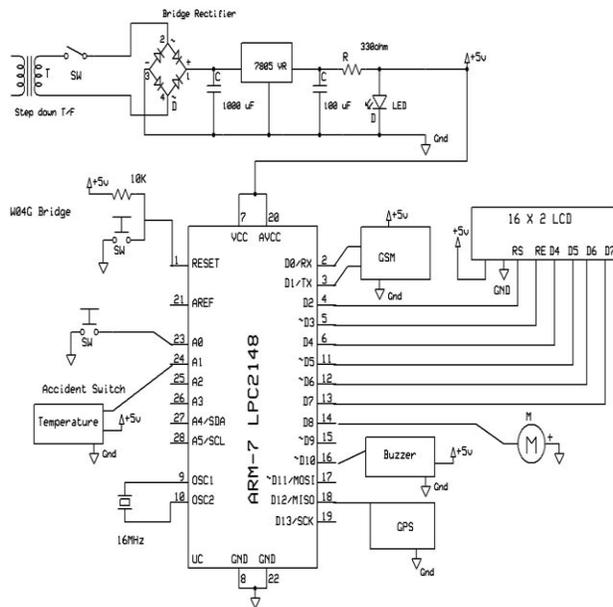


Fig.2. Schematic Diagram

WORKING

Whenever a vehicle is met with an accident then owner can send an SMS to the vehicle to know the location or position of the vehicle. The SMS sent would pass through the GSM service provider and then reach the vehicle, which is travelling, because the vehicle has a GSM device with a SIM card. This GSM modem will receive the SMS and send to the microcontroller in the vehicle. The microcontroller will receive this SMS and compare the password and the command. If the information matches the already programmed one, then it will perform the request required by the owner. It will then send the required location; latitude, longitude and time to the registered number of the owner and the results will be display on the screen of the owner’s mobile phone. The owner can then send a message to stop the engine of the vehicle. The Microcontroller processes this information and

this processed information is sent to the user/owner using GSM modem. This system monitors temperature of the engine. If the temperature increases it automatically send alerts to authorized person and ignition turn off for protection of engine.

The care services in medical centers are consistent with the assessment of the well being of the patients. The body of the patient is continuously monitored for temperature and pulse and registered. This interface is simple, illustrating the usage of ESP8266 and Arduino IoT Patient Safety Monitoring Program. Temperature sensors Pulse and LM35 monitor separately BPM and Ambient Temperature. The Arduino designs the application and shows an LCD panel with 16 * 2. Starts sending the data to the IoT application server via WLAN ESP8266 unit partners with both the WiFi. Thing speaks is the IoT server used in this. Finally, data from anywhere in the world can only be verified by identifying the channel Thing speak. Hardware modules used in this proposed system is explained in below.

5. EMBEDDED MODULES

ARM-7:LPC2148

The Arduino Uno R3 is a open source microcontroller board based on the ATmega328 chip. This Board has 14 digital input/output pins, 6 analog input pins, Onboard 16 MHz ceramic resonator, Port for USB connection, Onboard DC power jack, An ICSP header and a microcontroller reset button. It contains everything needed to support the microcontroller. Using the board is also very easy, simply connect it to a computer with a USB cable or power it with DC adapter or battery to get started. The recommended range is 5v to 12v for Arduino Uno.

Features:-Microcontroller:

ATmega328P,Operating Voltage: 5V,Input Voltage: 7-12V,Digital I/O Pins: 14 (of which 6 provide PWM output),Analog Input Pins: 6,DC Current: 40mA,Flash Memory: 32 KB,SRAM: 2 KB,EEPROM: 1 KB,Clock Speed: 16 MHz



Fig.3. ARM-7

LCD Monitor:

Liquid Crystal Display used to display the parameters for status of the proposed system. This can display 32 characters having 2 columns. When each sensor is activated corresponding message will be displayed in 16*2 LCD modules. In this we use four data pins using this pins we transfer the data from micro preprocessor to LCD.



Fig.4. 16X2 LCD

GSM - Module:

GSM, which stands for Global System for Mobile communications, reigns (important) as the world’s most widely used cell phone technology. Cell phones use a cell phone service carrier’s GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz It is estimated that many countries outside of Europe will join the GSM partnership.

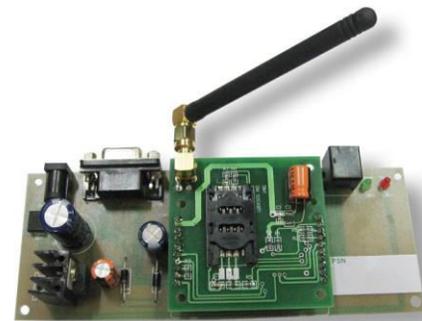


Fig.5. GSM module

Buzzer

Buzzer is the output module for alerting of any parameter changes. If any sensor increases the threshold value or if increases then microprocessor alert us by using this system.



