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Car Safety

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Acknowledgments

In the name of Allah, The most Gracious, The most Merciful

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To my teachers who dedicated their precious time to educate me and enlighten my brain, thank you, and a "thank you" word will never reward you all for your efforts.

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And at last, I thank everyone who helped and advised me with this project.

I dedicate this project to you all.

Thank you, really thank you everyone.

Abstract

This project aim is to design a device that is suitable and dedicated for cars, the device will help us to overcome a serious issue we face a lot in our life, it will help all Moms and Dads to rescue their children lives when they are trapped inside a car for a long time.

What our device mainly does, it receives different readings from sensors that are attached to an Arduino and then processes inputs in the microcontroller, in simple words the device measures the carbon dioxide(CO2) concentration, carbon monoxide (CO) concentration, humidity and temperature inside the closed car, if there is someone in it which is detected by the motion sensor, and then compares them to a predefined values if they were high then the device starts action.

The first step it investigates existence of human beings by the motion sensor if there is any one and the CO2and CO concentrations are low the device opens the driver window by a certain amount and then sends a message to parents defined number if they were too late, it sends a message to emergency containing the coordination of the car depending on GPS readings.

By using this device, parents concerns about their children lives will vanish as soon as they start using it inside their cars, since it responds very quickly to any changes that happen inside the car by sending messages to them and to the emergency if needed.

The project scope can be specified to include car manufacturers and car accessories shops, were the device will be well installed and operated, since it needs knowledge in cars field, manufacturers can include this device as a new option in new cars or simply adding it to a any car, the only requirement is that the model of the car is higher than 2010.

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Chapter 1

INTRODUCTION

In this chapter I introduce to you the introduction of my project, starting with an overview of the problem, then motivation, a brief description of the project, the system methodology, objectives and goals, and then finally the literature review that is related to my work.

OVERVIEW

All children have the right to protection. They have the right to survive, to be safe, to belong, to be heard, to receive adequate care and to grow up in a protective environment.

Family is the first line of protection for children, for that there are lot of projects were invented for that roll, Devices watching and monitoring children inside home, when parents are not beside them. But what could happen when they are outside, in cars for example and parents were not beside them?

From here I came up with this idea, a device will monitor and keep safe of children inside vehicles in absence of the responsible people.

"KSPD" is shortcut for kids savior as a portable device, and it is a device used in emergency situations, as when the CO2 and CO concentrations are high inside of a closed car, while there are children in it.

The device saves them in two steps. First, reports the responsible person about the current situation by sending a text message to his cell phone. Second, the device opens the windows with a certain limit allowing air to enter in. Third, if parents take a long time to response after the

message had been sent and the device still working, in this case the device send a message to the civil defense department as an emergency situation with coordination of the car attached.

In other words, this project will serve as a supervisor, keeps watching the car situation while there children in the vehicle with absence of their parents, keeping them on touch in case something wrong happened.

MOTIVATION

I will reflect a lot of what I have learnt from the courses that I took in my specialty. And it’s a human action that I did, designing a device that its first mission is to prevent death occurrences to happen for children. Beside to adding a very needed and useful product to the available market, to be easy to useand reachable for all. As parents and school's bus drivers and the accompanying person.

BRIEF DESCRIPTION OF THE PROJECT

KSPD works as follows, when you leave your car, leaving a child in it, the device will be in working position, and operations begin when the device starts reading the measurements of the CO2 and CO sensors in periodic times, In addition to the temperature and PIR sensors. In case the CO2 and CO sensor readings Increasesabove a certain value, the device starts working in an emergency situation, and children lives might be in danger. The device sends a signal to start the motor connected to the window, making it open for a certain limit allowing the air to come through, until the CO2 and CO concentrations decreases back to normal values.

The device sends a message to the emergency, In case parent's response takes too long. The device texts the civil defends by a message, contains the coordination of the car location to help them to reach to the car as fast as possible.

PROJECT GOALS AND OBJECTIVES

The project intents to keep a normal concentration of oxygen in the car and monitors whenever someone in it through the periodic measurements readings of sensors, when the readings change indicating a real danger, the device starts to work as an emergency situation, the goals of the project can be statement as a:

- Reduce the percentage of children death and suffocation inside closed cars.
- Help parents to be aware of their children presence inside the car after a while in case they forgotten them.
- Locate the car in case of an emergency.
- Contact with parents in case the oxygen percentage is no longer appropriate for the children to stay in the car.

LITERATURE REVIEW

Since all around the world is developing technologically, a device like this, is certainly available, in different scopes. Like houses, schools, hospitals and in cars.

The cars manufacturers have developed cars in modern days to monitor all changes that happen inside a car while there is someone in it or not. They created devices that change the mechanical status of windows or air conditioner to maintain natural mode.

If we looked back to the origin of this idea we will find projects done earlier in 1999 year. As a beginning under the title “Vehicle having a thermal protection arrangement for toddlers and pets”. This invention has to work in general with a system controlling power window and sunroof of a vehicle for protecting toddlers, pets, and other incapacitated living beings, from ill effects of high and low temperatures. An aspect of the invention relates to the lowering and

raising of a power window and opening and closing of a sunroof both to pre-defined positions to prevent the vehicle interior to become too hot or too cold. In addition, this invention is related to an emergency arrangement for alerting the vehicle driver in case of thermal danger to the well-being of those left unattended in the vehicle. Advantageously, this invention also lengthens the operational life span of electronic and mechanical components near or in the vehicle interior. [1]

Also there is one that was made in our university by the mechatronics department in College of Architecture. The main idea of their project is to save children from suffocating and getting a heat stroke. They developed it to work on the solar cells to provide energy to run the air conditioner, therefore providing the vehicle with oxygen and to decrease the arising temperature from the sun. What differs my device, it is independent of the car power and we can say that it is partially portable and easy to add to any vehicle. The only condition is that the car model is higher than 2010 model, for it contains the “cut-out” piece that will help to control the front-driver window. This project will certainly be different and more exciting for it satisfying the new age requirements and prevents a lot of serious accidents that may cause death.

Chapter 2

PROBLEM STATEMENT

In this chapter I will introduce the problem statement of this project, starting with the problem analysis that explains the needs of this project, next the list of requirements, and at last the expected results to my project.

PROBLEM ANALYSIS

As usual in our daily life, with a lot of pressure works that facing parents and adults, appears the needs to finish some works outside, as in some institutions and malls and public places. Forcing the parents to accompany their children with them in cars, and leaving them into it. As for reasons that may be they are asleep or for their thoughts they will not get to late, unfortunately, the opposite could happen, leading regrettably the danger for their children, for getting busy and forgetting them for a long time without supervisor.

The device function comes to handle these situations. The device works as a rescue device that parents will be encouraged to own, the device playas the protector role in cars while parents or responsible person absent.

The clientshould buy a SIM card to put in his device and he has to format it to connect and contact with his cell phone on his number in case dialing, for using the device as a first time he should configure settings as he wish, meaning that he can connect the device to his desktop or

laptop and then a window will appear declaring that he will now start the configuration with a username and a password fields. Then he will enter a phone number or numbers as other person and the emergency number to call when needed, after he assembles everything, he becomes ready to put it on the car and clicking the start button.

