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Remote Usage of Vehicle Tracking, Accident Detection and Condition Observing System

Kommu Siviah
Department of Electronics & Communication Engineering
QIS Institute of Technology,
Ongole, A.P – 523272, India.

Talachuru Prakash
Department of Electronics & Communication Engineering
QIS Institute of Technology,
Ongole, A.P – 523272, India.

Abstract

An incorporated inexpensive GPS-GPRS vehicle following framework alongside observing wellbeing parameters of cars was planned and executed. 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 LCD. Likewise, the requirement for a following framework in client's vehicle is utilized to keep any sort of robbery. A GPS-GPRS based following framework gives every one of the particulars about the area of a vehicle. The framework uses geographic position and time data from the Global Positioning Satellites.

I. INTRODUCTION

With the advancement of GPS innovations and the change of 3G remote correspondence organize, the correspondence method of GSM/GPRS-based situating and checking framework is always showing signs of change as well as its creating innovation, planning to fabricate an effective, dependable and wide range secured framework by coordinating the most recent interchanges innovation and the most up to date remote system condition. In this day and age as the populace expands step by step the quantities of vehicles likewise increments on the streets and expressways. This outcome in more mishap that understudies prompts the roads turned parking lots and open get help momentarily. This module gives data about the mischance to the doctor's facility and police headquarters. Subsequently sudden help open life may spare and the roads turned parking lots are reduced [1], [2]. To move forward the level of supervision and administration for load transport vehicles, particularly trucks conveying coal it is imperative to create transport vehicles remote observing module 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 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 [5].

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Mankind has always reacted to problems with strong determination aimed at providing better solutions to difficulties. From the use of celestial navigation to the use of compass man has always searched for a means of accurately locating his position on the globe with precision and accuracy necessary to avoid tragedy and to reach his intended destination. One could also want to locate a specific place in a locality familiar to him. This could be a shopping mall, a petrol station, a hotel, or even an office. A tracking system is required to determine the location of any object at any given time and the distance travelled. Also, the need for a tracking system in users vehicle is used to prevent any kind of theft since police can use tracking reports to locate a stolen vehicle location. The Global Positioning System (GPS), is a popular satellite navigation system which makes use of a constellation of more than two dozen GPS satellites to transmit precise radio wave signals in any weather, day or night, anywhere on Earth. This allows a GPS receiver in an unobstructed line of view to synchronize with the satellite to determine its current horizontal location to the nearest 15 meters radius in latitude, longitude and altitude by connecting to just four satellites in its horizon [3]. The system uses an On-Vehicle Module consists of GPS receiver and GSM modem, the device resides in the vehicle to be tracked. In order to track the movement of the vehicle Google Maps used for mapping the location. The GSM modem fetches the GPS location and sends it to the server using GPRS.

II. PROPOSED SYSTEM

The system consists of cooperative components of an accelerometer, microcontroller unit (MCU), GPS device and GSM module for sending a short massage. An accelerometer is applied for awareness and fall detection indicating an accident. The speed of motorcycle and threshold algorithm is used to decide a fall or accident in real time. Mobile short massage containing position from GPS (latitude, longitude) will be sent when motorcycle accident is detected. The robust package design is implemented so that it is safe from water's spray and dust in environment. The module is aimed to be installed under the motorcycle seat. A high performance 16 bits MCU is used to process and store real-time signal from the accelerometer. Thus, this device is analogous to a black box in airplane. The police and insurance examiner can obtain accident history to investigate accident situation from data-logger in this device.

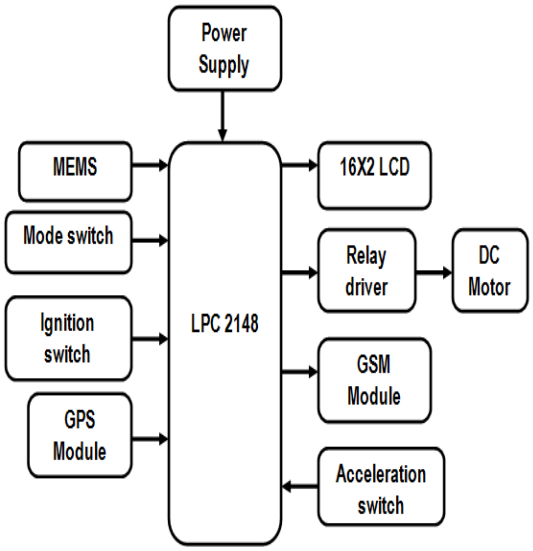

Fig.1: Proposed block diagram

A. LPC 2148

The LPC2148 microcontrollers is based on a 32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2141/42/44/46/48 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end

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imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADCs, 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

Features of LPC 2148:

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory; 128-bit wide interface/accelerator enables high-speed 60 MHz operation
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software, single flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution. USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM
- In addition, the LPC2146/48 provides 8 kB of on-chip RAM accessible to USB by DMA
- One or two (LPC2141/42 vs, LPC2144/46/48) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 ms per channel Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only)
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- CPU operating voltage range of 3.0 V to 3.6 V (3.3 V ± 10 %) with 5 V tolerant I/O pads.

