GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Affiliated

Government Engineering College, Gandhinagar

A FINAL YEAR

PROJECT REPORT

On

("**HYPERTHERMIA ALERT SYSTEM IN CARS**")

B. E. IV, Semester – VIII

(Electronics and Communication Engineering Branch)

Submitted by:

Sr. No.	Name of Student	Enrolment Number
1	Grishma [redacted]	[redacted]
2	[redacted] Shifabanu [redacted]	[redacted]

Academic year

(2018-2019)

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We would like to extend our heartily thanks with a deep sense of gratitude and respect to all those who has provided us immense help and guidance during our project.
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We would like to extend our gratitude to Professor, Head of EC Department, Government Engineering College, Gandhinagar for his continuous encouragement and motivation.
Last but not the least we would like to mention here that we are greatly indebted to each and everybody who has been associated with our project at any stage but whose name does not find a place in this acknowledgement.

Yours Sincerely,
Grishma ~~Gupta~~
~~Shaikh~~ Shifabanu ~~Mohd. Rafiq~~

Abstract

This project deals with the detection of onset of hyperthermia, which is a condition when the temperature of the body increases to a dangerously high level. This condition may occur in children as well as pets, when they are left inside the car unattended, either due to some miscommunication between the guardians or due to some other reason for some interval of time. Hyperthermia comes in various stages. The temperatures in which this can occur can vary from person to person based on their age, weight etc. The onset of hyperthermia is even more dangerous in pets like dogs, which unlike humans, have lack of sweat glands through which they can sweat through. Our project deals with this critical problem. This project will detect the temperature inside the car by using temperature sensors, and along with that it will also detect for the presence of an entity inside the car. When the temperature crosses the threshold and the condition of someone being inside the car is found out to be true, a message is send to the parents or the guardian's phone to take some action regarding the issue as soon as possible. Along with this, it will also alert the passersby about the happenings inside the car so that they can also take some action and prevent such a fatal accident from happening.

Government Engineering College Gandhinagar

Electronics & Communication department

April, 2019

CERTIFICATE

Date: 12/04/2019

This is to certify that the dissertation entitled "HYPERTHERMIA ALERT SYSTEM IN CARS" has been carried out by Grishma Gupta (150130111037) under my guidance in fulfillment of the degree of Bachelor of Engineering in Electronics and Communication, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2018-19.

Guide: Suhas Patel

Asst Professor, EC Dept

GEC, Gandhinagar

Prof. Kishore Maradia

Head of the Department

Government Engineering College Gandhinagar

Electronics & Communication department

April, 2019

CERTIFICATE

Date: 12/04/2019

This is to certify that the dissertation entitled "HYPERTHERMIA ALERT SYSTEM IN CARS" has been carried out by ~~Shaikh~~ Shifabanu ~~Mohd. Rafiq (150130111057~~) under my guidance in fulfillment of the degree of Bachelor of Engineering in Electronics and Communication, 8th Semester of Gujarat Technological University, Ahmedabad during the academic year 2018-19.

Guide: **Suhas Patel**

Asst Professor, EC Dept

GEC, Gandhinagar

Prof. Kishore Maradia

Head of the Department

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Chapter 1: Introduction

1.1 Problem Summary

Summers in India lasts not only for initial and mid months of the year, but almost throughout the year because of global warming. In recent years, it has been noticed that the temperatures across many states of India have crossed the deadly 50 degree mark. There are many deaths that have been reported in these months, the sole reason being heat strokes. Cars, when parked outside in heat, the temperature inside them can rise to a very high extent within a very short interval of time, which when heard for the first time may not sound very true, but it is.

Researchers have found out that the temperature inside the car, when parked directly under the sun can reach up to forty seven degree Celsius within an hour, which is deadly. Even if the car is not parked in direct sunlight, the chances of increase in temperature inside the car are more in hot and humid weather. Now, if because of some sort of miscommunication between the parents and care-taker, or let's take a scenario where the parent, thinking that they will come as soon as possible after running a few errands, might have left their child inside the car and locked the car from outside, can result into a very undesirable condition if they don't return on time and the temperature inside the car reaches a high level. The same scenario can be applied to pets, sometimes the owners have to unwillingly leave inside the cars, as not all the places in cities are pet friendly. The only way someone can help them in this condition is when someone passes through the car and sees them trapped inside the car, which may not happen every time.

Our main aim and objective for this project is to create a proper presence and temperature detection and monitoring system inside the car, which will detect the presence of an entity inside the car, as well monitor the temperature and give out the alert when the conditions for both of them are found out to be true and take proper steps pertaining to it.

There can be many ways to detect the presence such as using PIR motion sensor, CO2 level sensing device, pressure sensor and others. The more

the number of sensors used the more is the accuracy. Our guide suggested us to use PIR motion and LM35 temperature sensor. Also for alarming the users there can be many methods, for instance Wi-Fi, Bluetooth, GSM module, Node MCU etc. Due to one or the other limitations of other options available we ended up using GSM module.

1.2 Aim and objective

Our main aim and objective for this project is to create a proper presence and temperature detection and monitoring system inside the car, which will detect the presence of an entity inside the car, as well monitor the temperature and give out the alert when the conditions for both of them are found out to be true and take proper steps pertaining to it.

1.3 Literature Review

For our project title, we referred to various research papers and patents available online. In one of the patents, titled “Baby seat belt alarm system” we studied that they used a seat belt alarm system which serves to prevent a driver from inadvertently leaving her baby in the car. Here, an alarm device is activated when the car key is removed from the ignition and the baby is still buckled in the car seat.
Also in one of the research paper, titled “Design of a Smart Automotive Ventilation System for a Parked Car”, a ventilation system has been designed that uses a exhaust fan and blower, temperature sensors and electronic control circuitry to automatically control the temperature inside the car cabin. In one of the patents, the human being presence’s was detected using pressure transducers located in an area of interest. This system distinguishes between human being-occupied and empty vehicle seat. According to the patent, it can also be integrated into seat-belt and protection (also called as airbag) system.

