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Health Safety of Children Unintentionally Forgotten in a Car

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ABSTRACT: Children dying from heatstroke in cars have increased over the past few years. To avert these avoidable tragedies, a better system is required for recognizing back seat youngsters and giving a timely and precise signal to their parents. This essay advocates for a cutting-edge, all-encompassing mechanism to prevent the abandonment of children in moving automobiles. The current car seat detection technology either compromises people's privacy (based on a camera) or fails to distinguish between children seated in the back seats and heavy objects, giving out erroneous signals based on a pressure sensor. A force sensing resistor, infrared sensors, a carbon dioxide sensor, and a temperature/humidity sensor are all used in the proposed system. These sensor devices are linked to a microprocessor, which combines the information it gathers and, with the aid of a GSM module, sends users alarm messages. With the aid of IoT, data may always be watched on the cloud. If the owner does not take any action, the DC motor for the car's glass window begins to operate. As a result, the suggested method provides adults, pets, and children with health safety through the implementation of warning measures.

KEYWORDS: Heart Stroke, Health Safety, GSM Module

I. INTRODUCTION

Each year, a small number of kids who were left in a locked car and succumbed to heatstroke die. The number of children dying from heatstroke in cars continues to rise. We need to figure out how to remind these negligent parents immediately. Effectively detecting youngsters in the backseat and sending timely, precise alerts to their parents would be a better way to prevent those deaths. A vast array of artificial systems that autonomously collect information from their surroundings, process it, and then take actual actions depending on the results of their analysis permeate people's daily lives. All of these systems communicate with us through graphical user interfaces, online forums, audio or visual feedback, and physical movements [1]. As depicted in Fig. 1, In the United States, heatstroke in vehicles caused 54 children to pass away in 2018, 42 in 2017, and 39 in 2016, the majority of which were accidents that might have been avoided.

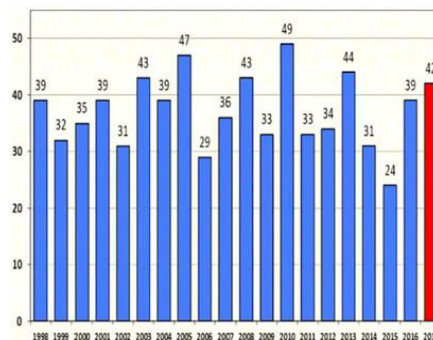


Fig. 1 Child deaths in USA for heat stroke in cars from 1998 to 2017 (www.noheatstroke.org)

Due to these circumstances, it is more important than ever to create and install cutting-edge systems that can effectively

use sensors to detect the presence of a child inside an unattended car and inform the driver or other potential contacts via a variety of alarms.

Approximately 87% of the children who die from heat stroke or hyperthermia in cars in the United States each year—about 37 on average—are between the ages of one and three.



Fig.2RearDoorAlertsysteminterface

(a)When the vehicle is turned on, an activation message appears after the back door has opened and closed,(b)When the vehicle is turned off, a warning message for the rear seat control appears. Interfaces for system settings and access are (c) and (d)respectively. (Nissan donated the pictures.)With increasing car complexity, there are more control systems to help the driver manage the vehicle. For instance, race vehicles require a high level of control over all functional parameters, therefore they wirelessly transmit information to the control station instantaneously. This allows the cars to be tuned in real time to maximize their functionalities. Since most cars will become more and more network-oriented in the future and employ telemetry on them, scientific study in this area is quite active [3].

