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Monitoring and Detecting Vehicle Based On Accelerometer and MEMS Using GSM and GPS Technologies

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ABSTRACT

In this paper we are proposing a system to removing the delay between accident incidence and primarily responder dispatch is to use in vehicle Automatic accident detection notification methods. The sense when a traffic accident is probable to occur and immediately notifies emergency situation occurred. Global positioning system technology this article designs and recognizes one kind of embedded wireless system location application using arm7 from the hardware and software. Here in terms of hardware completed the design and connection of arm embedded systems, testing modules, GPS module and the GSM module. Main aim of this paper is to find out the accident using accelerometer and spot at any location and intimating to ambulance through GSM. It provides the following contribution to detecting traffic accidents via ARM7controller.

Keywords:- Sensors, MEMS, GSM, GPS

I. INTRODUCTION

In this modern, fast moving and insecure world, it become elementary need to be aware of one's safety. Maximum risks occur in situations where in an employee travels for money relations. The Company to which he belongs should be aware if there is some difficult. If the person traveling can be tracked and also secured in the case of an emergency. Here's a system that functions as a tracking and a security system. It's the intelligent vehicle control for critical remote location application. This system can deal with both pace and security.

The GPS antenna present in the GPS module receives the information from the GPS satellite in NMEA (National Marine Electronics Association) format and thus it reveals the position information. The evidence got from the GPS antenna has to be sent to the Base station wherein it is decoded. We use GSM module which has an antenna. We have at the Base station; the complete data about the vehicle. When auto crash occurs suddenly, the reaction of the emergency services now becomes race between life and death. In this we are trying to program a GPS and GSM module incorporating an accelerometer to report occurrences of accidents via GSM communication platform to the nearest agencies such as hospitals, police stations, and fire services and so on, giving the exact position of the point where crash has occurred.

II. DISCRIPTION

The accelerometer is used to detect the acceleration .it is used to detect accident. It can give the data to detect the accident. Data used to detect the accident. Once the accident is detected the GPS sensor. Then the GSM modems send the GPS data and the number of vehicle to a predefined mobile number. Here in our system can detect the accident using the accelerometer.
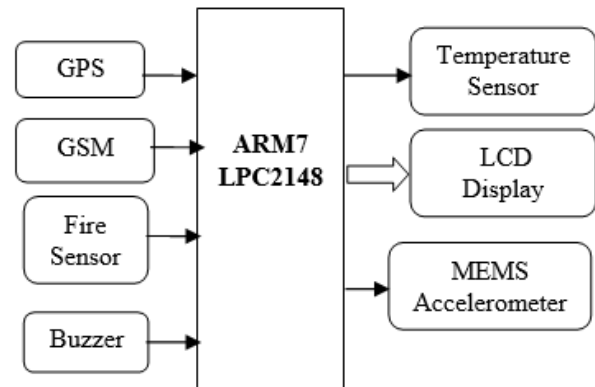

Fig 1 Block Diagram

A table can detect the acceleration value of the vehicle is provided. In case of accidents a large value of acceleration is obtained. When the condition of breaking comes it is extremely difficult. Here an alarm is given on the buzzer. It prolong for 30seconds.still if the driver does not press the reset switch, it will be interpreted as a serious accident. This case the system will calculate the GPS coordinates and it will be messaged. It also monitors vehicle temperature; if the engine gets over heats the system create alert. Afire sensor is also setup to sense is also setup to sense fire accident.

III. BUILDING BLOCKS

A. GSM Modem

Communication among vehicle, Owner, police and emergency is established accordingly as per requirement through GSM (Global Service for Mobile communication). AGSM modem is a specialized type of modem which accepts

a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection or it may be a mobile phone that provides GSM modem capabilities. A GSM modem could also be a standard GSM mobile phone the appropriate cable and software driver to connect to a serial port or USB port on our computer.
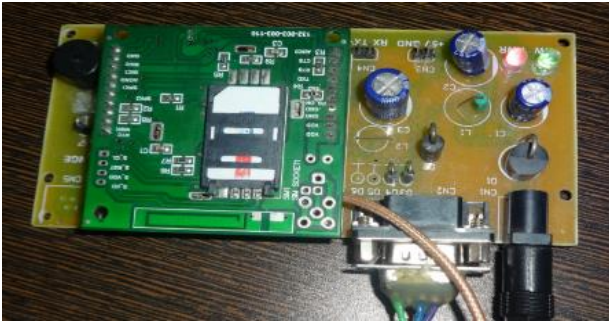
```
                                                11
      1         2       3 4        5 6 7  8   9 10 |  12 13  14    15
      |         |       | |        | | |  |   |  | |  |   |   |     |
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
```