LIST OF REQUIREMENTS:

System requirements can be summarized as:

Functional requirements:

- The system should have very fast response to the changes that may put the children life in danger.
- The system must be stable.
- The system must adapt to a range of situations.

Nonfunctional requirements:

- Easy to handle and use.

EXPECTED RESULTS

The results that are expected to attain are:

- A successful machine that works in emergency situations.
- A portable device that easy to use and to carry and attractive to buy.

Chapter 3

BACKGROUND

OVERVIEW

In this chapter I will give a detailed description of the device hardware and software components and at last we will demonstrate design specifications and constrains.

HARDWARE COMPONENTS

In this section I will give a brief description about the hardware components used to build and develop the device, I will simply talk about their contributions and tasks.

And here is a list of the components:

- Two Arduino shields to connect the system with each other.
- SIM808 GPRS+GSM/GPS shield to connect with the client cellular and locating the position.
- Motion sensor to detect existence of humans.
- MG-811 sensor to measure the concentration of CO2.

- MQ-7 sensor to measure the concentration of CO.
- DHTT22 sensor to measure the heat and the humidity in the car.
- Breadboard and wires.
- Lithium batteries and a car charger.

MICROCONTROLLER ALTERNATIVES

As an alternative of using both MEGA and UNO microcontrollers, you can use just one UNO microcontroller, but the reason why I chose two, is to enhance the response of the system and to make sure that it operates within a certain limitation of time, also UNO by itself may not be able to operate all of the selected sensor in addition to the GSM shield, since it should work for a long time period.

ARDUINO MEGA2560

A microcontroller includes a processor, memory, and peripherals, it is an open-source physical computing platform based on a simple I/O board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer.

It has 70 digital input/output pins (of which 15 can be used as PWM outputs and 16 can be used as analog inputs), a 16 MHz resonator, a USB connection. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. [2]

It is the basic component in my device it reads the inputs of the sensors connected with it and acts depending on the information provided in programming, and it is powered by a rechargeable battery that is recharged by the car's main battery by using a USB to the car charger port.

Figure 3.1: Arduino MEGA

ARDUINO UNO

Arduino Uno Microcontroller Board is based on the Atmel ATmega328 8-bit Microcontroller. Arduino Uno features 14 digital input/output pins (six of which can be used as PWM outputs), six analog inputs, and a 16MHz quartz crystal. Uno also includes a USB connection. This Arduino microcontroller board contains everything the user needs to support the microcontroller. The user can get started by connecting the Uno to a computer with a USB cable or by powering it with an AC-to-DC adapter or battery. The Uno can be programmed with Arduino Software. The ATmega328 on the Uno comes preprogrammed with a boot loader that allows the user to upload new code to the microcontroller without using of an external hardware.

Arduino Uno differs from preceding boards in that it does not use the FTDI USB-to-serial driver chip. This board instead features the Atmega16U2 programmed as a USB-to-serial converter. [3]

Figure 3.2: Arduino UNO

SIM808 GPRS/GSM+GPS SHIELD

SIM808 GPRS/GSM+GPS shield is a GSM and GPS two-in-one function module. It is based on the latest GSM/GPS module SIM808 from SIMCOM, supports GSM/GPRS Quad-Band network and combines GPS technology for satellite navigation. It has high GPS receive sensitivity with 22 tracking and 66 acquisition receiver channels. The module is controlled by AT command via UART and supports 3.3V and 5V logical level.[4]

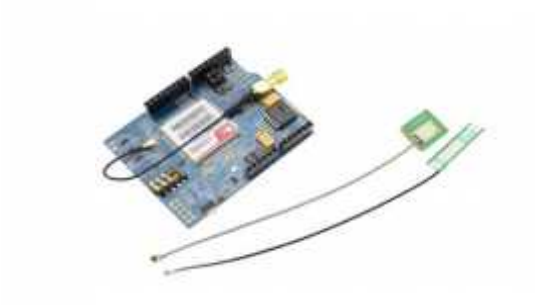


Figure 3.3: SIM GPRS+GSM/GPS Shield

PIR MOTION SENSOR MODULE

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range which will detect the motion of the person using the person body heat. They are small, inexpensive, low-power, easy to use and don't wear out.

PIRs are basically made of a pyro, which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. 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. [5]

Figure 3.4: PIR motion Sensor

MG811 CARBON DIOXIDE SENOR

Carbon dioxide sensor module (with analog signal, TTL level, output signal temperature compensator), one size: 32 mm X 22 mm X 30 mm L * W * H, the main chip: LM393 carbon dioxide gas detection probe and the working voltage: DC 6 volts .There are signs teaching; signal pairs (output analog and output TTL levels); TTL detects the correct signal is low (low

signallevel when the power output directly to the microcontroller). Analog output (0 ~ 2 volts / 0-4 volt) output voltage selection, starting hair 0-2 volt, highly sensitive carbon and good elixirs, the test can be designed plugs for easy. It is suitable for monitoring the concentration of carbon dioxide, carbon dioxide gas, the test gas concentration range: 0 to 10000ppm. [6]

Figure 3.4 Gas Sensor

BREADBOARD AND WIRES

Figure 3.5: MG-811sensor

Breadboard is a way of constructing electronics without having to use a soldering iron. Components are pushed into the sockets on the breadboard and then extra 'jumper' wires are used to make connections. It has two power rails on the sides to allow more than one power level. With a total of 830 ties in points, all pins are spaced by a standard 0.1″ (2.54mm). It has a self-adhesive on the back and also interlocking parts, so you can hook as many together as you'd like, I used it in testing the device which made a lot easier, comparing to testing while it soldered. [7]

MQ-7 CARBON MONOXIDE SENSOR

Sensor coupled with a simple adjustable comparator circuit using a LM393 IC. Detects Carbon Monoxide in the air. ɔr other micro controllers. Pitch Header pins for Power & OutputLEDs for Output and Power status indication.Detection Zone: 300-10000ppmResponse Time: <10Sec. Recovery Time: <30Sec.[8]

LITHIUM BATTERIES AND CAR CHARGER

Figure 3.7: MQ-7

Lithium batteries 3000mA are used in this project to provide the Arduino with the power it needs and also to power up the motor that already exists in the car when the cars battery is empty. To power the Arduino we need two batteries and two more for the motor. It is 3.7V 3000mAh Li-Ion Battery Pack, made of 2 pieces of 3.7V 1500 mA (PL325085) batteries with built in Protection IC (PCB) to avoid battery from over charge and over discharge, with a JST 3 pins connector (EH-3P) and 10K Thermistor included. [9]

The car charger needed for the device is available and contains USB ports with different ambers, it works as the charger of the Arduino batteries and will always charge as long as the USB connected.

