Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 07, July-2021

IoT based Anti-Suffocation Locked Car

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***Abstract*—For the passengers to survive, the interior of the car (or any automobile) must always be favorable and perfect. In today's world, passengers in cars sometimes find themselves in bad situations where they are uncomfortable or unhappy for a variety of reasons. One of these reasons is that people suffocate within the closed car cabin owing to a lack of oxygen. This is most likely due to a lack of ventilation caused by closed windows in a locked car. These situations can be severe, and the passenger may die as a result. The proposed model is a monitoring and alarming system that checks for carbon dioxide levels inside the enclosed space and detects any individual movements using a motion sensor. As a result, if the level of carbon dioxide rises above a specified threshold, the registered phone number will receive an SMS warning and the buzzer will sound to inform individuals nearby. This proposed method can be used in a variety of other isolated and poorly ventilated environments, such as chemical plants and industries.**

Keywords—Internet of Things; Arduino; Carbon dioxide; suffocation; sensors; Amazon Web Services;

I. INTRODUCTION

Suffocation deaths are prevented using the proposed technology, which is employed in automobiles. In our day-to-day lives, there have been a slew of similar tragedies. Even while it doesn't happen as regularly as it used to, it's still a severe problem that needs to be addressed. The following are a few of the cases.

Case 1: 3 Children Accidently lock themselves in car, Die of Suffocation in AP (August 07, 2020)

Case 2: In a tragic incident, four children accidentally locked themselves in a car and two of them died due to suffocation. Two other children have been hospitalized in a critical condition in MORADABAD, UP. (June 16, 2020)

These were the occurrences throughout the last four months. Cases like these have been on the rise for more than a decade, and something must be done to ensure the passengers' safety. According to statistics, 54 percent of instances were caused by parents' carelessness in leaving their children alone, and 42 percent of cases were caused by forgetful parents. Usually, the biggest factor is hypothermia as the temperature will drastically increase, as a result led to fatal rates. Not only in cars, but there were also many such instances where people got stuck in the elevators. Therefore, considering the seriousness of the issue this system is proposed in further preventing such unfortunate deaths.

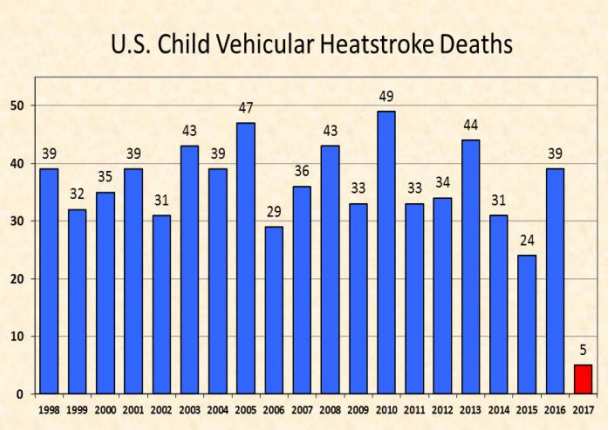

Figure 1.1 Department of Meteorology & Climate Science
San Jose State University 26 April, 2016

II. METHODOLOGY

A. *Prototype of car*

The suggested system is a single-board microcontroller - Arduino based monitoring and alarming system to avoid deaths in locked car cabins caused by suffocation (asphyxia). Various IoT components, such as a gas sensor, motion sensor, and RFID sensor, are linked to the Arduino and each performs a distinct purpose, completing the system.

- The door locking and unlocking system is implemented by a motor driver, while the RFID sensor scans the RFID card that represents the car's unique key.
- The gas sensor and the motion sensor are used to monitor the CO2 level and to detect movement inside the locked car, respectively.
- The LCD allows the measured CO2 levels to be shown, and the buzzer is activated to alert those in the local vicinity to take the essential steps to assist the victim survive.

B. *Message sending activity*

The sending of an alarm message to the car's owner through SMS is critical to the project's success.

The car's information is kept in the AWS Cloud, and an SMS is sent to the registered mobile phone using the information extracted from the cloud.