B. Accelerometer Sensor

An accelerometer measures acceleration. Acceleration is a measure of how quickly speed changes. Accelerometer sensor is used to measure static (earth Gravity) or dynamic acceleration in all three axes, forward/backward, left/right and up/down. The output of accelerometer provides 1.65V to 3.3V in positive direction and in negative direction the voltage drop from 1.65V to 0V. The output of accelerometer is in analogue form with three different output voltages each representing X, Y and Z direction of motion. These three voltage signal are processed through ADC0 on three different Channels available on ARM. ADC0 is configured at 4.5MHz clock from system peripheral clock. The 8 bit digital output from ADC0 is fed to UART1 of ARM [4], [5]. Accelerometer is used in this design for the collision detection. The maximum output voltage of accelerator module is 3.3V that is a CMOS voltage of the processor.

C. Regulated Power Supply

There are several ways to convert an AC voltage into the DC voltage. Traditionally, this has been done with a transformer and rectifier circuit. However, in applications that involve providing a DC voltage to only the controller and a few other low-current devices, transformer-based or switcher-based power supplies may not be cost effective. So, Transformer less power supplies which provide a low-cost alternative to transformer-based are used in this robot.

D. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

E. 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

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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.

F. 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 defense (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.

III. WORKING PRINCIPLE

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.

In this project, there are two modes developed in a vehicular system, one is normal mode and another is secure mode. These modes are differentiated using slide switch in the hardware section. In normal mode, as the owner or authorized person starts the ignition lock, the engine gets ON and the vehicle is ready to drive. The GPS receiver will continuously collects the location values and transmits to the controller. While driving the mems accelerometer is placed in a stable position so whenever the accident occurs, the vehicle position is misplaced and hence the mems changes its position and engine gets OFF which sends to the controller [6], [7]. The controller i.e., LPC 2148 board will send the information along with the location to three mobile numbers. If the driver is moving with high speed then immediately, the system sends the information to the owner with location.

When the owner leaves the vehicle, he/she will switch it to the secure mode. In this case, if any unauthorized person tries or switch on the ignition with duplicate keys, the engine will not start and message will be sent to the owner. If the owner with his/her confirmation replies with the message, the engine will get started and the vehicle is ready to access.

IV. RESULTS

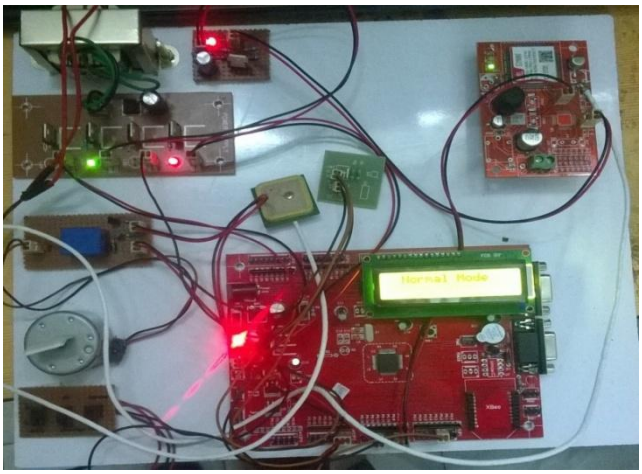

Fig.2: Hardware implementation

In this project, the LPC 2148 controller plays a major role which connects all the input as well as output devices to its GPIO pins. Here in the LCD screen, this shows the data of vehicle current mode with vehicle speed in normal. At this time, the GPS receiver sends the values of the current location of the vehicle continuously to the controller [5].

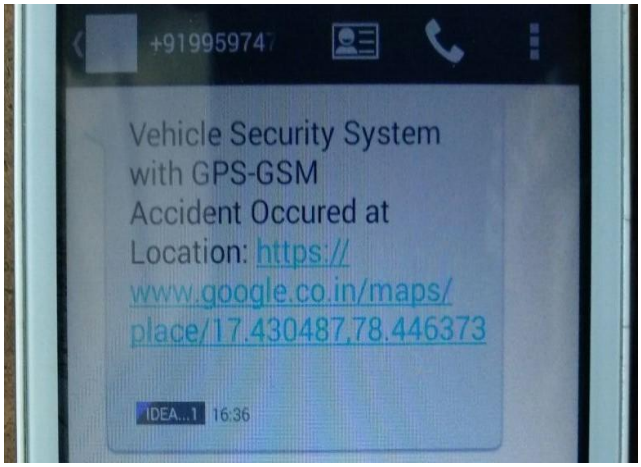

Fig.3: Output message of vehicle accident

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When the vehicle met with an accident i.e., detected by mems sensor, the controlling unit sends message as shown in the above figure with particular GPS location values.

