IOT Based Smart Car For The Safety Of Children From Automatic Locking System Car

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ABSTRACT

The increasing lifestyle of heavy work load and fast life of human beings has made them to forget some essential things in their life or sometimes irresponsible, either knowingly or unknowingly. The busy and fast life has made them to forget even their own kids and elderly parents who will require help on some emergency situations. One such situation of recent years is getting trapped inside the automatic locking system cars and finally it leads to death due to suffocation from lack of oxygen and excess heat called as death due to heat stroke. They would try to call for help but sometimes it will be unnoticed and even they would try for opening the car door, but due to lack of knowledge how to open it they will be trapped inside. This project is regarding the safety of children's or elderly person who gets locked in an automatic cars and the wards are unaware of it.

There are some readily available products for this purpose like Smart car seats which works based on the increase in the temperature in the seat where the child will be buckled up and Wireless proximity sensors which makes an alarm if the distance between child and ward increases a certain limit. But both are not a satisfactory one because for smart car seat the infant should be seated in the seat and for wireless proximity sensors the device should be tied to infant but the similar situations may happen for teenagers and elderly persons also whom will not stay at one place inside the car. So a device is required to sense the motion. The situation reaches to extreme point because of lack of oxygen supply, there is need of sensor to measure the level of oxygen availability.

The proposed system uses the feature of internet of things (IOT) with the network of devices like motion sensor, oxygen sensor and Raspberry Pi. The device motion sensor which is used to identify movement inside the car and an oxygen sensor to measure the oxygen level. These two sensor devices connected to each other so that oxygen sensor will be connected to motion sensor and in turn it is connected to Raspberry Pi. The oxygen sensors will be having a connection to car's automatic central locking system too so that when car gets locked it starts measuring the oxygen level. In the Raspberry Pi memory some emergency number will be registered. After the car gets locked the oxygen sensor measures the level of oxygen for every 5 minutes. When the oxygen level decreases below the 80%, the oxygen sensor sends signal to motion sensor. Once any movement is sensed by the motion sensor, it activates Raspberry Pi and the security alarm sensor. The Raspberry Pi gives an alarm call to one of the emergency number and at the same time car makes an alarm sound.

KEYWORDS: IOT, Sensor, Raspberry Pi, Heat Stroke

LITERATURE SURVEY

The domestic automatic locking system cars will have the safety measures for accident like seat belt, air bags and if any intruder tries to harm or tries to open the locked car means it makes an alarm so that passerby can identify. The existing safety measure exists only for infants which doesn't help teenagers or elderly people if they accidently get locked inside automatic locking system car.

EXISTING SAFETY MEASURES

1. Smart car seats

A company called TOMY International developed one possible solution.

In 2013, it began selling a "smart car seat" with iAlert technology that communicates between one of TOMY's First Years Brand car seats and your smartphone. The car seat, available through Amazon for $284, has temperature, angle, and motion sensors. If the seat gets too hot, the company says it will send an alarm to your phone. The system also alerts you if

the seat is installed improperly or if the child has unbuckled themselves while the car is in motion.

Amazon customers gave it mixed reviews. Though the seat's comforts and non-electronic features seemed fine, a few reviewers found that the alert system was unreliable. For example, customer "Jackie D" said on July 24, 2013: "When the unit was connected, the alerts would come through 9 out of 10 times but the problem is that they should come through 10 out of 10 times. When setting up secondary contacts to receive text alerts, the alert failure rate was even higher, maybe 2 out of 10 went through and when these did go through they still took at least 10 minutes to receive."

Customer "CRP Ag" commented on October 17, 2013: "Despite my reservations, if you view the alerts as another tool in your toolkit as a parent trying to keep your child safe, this is a nice innovation. Once the kinks are worked out, this will be a great device."

TOMY responded on the Amazon customer review site to Jackie D's comment, promising to work with her to address the issues she raised. CBS News contacted the company's public relations firm but was unable to get a statement at press time.

2. Wireless proximity sensors

Another type of technology that could help in these situations is a proximity sensor. Proximity sensors couple two devices: one part is activated when the child is in their car seat and the other is with the caretaker. An alarm sounds when the two devices become separated.

Baby Alert's Child Minder Soft Clip System Digital Wireless Technology Monitor replaces the plastic chest clip on the baby's car seat safety harness. You carry the other part with you as a key fob. Once the baby's chest device is clipped together, it connects digitally to the caretaker's device. If the two devices are separated by more than 15 feet for more than 6 minutes, an alarm goes off. It sells for $79.99 on Amazon.

Baby Alert also sells another version of the system, The ChildMinder Infant-Toddler ElitePad System, where the child's presence is detected by a pressure pad placed under the car seat cushion instead of through the harness clip.