1.4 Plan of Work

We studied about temperature sensor. We saw the pin diagram and learned it's working. We also studied PIR motion sensor and tried to understand its working. We tried to run simple program using this sensor and checked its output. Also we learned its function and usage through programming. We studied GSM modules and the commands related to it. We sent and received the messages simply for learning purpose. Then, we tested a circuit which senses the temperature of the surrounding along with presence of an entity using LM35 temperature sensor and PIR motion sensor respectively. After that, we separately tested the GSM module on how it would send the messages to the guardian's mobile phone. At this point, we combined what we have done in previous weeks by assembling the detection system of temperature sensing and motion sensing, along with GSM module to see if it sends message on proper detection or not. After testing of GSM and temperature + motion detection system together, we saw on how the system will work automatically by turning on a fan or motor in case the guardian fails to take any action.

1.5 Materials and tools required

The components that are used in this project are:

1) Arduino UNO

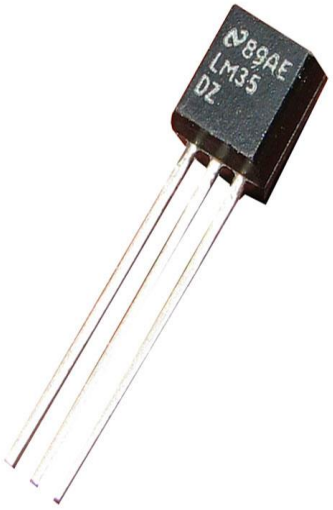
Arduino Uno board that we have used is a microcontroller based on ATmega328. It contains 14 digital input/output pins in which 6 can be used as PWM outputs. It has a 16 MHz ceramic resonator, along with an ICSP header. Additionally, a USB connection, 6 analog inputs, a power jack and a reset button is also provided.

2) PIR motion sensor

PIR motion sensor is a pyroelectric sensor, which can detect levels of infrared radiation. Every substance emits a low level radiation, and the hotter than substance is, the more radiation will be emitted. The sensor in a motion detector is split into two halves. Here, we are looking to detect motion and not average IR levels. Here, the two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.

3) Temperature Sensor (LM35)

LM35 is a precision IC temperature sensor with its output proportional to the temperature (in ºC). Using **LM35**, temperature can be measured more accurately than thermistors. It also possess low self heating and does not cause more than 0.1 ºC temperature rise in still air. The operating temperature range is from -55°C to 150°C. Here, the output voltage varies by 10mV in response to every ºC rise/fall in ambient temperature, *i.e.*, given that its scale factor is 0.01V/ ºC.

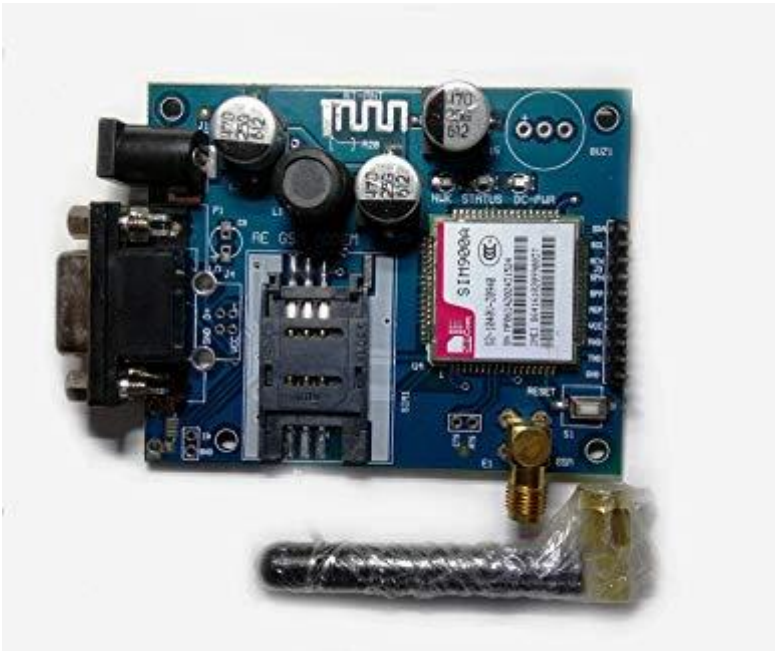


4) Buzzer

A buzzer is an audio signaling device, which can be either mechanical, electromechanical, or piezoelectric (piezo for short). Buzzers are usually included in alarm devices, timers etc.

5) GSM Module(SIM900)

SIM900A is a Dual-band GSM/GPRS solution in a SMT module. It can be embedded in many customer applications. An industry-standard interface, the SIM900A delivers 900/1800MHz performance for voice, SMS, etc. It has a small form factor and also low power consumption. It has a tiny configuration of 24mmx24mmx3mm. SIM900A can fit in almost all the space requirements in user applications, especially where there is a slim and compact demand of design is required.


SIM900A
RESET

6) Motor/DC FAN

Motor Fan converts electrical energy into mechanical energy. Operates normally above 12V. Here usually a transistor or a relay is required to the drive the fan such that it does not damage the microcontroller with which it is interfaced. Normally used along with temperature sensors.