DHT22 TEMPERATURE AND HUMIDITY SENSOR

DHT22 output calibrated digital signal. It applies exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability. Its sensing elements are connected with 8-bit single-chip computer. Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of programming in OTP memory, when the sensor is detecting, it will cite coefficient from memory. Small size and low consumption and long transmission distance(100m) enable DHT22 to be suited in all kinds of harsh application occasions. Single-row packaged with four pins, making the connection very convenient. [10]

Figure 3.8: Temperature and humidity sensor

SOFTWARE COMPONENTS

This part will talk about the software that I'm intending to use to help operating the device correctly.

ARDUINO SOFTWARE IDE

Arduino integrated development environment (IDE) is an open source software which is cross-platform, the open-source (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. An Arduino C/C++ sketch consists of two functions that are compiled and linked with a program stub main ()

into an executable cyclic executive program (setup () and loop ()) functions, this software is used to program the Arduino and install all requirements to it.

SPECIFICATION AND CONSTRAINS

In this section I will talk about design specifications, constrains and limitations that should be provided and that I may face.

DESIGN SPECIFICATIONS.

- The device will be built in simple way clear to next developers, it should depend on the microcontroller to guide all devices parts and make sure they work probably.
- All sensors should be reliable and ready to work in real time.

DESIGN CONSTRAINS

- Use of inexpensive products and devices as much as possible.
- The motion sensor readings might be inaccurate all the time

Chapter 4

DESIGN OPTIONS

OVERVIEW

This chapter discusses the design option of hardware and software components of the project, and conceptual design of the system such as block diagram and the flow chart of the hardware components of the system.

BRIEF DESCRIPTION OF THE SYSTEM

The device receives a set of signals, such as the CO2 sensor, CO sensor, temperature and humidity sensorbeside to the motion sensor, and then sends it to the Arduino piece, if the CO2 and CO concentrations are higher than a certain limit and there was a person in the car and also the car temperature is high, the Arduino send a signal to the car window to open for a certain amount allowing air in, and send a message to parents stored number notifying them to watch out for their kids in case they have forgotten them.

After a period of time if the parents did not arrive, the device sends a message to the civil defense containing the car location.

DESIGN OPTIONS

This section will demonstrate the hardware components design and role.

HARDWARE DESIGN

As mentioned, the device contains a carbon dioxide sensor, carbon monoxide sensor, motion sensor, temperature and humidity sensor, SIM808 GSM/GPRS+GPS module, rechargeable batteries, and two Arduino, we will discuss each here.

ARDUINO MICROCONTROLLER

Arduino receives data from previous mentioned sensors. It then analyzes the data and makes the decision to send a message to the parents and open the car window. After a specified time, it checks the carbon dioxide and carbon monoxide concentrations beside to temperature. If it is normal it closes the window, after a long time passed while there is no response from parents, send a message to the civil defense.

We have two Arduino shields:

- Arduino MEGA 2560.
- Arduino Uno

Advantages of Arduino mega 2560:

- It has many digital and analog pins.
- Memory size is large.
- Easy to use.
- Suitable to connect many sensors on it.

Disadvantages of Arduino mega 2560:

- Expensive.

Advantages of Arduino UNO:

- Ready to use structure.
- Big library.
- Effortless functions.

Disadvantages of Arduino UNO:

- Small in size.
- High in cost.
- Complex and easy to use.

SIM808 GSM/GPRS+GPR SHIELD

This shield allows you to install SIM card to Arduino chip to store the numbers on it, make calls, send messages, and also supports internet access, and detecting the location.

Advantages

- Quad – band 850/900/1800/1900MHz – connect onto any global GSM network with any 3G SIM
- Fully- integrated GPS
- Make and receive voice calls using a headset or an external 32Ω speaker + electrets microphone
- Send and receive SMS message
- AT command interface with "auto baud" detection
- Send and receive GPRS data (TCP/IP,HTTP, etc.)
- Available anywhere, anytime and within mobile network coverage.
- High speed data transfer compared to current speeds.

PIR MOTION SENSOR

The sensor detects the presence of children inside the car by the thermal radiation coming out of the child's body, based on infrared technology and it can automatic control by itself with high sensitivity and high reliability.

Advantage:

- Minimum size.
- Automatic Control.
- Low power
- Wide range of operating voltage

Disadvantages

- It may be inaccurate if the child stood still or was asleep and didn't move.

DHT22 TEMPERATURE AND HUMIDITY SENSOR

The Sensor consists of an electric capacity -style sensor of humidity and two NTC temperature measurement devices, combined with a high-performance 8-bit microcontroller. Therefore, it has excellent quality, fast response, anti-interference ability, low cost and its extremely accurate because of individual calibration in a humidity chamber. Calibration coefficients are stored in non-volatile onboard memory.

Ultra-small size, low power consumption, and a signal transmission distance up to 20 meters, make it a good choice for a wide range of applications and demanding applications.

MG-811 CARBON DIOXIDE SENSOR

The MG-811 sensor is a cell structured 6 pins module that has a very small output range with the change in CO2 level. As the output signal is very small, it needs to be amplified in order to have clear readings. Thus the sensor module consists of signal conditioning circuit and the heating circuit. It has the principal advantage of very low energy consumption, and can be reduced in size to fit into microelectronic-based systems. On the downside, short- and long term drift effects as well as a rather low overall lifetime are major obstacles.

MQ-7 CARBON MONOXIDE SENSOR

This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC, this sensor comes in a package.

FULL SIZED BREADBOARD AND JUMPER WIRE

The breadboard is a very useful component, it is used without having to use a soldering iron. Components are pushed into the sockets on the breadboard and then extra 'jumper' wires are used to make connections, the only problem that might face us that the wires might not give us full connectivity, and the breadboard may limit our hardware component, and make them all loosely coupled.

LITHIUM BATTERIES AND A CAR CHARGER

Those batteries are mainly used to charge the Arduino for it needs 5-12 volts so we will connect it with two batteries of this kind each 3000 mA, and we will need the microcontroller to supply the motor driver, instead we will add another two batteries to do that job, their disadvantage is the high temperature that is produced by them as for they operate for a long time.

As for the car charger it's connected to the Arduino to provide power when the car is running the only disadvantage that the car charger may not suite the Arduino shield.

SOFTWARE DESIGN

The software I used to simulate my codes and verify my work is the Arduino Software, the open-source Arduino Software (IDE) makes it easy to write codes and upload them to the board. It runs on Windows. The environment is written in java and based on processing and other open-source software. It will be used to write codes for driving the component of the kit to be able to function.

DETAILED DESIGN

SYSTEM DIAGRAMS

Figure 4.1 shows the block diagram of the system, and how hardware components communicate with each other in Figure 3.2 and at last we will draw a Figure illustrating the connections between the hardware components.

