AUTOMOBILE SENSOR BASED SAFETY SYSTEM

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Abstract: A normal automobile when parked for a few minutes during daytime becomes hot. When a person enters the automobile, it is so hot that he opens the door and waits for a few minutes before getting in. This hot air and such a situation are harmful and suffocating for an infant, children’s, disables and even for adults.Hence it is essential for us to not ignore it and to overcome it and find a remedy or if possible, eliminate the problem itself. Because such situation can be very harmful and leads to hospitalization and even death. In order to overcome such harmful and injurious situation, we are designing an alert and an exhaust system to deal with this problem. Basically, we are designing a system which can detect the harmful scenario by using sensors (NTC thermistor, frequency sensor, smoke detector) which is controlled by Arduino and safety measures are activated accordingly and alert the person regarding the harmful situation. After the safety measures are activated, the window moves down to create a temperature difference for cooling. Secondarily an exhaust system drives out the gases effectively and cools the interior or inside atmosphere of the automobile.

Keywords: automobile safety, sensors, exhaust system

1. INTRODUCTION

An automobile parked on a sunny day becomes really hot in a few minutes. In India twin sisters about the age of five years were found dead in Gurugram inside the car because of the heat stroke. Both were accidentally locked inside the car for about 2 hours. The incident took place in Jamalpur village and they were locked in a Hyundai car. In India a lot of people die every year due to heatwave. Dr Deepiti Chaturvedi, specialist – pediatrics, Burjeel hospital, ABU DHABI says that even for a minute neglecting your children inside the car can prove fatal. Hyperthermia damages the brain as well as other organs. In June 2017 two Emirati sisters suffocated to death inside a vehicle in Ajman. The sisters aged just two and four, got automatically locked as they entered the vehicle. In the same month a 20-month-old baby was rescued by Ajman police who was accidentally trapped inside the car. 791 children have died due to paediatric vehicular heatstroke in the US since 1998. All of this could have been prevented. This study has been published in a paediatric journal. Out of these 791, 54% of these children were forgotten by their guardians while 27% were left unattended. Although in comparison to this study which spans nineteen years these deaths seem less, but they are significant. This vehicular heatstroke called hyperthermia can happen almost anywhere and is most deadly in gulf countries and the Indian subcontinent. Infants and children are usually at risk because of their biology. Children’s body temperature rises 3-5 times faster than adults. The temperature of a car can climb 20 degrees in just 20 minutes. An average of 37 children die each year in hot cars only in United States. Also, other than infants and children who are forgotten, the same case goes for mentally challenged person, dogs, physically challenged people and people who need others for support (to walk, run and do daily activities). Hence this problem should not be overlooked to eliminate such causalities with the help of safety measures.

This project deals with the safety of the person who is locked inside the car intentionally or unintentionally. The one locked inside the car might be children, infants, dogs, small animals, physically and mentally challenged beings. As it gets hot and suffocating the person needs to get out as quickly as possible or to make use of such system which makes the inside atmosphere of the car cooler and less suffocating.

As it gets hot inside the car the person trapped inside will shout and the infant will start crying. This project includes three sensors. We have the voice sensor to catch any audible frequency of the person trapped, a temperature sensor to sense the temperature which is threatening the person and a smoke detector which is
harmful for living beings. All these sensors are controlled by an Arduino. This Arduino is connected to your window motor of the normal car window mechanism and to an exhaust system. When inside atmosphere exceeds normal conditions, the sensors alert the Arduino which in turn opens the window and the exhaust system.

Figure 1. Flowchart
2. SYSTEM COMPONENTS

This project or safety system consists of the following:
1. Window regular mechanism
2. Arduino
3. Sensors
4. Exhaust system
5. Battery

2.1 WINDOW REGULATOR MECHANISM

A window regulator is the mechanical assembly behind a door panel that’s responsible for moving a glass window up or down along a guided track. We are employing a simple rack and pinion gear arrangement for this purpose.

Figure 2. Window mechanism
2.2 ARDUINO

Arduino is an open-source prototyping platform based on easy-to-use hardware and software. Arduino boards can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. It is like the brain of a project.

Because it is so flexible and open source, Arduino is the best solution if you are interested in creating interactive objects or environments no matter you are artists, designers or hobbyists. A sensor is an electronic device that converts a change in physical phenomenon into an electrical signal. It can send the information to computers or other electronic devices (ARDUINO). Therefore, it is a part of the interface between the environment or physical world and the electronics (Kenny, 2005).

