



International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 7, July 2015

Design and Implementation of Wireless Security System in Vehicle

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ABSTRACT: A related paper consists of advanced technologies to avoid vehicle collision. This paper consist of different modern technologies such as adaptive cruise control, ultrasonic technology, GSM,GPS working in synchronous manner to avoid crash and to assist the driver with warnings or automatic braking to mitigate a crash with Anti-theft Tracking and locking System. Even in rare case, if accident to occur then system will activate GSM and GPS Accidental monitoring. The system is compact and easy to install in vehicle. This system also assures Anti-theft System by self locking technique

KEYWORDS: Adaptive cruise control, Ultrasonic, MEMS Accelerometer, GSM, GPS

I. INTRODUCTION

In today's life style the vehicle plays an important role in the human life. Every work is depends on the vehicles such as going somewhere with the family or friends where vehicles are compulsory part of life but with that there must be some kind of security issues which are also have to consider. The roads accidents are today are being common. By the research said that about 80% of accidents are happens in one day because of fast driving, drowsiness or drunk and drive .Therefore it is a need of the day to have a secure travelling that's why a system has been developed for making the vehicle more safe with the help of technology.

The number of vehicles on road is increasing and the graph of accidents is also increasing. These accidents are largely caused by the delay of the driver to press the brake. To avoid the accidents caused by delay, ultrasonic braking system is implemented in automobiles. For Accidental Monitoring, wireless security system based on MEMS accelerometer, GSM, GPS are use for Vehicle Tracking and Anti-Theft Tracking System

II.RELATED WORK

This system defines the composition and function of an advanced system, which consist of adaptive cruise control, Ultrasonic technology and for wireless data transmission, GSM and GPS technology are commonly used. The main aim of the ultrasonic braking system is that, cars should automatically applied brake when the sensors sense the obstacle. This technology for automobiles to sense collision with another vehicle or with an obstacle, and to applied brake of the car, which is done by the braking circuit. This system includes two sensors viz. ultrasonic wave receiver and ultrasonic wave emitter. The ultrasonic wave emitter install on an automatic braking car, producing and emitting ultrasonic waves in a predetermined distance in front of the car. Ultrasonic wave receiver is also provided in front portion of the car, receiving the reflected ultrasonic wave signal from the obstacle. The reflected wave (detection pulse) is used to measure to the distance between obstacle and the vehicle. Here the vehicle automatically maintains the speed in heavy traffic to adjust a safe gap without the driver to do anything. Sensors will track the distance to a lead vehicle, and the engine and brakes are used to maintain a secure gap, if traffic slows. If the traffic speeds up, the vehicle increases its speed to maintain the specific cruise speed. If the vehicle slows below a threshold speed as come closure to another vehicle, systems will give warning alarm and help driver to resume control over vehicle.

Then microcontroller ARM7 is used to control the motor based on detection pulse information and the motor in turn automatically controls the braking of the car. Thus, this new system is designed to solve the problem where drivers were unable to brake manually exactly at the required time, but the vehicle can still stop automatically by sensing the obstacles to avoid an accident. Even in rare cases if the accident occurs then MEMS accelerometer which will detect the accident of the vehicle.

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Once the accident is detected then the GSM will send mobile short message to the cell number of the family members, police station and nearby hospitals already saved in the system. The send message will be the location of the vehicle where the actual accident took place from where the message recipients can locate the site of accident and immediately the appropriate action can be taken by them. The send message will consist of information obtained from the GPS which will be in the form of longitude and latitude because of which the exact location can be found out

In case if there is unauthorized access of vehicle, the system will act as an Anti-thief tracking system. Anti-thief tracking system is the best way to prevent or search unauthorized access of vehicle. Anti-thief tracking system is used to protect vehicle from intruders by using GPS and GSM technology depend in tracking system. The tracking device is able to relay information concerning the current location of the vehicle and its speed, etc. Most of such tracking systems consist of an electronic device as usually installed in-vehicle and can be used for tracking motor cycles, buses, and trains. Figure1 shows the systematic used of various sensors and components which are used in the system.