BLOCK DIAGRAM

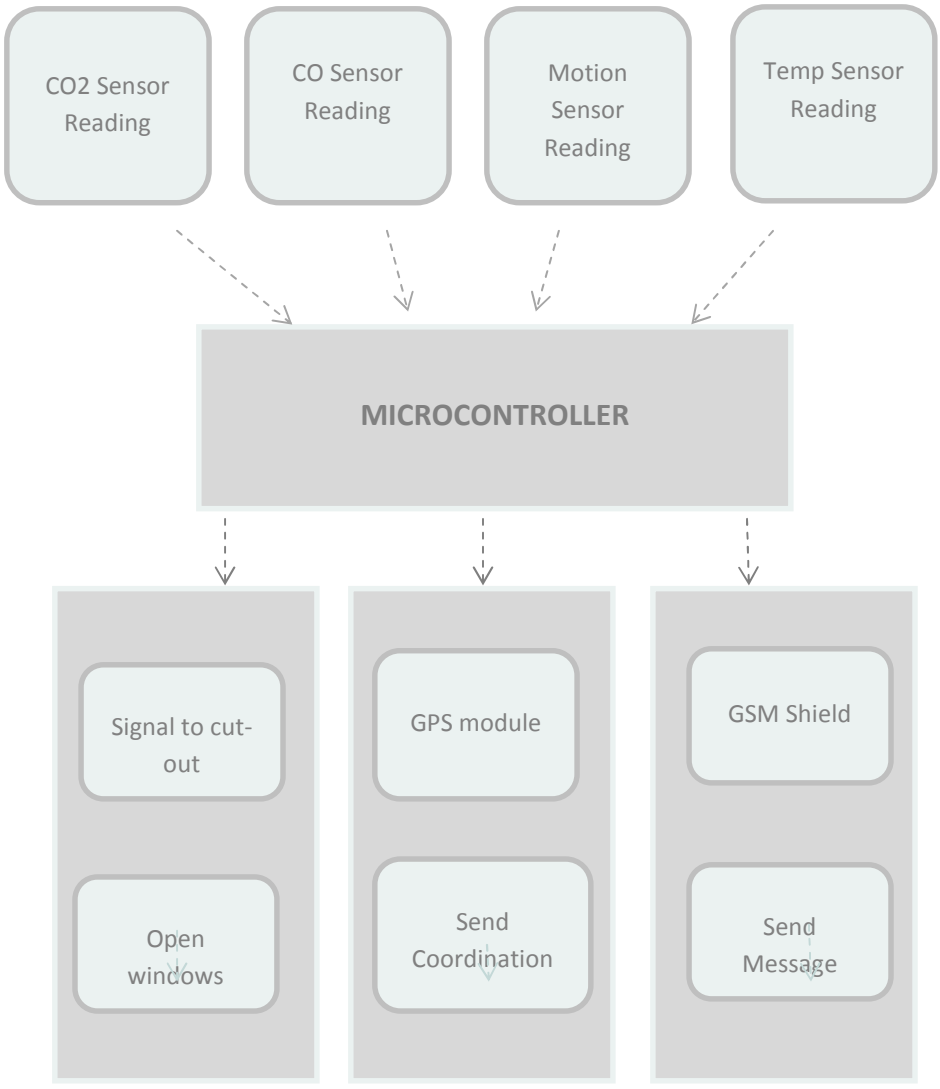


Figure 4.1: System Block diagram

Figure 3.1 is the block diagram for the system. It shows the main building blocks of the system and how they communicate. It shows at the beginning how to move data from sensors, CO2, CO, temperature and motion to the Arduino microcontroller. Then the microcontroller process the incoming data to make a decision to allow or not the opening of the window through the “cut-out” that is located in the front seat door in the car, by analyzing the incoming data and comparing them with the set up data. After the reading and comparison operations the Arduino send two signals, one to the “cut-out” component, which is connected to a DC motor in the cars window, making the window open for a certain amount.

The second block shows the GPS module that determines the location of the car and send the coordination by a message to parents and when needed they are sent by a message to emergency.

The third block is describing the GSM shield that will work on sending a message to parents using the saved number after a long time is passed while their kids in the car, of course this time is calculated by a timer in the Arduino.