Chapter 2: Design

2.1 AEIOU

In our Design Engineering Canvases, for AEIOU sheet, we have included the names of all the activities, objects, users, environment, and the interactions which can be included in the domain of our project title. This sheet covers the aspects of research process. They are explained in detail below:

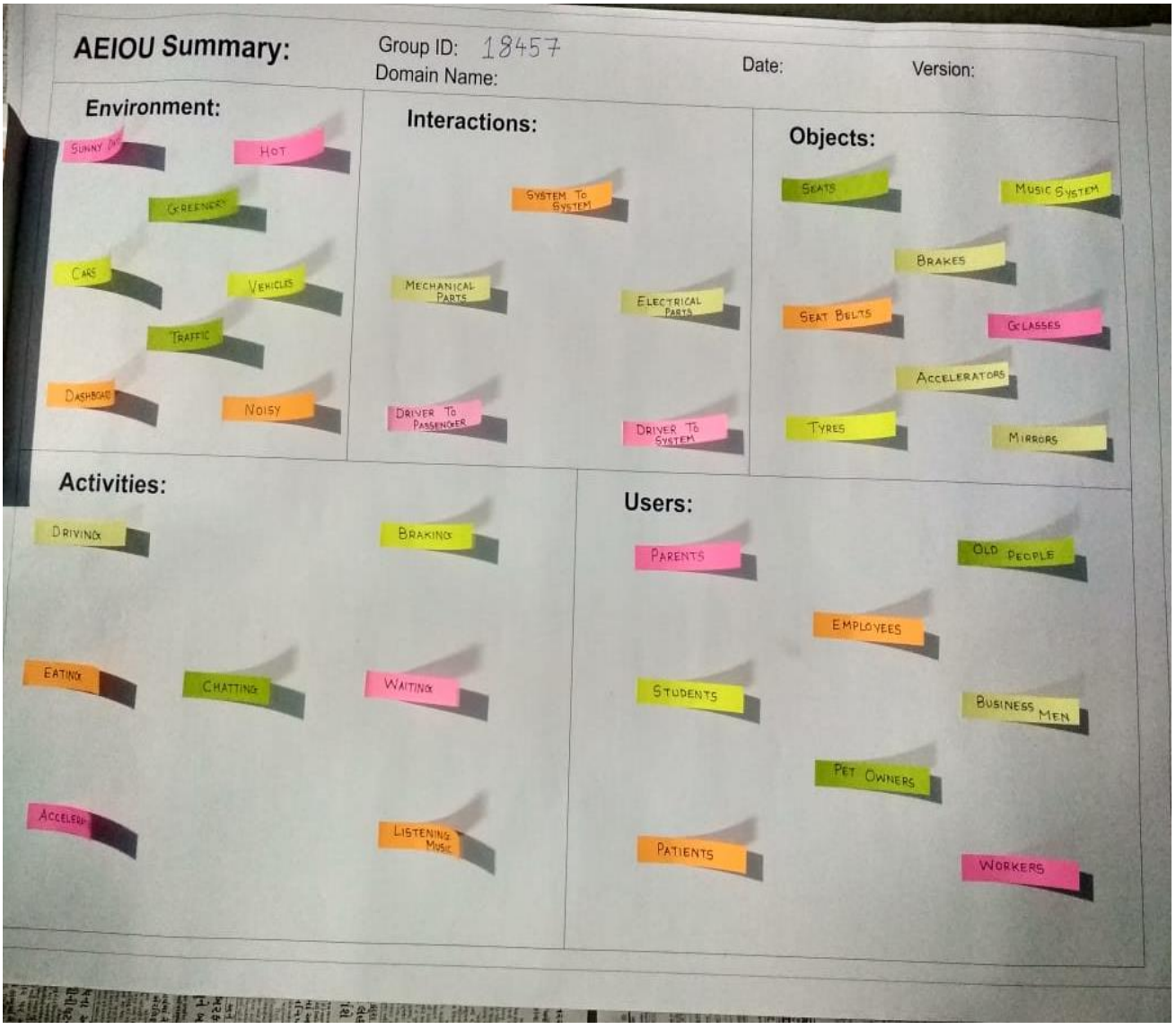
For objects, we have included seats, music system, brakes, seats belts, tyres, mirrors etc.

For users, we have included children (especially infants) who have to be dependent on elders most of the time, parents, patients or physically handicapped people who may suffer from some health disease, students, pet owners, old people etc.

For environment, we have included situations where the car may be parked such as greenery, traffic, sunny weather etc.

For activities, we have included the activities that are related to the car and user, such as Driving, Listening music, Braking, Accelerating etc.

For interactions, we have included system to system, driver to system, driver to passenger etc.


AEIOU Summary:
Group ID: 18457
Domain Name:
Date:
Version:
Environment:
SUNNY
HOT
GREENERY
CARS
VEHICLES
TRAFFIC
DASHBOAD
NOISY
Interactions:
SYSTEM TO SYSTEM
MECHANICAL PARTS
ELECTRICAL PARTS
DRIVER TO PASSENGER
DRIVER TO SYSTEM
Objects:
SEATS
MUSIC SYSTEM
BRAKES
SEAT BELTS
GLASSES
ACCELERATORS
TYRES
MIRRORS
Activities:
DRIVING
BRAKING
EATING
CHATTING
WAITING
ACCELER
LISTENING MUSIC
Users:
PARENTS
OLD PEOPLE
EMPLOYEES
STUDENTS
BUSINESS MEN
PET OWNERS
PATIENTS
WORKERS

