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Travolution — an Embedded System in Passenger Car for Road Safety

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Abstract

Security in travel is primary concern for every one. This Project describes a design of effective alarm system that can monitor an automotive / vehicle / car condition in traveling. This project is designed to inform about an accident that is occurred to a vehicle to the family members of the traveling persons.

This Project presents an automatic vehicle accident detection system using GPS and GSM modems. The system can be interconnected with the Alcohol detection, and alert the owner on his mobile phone. This detection and messaging 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.

INTRODUCTION

World Health Organization's , first ever Global Status Report on Road Safety reveals that 90% of deaths on the world's roads occur in low and middle income countries (21.5 and 19.5 per lakh of population, respectively) though they have just 48% of all registered vehicles. India has the second largest road network in the world with over 3 million km of roads of which 60% are paved. These roads make a vital contribution to the India's economy. According to a government report, road accidents in India killed 1,34,000 people in 2010 (an average of 336 a day). Accidents due to drunken driving are a major problem in India. The problem is unrecognized and hidden due to lack of good quality research data. A study conducted by Alcohol & drug Information Centre (AIDC), India revealed that around 40% of the road accidents have occurred under the influence of alcohol. Young male drivers are at a high risk of such accidents.

Though some efforts are being taken to reduce the Road Accidents due to drunken driving, considering the gravity of the situation it is important to change strategies and mechanisms with foresight and effective implementation.

Alcohol is a depressant drug that Slows down the activity of the brain Contains absolutely no nutrients Does not help to relieve tension, induce sleep or solve problems.

DRINKING AND DRIVING –DON'T GO TOGETHER

Literature review

Existing system

This Project presents an alcohol detection and vehicle accident detection system using GPS and GSM modems. The system can be interconnected with the car alarm system and alert the owner on his mobile phone.

The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem A GSM modem is interfaced to the

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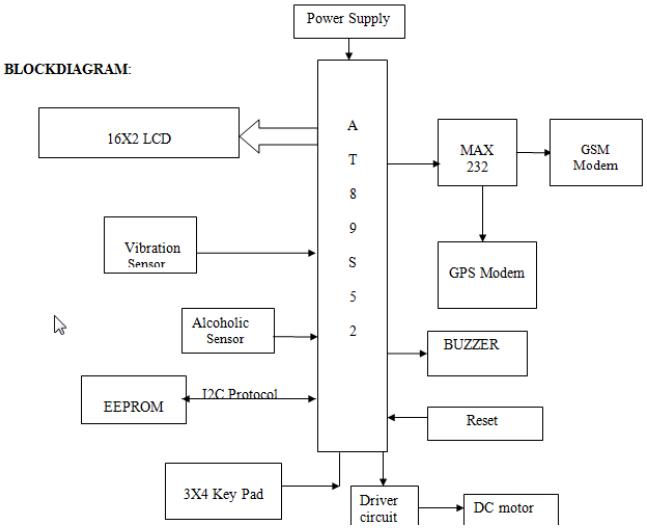
MCU. The GSM modem sends an SMS to the predefined mobile number and informs about this accident. This enable it to monitor the accident situations and it can immediately alerts the police/ambulance service with the location of accident.



Draw backs

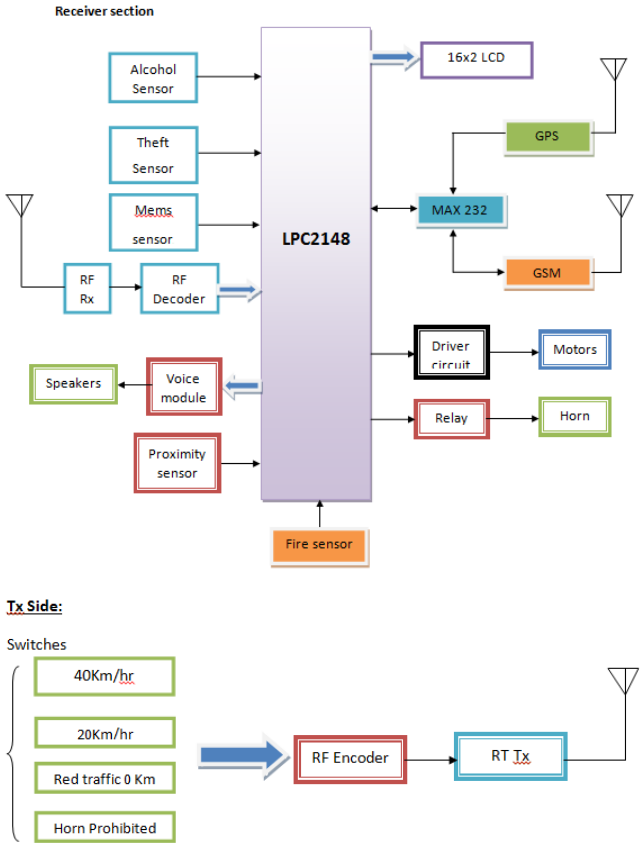
There is no voice alert to inform neighbors.
No sensor to detect while some one tries to steal the vehicle.