FLOW CHART

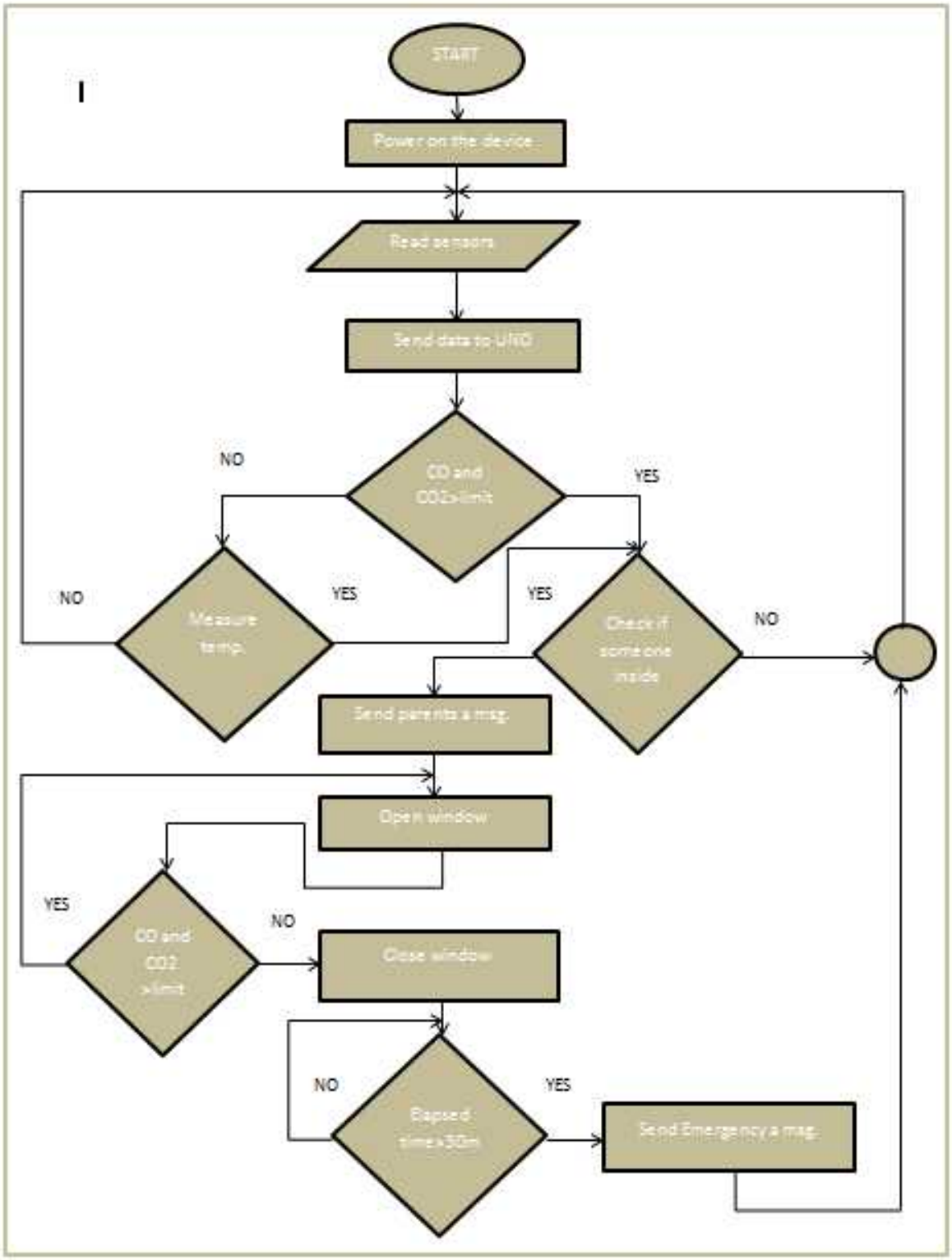
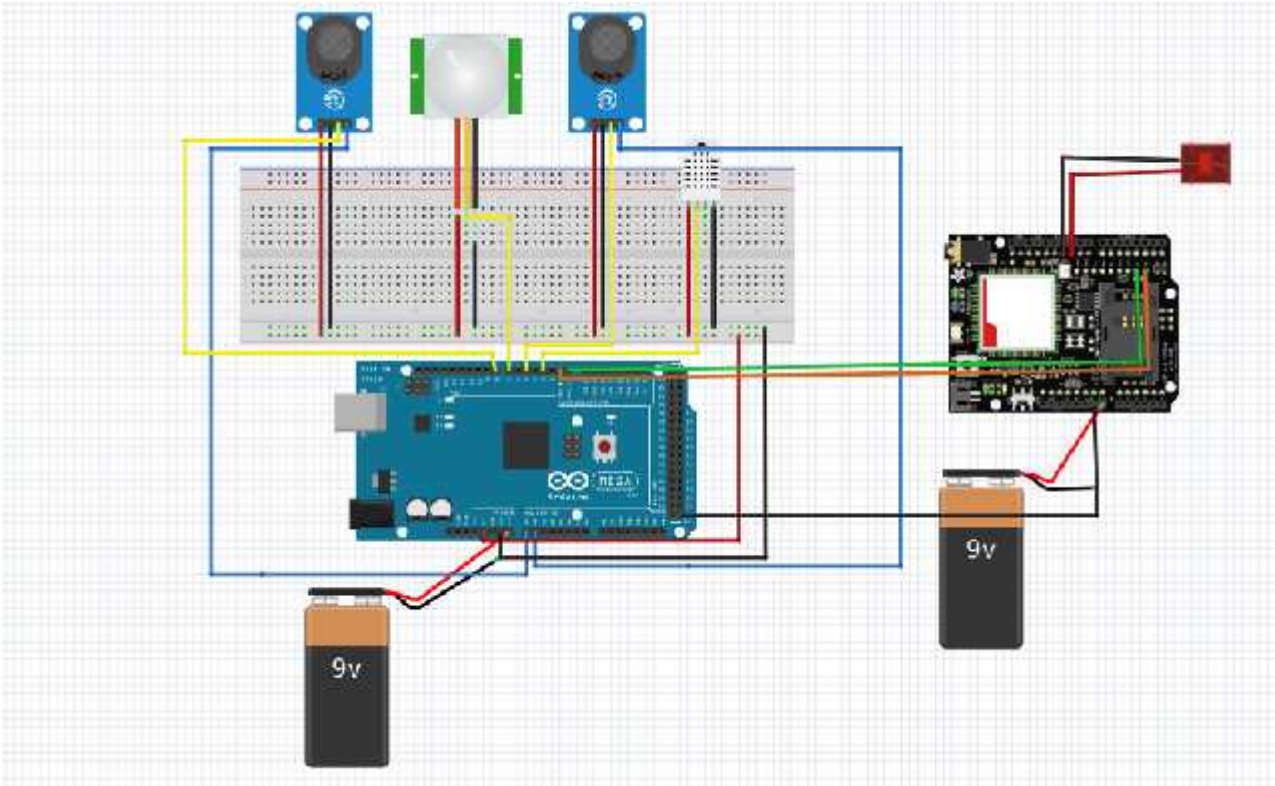


Figure 4.2: System flowchart

The previous flowchart describes system execution flow, it starts by reading the sensors, carbon monoxide, carbon dioxide and temperature sensors, then send the readings to the microcontroller, then it compares the readings with the extreme values stored, if the readings are high it checks the reading of motion sensor to decide if there is someone inside the car or not, if there is, it sends a message to parents and opens the window until the gases concentrations are back to normal, and while that it checks if the elapsed time since the message was sent over 30 minutes, if so, it sends a message to emergency, back to the other side of the conditional term, if the gas concentration is normal, it checks the temperature rate, if its high it checks the motion sensor to indicate if someone is in the car or not, if so, it does the same operations done in the gas case.

HARDWARE LAYOUT DIAGRAM

As shown below the system hardware components are connected to the Arduino shield through the breadboard:



Chapter 5

VALIDATOIN AND TESTING

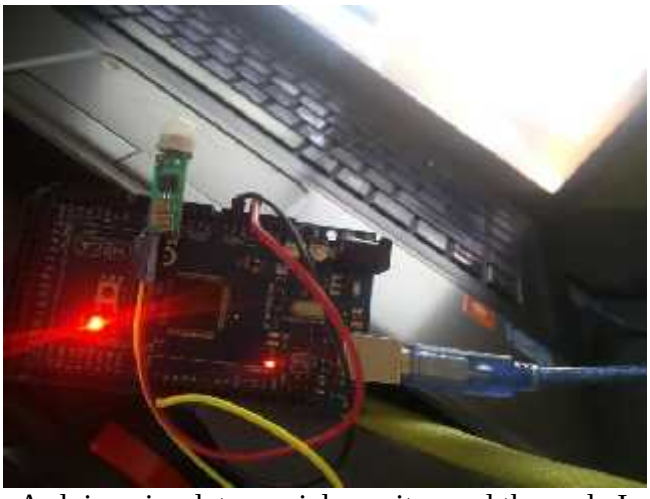
OVERVIEW

In this chapter I'll be showing you the steps I took to validate the device and how I ensured it worked probably by testing each element one by one and then by gathering all the components together.

SENSORS TESTING

PIR MOTION SENSOR

I started with testing PIR motion sensor, which in a real car should be raised on the upper sealing of the car for better results, I uploaded the code on the Arduino mega and connected the wires as shown in the figures, I applied more the one movement to validate the operations of the sensor, it detects small movements very responsively, the readings of the sensor using the



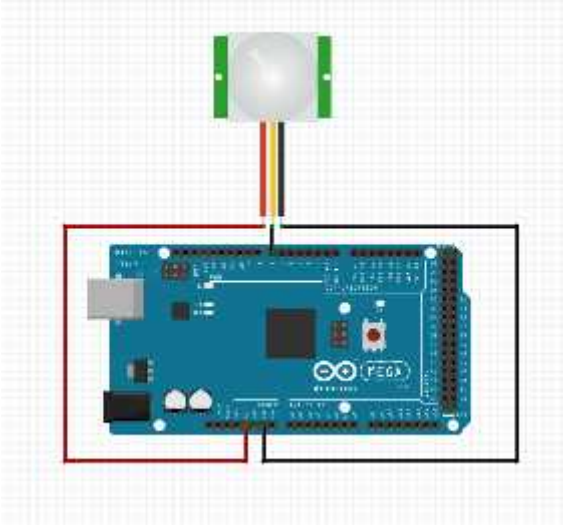


Figure 4.3: Hardware diagram

Arduino simulator serial monitor and the code I used are shown also below.