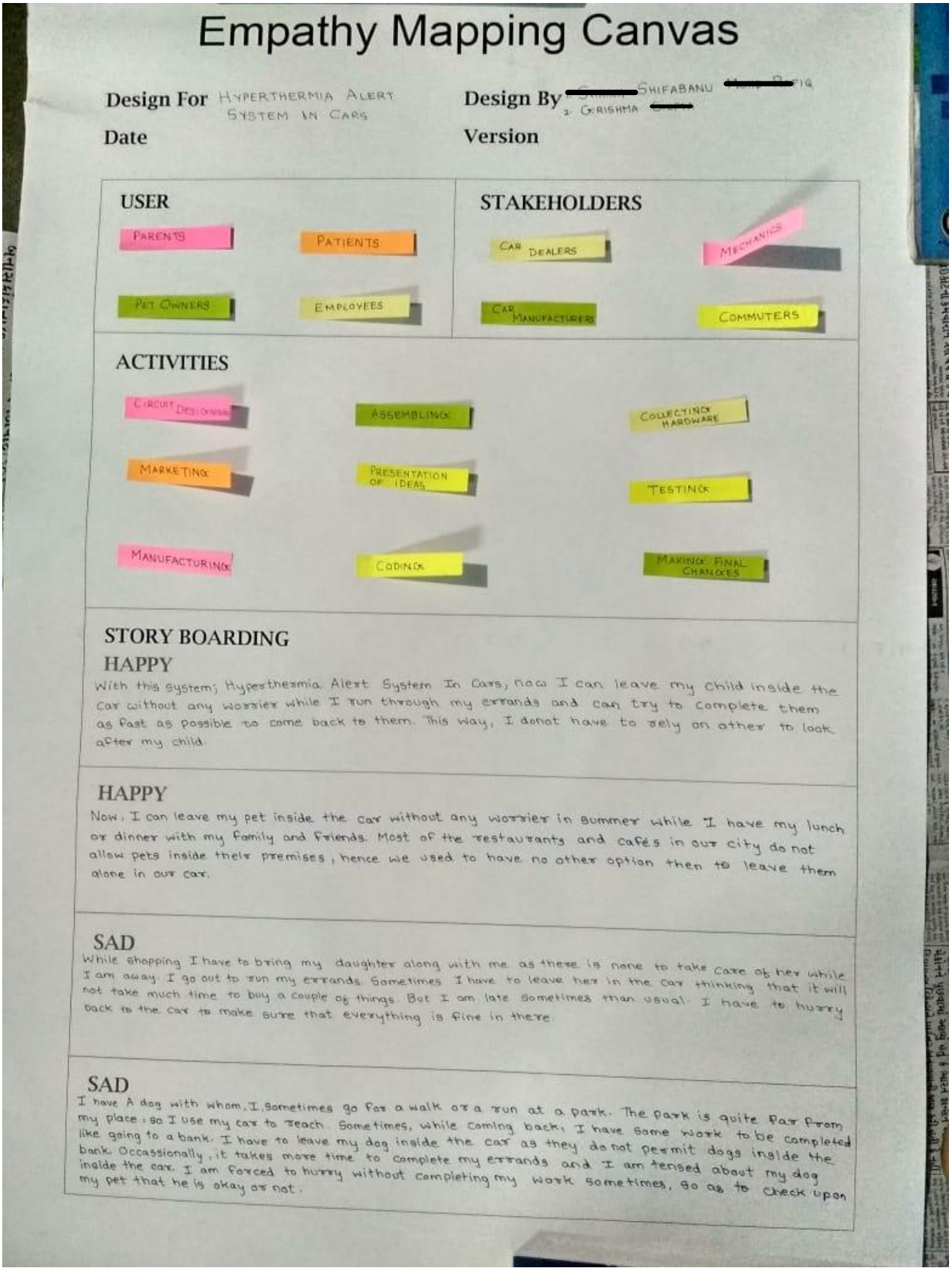
2.2 Empathy Mapping

While considering the people that may use this feature, we have included employees (who may or may not be parents too), parents and pet owners. These people may be using their own cars to commute daily to their work places located in nearby cities. They also may often use their vehicles for their general use.

As stakeholders, we selected Car Manufactures who might be interested in using our product in their Automobiles, and Car Dealers who can sell their vehicles based on this feature. Here stakeholders mean people who wouldn't directly use the product.

As of for the activities related to product, Initial activities will include developing of circuit, presenting this circuit design to interested automobile manufactures, making necessary changes, testing them, then actually using it in automobiles and their manufacturing. After it has been installed in a given automobile, the user can finally use it.

Along with the above mentioned information, we have also included two happy and sad stories related to this project in the sheet shown below.



Empathy Mapping Canvas

Design For HYPERTHERMIA ALERT SYSTEM IN CARS

Design By [redacted] SHIFABANU [redacted] RIQ
2. GIRISHMA [redacted]

Date

Version

USER

PARENTS

PATIENTS

PET OWNERS

EMPLOYEES

STAKEHOLDERS

CAR DEALERS

MECHANICS

CAR MANUFACTURERS

COMMUTERS

ACTIVITIES

CIRCUIT DESIGNING

ASSEMBLING

COLLECTING HARDWARE

MARKETING

PRESENTATION OF IDEAS

TESTING

MANUFACTURING

CODING

MAKING FINAL CHANGES

STORY BOARDING

HAPPY

With this system; Hyperthermia Alert System In Cars, now I can leave my child inside the car without any worrier while I run through my errands and can try to complete them as fast as possible to come back to them. This way, I donot have to rely on other to look after my child.

HAPPY

Now, I can leave my pet inside the car without any worrier in summer while I have my lunch or dinner with my family and friends. Most of the restaurants and cafés in our city do not allow pets inside their premises, hence we used to have no other option then to leave them alone in our car.

SAD

While shopping I have to bring my daughter along with me as there is none to take care of her while I am away. I go out to run my errands. Sometimes I have to leave her in the car thinking that it will not take much time to buy a couple of things. But I am late sometimes than usual. I have to hurry back to the car to make sure that everything is fine in there.

SAD

I have A dog with whom, I, sometimes go for a walk or a run at a park. The park is quite far from my place; so I use my car to reach. Sometimes, while coming back, I have some work to be completed like going to a bank. I have to leave my dog inside the car as they do not permit dogs inside the bank. Occassionally, it takes more time to complete my errands and I am tensed about my dog inside the car. I am forced to hurry without completing my work sometimes, so as to check upon my pet that he is okay or not.

2.3 Product Development Canvas

The main purpose of our product is to provide safety feature for kids and pets that are accidently left inside the cars knowingly or unknowingly in hot weathers, or if they are trapped inside. So one of our other purposes is also to reduce the number of accidents occurring because of this reason. One more use of this feature can be to save the internal accessories in the car to damage because of excessive heating taking place inside the car.

The people related to this product directly or indirectly are Students, Employees, Pet owners, Parents and Automobile Manufactures.