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III. BLOCK DIAGRAM

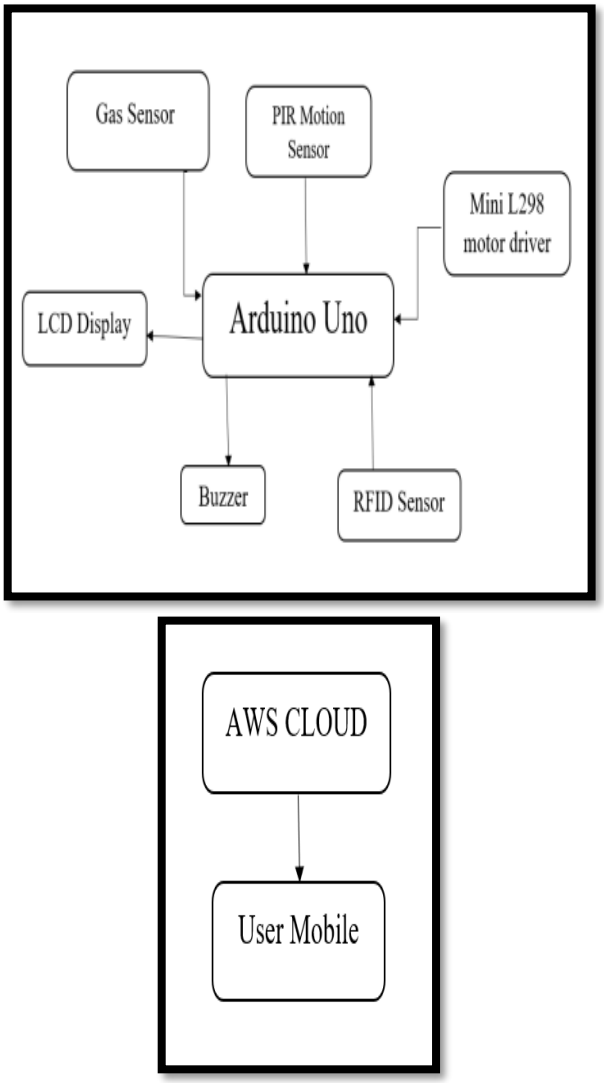

Figure 3.1 Block diagram representing all components

Block diagram of this system is as shown in the above figure.
Components of this system are:

- Motion Sensor: A motion sensor detects moving objects, especially people [6]. The PIR motion sensor in the proposed system searches for movement inside the car and transfers control to the next procedure of gas level detection when it detects it.

- Gas Sensor: A device that detects the presence or concentration of gases in the atmosphere is known as a gas sensor. The gas sensor is activated in the proposed system once the motion sensor detects movement. The amount of carbon dioxide in the atmosphere is measured on a regular basis, although with some lag (say for every 5 minutes).

- RFID sensor: RFID tags connected to things are automatically identified and tracked using electromagnetic fields. A tiny radio transponder, a radio receiver, and a transmitter make up the device.
  The tag transmits digital data, usually an identifying inventory number, back to the reader when triggered by an electromagnetic interrogation pulse from a nearby RFID reader device. The RFID card, which has a unique identifying number, serves as a unique car key in this suggested system.

- Motor driver: This Motor Driver Module is a high-performance motor driver for DC and Stepper Motors. The Automatic Door Unlocking System is aided by the Mini L298 motor driver in this system.

- Buzzer: It's an audio signalling device that's either mechanical, electromechanical, or piezoelectric in nature. An alarm is broadcast to the surrounds utilizing Buzzer with the alert message that is delivered to the car's owner.

- LCD: It is a flat panel display that operates primarily through liquid crystals. On the LCD, information concerning carbon dioxide levels and motion detection will be presented.

- Arduino UNO: Arduino is a single-board microcontroller corporation, initiative, and user community that designs and manufactures open-source hardware and software for making digital devices. It is the brains underlying the suggested system's whole operation.

- AWS cloud: Amazon Web Services (AWS) is a comprehensive, ever-evolving cloud computing platform that comprises infrastructure as a service (IaaS), platform as a service (PaaS), and packaged software as a service (SaaS) solutions. The details of the car are saved in the AWS Cloud in this suggested system, and an SMS is delivered to the registered mobile phone number by extracting it from the cloud.

