



ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 2, February 2017

Design and Implementation of Child Presence Detector in an Unmanned Car

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ABSTRACT: The network service system is increasingly extended as the demand from several of usage is growing. Although many products had been invented, there are still the incidents that involve to death of children which been left in cars often occur. The system is designed in order to overcome this unwanted incident from happening. The prototype of this model for the child safety is built on the embedded platform using ARM7 Microcontroller which controls all the processes and cost is very stumpy. The paper presents an efficient technique to protect a child when it is forgotten in car unknowingly by parents. Here we have developed a system that will sense the presence of child and will generate an alarm. If no one attends the child, the system will make a call to parents and emergency person. The validation part of project will be carried out by KEIL software along with results so that the same system can be implemented from industrial point of view.

KEYWORDS: ARM-7 microcontroller, Sensors, LCD, LED, GSM.

I. INTRODUCTION

Once a car is turned-off and parked, keeping its window glasses closed, the temperature inside the car increases rapidly even on a day with atmospheric temperature of about 210 degrees. As the thermoregulatory system of the child is not well developed, this condition may lead to hyperthermia or heatstroke which can be fatal. As we know, the child entirely depends on elders but, unknowingly, in a busy schedule, the driver or passengers may forget to take the child (who may be sleeping) in the infant seat, usually kept in the back seat of the car. Such incidents can be prevented by sensing the presence of a child soon after a car is turned-off and then generating/sending a suitable warning signal to the driver or parents who can take timely action to save the child. A child presence detection system based on a combination of optical detector, mechanical switch and temperature sensor is taken as reference. Optical or thermal sensors are not well suited for this as it may not detect when a child is wrapped in a blanket or clothes. In this paper, we propose a simple and compact child detector sensor that can be placed in an infant seat to detect presence of a child. The proposed system also has a vehicle ignition monitor to confirm presence of driver inside a car. It has a temperature sensor to keep track on current temperature inside the car. A GSM modem is used to alert driver or parents/guardians as soon as a child left in the car in an infant seat is detected and the car is found to be turned-off. Principle of operation of the capacitive sensor, measurement scheme employed details of prototype sensor and warning system developed and test results are discussed in the following sections of the paper.

II. RELATED WORK

Fairuz R. et al., reported about the cases that involving the death of a child in a vehicle [1]. It happens almost every year because of negligence committed by parents who often abandon their children alone in a car. The tragic events happen frequently and it makes every person feel scared and worried. When a driver has safely arrived to their destination, they sometimes forget and overlook the presence of children in the car because of his hasty exit from the vehicle. A baby is susceptible to dehydration and this can cause them to become coma or something worse that will cause succumb to death. So, to avoid incidents like this from ever happen, a vehicle must be equipped with an alarm or sensor that can be placed under or on the seat. If an alarm is success to detect the presence of a human body or any movement, it will produce a sound to tell the parents about it.



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Greg C. Kautz proposed a system to detect presence of occupants of an automobile [2]. In particular, the invention relates to systems that detect the presence of a child in a child's seat without other passengers and the automobile is not in an operational mode. In this case, to minimize injuries to the child, corrective action is needed to be taken. This system generates the control signals that can activate an alarm, open the doors of the car, and roll down the windows if there is a child in a car that had left.

Marc A. Rossi reported that child safety seats are required by law when transporting young children in motor vehicles [3]. Typically, the child seat is securely positioned in a back seat of the vehicle and the child secured in the child seat via a child seat safety belt. These laws have been established and strictly enforced to protect children from injury when being transported in motor vehicles. However, there have been instances where children have been left behind in unattended vehicles due to various circumstances. Unfortunately, some of these children have suffered serious injuries and in some cases even death, particularly during extreme temperature conditions in the summer and winter.

III. SYSTEM ARCHITECTURE

In this proposed system, automation is made to find the child left inside the car unknowingly when the parents are in some urgent situation and also to monitor the internal temperature. The car module consists of a child presence detector in under the seat. It also consists of a temperature sensor for monitoring the temperature inside the car if it has been stopped. The circuit is mainly consisting of LPC2148 Microcontroller, GSM module, child presence detector, LCD display, Buzzer, sound sensor, temperature sensor the explanation of this circuit component is as shown below.

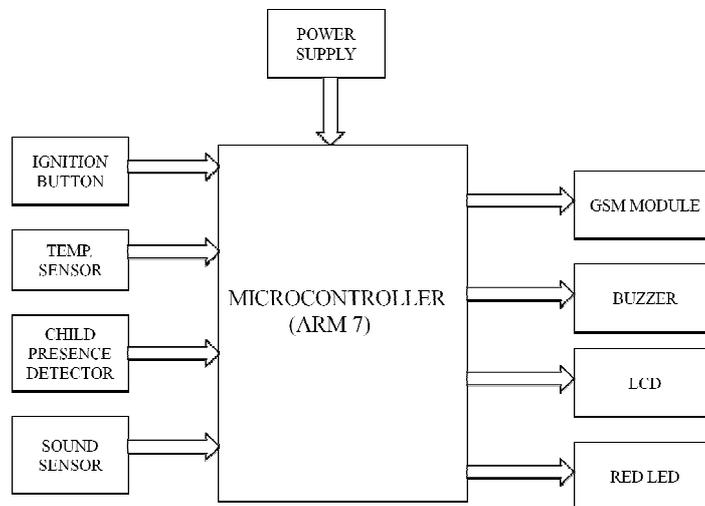


Fig.1. Block diagram

The Hardware System

1. MICROCONTROLLER

This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7

ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind of technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.