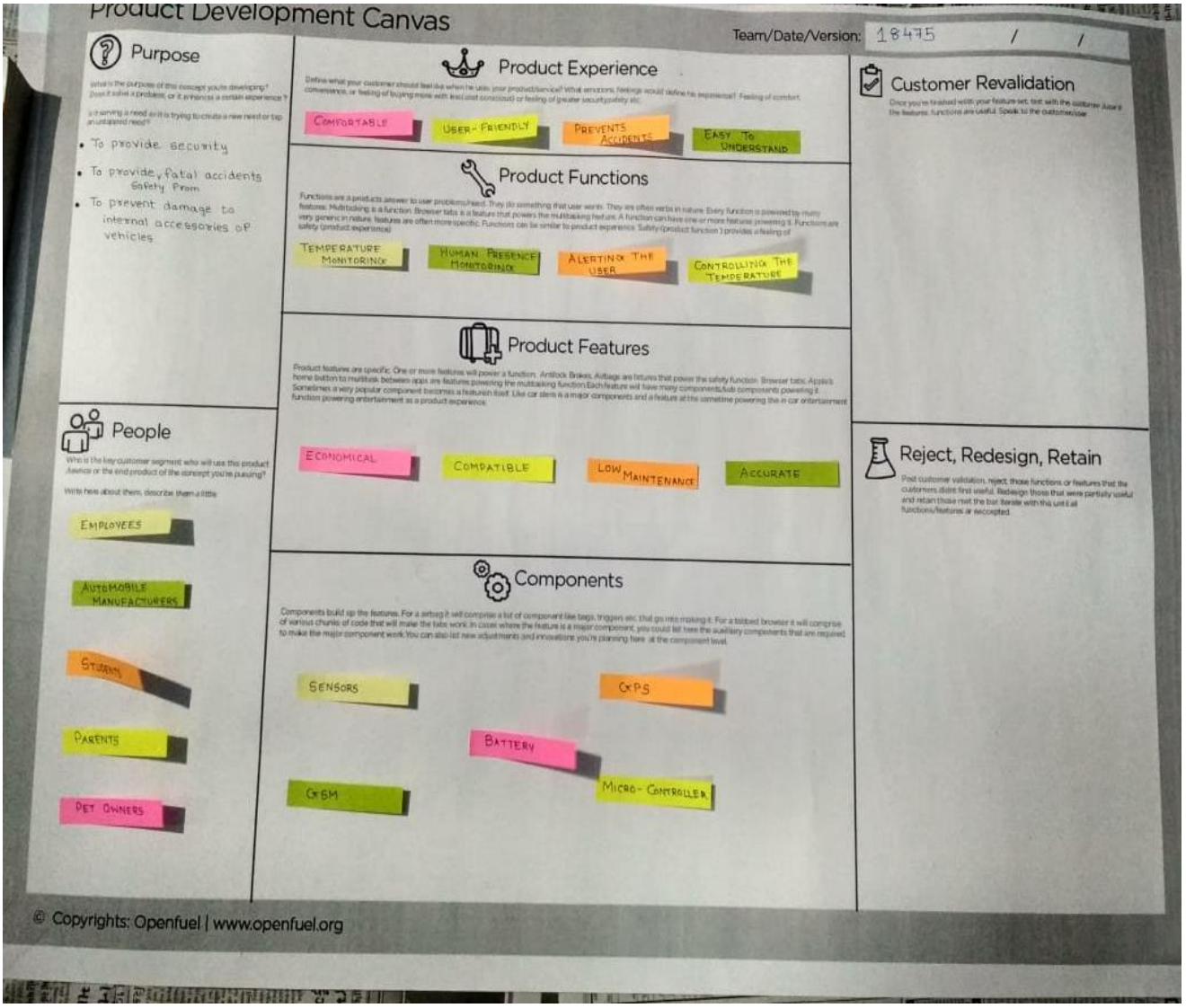
The first four mentioned will be able to use the end product in their respective automobiles and the latter will help in manufacturing/installing and dealing the automobiles with this feature.

The customers who are using our product will experience comfort with this device installed in their vehicles. It will also be easier to understand, user-friendly and will prevent accidents.

As for the product function, it is an automatic system. Whenever the temperature inside the car crosses the threshold and presence is detected inside the car, the system will start working and will help in controlling the temperature inside the car.

In features, the product can work in any weather, especially in summer. It can also be installed in any type of automobile. The maintenance cost will be low and it will also be highly economical. It will also be accurate.

The components used in this device will include PIR sensor, CO2 sensor, GSM, GPS, microcontroller, normal resistors, wires, transistors, circuit protecting material, circuit board etc.


Product Development Canvas
Team/Date/Version: 18475 / /
Purpose
• To provide security
• To provide, fatal accidents Safety From
• To prevent damage to internal accessories of vehicles
Product Experience
COMFORTABLE
USER-FRIENDLY
PREVENTS ACCIDENTS
EASY TO UNDERSTAND
Product Functions
TEMPERATURE MONITORING
HUMAN PRESENCE MONITORING
ALERTING THE USER
CONTROLLING THE TEMPERATURE
Product Features
ECONOMICAL
COMPATIBLE
LOW MAINTENANCE
ACCURATE
Components
SENSORS
GPS
BATTERY
GSM
MICRO-CONTROLLER
People
EMPLOYEES
AUTOMOBILE MANUFACTURERS
STUDENTS
PARENTS
PET OWNERS
Customer Revalidation
Reject, Redesign, Retain
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2.4 Ideation canvas

The main purpose of Ideation sheet is not aimed at finding solutions to the defined problem, but it is used to define the best possible problem and stretch out its possible scope.