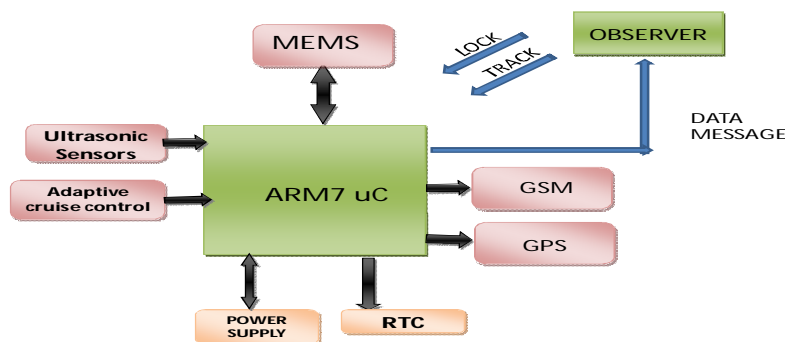
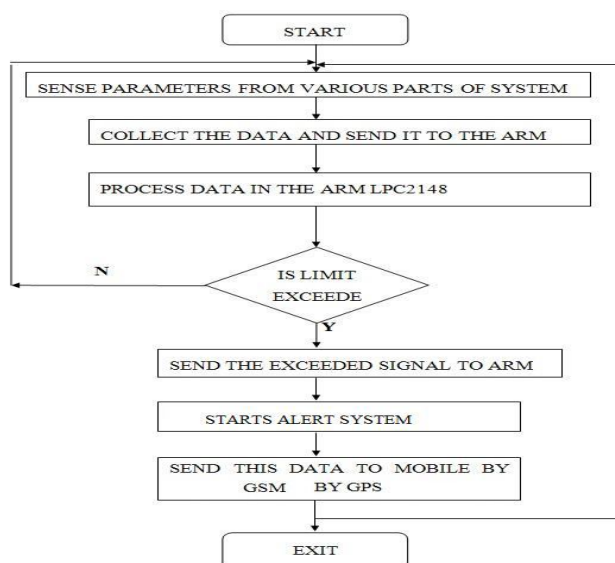


Figure1. Block diagram of system

III. WORK FLOW OF SYSTEM



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IV. TECHNOLOGY INVOLVED

1. HEART OF THE SYSTEM (32bit MICROCONTROLLER ARM7)

LPC2148 microcontroller is based on a 32bit ARM7TDMI-S CPU that combines the microcontroller with embedded high-speed flash memory ranging from 32 kB. ARM or Advanced RISC Machine, uses a 32-bit RISC (Reduced Instruction Set Computer) processor which offers high performance and very low power consumption.

LPC2148 microcontroller is having following features:

1. Most important feature of ARM is its operating voltage is '3V to 3.6V'.
2. LPC2148 supports two UARTs and two fast I²C bus (400kbit/s) which is bidirectional, for inter-IC control uses only two wires: a Serial Clock Line (SCL), and a Serial Data line (SDA).
3. LPC2148 has a Real Time Clock in itself that uses a 3V reserved battery. Unlike other microprocessors, there is no need for an extra RTC IC.
4. LPC2148 provides two ADCs that has 2 analogy signal input from ADC0 and ADC1. ADC0 has 6 channels and ADC1 has 8 channels. The output is a 10-bit digital signal. It also provides one 10bit DAC that has 1 10-bit digital input and 1 output analogy signal.
5. LPC2148 has two types of memories such as 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory.
6. The LPC2148 is equipped with a USB device controller that enables 12 Mbps data exchange with a USB host controller.
7. 21 external interrupt pins are available in LPC2148.