Proposed system

Alcohol sensor is provided to know whether the driver is alcoholic or not. The red traffic light zone, over speed detection in restricted areas, horn prohibited areas will be provided by RF transmitter. The vehicle security is enhanced as all the features are embedded in it. Simple sensors can be fitted inside vehicles embedded with various features like, automatic collision notification, vehicle security, speed control which can give impetus to an efficient road safety system. A voice module is also interfaced to give the voice output through speakers.

This project uses regulated 3.3V, 750mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

Block Diagram:



LPC2148 controller:

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory.

A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol

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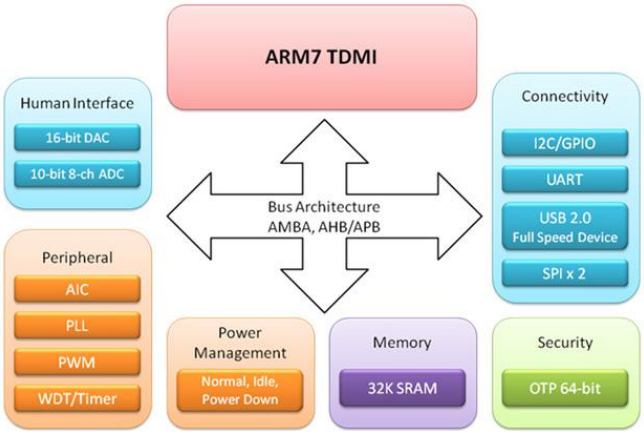
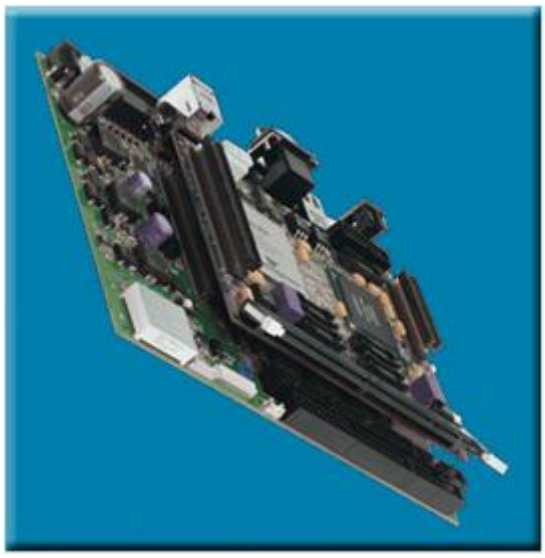
converters and embedded soft modems as well as many other general-purpose applications.



Architecture

ARM PROCESSOR



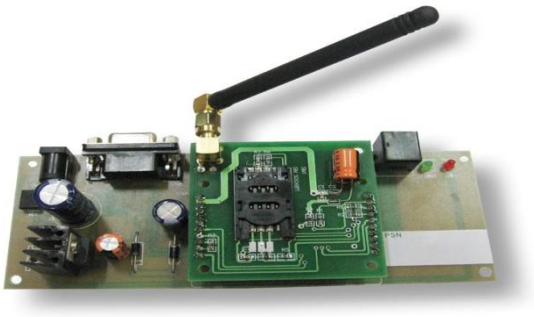
ARM7 board

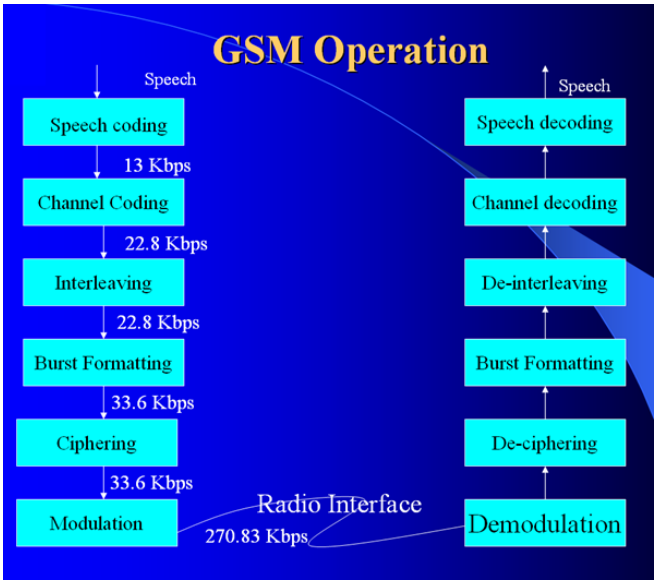
Global System for Mobile Communication (GSM)

Definition:

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.





Basic concept of GPS

A GPS receiver calculates its position by precisely timing the signals sent by the GPS satellites high above the Earth. Each satellite continually transmits messages which include

- the time the message was transmitted
- precise orbital information (the ephemeris)
- The general system health and rough orbits of all GPS satellites (the almanac).

