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Design of Sensors based Hyperthermia Car Alert Surveillance System using GSM

Shivani Shirkande
Shivanishirkande31@gmail.com
Shri Vithal Education and Research Institute, Solapur, Maharashtra

Shital Survase
shitalnsurvase@coep.sveri.ac.in
Shri Vithal Education and Research Institute, Solapur, Maharashtra

Tejshri Vitekari
tejshrirvitekari@coep.sveri.ac.in
Shri Vithal Education and Research Institute, Solapur, Maharashtra

ABSTRACT

This paper presents the technology to save child's life when by mistake a child is forgotten in the by parents. There are many such cases which were reported and recently the survey by the organization called kids and cars reported that more than 30 children died America because of hypothermia when are forgotten in the car. Form this news it comes to know that severity of the problem and need to design a model for the same. In this system, we have designed a system that will be generating an attentive message through GSM and will be sending to the parents or the numbers that are stored. With this, a buzzer also generates when it detects the child. This condition will take place only when the car is in-off state. Here we using Arduino uno and temperature sensor also to detect the car's temperature. We are using PIR and sound sensor as well. This design is designed by considering industrial requirement it is very companionable and low cost.

Keywords: *Arduino, Temperature Sensor (LM35), Sound Sensor, PIR, GSM.*

1. INTRODUCTION

In between 1998 to 2010 there were 500 children are died. Only because of the parent left behind their child in the parked cars. These incidents are happening worldwide. When the car is, turns off its windows are closed that's why the temperature within the car increases rapidly even if there is an ordinary day. As the child's thermoregulatory system is not finely urbanized, this condition may cause hyperthermia or heatstroke which can be dangerous.

As this problem is increasing day by day so there is a requirement to develop such systems. Due to this system, the child's life is going to save as well as this design is also providing the protection to the car. As the child depends on the elder but by mistake, in a busy schedule the parent or driver may forget to take a child who is kept in the back seat. We have developed such system that it should immediately take action after the car is parked and a warning message will be sent

2. COMPONENTS

2.1 Arduino

In our design, we have used Arduino. Arduino consists of following points:

2.1.1 Power USB: By using USB cable from computer Arduino board can be powered. It only requires the connection of the USB cable to USB connection.
2.1.2 Power (Barrel Jack): By linking it to the barrel jack it can be motorized directly started by AC mains power.
2.1.3 Voltage Regulator: It controls the voltage and stabilizes the DC voltage used by the processor.
2.1.4 Crystal Oscillator: The Arduino board calculates the time by using crystal oscillator. The frequency is 16 MHZ which is written on the peak of the Arduino crystal.
2.1.5 Arduino Reset: By using the reset button on the board we can reset the board or we can connect the external reset button to the Arduino pin labeled RESET.
2.1.6 Pins (3.3, 5, GND, Vin): 3.3 is the supply output volt. 5V is also the supply output volt. GNDs are present on the board any one can be used as ground. Powering to the Arduino from external source Vin pin can be used.

2.1.7 Analog Pins: There are five analog input pins A0 to A5.This pins can read the signal from analog sensors like a temperature sensor and convert it into a digital value.
2.1.8 Microcontroller: Each board consists of the microcontroller. It is the heart of the board. The microcontroller usually manufactured by ATMEL Company.
2.1.9 Power LED indicator: It is light up when we start the Arduino board. It indicates that the board is in the working state.
2.1.10 Digital I/O: The board contains 14 digital I/O pins. These pins can work in both ways first it can work as input to read logic values(0 or 1) or it can work as digital output pins as it drives different modules like LEDs, relays etc.
2.1.11 AREF: It stands for Analog Reference. Sometimes it is used to set an external reference voltage (between 0 and 5 volts).

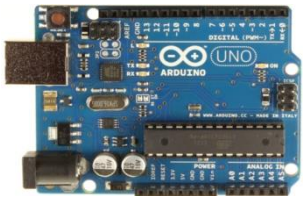

Fig1. Arduino

2.2 Temperature sensor

The heat or cold whichever situation is generated temperature sensor is used to detect. The temperature sensor provides the comparative current and that current we can use for our desired application. To detect precise centigrade temperature LM35 is used. The linearity is depending upon the change in output. Output voltage and Celsius temperature are linearly comparative. The temperature sensor has two inputs and one output pin. Out of the two inputs, one is inverting and another one is non-inverting.

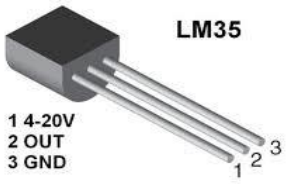

Fig2. Temperature sensor

Table1. Design Parameters of LM35

PARAMETER	VALUES
Accuracy at 25◦c	±0.5◦c
Accuracy from -55◦c to +150◦c	±1◦c
Temperature slope	10mv/◦c

2.3 Sound Sensor:

For detecting the sound intensity in the environment the sound sensors are used. In the sound sensor module, the main component is a microphone which is based on LM386 and electrode microphone. It is very easy to handle as its output is analog. So it is very easy to test.