EX:
*$GPRMC,001225,A,2832.1834,N,08101.0536,W,12,25,251211,1.2,E,A*03*

Fig 2 GSM Modem

B. GPS Modem

Exact location on earth can be known GPS latitude, longitude information. Global Positioning System (GPS) is space based radio navigation System consisting of a constellation of Satellites and a network of stations used for monitoring and controlling. The GPS is operated and maintained by the Department of defence (DOD).The GPS is a constellation of satellites in orbit around the Earth which transmit their positions in space as well as the precise period. It is receiver that collects data from the satellites and computes its location anywhere in the world based on information it gets from the satellites. Develop new microprocessor-based products and applications. The ARM is one of the major options available for embedded system developer.
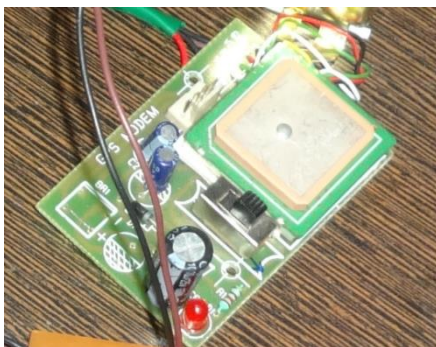

Fig 3 GPS Modem

A sample GPS NMEA RMC data is for given below and decoded as per the data. RMC format is mentioned below and we use (3) Latitude (5) Longitude for our vehicle tracing purpose.

Fig 4 RMC Decoded Results

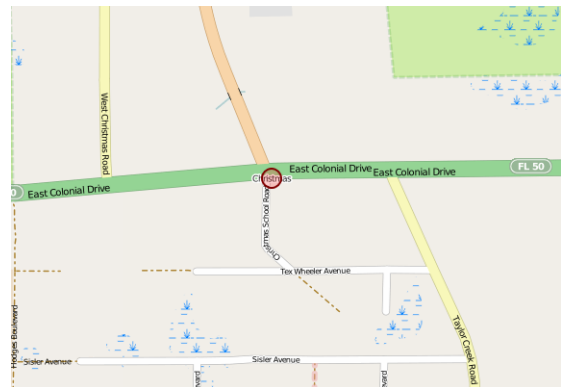| Decoding results	
Position	28.536390ºN 81.017560ºW
Timestamp	Sun, 25 Dec 2011 00:12:25 UTC
Movement	Speed 12.0 kts, heading 25º
Nearby place	Christmas, United States
Local time	Sat, 24 Dec 2011 19:12:25 EST
Timezone	America/New_York (UTC -0500)

Fig 5 Corresponding Map for Decoded Results

C. ARM7 LPC2148 TDMI

Over the last few years, the ARM architecture has become the most pervasive 32-bitarchitecture in the world through wide range of ICs available from various IC manufacturers. The ARM processors are embedded in products ranging from cell/mobile phones to automotive braking systems. Worldwide community of ARM partners and third-party vendors has developed among semiconductor and product design companies including hardware engineers, software developers, and system designers.

ARM7 is one of the widely used micro-controller family in embedded system application. These section is humble effort for explaining basic features of ARM-7. The ARM is a family of instruction set architectures for computer processors based on a reduced   (RISC) architecture developed by British company ARM Holdings.

A RISC-based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. Here this approach reduces costs, heat and power use. These are desirable traits for

portable, light, battery-powered devices—including smart laptops, phones, and tablet.

A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost providing higher processing power and improved energy efficiency for servers and supercomputers. It Provides 8kB of on-chip RAM accessible to USB by DMA. One or two (LPC2141/2 vs. LPC2144/6/8) 10-bit A/D converters provide a total of 6/14analog inputs with conversion times as low as 2.44 us per channel.

- Single 10-bit D/A converter provide variable analog output.
- Two 32-bit timers/external event counters PWM unit and watchdog.
- Low power real-time clock with independent power and dedicated 32 kHz clock input.
- Multiple serial interfaces including two UARTs (16C550) two Fast I2C-bus, SPI and SSP with buffering and variable data length capabilities.
- Vectored interrupt controller with configurable priorities and vector addresses.
- 45 of 5 V tolerant fast general purpose I/O pins in a tiny LQFP64.
- Nine edge or level sensitive external interrupt pins available.

On-chip integrated oscillator operates with an external crystal in range from 1 MHz to30 MHz and with an external oscillator up to 50 MHz.

D. Sensors

1) Temperature Sensor (LM35):

The Temperature- LM35 sensor continuously monitors the temperature of surface at which it is mounted, generally vehicle engine and body. If the Temperature exceeds predefined value, the microcontroller will send alert to the driver by means of buzzer usually fixed near to Dash board.