2.3 SENSORS

The function of a sensor is to respond to an input physical signal and to convert it into an electrical signal (voltage). It is a semiconductor device that is designed to respond by change in their resistive or capacitive property depending upon the type of sensor. Following are the sensors which will be use in this safety system.

There are three type of sensors used in this project:

A. Temperature sensor (NTC thermistor)
B. smoke sensor (MQ2 sensor)
C. Voice sensor (frequency sensor)

Let us discuss each of them in brief.
A. TEMPERATURE SENSOR.

![NTC thermistor circuit](image)

Figure 4. NTC thermistor circuit

A temperature sensor is an electrical device which is used to sense the temperature of the surrounding, object and environment. There are many temperature sensors which can be used to sense the temperature inside the car atmosphere. We have selected NTC thermistor as our temperature sensor because it is accurate, has quicker response time, is of low cost and easily available.

B. SMOKE SENSOR

An MQ2 sensor is used for smoke detection to avoid harmful situations for the infant. As soon as smoke is detected the sensor gets activated and gives signal to Arduino which in turn activates the system and removes smoke from inside of the car.

![Smoke sensor circuit](image)

Figure 5. Smoke sensor circuit
C. VOICE SENSOR

![Voice frequency detector circuit](image)

Figure 6. Voice frequency detector circuit.

We have incorporated a simple frequency detector using breadboard. The circuit includes an IC555 timer, resistors, capacitor, LEDs etc. This circuit gives us the value of frequency in hertz and if the value exceeds the threshold value a signal is generated to the motor drive. The threshold value for the frequency detector is anything that exceeds 600 hertz.

2.4 EXHAUST SYSTEM

An air circulation system which can work all the time in an automobile is very essential in order to keep the pleasant environment inside the motor vehicle all the time. The system is designed in order to achieve the normal temperature conditions inside the car i.e. to reduce the temperature inside the car to normal temperature and to remove or take away the carbon monoxide from the inside atmosphere. There are several reasons of providing a circulating system and some of them are as follows; Circulation of air is essential for pleasant and good health. Carbon monoxide is poisonous and hazards for living being. So, our air circulation system reduces the temperature of the inside of a car to a safe temperature, which directly protects the health of an individual. We attach an exhaust fan to the window glass which removes the smoke and circulates fresh air making the inside of the car normal.

3. CONCLUSION AND FUTURE WORKS.

In conclusion, our approach of modular design strategy was a good solution for providing the safety as it made the operation of car window automatic according to the inside atmosphere of the car. Basically, this project or safety and alert system not only deals with solution of vehicular heatstroke in car which cause lots of causalities and hospitalization but also deals with how to avoid it using a mechatronics system. Besides this the system ensure the safety inside the car atmosphere from poisonous gases all the time. The project emphasizes automobile safety for children, pets, and physically & mentally challenged beings. With the help of our project we can prevent or reduce the death rate worldwide which cause due to heatstroke and poisonous gas.
A thorough research on this topic may help build a more advance safety system. The sensors could be more advance and with increasing technology can be used more effectively. A lot of other sensors like a CO detector can be involved to cover all the aspects of a car cabin.

REFERENCES

1. Timothy, Z., (November 20, 2014), All About Window Regulators., CARDiD.com
   https://www.carid.com/articles/all-about-window-regulators-motors.html

2. Chun-Tang Chao, Chia-Wei Wang, Jueng-Shian Chiou * and Chi-Jo Wang, (2015), An Arduino-Based Resonant Cradle Design with Infant Cries Recognition, Wilmar Hernandez

3. Acromag, Inc (May 2011), CRITERIA FOR TEMPERATURE SENSOR SELECTION OF T/C AND RTD SENSOR TYPES:
   https://www.google.co.in/url?sa=t&source=web&rct=j&url=https://www.acromag.com/sites/default/files/RTD_Temperature_Measurement_917A.pdf&ved=2ahUKEwiD896OxZTeAhVaV0KHaKoB0M4FBAWMAZ6BAgAEAE&usg=AOvVaw1hJjMB3OBMPuecwqgAEgs

   https://www.google.co.in/url?sa=t&source=web&rct=j&url=https://research-advances.org/index.php/IRAJTE/article/download/510/518&ved=2ahUKEwiD896OxZTeAhVaV0KHaKoB0M4FBAWMAZ6BAgAEAE&usg=AOvVaw1hJjMB3OBMPuecwqgAEgs


6. https://www.noheatstroke.org/kid