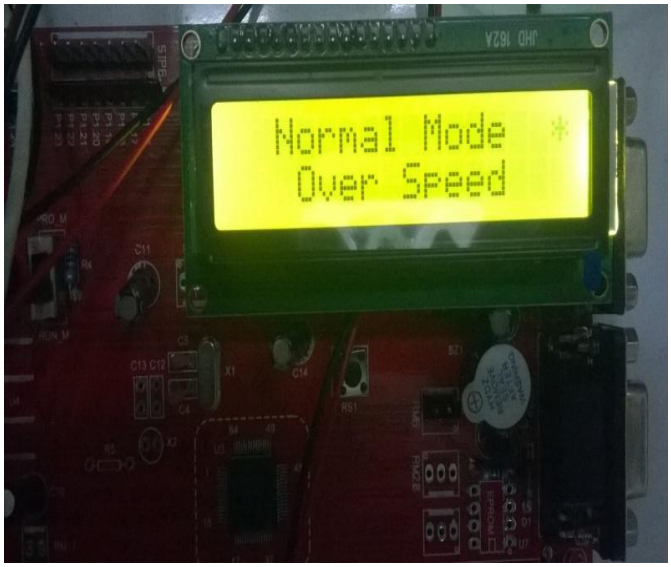

Fig.4: Vehicle Over speed indication on LCD screen

When the driver increases the speed of the vehicle beyond the limit, the controller makes the LCD to display and at the same time, it sends to the owner of the vehicle.

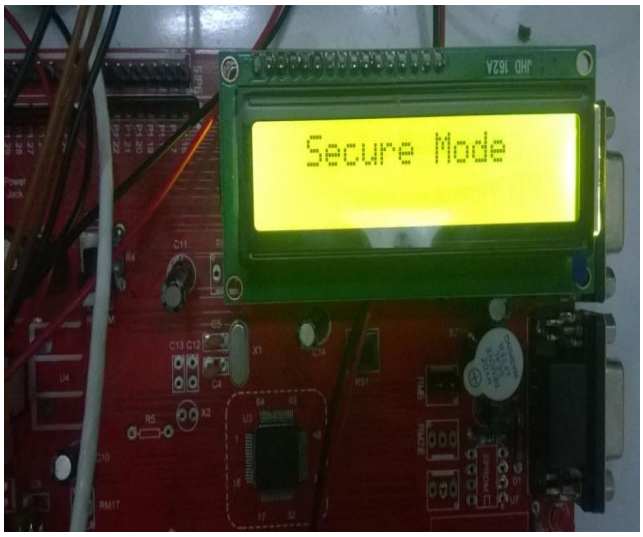

Fig.5: Theft mode representation

When the owner of the vehicle leaves and park it at some place then he/she will turn on from normal mode to secure mode i.e., theft mode.

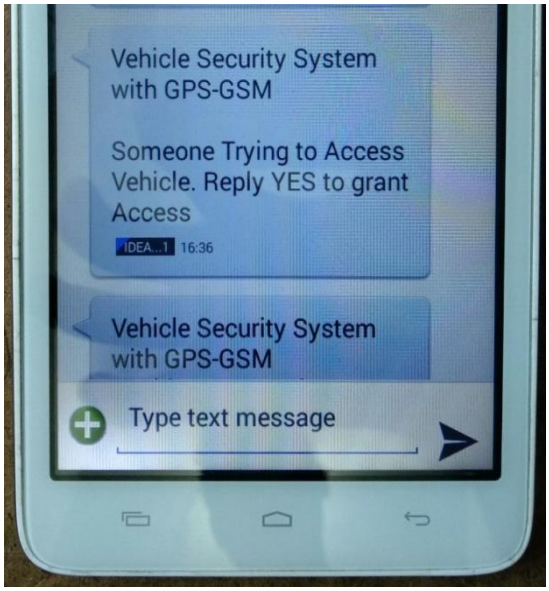

Fig.6: Output message in theft condition

If the vehicle is accessed by unauthorized person with duplicate keys, the information is sent to the owner as SMS to his/her mobile phone.

V. CONCLUSION

The proposed system was designed to be expandable with unlimited number of users and support independent different type of authorization. This system provides information of a vehicle like 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. Accelerometer senses the collision of the vehicle and sends this information in real time to a hospital/police station. The system is useful in much application such as surveillance, security, tracking, which may be installed in cargo trucks, cars, motorcycle, and boat.

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