Fig3.sound Sensor

Table 2.Specifications of Sound Sensor

PARAMETER	VALUES
Operating voltage	4-12V
Operating current	4-8mA
Sensitivity	48DB

2.4.PIR

The various conditions are going to affect this sensor's input and output. There are two slots present in this sensor. Both the sensors are made up of unique material which is susceptible to the IR. The lenses are used in this type of sensor. The work of this lens is not so much considerable. The same amount of IR is detected by both slots which are reflected by the substance when the sensor is in an idle state. First, the one half of the of the PIR intercepts when a warm body passes away. This condition results in the change which is a positive differential between two halves. The exact reverse condition happens when that warm body leaves the sensing area and generates the negative differential change and these changes were detected. The sensing metal is protected by the IR-transmissive material. The working can understand by the below diagram

Fig4. PIR

Table 3. Specifications PIR

PARAMETER	VALUES
Operating voltage	DC 5V-20V
Static power loss	≤50µA
Range	≤110 degrees cone angle and ≤5M

2.5.GSM

GSM is nothing but Global System for Mobile Communication. It is developed by the standard named as European Telecommunications Standard Institute. It describes the protocols which are useful for digital devices like tablets, in 1991 it was first developed by Finland. GSM describes the digital, circuit switched arrangement used for complete duplex voice communication. It is the replacement of the first generation to the second generation. This technology developed by the time first uses the circuit switching and then packet switching and this development is known as GPRS.

Fig5. GSM

3. BLOCK DIAGRAM

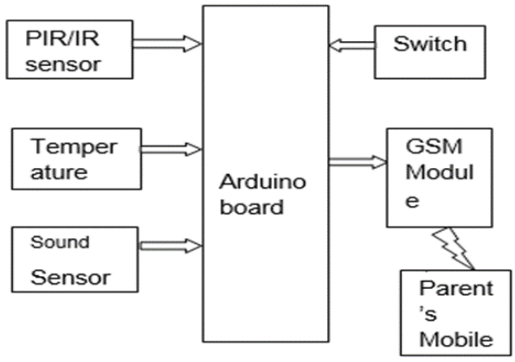

Fig6. Connection Diagram

4. WORKING

In work we have made two parts first one is hardware analysis and the second one is software analysis.

4.1 Temperature sensor

There is an increase in temperature when the car is locked. This amplifies in the temperature is detected by the LM35. Here the working temperature sensor takes place. The LM35 is capable of detecting the increase in temperature and starts the working. First, it sends an instruction to Arduino. The Arduino accepts the information in analog form and displays the information in digital part. The connection diagram is as follows,

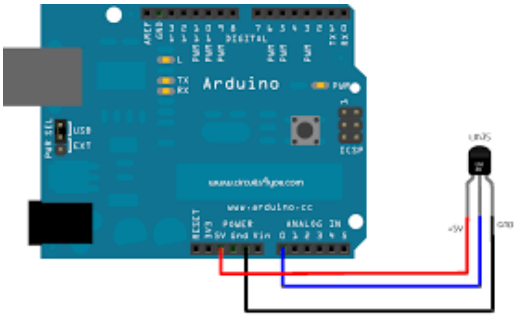

Fig7. Interfacing of LM35 to Arduino

4.2 Sound sensor

After the working of the LM35, the working of sound sensor took place. There is a led mounted on the sensor. The led starts to blink when there is the detection of sound in the environment. In this sensor, we have to set some range and according to that, the sensor will detect the sound. There is microphone used in this sensor the sound is sensed by this only. After sensing the sound the sound is feed in op-amp known ag LM393. There is an on-board potentiometer by which we can set the range for it. If the sound level overcomes the level which we have set the led starts to blink. The connection diagram is as shown below:

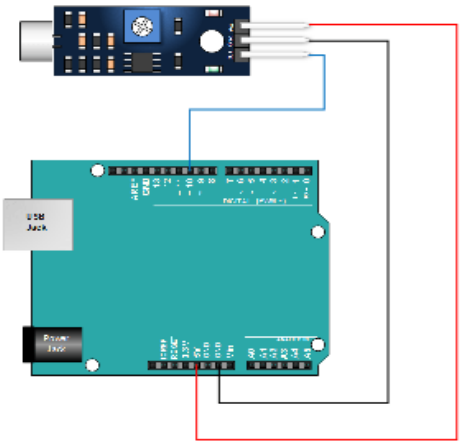

Fig 8. Interfacing of the sound sensor to Arduino

4.3 PIR

The next part is to sense the activity of the child for this we are using the PIR sensor. There are three major components present in this sensor i.e. Fresnel lens, an infrared detector, and supporting directory. The working of the lens is to detect the infrared radiations which are coming towards the detector. Our body generates the heat. This cause the transmission of infrared rays and these rays are sensed by the PIR. After the 60 secs the sensors gives the result of 5V. There is a tentative range. The working can be better understood by following diagram:

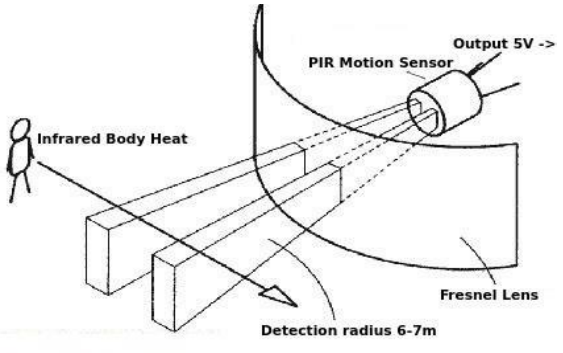

Fig9. Working of PIR

And the connection diagram is as follows:

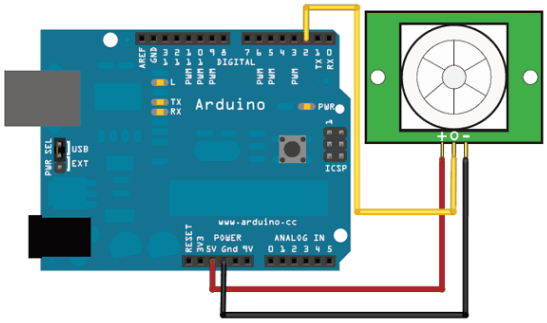

Fig10. The connection of PIR with Arduino

4.4. GSM Module

In our design, we are using the sim 900 module. GSM module is nothing but GSM modem. Now we will learn how to connect the GSM module. The initial step is that we have to put in the sim card into the module and after inserting it we have to lock it. After thus the connection of the adaptor takes place and module become on. After becoming on wait for some time for example 60 secs and observe the glowing rate of the network LED. After establishing the connection successfully the LED starts blinking after every 2 seconds. And then we have to interface it with our Arduino board. Two ways are available for interfacing. In eaccases the transmission i between the GSM module and Arduino board will be serial. So the serial pins are used for communication. We are connecting the transmission pin of GSM module to reception pin of Arduino and reception pin of GSM module to transmission pin of Arduino. After the successful connection connect both the grounds. After all these connection loads the appropriate programme.

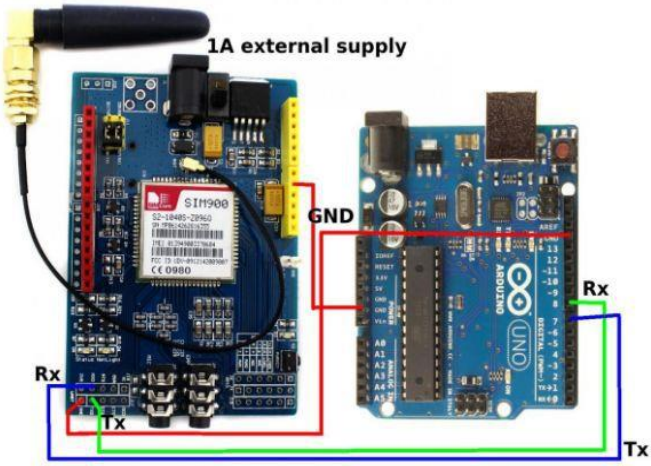

Fig11. GSM to Arduino

5. CONCLUSION

As the conclusion to the system is that it can be worked for the detection of sound generated by the child at his maximum strength. In addition, as it is also able to detect motion that was created by the child present in a vehicle. The noise from outside the car will not be detected by the sound sensor. Because the car door is closed tightly the sound sensor is failed to detect the outside noise only the child's noise will be detected. Like the sound, the PIR sensor also has a function to detect the movement of the child. The range is fixed as in the way that only the movement of the child will detect. In addition, to this system we have also used Global System Mobile Communication (GSM) module, for the communication with the parents or the people even they are in the long distance. We have designed the system in a order that if the temperature will increase then it will go for the checking of sound if it will detect then we go for movement if all the three things will detect then the message will send to the parents mobile or whichever predefined number. The system which we have designed is also has many scopes to develop and expand with new technology which will come with time. It is proved that the system is capable to overcome the problem of accidents that are related with the children that often left in the car. With the development of this system, hopefully, parents will become more responsible for considering their children's safety. However, the system is also be used in a school bus as well. This system is also capable to save the car from theft.

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