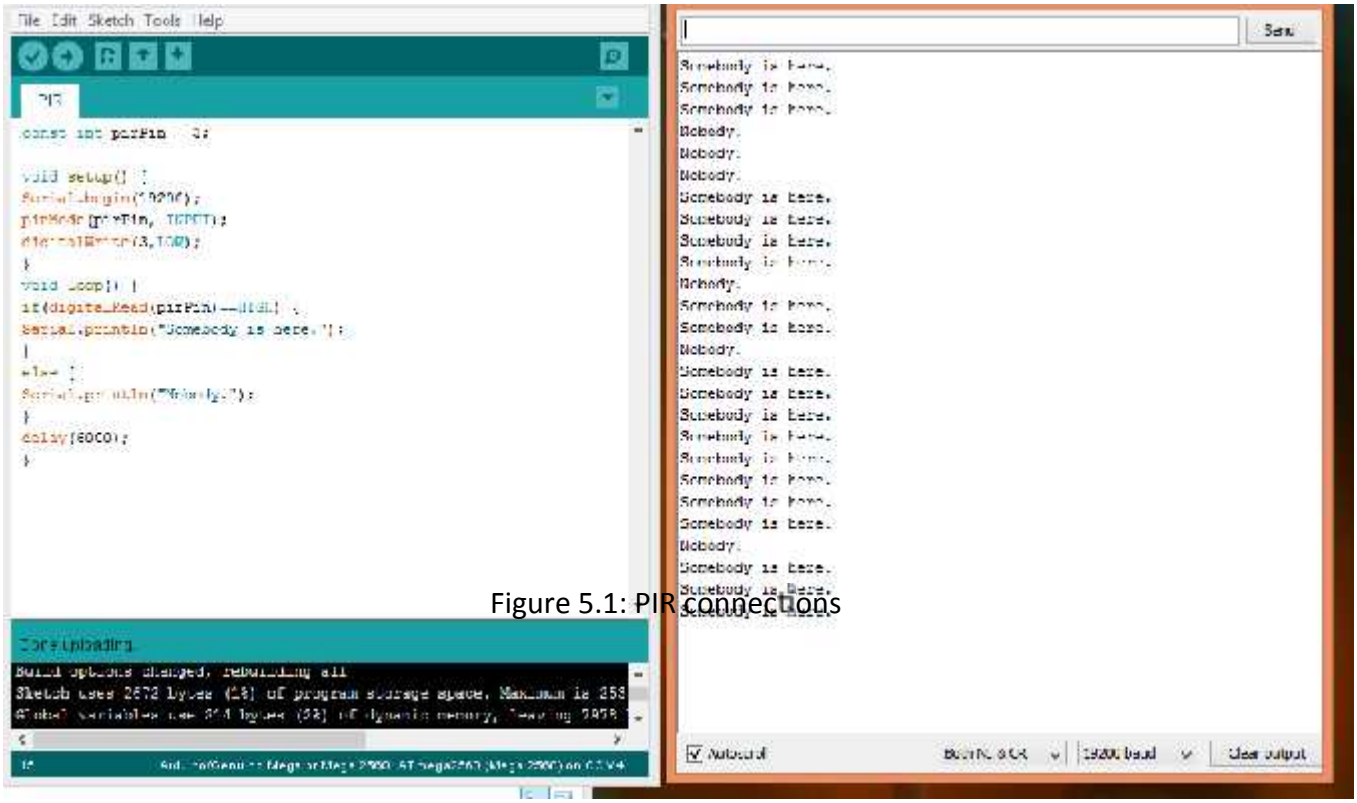


Figure 5.1: PIR connections

MG-811 CARBON DIOXIDE SENSOR

Secondly, I tested the MG-811 sensor which is supposed to measure the carbon oxide concentration in air, and then the Arduino mega will determine if the gas concentration is below the threshold value. The threshold value is set to be 40,000 ppm, this value is measured under true circumstances in a closed car, and the temperature was 24 Celsius, the car was parked in sunlight and two persons were in it, the threshold value I referred to was found by studies and I tried it on a closed car, the working mechanism I applied is by calculating the oxygen concentration left after each reading for the MG sensor, by that I concluded that this is the maximum co2 percentage a human can bear, after that the gas concentration will affect the human body beginning with affecting the neural system leading to suffocation and then death, I

Figure 5.2: PIR Serial output + code

have to mention being exposed to this co2 concentration for a short time bay be bearable but for a long time the effects increases.

And now those are the testing pictures:

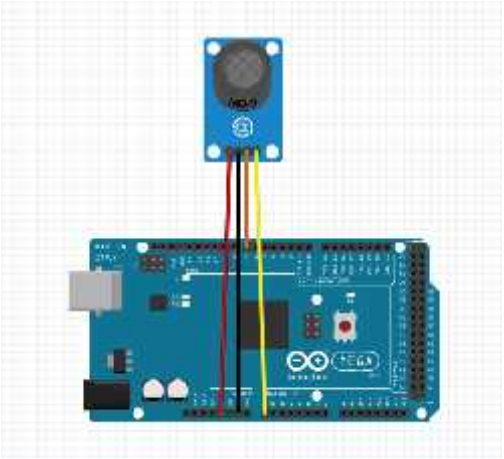
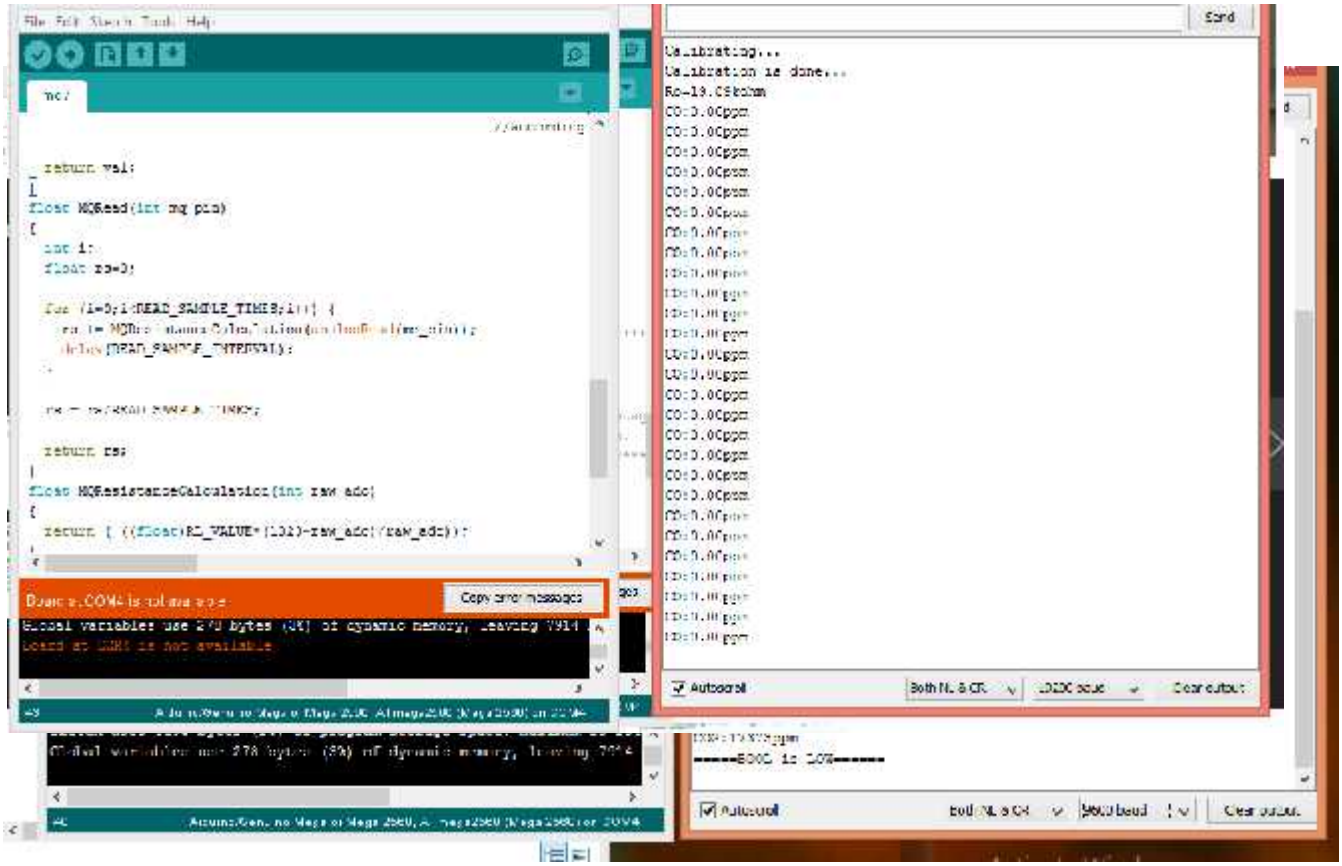