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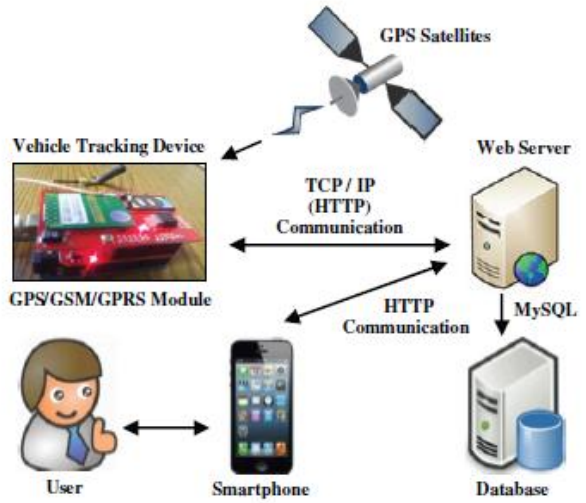


Alcohol Gas Sensor - MQ-3

Description: This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

Features:

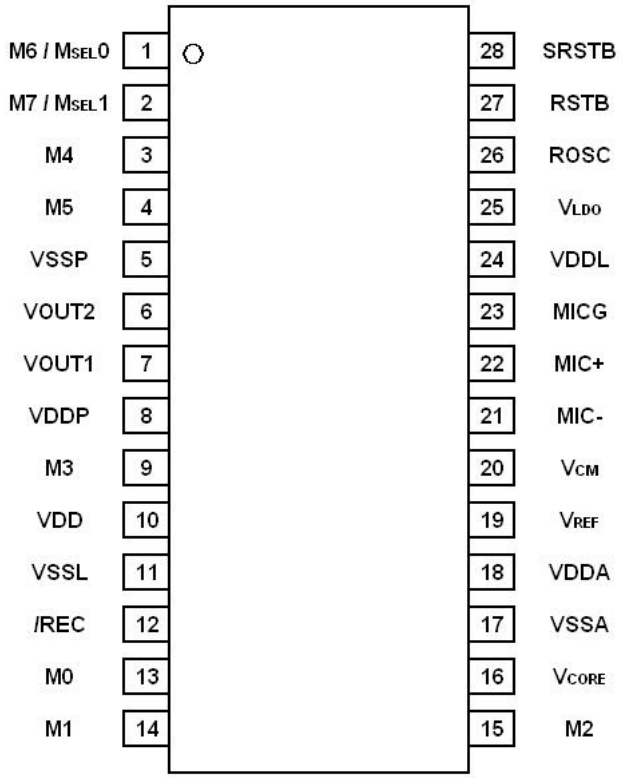
- 5V DC or AC circuit
- Requires heater voltage
- Operation Temperature: -10 to 70 degrees C
- Heater consumption: less than 750m

Dimensions:

- 16.8mm diameter
- 9.3 mm height without the pins

aPR33A

The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.



Pin diagram

MMA7660FC

An accelerometer measures acceleration (change in speed) of anything that it's mounted on. Single axis accelerometers measure acceleration in only one direction. Dual-axis accelerometers are the most common measure acceleration in two directions, perpendicular to each other. Three-axis accelerometers measure acceleration in three directions.

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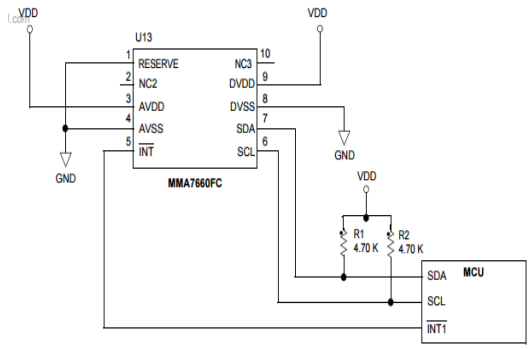


I2C Connection to MCU

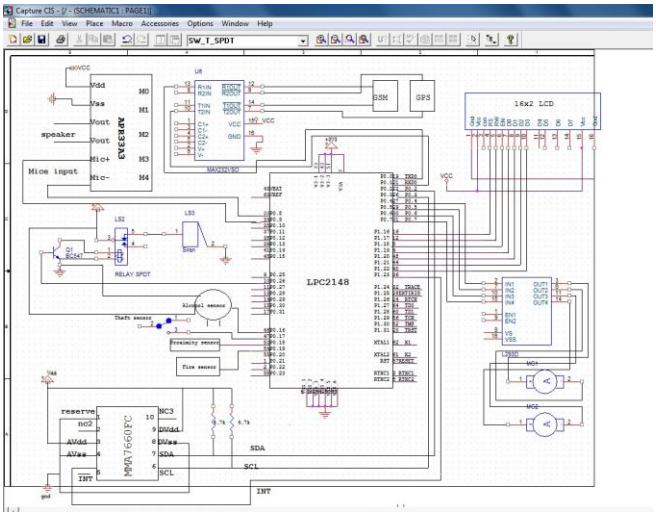
Advantages:

- Sophisticated security
- Monitors all hazards and threats
- Alert message to mobile phone for remote information
- Mobile number can be changed at any time

Applications:

- Automotive and transport vehicles
- Security, Remote monitoring, Transportation and logistics
- This system is also can be interfaced with Vehicle airbag system

Interfacing diagram



Conclusion

Here We Have Designed and implemented Travolution — An embedded system in passenger car for road safety ARM7 LPC2148 controller.

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