A Child-Left behind Warning System Using Capacitive Sensing Principle

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ABSTRACT: This paper presents a simple and efficient capacitive sensing system suitable for detecting presence of a child inside the car. It also details a warning system that alarms the parents once a child is found to be left alone in a car. Driver and passengers, in some situations, may leave the car without taking (forgetting) the child. When a car is turned-off (windows closed) temperature inside it will increase rapidly and can be life threatening as the thermoregulatory system of child is weak. Such incidents have been reported worldwide. The proposed capacitive sensor system detects child occupancy. After a present time, if no one takes the child, it will automatically dial (using a GSM module) to parents or driver to help the child. The developed sensor accurately detected presence of a child (in various postures) in an infant seat. The notifications are immediately sent to the parent/caretaker phone using a mobile application, which an effective response system to notify car owners or the relevant authorities when the child is in danger.

KEYWORDS*:* Child-left behind alert, Internet of Things, Temperature sensor, Global Positioning System, Accident alert, PIR sensor, Gas sensor,

I. INTRODUCTION

The number of unnecessary deaths to toddlers caused by careless car owners has been increasing year after year. In India about 700 children died due to hyperthermia. This paper aims to develop a reliable system, targeting car owners to reduce such avoidable deaths to innocent children. The report will firstly provide a detailed analysis on the current problem we are facing, followed by strength and weakness analysis on the various existing solutions available in the market. Because of the ineffectiveness of these solutions, we will propose our own product which uses various sensing technologies to establish vital signs and the environment of the subject, with an effective response system to notify car owners or the relevant authorities when the child is in danger. As science and technology has advancing to be part of our lives, most of everyday applications are now connected to each other virtually. Children are our future innovators so; make sure that they are safe. Studies have demonstrated that the temperature inside a halted vehicle can rapidly rise to a hazardous level for infants, pets and even elders.

II. EXISTING SYSTEM

Newspaper articles and campaigns by safety advocates had brought some attention to the problem, but its visibility grew when a March 2009 article by Gene Weingarten in The Washington Post Magazine, "Fatal Distraction," asked whether the mistake of forgetting a child in the back seat of a car was also a crime. Some companies have developed devices that a signals parent about tragedy is going to happen. Some devices in market in order to prevent these tragedies, but studies suggest that they are all unreliable.

William Edwards, a senior engineer at NASA's Langley Research Centre in Hampton, Va., led an effort to develop a child-left-behind warning device after a child died of hyperthermia in the centre's parking lot. When a child is placed in the car seat, a sensor under the cushion, working through a module mounted on the side of the seat, establishes communication with an alarm on the driver's key ring. If the driver walks away from the car while the child is still in the seat, the alarm sounds — and can be turned off only by removing the child.

Catherine McLaren, MD, Jan Null, CCM, and James Quinn, MD: Children left in a motor vehicle, even for short periods of time in moderate ambient temperature (say 21c) are risk of hyperthermia. The internal temperature within the closed motor vehicles ascends rapidly in first 15 minutes dispute of variations in the rate of increase due to vehicle type, colour and window tainting. Temperature increases by 1.7-1.9°C per 5 minutes. Within 30 minutes 80% of

temperature is increased and in 60 minutes vehicle have reached peak temperature regardless whether window is closed or cracked open.

III. SYSTEM DESIGN

An easy as well as low cost solution for child-left-behind difficulty in a car is presented. A novel capacitive sensor has been expanded to notice presence of child in an infant seat. A measurement and control unit that measures capacitance of sensor, by means of a sigma-delta capacitance to digital converter, as well as generates a warning signal based on sensor data along with engine status has moreover been developed.

When the temperature inside the car increases upon the limits, warning message will sent to the parents and the AC is turned on. Parents also have the control over AC. As soon as controller gets information that the engine is turned-off, it instructs capacitance-to-digital converter to compute capacitance available data. When the oxygen content is insufficient inside the car due to other poisonous gases, notification will sent to the parents and the window will be slightly opened for air circulation and when the oxygen level is saturated the window will be closed automatically. If at all the parked car is hit by another vehicle, the buzzer will be turned on and the notification is sent to the parents.

The measurement and control unit initially generates an audio alarm and if no one acts inside a pre-set time, it instructs a GSM modem to call to liable persons to assist the child. A prototype capacitive sensor as well as measurement and control unit have been build and tested. Presence of a child in seat can be precisely detected and suitable warning signal can be produced to save the child.Fig1 shows child presence detector as well as warning system.
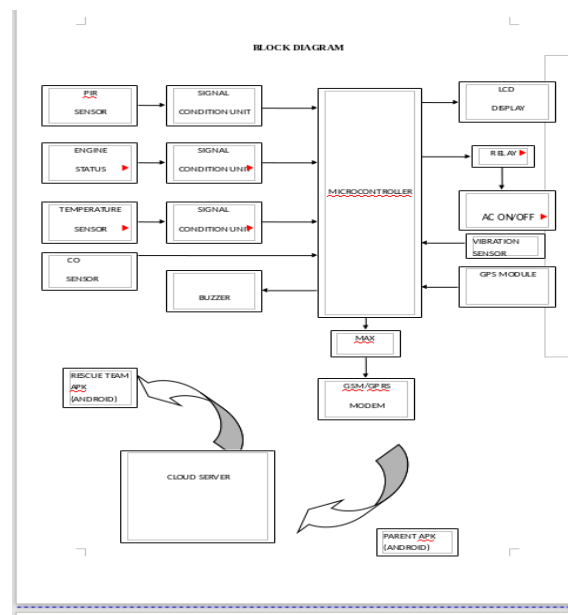