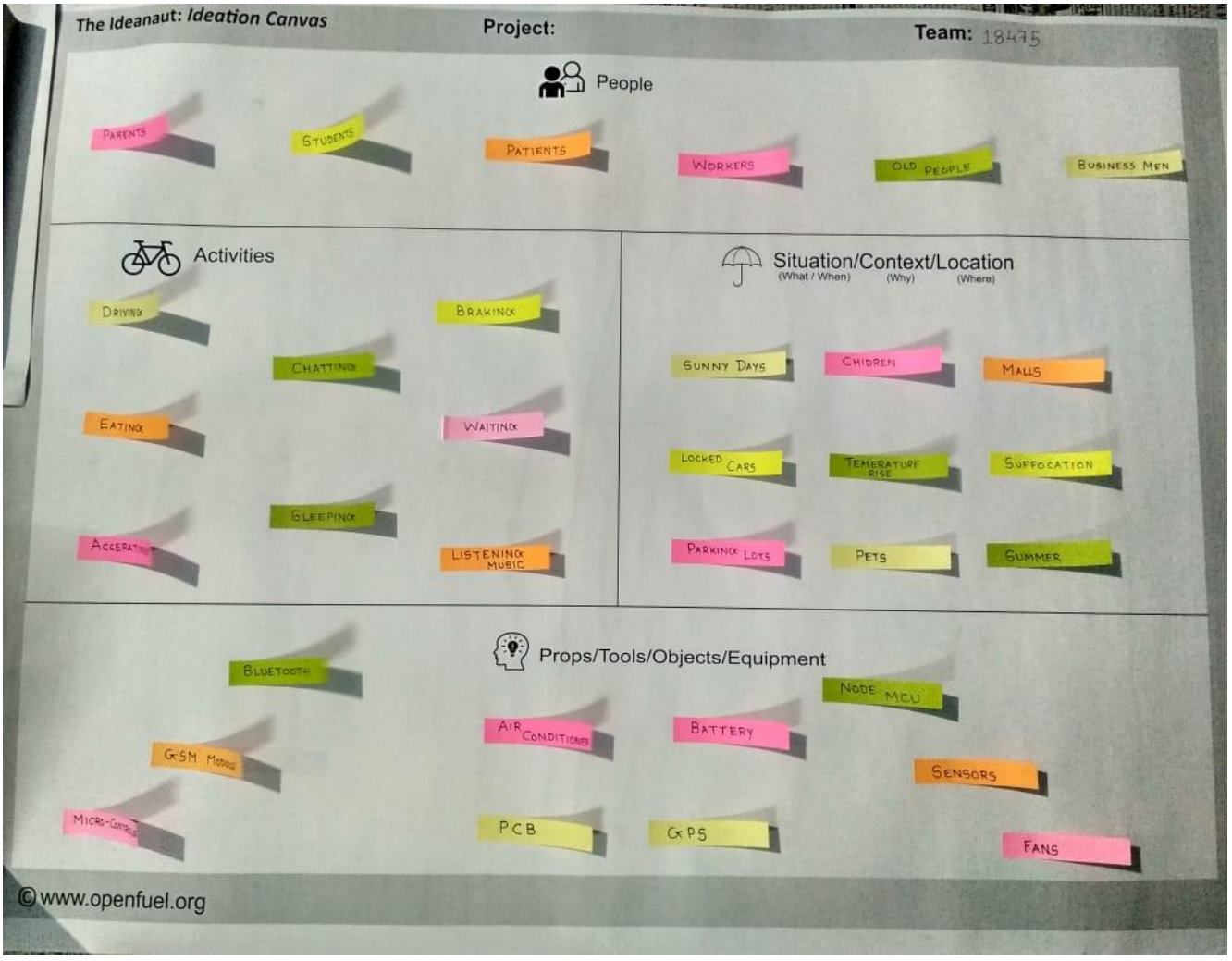
In Ideation canvas, we have included the below mentioned details:

People: Parents, Students, Patients, Workers, Old people and Businessman

Activities: Driver, Chatting, Waiting, Sleeping, Listening to Music etc.

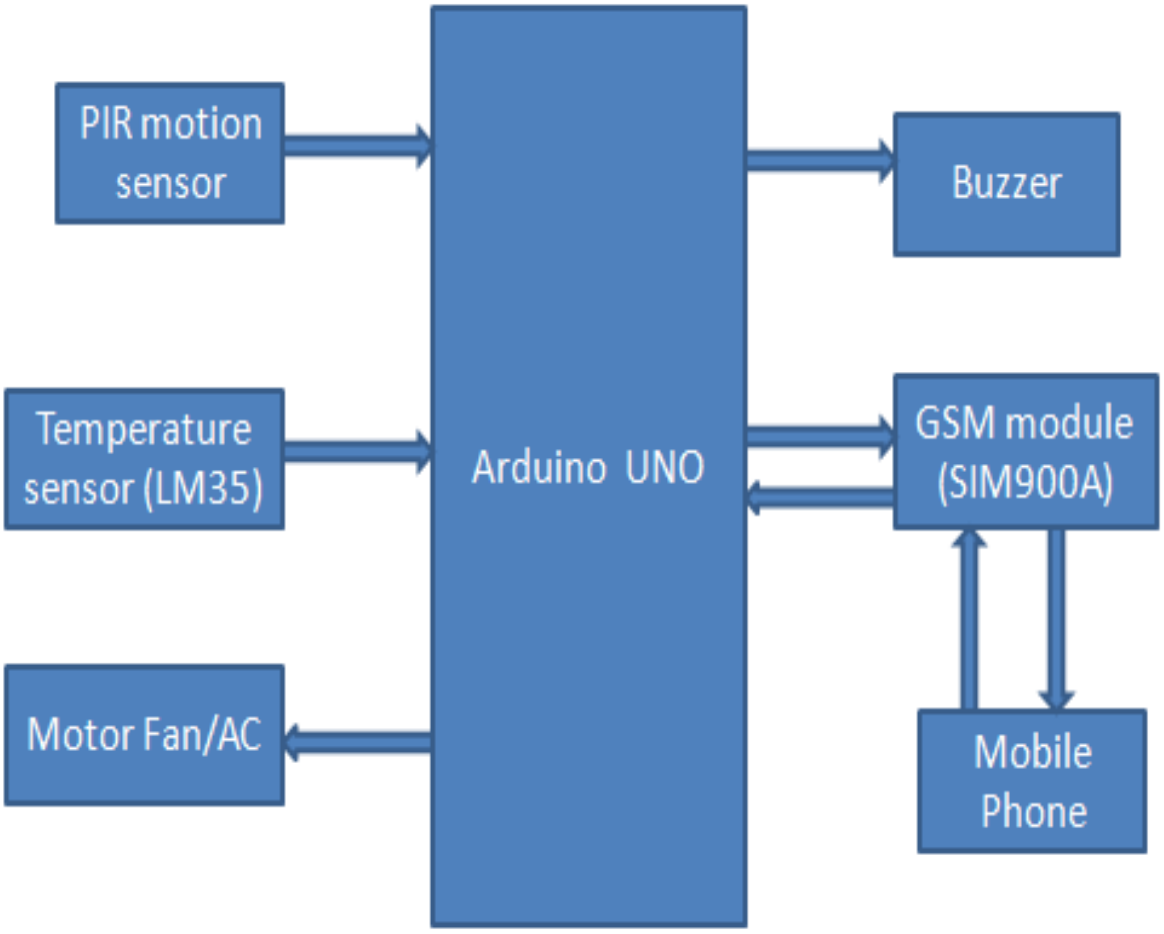
Situation/Context/Location: On Sunny Days, Malls, Locked cars, summer, Pets, Parking Lots etc.