The problem with this type of system, according to safety expert Arbogast, is that most deaths happen when there is a change in routine. For example, the person who usually drops the child off to daycare doesn't do it that day. "If you are relying on a key fob, you need to remember to transfer the key fob to someone else. It is easy to break the chain."

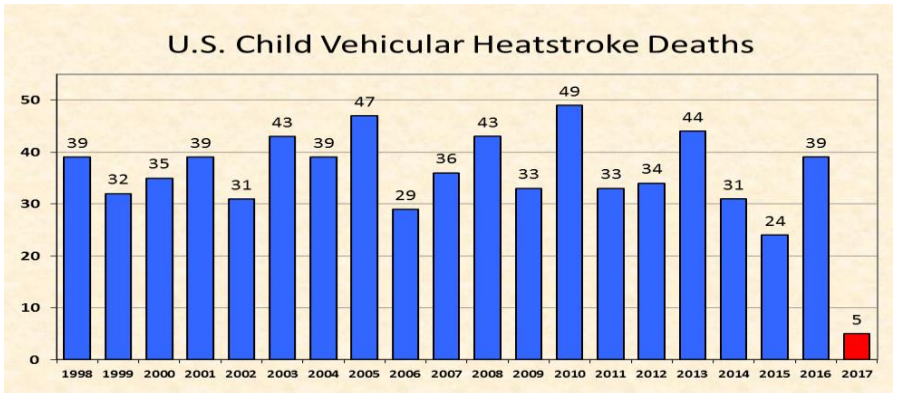
PROBLEM

On average, 37 children die from heat-related deaths after being trapped inside vehicles. Even the best of parents or caregivers can unknowingly leave a sleeping baby in a car; and the end result can be injury or even death.

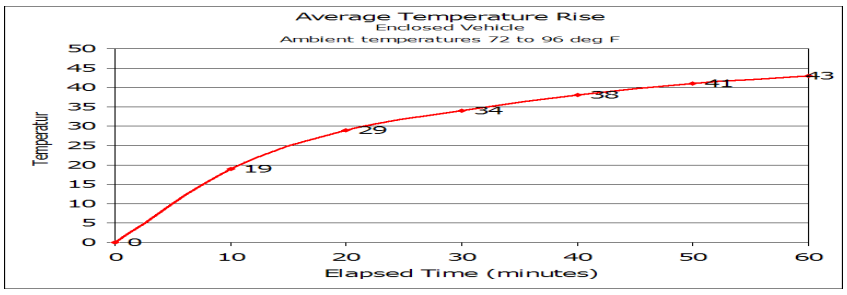
According to the safety organization Kids and Cars, an average of 37 children die each year in hot cars. These include instances where a child has been forgotten in a car, accidentally locks themselves in a car or trunk, or, in a small number of cases, when a child has been intentionally left in a car.

NoHeatStroke.org, a data site run by a meteorology and litigation expert, has been collecting data on these incidents since 1998. Since that time, the highest number of deaths per year was in 2010, with 49 deaths. 2015 had the lowest rate of incidents, with 24.

Rate of death of children from 1998 to 2017



The graph below shows temperature rise which will cause a heat stroke



PROPOSED SYSTEM

The proposal system includes a network of IOT devices like:

- A Motion sensor used to sense any movement inside the car,
- A Oxygen sensor to measure the oxygen level periodically for every 5 minutes and
- A Raspberry Pi; in the memory of Raspberry Pi some emergency cell phone numbers will be stored.
- The Raspberry Pi will be even connected to car's safety alarm system for touch.

WORKING OF COMPONENTS

- When the car gets locked automatically and the oxygen sensor gets activated and measures the oxygen level. If the level of oxygen is below 80% and it sends a signal to motion sensor.
- The motion sensor searches for movements inside the car and if any movement is sensed by the motion sensor, it sends a signal to Raspberry pi.
- When the Raspberry Pi gets activated, it gives a call to the stored numbers in its memory and sends a signal to the car's locking system for touch and at the same time car makes an alarm sound.
- The oxygen sensor will be programmed such a way that it should measure the oxygen level periodically with a delay.

The sensors are designed such a way that oxygen sensor will be connected to motion sensor and in turn oxygen sensor will be connected to Raspberry Pi. Raspberry Pi in turn it will connected to automatic locking system of the car, which is already designed to make the alarm sound on touch.

COMPONENTS OF THE SYSTEM

i) Hardware Components

- The different hardware components of the system are listed below:
  1) **Oxygen sensor**
  2) **Motion sensor**
  3) **Raspberry pi**

1) Oxygen sensor

An **oxygen sensor** (or lambda sensor) is an electronic device that measures the proportion of oxygen in the gas or liquid being analyzed.

