CHILD SAFETY WEARABLE DEVICE

A Dissertation submitted in partial fulfillment of the requirements

for the award of degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS & COMMUNICATIONS ENGINEERING

Submitted By

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGG
G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE

(For Women)

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(Accredited by NBA& NAAC)

Affiliated to JNTU, Hyderabad

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DEPT. OF ELECTRONICS & COMMUNICATION ENGG

CERTIFICATE

THIS IS TO CERTIFY THAT THE MINI PROJECT ENTITLED

CHILD SAFETY WEARABLE DEVICE

IS THE BONAFIDE WORK OF

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SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING DURING THE YEAR 2020-2021

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ABSTRACT

Child care is a necessity for most working families, and millions of parents across the world are concerned about it each day. Children, in particular, are vulnerable to accidents, and their safety requires different approaches. In the early 21st century, approximately one million children worldwide died each year from accidental injuries, with about 95 percent of those injury-related deaths taking place in low and middle-income countries. Therefore, child safety is increasing in importance day-by-day. Wearables are electronic technology devices incorporated into items that can be comfortably worn on a body. These wearable devices are used for tracking information on real time basis. They have motion sensors that take the snapshot of the day-to-day activities and sync them with mobile devices or laptop computers. The use of wearables with proximity sensors can help mitigate this risk. These wearables are designed to monitor each and every move of the child by the parent and ensure their safety.

At the moment there are many wearables in the market which help track the daily activity of children and also help find the child using Wi-Fi and Bluetooth services present on the device. But Wi-Fi and Bluetooth appear to be an unreliable medium of communication between the parent and child. Therefore, the focus is to have an SMS text enabled communication medium between the child's wearable and the parent as the environment for GSM mobile communication is almost present everywhere. The parent can send a text with specific keywords such as "LOCATION" or "TEMPERATURE" or "UV" or "SOS" or "BUZZ", etc., the wearable device will reply back with a text containing the real time accurate location of the child which upon tapping will provide directions to the child's location on google maps app and will also provide the surrounding temperature, UV radiation index so that the parents can keep track if the temperature or UV radiation is not suitable for the child.

LIST OF FIGURES

ACRONYMS

S.No.	Abbreviation	Full form
1	IoT	Internet of Things
2	GPS	Global Positioning System
3	GSM	Global System for Mobile Communication
4	SOS	Save Our Souls
5	SMS	Short Message Service
6	UV	Ultra Violet
7	LCD	Liquid Crystal Display
8	SMS	Short Message Service
9	ROM	Read Only Memory
10	TX	Transmitter
11	RX	Receiver
12	GPRS	General Packet Radio Service
13	AC	Alternating Current
14	DC	Direct Current
15	RAM	Random Access Memory
16	RTD	Resistance Temperature Detectors

1. INTRODUCTION

1.1 About Project In Brief

The Internet of Things System (loT) refers to the set of devices and systems that stay interconnected with real-world sensors and actuators to the Internet. loT includes many different systems like smart cars, wearable devices and even human implanted devices, home automation systems and lighting controls; smartphones which are increasingly being used to measure the world around them. Similarly, wireless sensor networks that measure weather, floods, tides and more. There are two key aspects to the loT: the devices themselves and the server-side architecture that supports them. The motivation for this wearable comes from the increasing need for safety for little children in current times as there could be scenarios of the child getting lost in the major crowded areas.

This paper focusses on the key aspect that lost child can be helped by the people around the child and can play a significant role in the child's safety until reunited with the parents. Most of the wearables available today are focused on providing the location, activity, etc. of the child to the parents via Wi-Fi and Bluetooth. But Wi- Fi and Bluetooth seem a very unreliable source to transfer information. Therefore it is intended to use SMS as the mode of communication between the parent and child's wearable device, as this has fewer chances of failing compared to Wi-Fi and Bluetooth. The platform on which this project will be running on is the Arduino Uno microcontroller board based on the ATmega328P, and the functions of sending and receiving SMS, calls and connecting to the internet which is provided by the Arduino GSM shield using the GSM network. Also, additional modules employed which will provide the current location of the child to the parents via SMS.