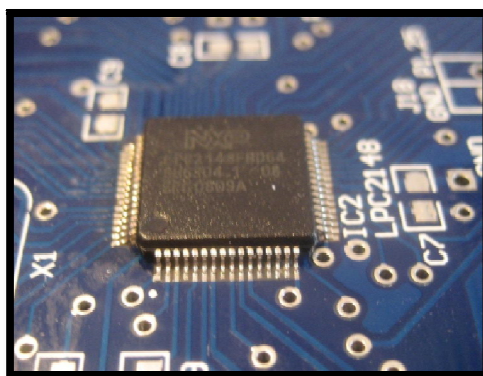


Figure2. Schematic of LPC2148 microcontroller

2. ADAPTIVE CRUISE CONTROL

Helps maintain a constant vehicle speed on the road, if the distance increases then the speed of the vehicle increases and if the specific distance decreases then the speed also decreases. In this way it allows a vehicle to maintain the specific distance and avoid the possibilities of vehicle collision. Following figure3.block diagram shows a systematic way actually how the system is working distance and tries to maintain the specific gap between the vehicles.

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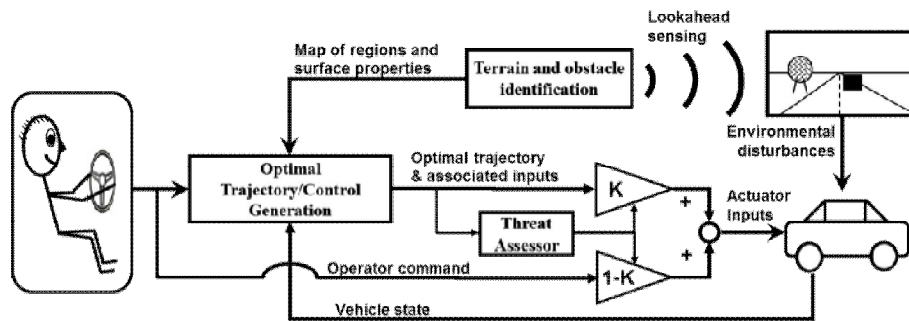


Figure3. Working block diagram of adaptive cruise control.

3. ULTRASONIC TECHNIQUE

The Timing diagram is shown below. The transmitter is used to send the ultrasonic waves from the sensors installed on the vehicle. If the obstacle is detected within the specific range then the detected pulse will be used to measure the distance. Then the microcontroller will control the motor based on the pulse with modulation which will ultimately control the braking of the vehicle. Figure4 shows the basic timing diagram of ultrasonic.

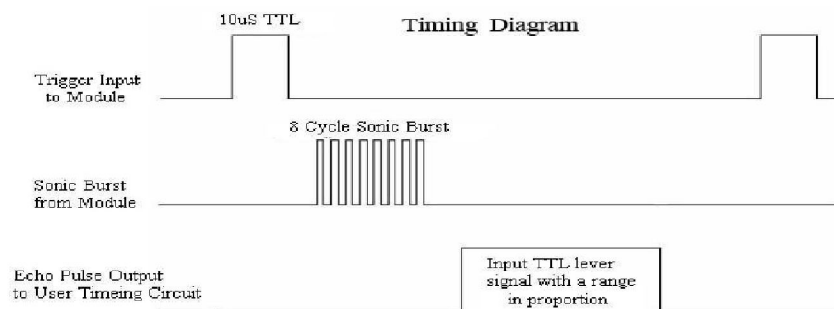


Figure4. Timing diagram of ultrasonic.

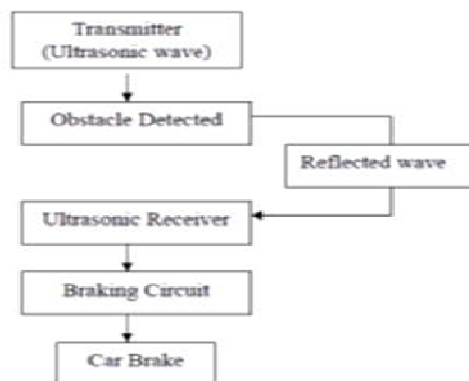


Figure5. Ultra sensor braking system block diagram

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4. MEMS ACCELOMETER

The ADXL325 is a complete 3-axis acceleration measurement system. The ADXL325 has a measurement range of ± 5 g minimum. It contains a polysilicon surface micro machined sensor and signal conditioning circuitry to implement an open-loop acceleration measurement. The analog voltages which are the output are proportional to acceleration. The accelerometer is used to measure the static acceleration of gravity in tilt-sensing applications, dynamic acceleration as the result of sudden shock, jerk or vibration.