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IV. DESIGN FLOW:

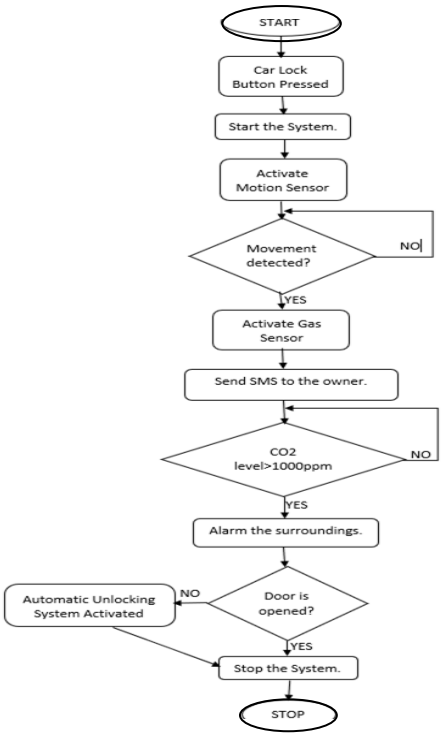

Figure 4.3

V. SYSTEM IMPLEMENTATION

A. Prototype of car

- Using the car's ignition switched off, the owner/user locks the vehicle with his RFID card.
- When the motion sensor is turned on, it checks for motion inside the locked car and sends an alert SMS to the owner's registered phone number, which is taken from the database (csv file) stored in the AWS cloud. The procedure continues after the alert message is sent, with the gas sensor collecting data and calculating the CO2 level rise.
- If the CO2 level rises above 1000 ppm, the buzzer goes on, notifying everyone in the vicinity that someone is in danger.
- The automobile door can be unlocked in two ways: with the user's RFID card, or with the automatic unlocking system, which is engaged when the CO2 level exceeds the threshold but the RFID card is not scanned.

B. Message sending activity

- The database, which contains the user's phone number and unique RFID card, is fed into an AWS S3 bucket and extracted while sending the alert SMS utilising various tools and libraries.

CO2 Levels in ppm	Result on human sustenance
400ppm	Atmospheric CO2 Level
350-450ppm	Average indoor CO2 Level
1000ppm	Maximum acceptable CO2
>2000ppm	Dangerous CO2 levels

VI. SNAPSHOTS

Figure 7.1 LCD displays the above message when the RFID card is read.

Figure 7.2 LCD displays the above message when the PIR motion sensor detects any movements

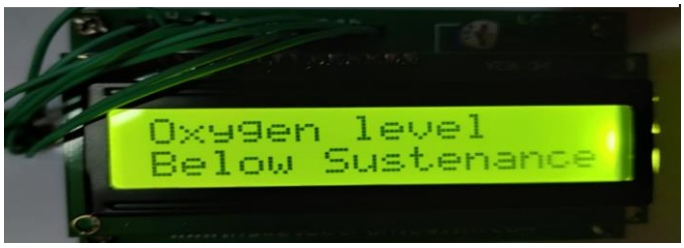

Figure 7.3 LCD displays the above message when the CO2 level goes beyond threshold

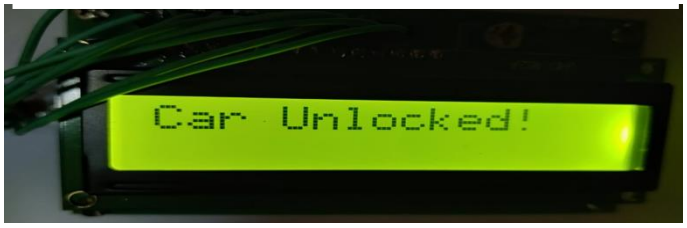

Figure 7.4 LCD displays the above message once the car unlocking process takes place

VII. CONCLUSION AND FUTURE SCOPE

The IoT-based anti-suffocation locked car attempts to prevent suffocation in closed car cabins owing to a lack of oxygen or excess carbon dioxide. This technology not only alerts the automobile owner to the person suffocating within the vehicle,

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but it also alerts the surrounding area via a beep sound.

The proposed technology is intended for any vehicle with a centralized window locking and air conditioning system. This technique can also be employed in places with a closed cabin, such as elevators and factories. The system is cost-effective, automated, and smart, and it will assist in achieving the stated goal in a minimal manner.

The proposed methodology could be improved in a number of ways. One method is to create a sensor that can scan the pulse rate or measure the rate of respiration. This will not only notify the car's owner of the suffocation, but also anyone having a panic attack or having difficulty breathing, as indicated by a deflection in the sensor. [1]. A combination system might be designed to help prevent asphyxia caused by smoke emissions, oxygen loss, and heat. Many lives could be spared in the future as a result of our efforts.

In the near future, we hope to create an adequate machine learning algorithm that will allow the complete system to function without human intervention at any stage during the process. Fully automated systems are not only time efficient but also, in most cases, incredibly accurate.

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