All cars that were manufactured post 1980 feature an oxygen sensor. It is located within the emissions control system. When functioning, the O2 sensor sends data to the management computer located within the engine. In your car, a functioning O2 sensor ensures that your engine is running at top performance. Additionally, this sensor keeps your emissions in check and alerts you to when emissions are too excessive. For states that have vehicle inspection programs to regulate emissions, the use of the CEL and O2 light will alert officials to any excessive emissions. As a result, if one or more of your oxygen sensors is faulty during an emissions inspection for your car, you will most likely not pass the inspection.

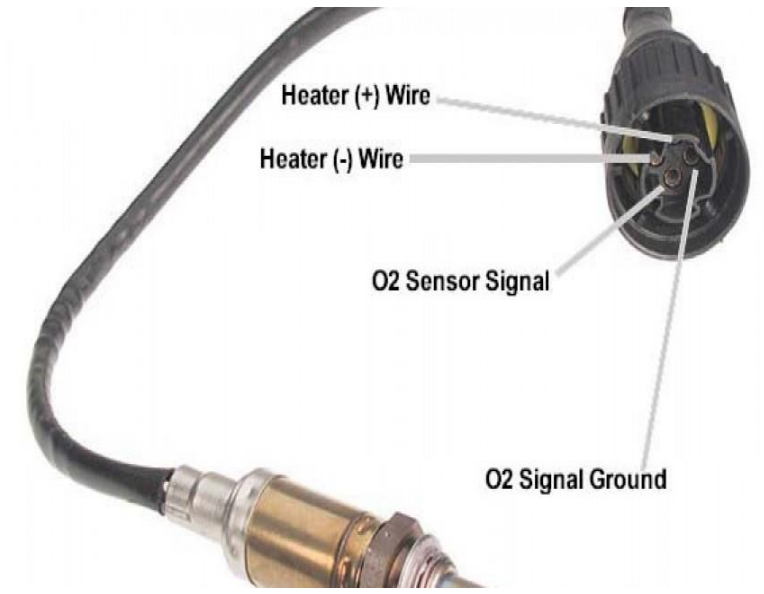
When a gasoline-powered engine burns gasoline there is oxygen present. Oxygen in an engine is the result of a number of factors including the air temperature, altitude, engine temperature, load on the engine, and barometric pressure.

For the proposed system, the oxygen sensor will be connected to the automatic car locking system. When car gets locked it starts measuring the oxygen level periodically with some delay (say for every 5 minutes). When it detects oxygen level falls below 80%, it sends a signal to motion sensor. The latest versions of cars are four oxygen sensors. If the car is built with proposed model, then five oxygen sensors will be present.

- The number of sensors varies according to engine type:

  - Traditional V6 and V8 have three oxygen sensors including a left bank and right bank sensor upstream and a downstream O2 sensor.
  - 4 cylinder transverse has an upstream and a downstream O2 sensor.
  - V6 and V8 transverse have four oxygen sensors including a left or front bank upstream; right or rear bank upstream; rear of engine; and a downstream sensor.
  - 4 and 6 cylinder in-line have three oxygen sensors including a front and rear bank upstream, and a downstream sensor.

- **Images of oxygen sensor**



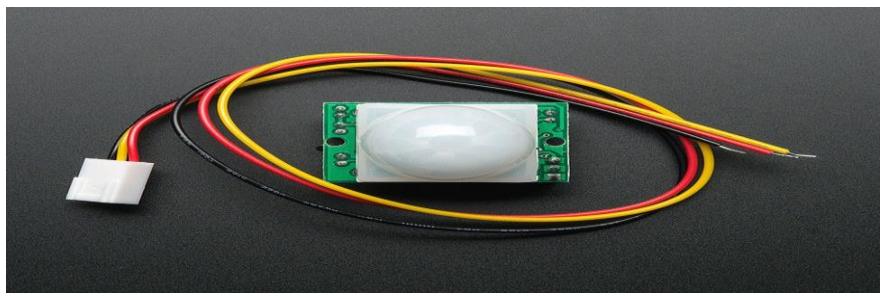
2) Motion sensor

A **motion sensor** is a device that detects moving objects, particularly people. Such a device is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area.

Motion sensors are commonly used in security systems. They work based on a wide variety of principles and are used in a wide variety of applications. Typical usage could be in the exterior doorways or windows of a building for monitoring the area around the building. Upon detecting motion, they generate an electrical signal based on which some actions are taken.

For the proposed system, the sensor considered is “Passive Infrared Sensor (PIR)”, which detects a human being moving around within approximately 10m from the sensor. This is an average value, as the actual detection range is between 5m and 12m. PIR are fundamentally made of a pyro electric sensor, which can detect levels of infrared radiation. They are small, inexpensive, low-power, easy to use.

In the proposed system, the motion sensor will be connected to Raspberry Pi which will be in turn connected to automatic locking system sensor of the car. When the motion sensor gets activated from the signal sent by oxygen sensor, it searches for movement inside car. Once it detects the movement, it measures the heat generated by the object and sends signal to oxygen sensor, which in turn will measure the oxygen level. Once level of oxygen falls below 80% sends signal to Raspberry Pi.