Props/Tools/Objects/Equipment: Bluetooth, GSM Module, Node MCU, Sensors, GPS etc.


The Ideanaut: Ideation Canvas
Project:
Team: 18475
People
PARENTS
STUDENTS
PATIENTS
WORKERS
OLD PEOPLE
BUSINESS MEN
Activities
DRIVING
BRAKING
CHATTING
EATING
WAITING
SLEEPING
LISTENING MUSIC
Situation/Context/Location
(What / When)
(Why)
(Where)
SUNNY DAYS
CHIDREN
MALLS
LOCKED CARS
TEMERATURE RISE
SUFFOCATION
PARKING LOTS
PETS
SUMMER
Props/Tools/Objects/Equipment
BLUETOOTH
NODE MCU
AIR CONDITIONER
BATTERY
GSM MODULE
SENSORS
PCB
GPS
FANS
© www.openfuel.org

Chapter 3: Implementation

3.1 Block Diagram



Components:

As seen from the block diagram, the components that are or can be used in this project are:

1) PIR motion sensors: To detect the motion of children and pets inside the car

2) Temperature Sensors (LM35, Thermistors): To measure the temperature inside the car

3) Buzzer: To alert the passersby

4) GSM Module: To send out the alerts to parents/guardians

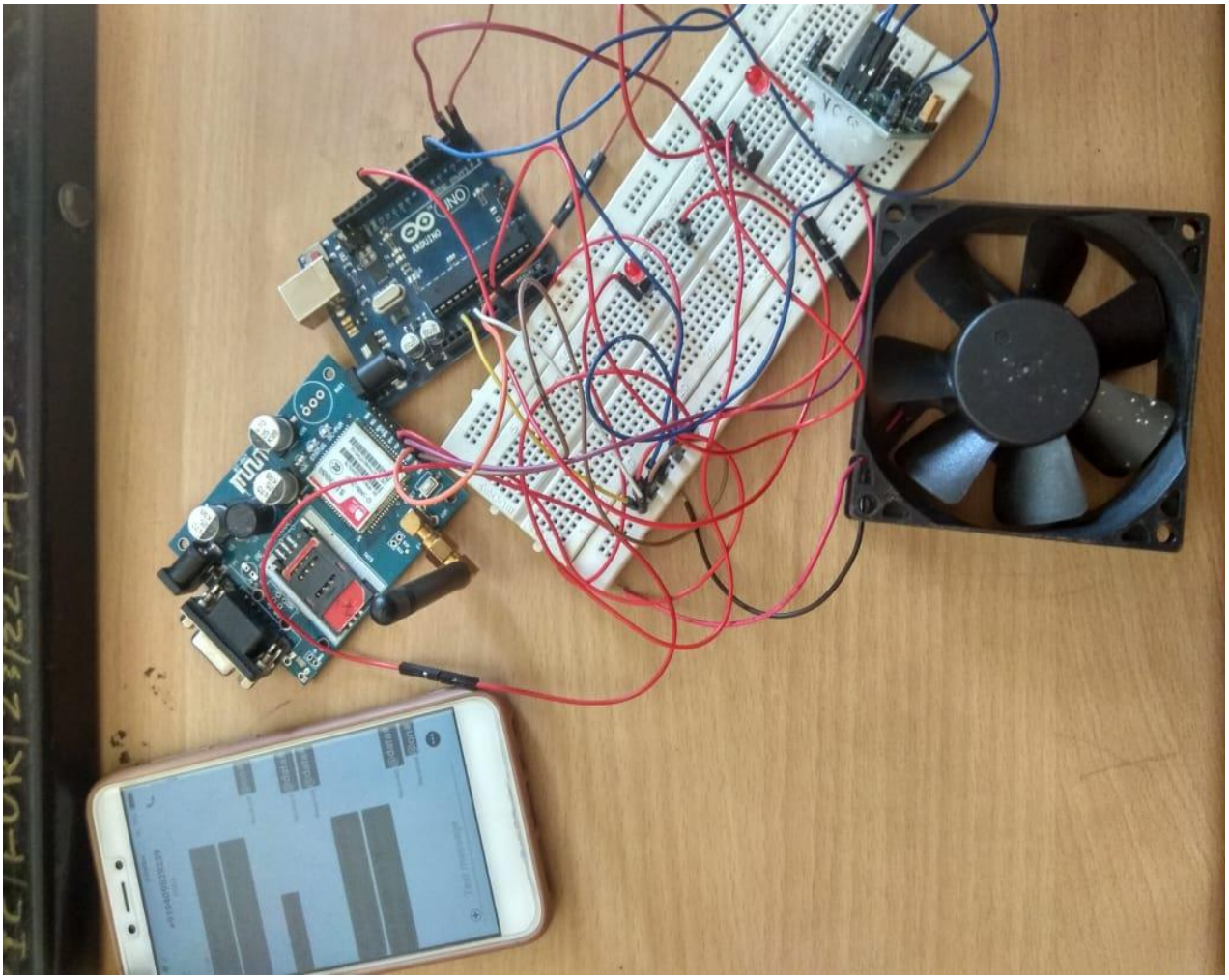
5) Motor fan: To reduce the temperature inside the cars in worst case scenarios.