Figure 5.3: MG-811 Carbon dioxide sensor

MQ-7 CARBON MONOXIDE SENSOR

Here I validate the operations of carbon monoxide sensor, this sensor measures the CO concentration in air, also done in a closed car, but this sensor has small readings since there is no car engine running, and so not a high CO concentration, but that does not means that this sensor is not important, on the contrary, what differs CO among all toxic gasses that this one displace the oxygen in blood, and the replacement rate is very high, you cannot feel it or smell it, that what makes it

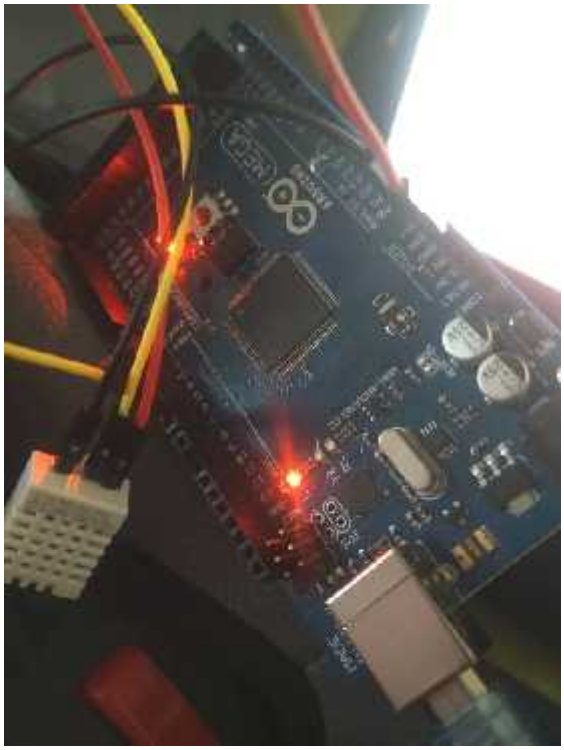


more dangerous, I referred to studies, tens of studies that emphasize on the toxicity of this gas on the threshold value 6400 ppm, I tried to reach that value by setting some coil and opening

the air conditioner for a long time in a closed car, but still no significant change, and here are the pictures and the results:

DHT22 TEMPERATURE AND HUMIDITY SENSOR

Temperature increasing inside a closed car with a child in it is as important as a closed car getting out of oxygen to breath, inside a closed car parked in the sun the temperature increases quickly by every 30 minutes passes, suppose that the temp. outside is 30 C, inside a car it may reach 60 C within couple of hours, that's what the scientist call "greenhouse", what happens here is, CO2,CO,O2 and other gasses have concentrations with their concentrations changing the temp. changes as well, and quickly with humidity value over 60%.



Carbon monoxide sensor

The problem with temp. is even If you opened the window that might not help decreasing it especially if it's hot outside too, and also we, as humans can adjust our bodies temp. by sweating in general to accommodate with the surrounding temp. but what happens when you stay for a long time under high temp. is what is called a heat stroke, which may lead to death, the maximum temp that a human can survive is 60 C for proximately 1:30 hour, and now those are the connections and the experiment result taken in a normal day of temp. 20 C inside a closed car.