3) Raspberry Pi

The last and the most important device of the entire network is “Raspberry Pi” which is called as “mini-computer”.

Raspberry Pi is an **ARM** based credit card sized **SBC**(Single Board Computer) created by Raspberry Pi Foundation. Raspberry Pi runs Debian based **GNU/Linux** operating system Raspbian and ports of many other OSes exist for this SBC.

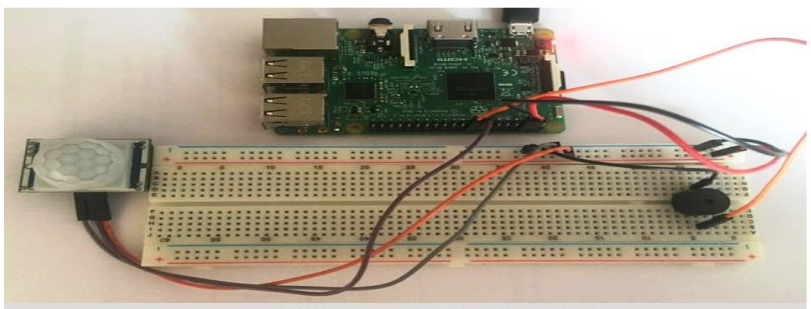
For the proposed system, Raspberry Pi B model is considered which has a quad core processor works at the speed of 1.2GHz with 1GB RAM.

WORKING OF THE SYSTEM

Raspberry Pi acts as the heart of the entire network of devices because it supplies necessary power required for the sensors used in the system. For Raspberry Pi there a connection from car battery so that when the car is in ON state or running mode it gets charged. This charge is supplied to the sensors. All the devices are kept in between AC wind and steering.

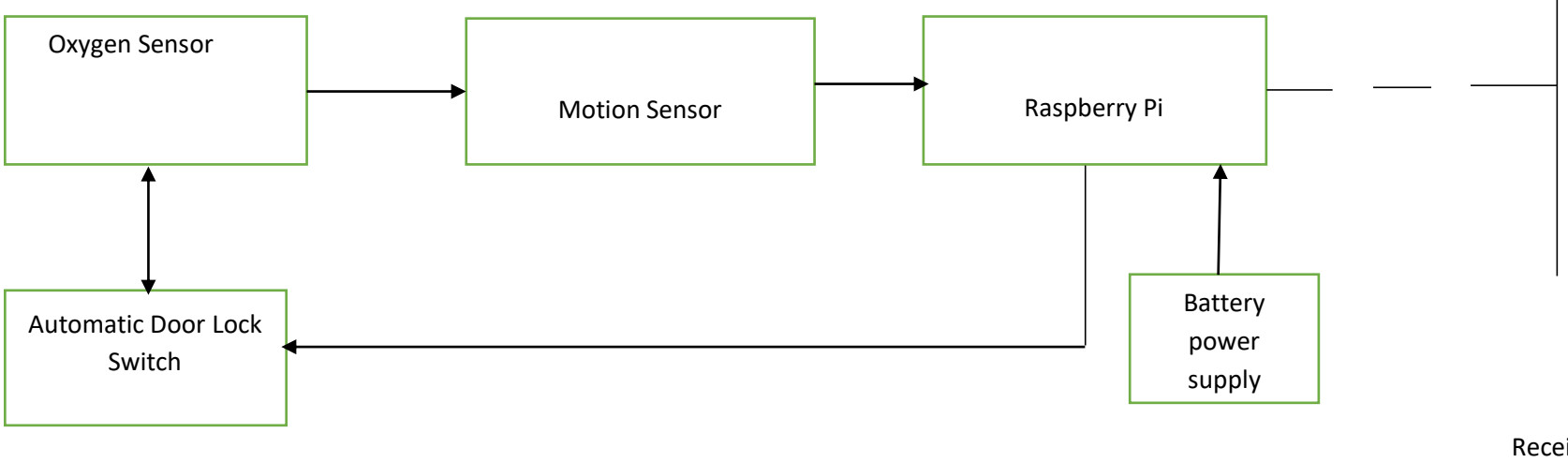
When the car stops, the automatically it gets locked within two minutes. The automatic lock button activates oxygen sensor which will measure the oxygen level periodically with some time delay of 5 minutes only when it finds the car is locked. When the oxygen level is below the threshold of 80% it sends signal to motion sensor.

After the motion sensor activates it searches for human movement within the range of 6 meters. If it finds any movement, sends signal to Raspberry Pi which in turn gives call to the registered numbers and activates car alarm for touch.



Raspberry Pi Motion Sensor/Detector Circuit using PIR

Block Diagram



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