6) Transistor: To prevent damaging of the microcontroller from high voltage current of Motor fan.

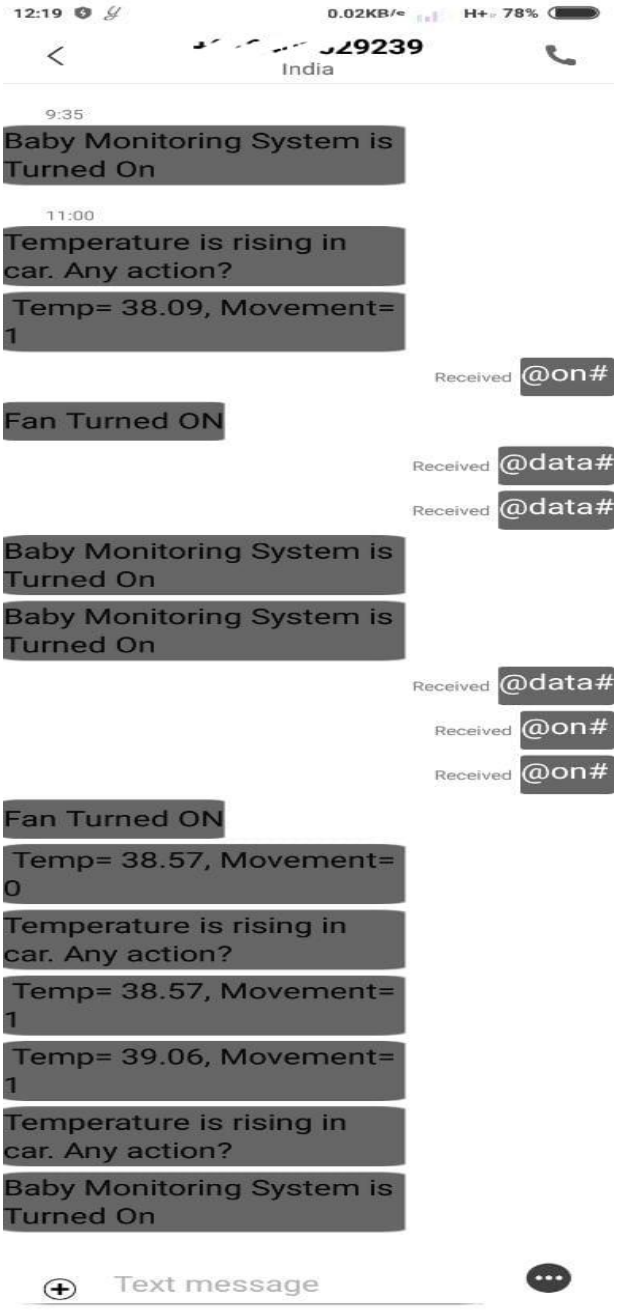
Here we can use Arduino UNO as our microcontroller board.

3.2 Circuit

We have created a circuit in which we have interfaced a PIR motion sensor and an LM35 temperature sensor using Arduino. The temperature thresholds that we have kept here is 30 and 35 degree Celsius. As per the code, the circuit will continuously measure the temperature and the motion inside the car. As soon the temperature crosses the first threshold and the presence is detected, it will send out a message to the guardian to take some action. Meanwhile, it will continuously monitor the temperature. If a message is received from the parent's mobile phone saying to turn on fan, it will turn on the fan. However if the temperature crosses the second threshold, and no message is received, it will automatically turn on the fan and will try to bring down the temperature using fan.



3.2.1 Result


12:19
0.02KB/s
H+ 78%
29239
India
9:35
Baby Monitoring System is Turned On
11:00
Temperature is rising in car. Any action?
Temp= 38.09, Movement= 1
Received @on#
Fan Turned ON
Received @data#
Received @data#
Baby Monitoring System is Turned On
Baby Monitoring System is Turned On
Received @data#
Received @on#
Received @on#
Fan Turned ON
Temp= 38.57, Movement= 0
Temperature is rising in car. Any action?
Temp= 38.57, Movement= 1
Temp= 39.06, Movement= 1
Temperature is rising in car. Any action?
Baby Monitoring System is Turned On
Text message

Chapter 4: Summary

4.1 Advantages

- ❖ Maintains the safety of children inside car.
- ❖ Would work in case of a child left in car intentionally or inadvertently.
- ❖ Easy to use.
- ❖ Cost affordable.
- ❖ The system will act automatically to help the child if the guardian does not provide any help to save him/her within some time interval.
- ❖ Can be compatible with all types of cars with some modifications.

4.2 Scope of future work

- ❖ Along with PIR Motion sensor, we can use other sensors such as NDIR CO2 sensors to measure the levels of gases inside the cabin, sound sensors, or pressure transducers to detect the presence of someone inside the cabin.
- ❖ A mobile application can further be built through which the parents can continuously monitor on what is happening inside the car cabin and take necessary precautions.
- ❖ A camera can also be installed for the same.

4.3 Features

- ❖ Easy to understand and use.
- ❖ Reliable. It has an option of alerting the passersby in case the message is not delivered to the guardian before the temperature crosses the second threshold.
- ❖ Automatic. In case the guardian doesn't respond in given time interval, and the temperature crosses the second threshold, it will automatically bring the temperature down.

4.4 Limitations

- ❖ In order to make the system more accurate, multiple sensors are needed to be installed in different places inside the car.
- ❖ This can increase overall cost of the system.
- ❖ There should be a proper network connection available so that the message can be delivered successfully to the parents and they can take proper action

4.5 Conclusion

We can conclude form the entire discussion that a system can be created, which will reduce the risk of onset of hyperthermia in children, when they are locked into cars unknowingly or because of some sort of miscommunication between parents or guardians. This system will me more reliable, accurate and easier to understand then the existing systems and will ensure safety for both.

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