gure 5.6: DHT22 Sensor connections

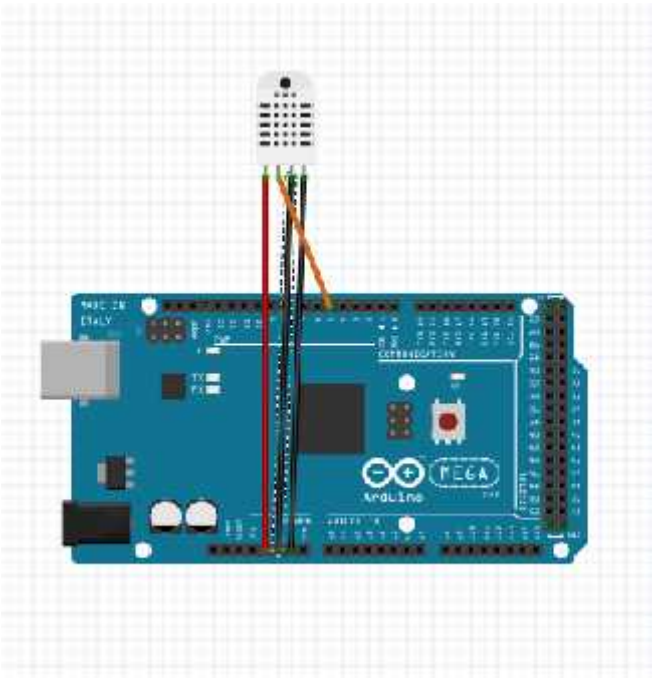
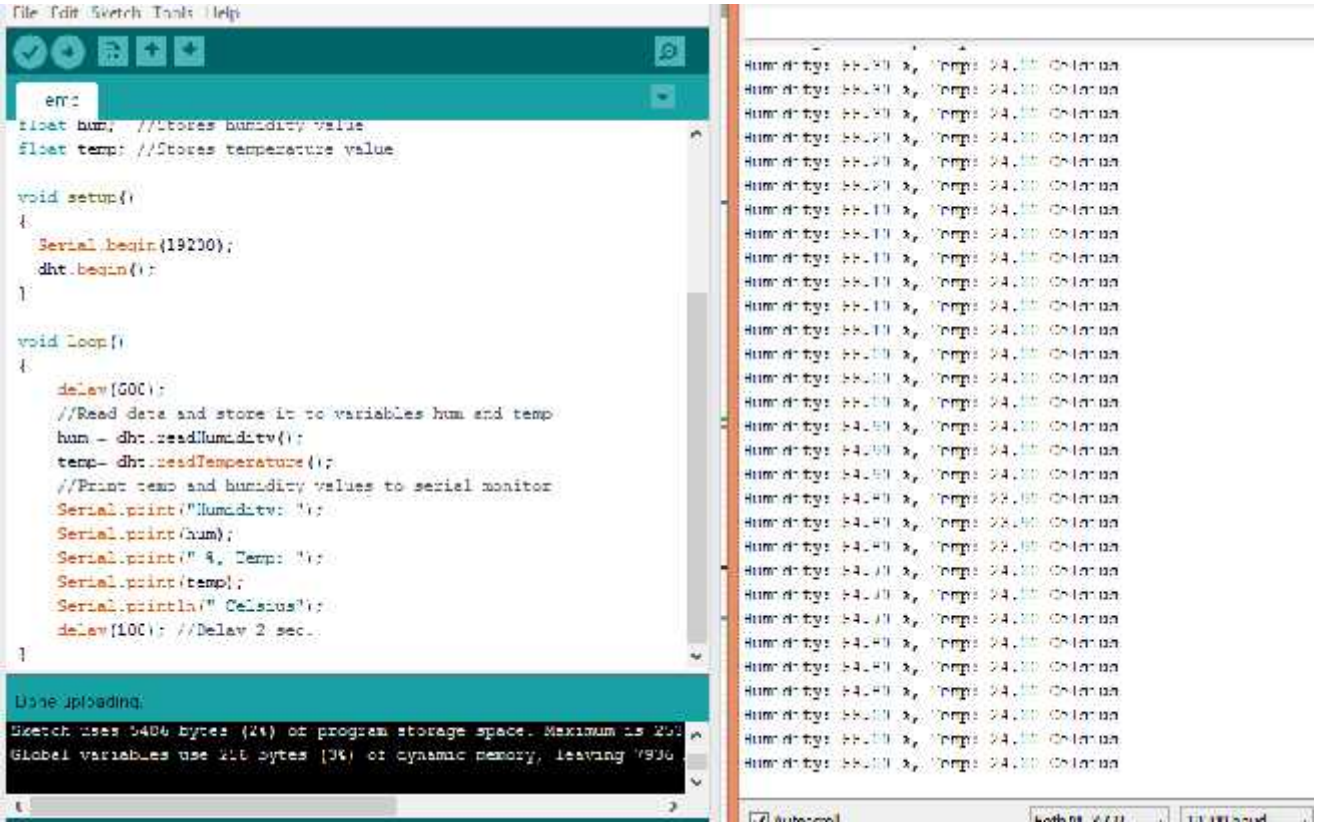


Figure 5.7: DHT22 Sensor Serial output and code



KSPD TESTING

The final test is the whole components operating together, Arduino mega reading outputs of sensors and the UNO operating the SIM shield and opening the window, the following is a picture of the connections made earlier in chapter four, and a demo will be shown to you showing the operations of the device

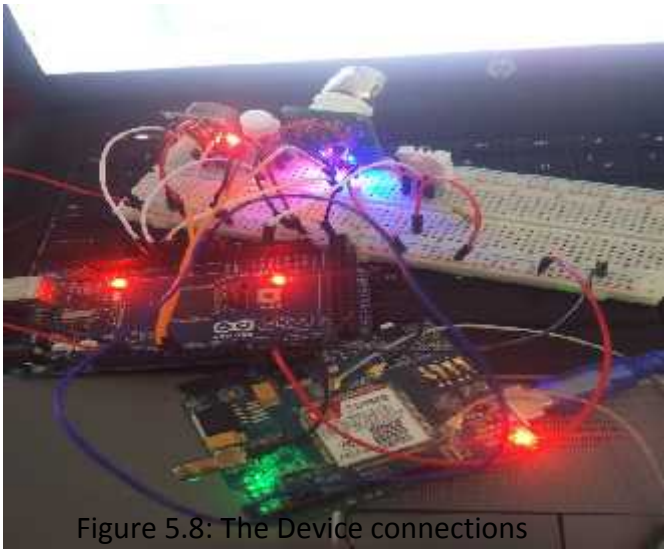


Figure 5.8: The Device connections

Chapter 6

DISCUSSION

IMPLEMENTATION CHALLENGES

During the implementation of this project I have faced some problems, starting with the variation of the air gap from one place to another to calibrate the sensors, then in the end when I composed all the components together to work on different conditions, let me mention the temperature sensor challenges, first I didn't notice that it may be affected by humidity and so I didn't start examining it under low humidity, during the last days the weather was not that much dry so I had a little bit complications determining the maximum temperature, and then when I solved that, I had another problem in measuring, that is I have been putting the sensor under the sun light which after the searches that I have done, leads to errors and giving a high value to start with, so in order to maintain correct errors make sure that is in a shaded place, I could recommend to put the whole device in the sealing of the car to attain correct measurements.

Another challenge that worth mentioning is adapting the gas sensors I have had some troubles getting correct values, and after referring to data sheet, I found that there is something called heating, and before you do that you will not have any correct readings, so after heating up the sensors for two days I started measuring right values and somehow reliable readings.

And for the PIR motion sensor that was a whole other story, see I have used a PIR sensor that tracked motion within more than three meters, so whenever someone is passing beside the car it detected motion, which is totally unnecessary because all I have to detect, is motion for two to three meters, that is the car length and "inside car", so I replaced it with a mini PIR motion sensor, which did the job and solved the problem.

IMPLEMENTATION ISSUES

The first implementation issue face me was me not knowing how to program the Arduino so I had some trouble understanding how to connect the elements together, I have damaged some ports because I didn't know how to connect correctly, I also tried to download the code on the MAGE while connecting it with the UNO which led to unknown errors and damaged ports or a while, I had a trouble powering the GSM shield for it had a mechanism should be done to make it enter the GSM coverage in order to send messages and GPS coordination.

CONCLUSION

The main goal a perceive to attain is to help helpless kids locked or forgotten inside cars for a long time, and also to help their parents to rescue them before it is too late, there is not a year that passes that we have not heard about a child death inside a closed car, this is a heartbreaking news to hear when we have become a technological world, what technology will console the parents that have lost their children inside a car, when they could have been notified about them.

That is certainly my goal, to help rescuing children lives from being taking, when we can make something to keep.

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