II. DETECTION SYSTEMS CURRENTLY AVAILABLE IN THE MARKET

Despite the fact that airbags are a car safety feature, they forcefully kill children under the age of 12[4]. This essay describes how to count the number of passengers in the automobile and then classify each person according to whether they are a child or an adult using the image the camera captured. thus that airbag deployment is frequently avoided in close proximity to children. In the USA, patents for two related systems have been granted. The first one uses a weight sensor to identify the driver and a sensor on a baby chair's safety belt to identify the child [5]. The other makes use of frequency identification (RFID) technology to detect the presence of a child in a safety seat by placing an RFID reader inside the car and an RFID tag on the baby's chair [6]. Therefore, utilizing machine learning approaches, we propose the back seat children identification using Wi-Fi signals in this study [7, [8]. Our detecting process involves two steps. The first is to use the static Channel State Information (CSI) of Wi-Fi signals to determine whether there is a pet, a child, or other items in the backseat of the automobile. Then, using the CSI signals over time, we attempt to separate the children from the pets. The technological elements and primary functions of the suggested system are summarized in Table 1. However, as cars grow more autonomous, the number of collisions will gradually decline [9]. In order to discriminate between an adult and a young child, the system presented in this research makes use of sensors to detect characteristics like height and weight. By uploading raw data to the cloud, it should be easy to detect these scenarios thanks to modern sensor and networking technology[10]. In this study, we investigate how cloud computing can analyze sensor system updates and deliver alerts to prevent these unfortunate outcomes.

In [11], an identical system uses a PIR sensor, a PIC16F877A microcontroller and a GSM module for detecting the presence of a toddler during a parked vehicle and to alert the driver with an SMS transmission. These systems typology, based only on presence sensors, can lack of detectability in conditions during which the child/ infant is asleep or is roofed with a blanket; for these reasons, the proposed system integrates, not only presence sensors, but also a sensible camera and a voice detection device to beat these shortcomings.

The system described in [13] employs a weight sensor to identify the presence of the child in the car seat, after which it notifies the driver via their smartphone and activates an alarm on an electronic keychain. The keychain gadget loses contact with the transmitter in the mat and activates its auditory alarm if the driver moves outside the RF signal's

transmission range. The device mentioned in [14] is capable of locating a child who has been left in a car and tracking their movements.

The "Hot Car Baby Detector" technology described in [15] permits detecting a child's presence in a car through their movement, speech, and breath, even when the cockpit temperature is high. The child's breathing is detected by a temperature sensor, an ultrasonic movement sensor, a voice detector, and a CO2 sensor. The device activates an auditory alert in the event that it detects motion, sound, or an increase in carbon dioxide levels. We placed a Wi-Fi transmitter and receiver near the back door of the vehicle to check if there is a child occupying the back seat[16]. Most of the time, people always place their dogs, kids, and other belongings in the back seat. The primary concept is to record how the wireless channel changes when various things are positioned. The discrepancies between the answered CSI are caused by different materials and varying sizes for the various objects.

NAME	DETECTION METHOD	ALARM CONDITION	ALARM TYPES
Rear occupant alert	Ultrasound movement sensor	Vehicle off, doors locked	Flashing lights, horn sound
Car passenger detector	PIR movement sensor	Vehicle off	Acoustic and bright sound
Rear door alert	Rear doors opening before vehicle start	Vehicle off, doors locked	Message on panel, acoustic sound
Rear seat remainder	Rear doors opening before vehicle start	Vehicle off	Message on panel, acoustic sound
Baby care	Weight sensor in baby seat	Phone sensor Bluetooth connection	Phone message

Table.1. Characteristics [12]

III. PROPOSED SYSTEM

The suggested system monitors patient conditions using force sensing resistor sensors, temperature sensors, IR sensors, and gas sensors. These acquisition devices are linked to a microcontroller board, which can aggregate all the data it has collected to set off the alarm. As a result, various warning protocols are being implemented, and users with GSM modules are receiving alarm messages. We can monitor the data in the cloud by using IoT. If no action is taken by the owner, the DC motor for the car's glass window begins to operate. Temperature sensors measure the amount of heat energy, or maybe coldness, produced by a system or an object. The voltage across the diode determines how well a temperature meter functions. The resistance of the diode is exactly proportional to the temperature change. Temperature measurements are made by converting the resistance across the diode into readable quantities. A type of piezoresistive sensing technology known as force sensing resistors (FSRs), sometimes known as printed force sensors or force-sensitive resistors, comprises of a semi-conductive material, such as ink, placed between two substrates that are separated by a spacer. Inversely proportionate to the applied force, the resistance decreases.