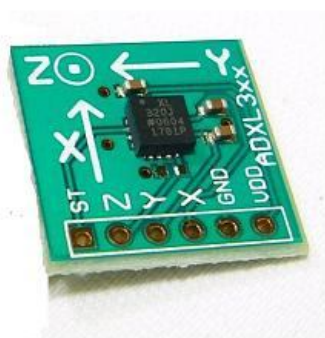


Figure6. MEMS IC

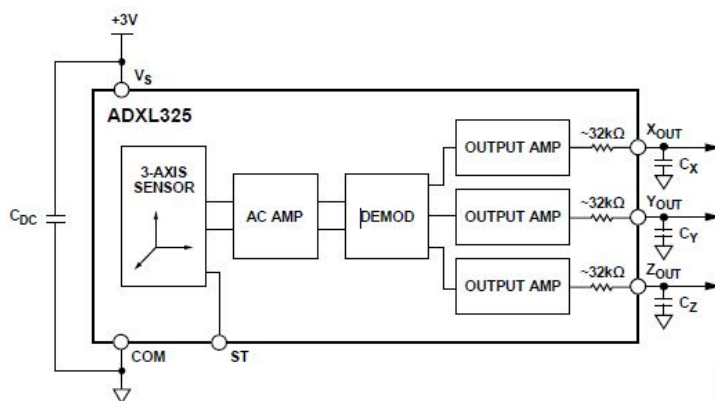
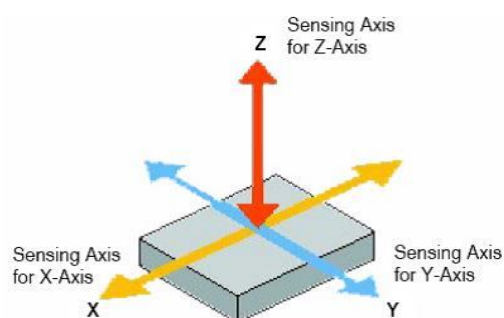


Figure7. Functional Block Diagram

5. GSM TECHNOLOGY

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique cell number. This modem will be using its RS232 port to communicate and develop embedded applications like SMS Control, data transfer, remote control and logging can be applied easily. The modem is used to connect to PC serial port or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls.

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Figure8. SIM300 Kit

6. GPS TECHNOLOGY

A The GPS signal is applied to the antenna input of module, and a complete serial data message with location, speed and actual time is presented at the serial interface with NMEA protocol or custom protocol. When the system sends SMS then the GPS get activated and the location (longitude and latitude) of the actual position of accident or the position of the vehicle will be received.



Figure8. GPS Module

V.EXPERIMENTAL RESULTS

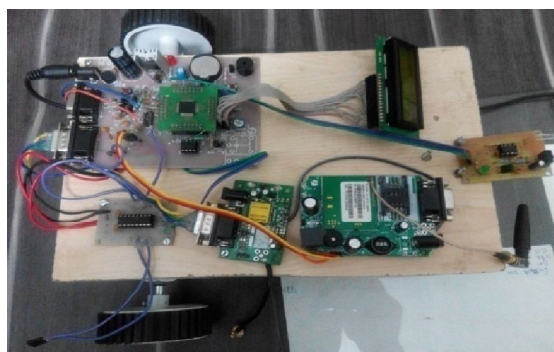


Figure9.Prototype of system

We have successfully developed a prototype that includes Ultrasonic sensors which detects obstacles and is accompanied by gradual decrease and increase in speed of motors as per the distance measure.. It also help to develop a suitable warning and alarm system to notify the driver when under threat. Thus it reduces the risk of accident and save the life of driver.



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VI. CONCLUSION AND FUTURE WORK

This paper presents the implementation of an adaptive cruise control with the help of Ultrasonic Automatic Braking System for Collision Avoidance of vehicle. If in rare case if accident occurs then we have GPS and GPS system to locate the exact location of the accident which can be sent as SMS to the family members, police station and hospital. Again tracking and locking system add additional features to this system, thus helping to improve safety and offer a hassle free driving experience at a reduced cost.

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