2) MEMS Accelerometers (ADXL335):

The ADXL335 is a low power, thin, small, complete 3-axis accelerometer with signal conditioned voltage outputs. Product processes acceleration with a minimum full-scale range of ±3 g. They can measure the static acceleration of gravity in tilt-sensing device, as well as dynamic acceleration resulting from vibration, shock, or motion. X-axis is connected with controller and continuously checks that 'g' value change.

3) Fire sensor:

An IR Fire sensor module is interfaced to the vehicle control system, used to detect occurrence of any fire accidents within it; and if the sensor will give alert to microcontroller to take necessary actions to save life. The controller sends message to both fire and Ambulance as per required.

4) LCD INTERFACING

We have interfaced a 16x2 character based LCD Display to show necessary information regarding different parameters like Temperature, GPS RMC data etc.

Fig 6 16X2 LCD Display

IV. ALGORITHM AND WORKFLOW OF THE SYSTEM

A. Algorithm of System Working

1) Start
2) Detect the parameter from various sections of the vehicle
3) Feed the collected information to the ADC
4) Then ARM process the data
5) If processed parameters exceed their limit then ARM 7 send command to set alert system
6) Send the GPS data over GSM
7) If the parameter does not exceeds the limit it will continued.
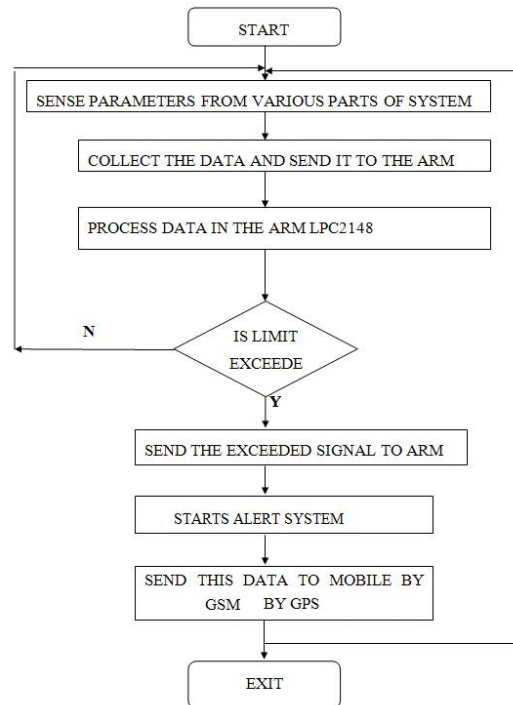8) Exit

B. Work flow of the system

Fig 7 Flowchart of system working

V.   RESULTS

The system's results are illustrated in this section. The ARM7 Board which is shown in below figure is main control section of all functionalities in the system i.e. Observing, Handling collected data and taking necessary action based on the limits given for individual sensors.

Fig 8 Overall system Prototype setup

Fig 9 LPC2148 Board with Measured Data on it

Upon detection of Fire in any part the system sends Message to Fire station and ambulance. And on detection accident message is sent to only Ambulance as shown in following below two figures.
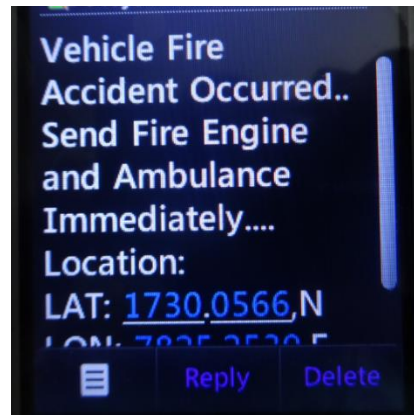

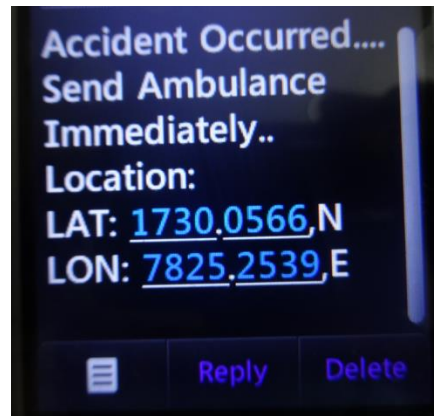**Fig 10 On Fire Accident Detection**

Fig 11 On Accident Detection

VI.   CONCLUSIONS

In this system effective solution is provided to develop the Monitoring vehicle which will monitor various parameters of vehicle in-between constant time period and will send this data to the base unit is explained in this paper. We have used hardware like ARM7, GPS, GSM and Sensor modules. Designed system will perform the function of communicating with the ambulance and fire station via GSM. The whole Control system has the advantage of small volume and high reliability.

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BIOGRAPHIES

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