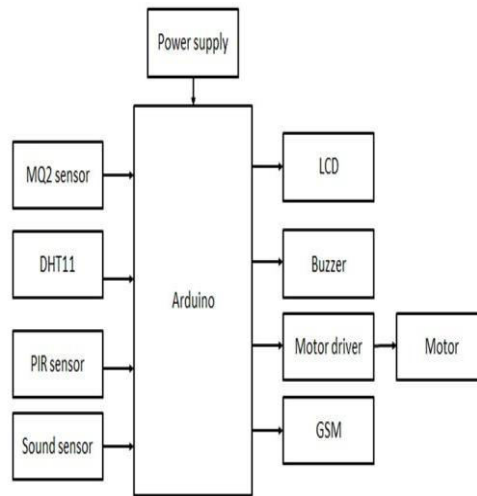


Fig. 3 Block diagram of proposed system

An IR sensor can monitor an object's heat while also spotting movement. An IR LED (Light Emitting Diode) serves as the emitter, and an IR photodiode, which is sensitive to IR light of an analogous wavelength to that emitted by the IR LED, serves as the detector. A gas detector is a tool that can identify the presence of gases in a community, frequently as part of a security system. This kind of gear is used to find emissions, such as gas leaks. Oxygen depletion and poisonous, flammable, and combustible gases are frequently found with gas detectors.

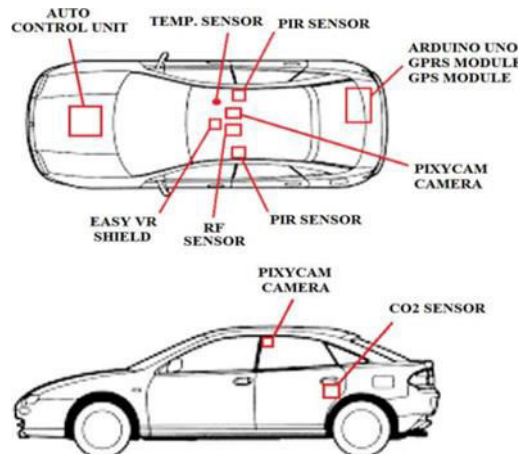


Fig. 4 System device positioning from[7]

Any rotary electrical motor that uses DC power to produce energy is referred to as a DC motor. Almost all types of DC motors feature an internal system, either electromechanical or electronic, that enables periodic changes in the motor's partial current direction. A DC motor's speed can frequently be adjusted over a wide range by varying the supply voltage or the amount of current flowing through its field windings.

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IV. RESULTS

The result surely satisfies, given the critical scenario in which the system has to operate, taking into account that in similar conditions other competitor systems cannot ensure comparable performances. Summarizing, thanks to the wide set of used sensors and detectors, the developed unattended child detection system guarantees a mean detection probability higher than 86% relative to the critical scenarios described in Table 2, a satisfactory result considering the unusual and worst conditions in which the system

was tested. Specifically, a 90% maximum detection percentage was obtained when the child is mute but he is moving and not covered, detection mostly ascribable to the face recognition detector and to movement sensors; instead an 82% minimum detection percentage was determined with the experimental tests when the child is not covered but he is motionless and mute, detection attributable to the face recognition module and CO2 sensors.

V. CONCLUSION

A new sensor-based system with IoT and GSM alert has been developed by our team. We used a force sensing resistor, infrared sensors, carbon dioxide sensors, temperature/humidity sensors, and infrared sensors in this system. These data collection devices are attached to a microcontroller board that is prepared to aggregate all collected data in order to identify an alarm scenario, act on warning processes, and send alert messages to users using a GSM module. To open the window, the Dc motor of the car's glass window begins to operate. The proposed detecting system is therefore put into practice to provide warning and safety measures for kids left in cars.

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