Fig.6. Buzzer

Software

Software is the important parameter to make the device automation. In proposed implementation we used embedded c programming language and compiler arduino IDE we used. Here we used arduino IDE software for programming write up and execution of entire system

GPS Module:

The Global Positioning System (GPS) is a burgeoning technology, which provides unequalled accuracy and flexibility of positioning for navigation, surveying and GIS data capture. The GPS NAVSTAR (Navigation Satellite timing and Ranging Global Positioning System) is a satellite-based navigation, timing and positioning system. The GPS provides continuous three-dimensional positioning 24 hrs a day throughout the world. The technology seems to be beneficiary to the GPS user community in terms of obtaining accurate data up to about 100 meters for navigation, meter-level for mapping, and down to millimeter level for geodetic positioning. The GPS technology has tremendous amount of applications in GIS data collection, surveying, and mapping. The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous

worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people



Fig.7. GPS module

Mercury switch Vibration sensor

A mercury switch is an electrical switch that opens and closes a circuit when a small amount of the liquid metal mercury connects metal electrodes to close the circuit. There are several different basic designs (tilt, displacement, radial, etc.) but they all share the common design strength of non-eroding switch contacts.

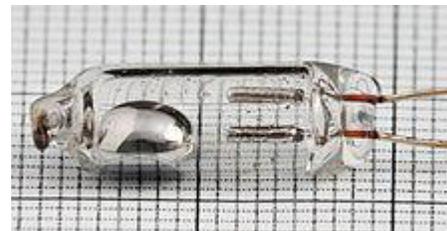


Fig.8. Vibration sensor

The most common is the mercury tilt switch. It is in one state (open or closed) when tilted one direction with respect to horizontal, and the other state when tilted the other direction. This is what older style thermostats used to turn a heater or air conditioner on or off. The mercury displacement switch uses a 'plunger' that dips into a pool of mercury, raising the level in the container to contact at

least one electrode. This design is used in relays in industrial applications that need to switch high current loads frequently. These relays use electromagnetic coils to pull steel sleeves inside hermetically sealed containers.

6. RESULTS

We designed the hardware of GSM GPS based vehicle tracking monitoring system. All modules are integrated to the ARM -7 Microcontroller. The initial state of all the sensors which displays their measured values on the LCD screen. The same data generated by the sensors will post into the GSM based SMS with location wireless data accessing system.

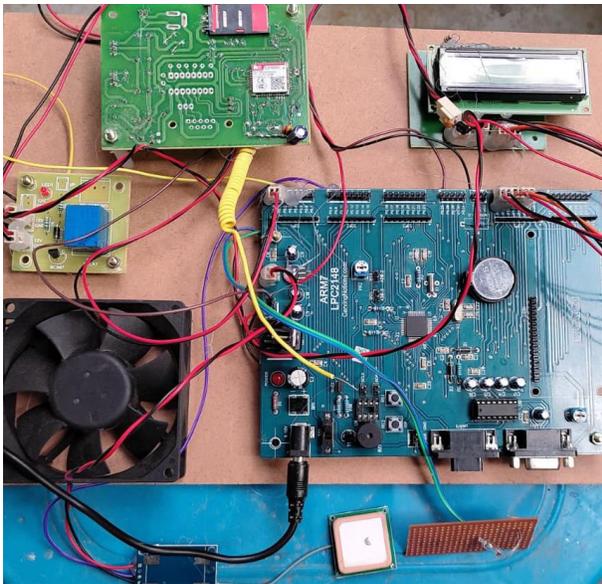


Fig.9. Hardware Model of vehicle

All sensors Vibration sensor, temperature and dc motor are integrated to Arduino. All the sensors data firstly displayed in lcd module as showed in the below figure. Below figure it displays the live temperature and live location co ordinates on the LCD screen.



Fig.10. LCD data of vehicle monitor

This tracking system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. This system monitors temperature of the engine. If the temperature increases it automatically send alerts to authorized person and ignition turn off for protection of engine.

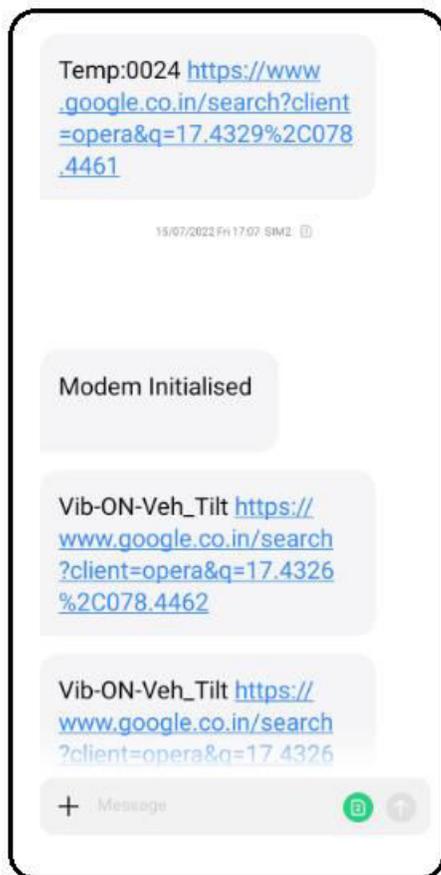


Fig.11. GPS alert Vehicle location

CONCLUSION

The vehicle tracking and monitoring system works mainly by receiving messages from a mobile phone. There is a message command by which we can track the vehicle. And this command is to send an SMS; “Vehicle monitoring system” to the registered SIM card number in the GSM modem. This command initiates the GPS modem and receives the latitude and longitude position and this information will then be sent as SMS to the mobile device. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. This system monitors temperature of the engine. If the temperature increases it automatically send alerts to authorized person and ignition turn off for protection of engine.

Whenever theft occurs or on demand request of the vehicles location, the device sends a message to the vehicle owner’s mobile.

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