Figure 1: Block diagram of the proposed system

IV.WORKING METHODOLOGY

The call of the design process is to produce a model or representation of a system. It is the transition from a user Oriented document to a document oriented to the programmers. First we need to understand the most basic concept of interaction between microcontroller, sensors and GPRS/GSM module.
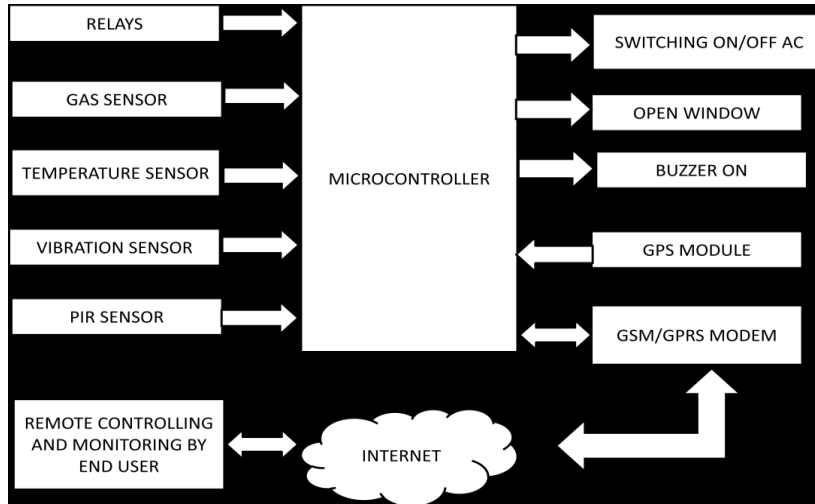
Figure 2: Interaction between microcontroller and sensors

V. IMPLEMENTATION

The following hardware components are used in this system

ARDUINO UNO: The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.
GPS MODULE: The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.
VIBRATION SENSOR: The sensor used to detect accident is shock sensor. This is a single stage shock sensor, it detects any hard impact acted on it. The output from sensor after impact will be +5v and connected to INT (pin 12) of processor.

The software requirements of the system are android 4.4 or later operating system, eclipse 3.4 (min) IDE, Proteus 8 and Isis 7.
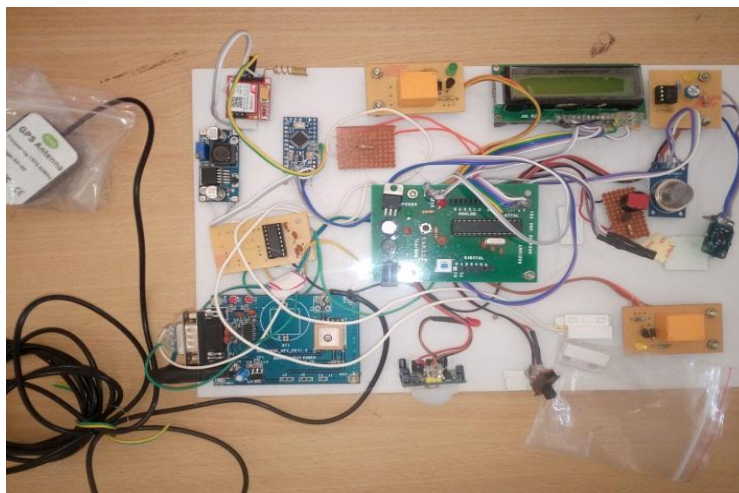

Figure 3: Hardware setup

The figure 3 shows the total hardware setup of the proposed model.

VI. RESULTS AND OBSERVATION

Figure 4 screenshot of getting location from the application

Figure 4 Message sent alert

Figure 5 shows the temperature over limit alert in user application and parent can switch on the AC accordingly. If there is no response from parent then alert will sent to the rescue team with location

Figure 5 Temperature Alert

Figure 6 shows when the oxygen content is insufficient inside the car due to other poisonous gases, notification will sent to the parents and the window will be slightly opened for air circulation.

Figure 6 Gas alert

Figure 7 shows screenshot for accident alert. If at all the parked car is hit by another vehicle, the buzzer will be turned on and the notification is sent to the parent

Figure 7 Accident Alert

VII. CONCLUSION

The system is a simple and cheap and is presented for detecting the unattended child who left intentionally or inadvertently inside car to prevent him/her from hyperthermia. This system is developed based on sensors for motion, temperature, accident detection and oxygen regulation along with smartphone application. In doing so, this system advanced the state of the art by improving the way for preventing children from hyperthermia and enhancing the communication features for more children protection. Test results clearly show that presence of a child in an infant seat can be accurately detected and appropriate warning signal can be generated to save the child using the smartphone application and it is easily evaluated.

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BIOGRAPHY

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