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2. TEMPERATURE SENSOR (LM35):

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$ over a full -55 to $+150^\circ\text{C}$ temperature range.

Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only $60\ \mu\text{A}$ from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to $+150^\circ\text{C}$ temperature range, while the LM35C is rated for a -40° to $+110^\circ\text{C}$ range (-10° with improved accuracy).



Fig.2. Temperature Sensor

3. CHILD PRESENCE DETECTOR (FORCE SENSOR)

To know whether the child is present or not. It is used to recognize the crying voice of Child. Force Sensor is used to give the support to the detector. Child presence detector uses one wire for transmission and have parallel interface. Child presence detector uses GPIO module (General Purpose Input and Output).

4. SOUND SENSOR

Sound Sensor is used to recognize the crying voice of Child when child inside car suffocates due to insufficient oxygen. When Sensor gets the inputs, it will make the Output High which is applied to microcontroller. Sound sensor uses one wire for transmission and have parallel interface. Sound sensor uses GPIO Module.

5. LIQUID CRYSTAL DISPLAY (LCD)

It is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

6. GSM MODULE

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in many parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. GSM operates in the 900 MHz, 1800 MHz or 1900 MHz frequency bands. GSM has been the backbone of the phenomenal success in mobile telecoms over the last decade. Now, at the dawn of the era of true broadband services, GSM continues to evolve to meet new demands. One of GSM's great strengths is its international roaming capability, giving consumers a seamless service. This has been a vital driver in growth, with around 300 million. In the Americas, today's 7 million subscribers are set to grow rapidly, with market potential of 500 million in population, due to the introduction of GSM 800, which allows operators using



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the 800 MHz band to have access to GSM technology too. Here in this project the modem will communicate with microcontroller using serial communication. The modem is interfaced to microcontroller using MAX 232, a serial driver.

Software analysis:

Software analysis will be discussing on how the C programming operated and function. First, GSM modem and ARM 7 microcontroller was initialized. Second, the text mode format, "AT+CMGF=1" command was executed before sending other command. Follow by the SMS at memory location 1 in the SIM card of GSM modem was deleted. GSM modem was ready to receive SMS message from user now. Once SMS was received, it will be read and the contents will be checking to make sure the SMS that had received was in correct or not. The appropriate output to switch on or off the appliances only will be sent if the content no error. Through hyper terminal, the interface between mobile phone, GSM modem and controlling circuit can be analysis. If the case such as got wrong message received by GSM modem or connection problem between the hardware, the "ERROR" command will be displayed. Else the "OK" command was showed if no error occurred in the communication interface of hardware.

MDK-ARM Keil μ Vision:

This is free software (evaluation version) which solves many of the pain points for an embedded system developer. This software is an Integrated Development Environment (IDE), which integrated text editor to write program, a compiler and it will convert your source code into HEX file. Here is simple guide to start working with Keil μ Vision which can be used for:

- Writing programs in C/C++ or Assembly
- Compiling and assembling programs
- Debugging programs
- Creating HEX, AXF and BIN file
- Test program without real hardware

Applications:

1. This project can be used to provide high level security to our vehicle.
2. Project will display basic information about the vehicle.

. Advantages:

1. Easy to use
2. Low cost
3. Easy to construct.

Disadvantages:

1. It is a low range circuit and cannot be implemented in critical condition.

IV. RESULTS & DISCUSSION

This car alarm system is proposed to be used by parents to always alert them about their children. By using this system, it can avoid from death cases of dying child increase every year. The death cases are very tragic because it involves child or person that very young. This system is created and develops by using simple components that easy to get in any types of component store. It also comes in very small of product that can easy to install inside the car. In a system to detect presence of occupants of an automobile. In particular, the invention relates to systems that detect the presence of a child in a child's seat without other passengers and the automobile is not in an operational mode. In this case, to minimize injuries to the child, corrective action is need to be taken. This system is generate the control signals that can activate an alarm, open the doors of the car, and roll down the windows if there is a child in a car that had left.

Methodology

- 1) Initially check force sensor then engine gets OFF.
- 2) If engine OFF and child present then we send one alert, and recheck child detection
- 3) If child is present then we check temperature and sound, if something goes wrong immediately send alert.
- 4) If Engine is ON and doesn't monitor anything, then it should be engine status indicate with 'S' code.



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V. CONCLUSION

The project entitled “Design and Implementation of Child Presence Detector in an Unmanned Car” which saves the child. Child presence detectors are key requirement in this project. It can be prevented by sensing the presence of a child soon after a car is turned-off. Generating/sending a suitable warning signal to the driver or parents who can take timely action to save the child. The circuit is force, which detect the presence of the child inside the car through weight which is kept behind the seat of the car. The temperature sensor i.e., LM35 is used to sense the temperature inside the car. Sound sensor is used to sense the sound of child presence inside the car. The System is further more enhanced due to the presence of the GSM module. GSM establishes the communication between a computer and GSM system. It is used to receive and send the message in the SIM. . LCD is used to display the temperature inside the car.

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