The second measure added is SOS Light indicator that will be programmed with Arduino UNO board to display the SOS signal using Morse code. The different modules stay enclosed in a custom designed 3D printed case . In the scenario, a lost child can be located by the parent could send an SMS to the wearable device which would activate the SOS light feature on the wearable. Therefore alerting the people around the child that the child is in some distress and needs assistance as the SOS signal is universally known as the signal for help

needed. Additionally, the wearable comes equipped with a distress alarm buzzer which sets to active by sending the SMS keyword "BUZZ" to the wearable. Hence the buzzer is loud and can be heard by the parent from very considerable distance. The parents via SMS can receive accurate coordinates of the child, which can help them locate the child with pinpoint accuracy. Some of the existing work done on these similar lines are for example the low-cost, lightweight Wristband Vital which senses and reports hazardous surroundings for people who need immediate assistance such as children and seniors. It is based on a multi-sensor Arduino micro-system and a lowpower Bluetooth 4.1 module. The Vital band samples data from multiple sensors and reports to a base station, such as the guardian's phone or the emergency services. It has an estimated battery life of 100 hours. The major drawback for the Vital band is that it uses Bluetooth as the mode of communication between child and the parent. Since the distance between the two in some cases could be substantial and the Bluetooth just won't be able to establish a close link between the two. Some more of the similar wearable devices are the Mimo, Sproutling, and iSwingband having their several drawbacks. Therefore, the wearable device proposed will be communicating with the parent via SMS which would ensure that there is a secure communication link. Also, customization of the wearable is possible as per our needs by reprogramming the Arduino system.

1.2 Literature Survey

- **Wearable Child Safety System**

The paper focuses on a smart wearable device used for children. The main benefit of this wearable compared to other wearable is that it can be used in any of smart mobile phones and does not need a very costly mobile phone and not a highly technical human. The main idea of this wearable safety system is to aid the parents in finding their child very easily. In the current scenario, there are lot of wearable that monitors the routine behavior and activities of children and also help to find the child using Wireless Fidelity (Wi-Fi) and Bluetooth services that are available on the device. But both of them seems to be an unsecured communication in between the parent and the child. Therefore, the objective of this paper is SMS (Short message service)

text enabled link in between the child's wearable and the respective parent. The main idea for achieving this is Global System of Mobile Communication (GSM). The parent has to send a text message in the form of SMS using words like “Temperature”, “SOS”, “Location”, “Buzz” etc., to the wearable system. The wearable device sends an acknowledgement in the form of a text showing the location of the child and will provide the atmospheric temperature, so that the parents can have a track if the temperature does not suit the child. Distress alarm buzzer present on the wearable device can also be activated by the parents through SMS text to display the SOS signal very clearly and rings an alarm which the nearby public can immediately react to the safety of the child till the parents come or they can try to reach he parents and assist in locating the child.

- **Child Safety Wearable Device**

The objective of this project is to safeguard the child from threads. Now a days the safety measures of children has been reduced in huge number. Thus the violence against children increasing day by day. Not only kids even women are also abused both physically and mentally. We are taking small step towards violence against the kids. Our project mainly focus on sensing the children’s Temperature and Heartbeat. By monitoring the activities the state of the child is analyzed. By using GSM, if child reaches the critical state then the latitude and longitude of that particular location is sent as an alert message to the parents. In this system, it has a MEMS sensor which is used to detect the abnormal vibration and it is controlled by NodeMCU micro controller.

- **Design and Implementation of Child Safety Wearable Device with GPS and GSM**

This project portrays child security utilizing GSM and GPS. The system comprises of an Arduino microcontroller, GSM module, GPS modules, UV sensor, and temperature sensor and switch. The framework looks like a typical watch in real-time which when initiated, tracks the place of the child utilizing GPS (Global Positioning System) and sends crisis messages utilizing GSM (Global System for Mobile correspondence), to the police control room or the parents.

before. The utilization of modern parts guarantees precision and makes it dependable. The watch gives every one of the elements which will investigate every possibility to help the trick in any sort of crisis circumstances. In the proposed system when we want to know the child location, we know by sending “w r u” to the system we will get latitude and longitude values.

- **A Research on Child Safety Wearable Devices**

In today’s world child and women are less secure and have many issues regarding their security purpose. They have to undergo among various difficult situations and have to prove themselves every time in all critical conditions. So, for their security and safety purpose government has provided security through rules and regulation to the society. Although there are many existing systems for security purpose need of advanced smart security system is increased. In order to overcome such problems smart security system for child and women is implemented. This paper describes about safe and secured electronic system for child which comprises of an Arduino controller and sensors such as temperature LM35, flex sensor, MEMS accelerometer, pulse rate sensor, sound sensor. A buzzer, LCD, GSM and GPS are used in this project. When the child is in threat, and the offender hand touches the touch sensor which is fixed in the bad touching places of a girl child, the device senses the body parameters like heartbeat rate, change in temperature, the movement of victim by flex sensor, MEMS accelerometer and the voice of the victim is sensed by sound sensor. When the sensor crosses the threshold limit the device gets activated and traces the location of the victim using the GPS module. By using the GSM module, the victim’s location is sent to the registered contact number.

2. EMBEDDED SYSTEMS

2.1 Introduction

Each day, our lives become more dependent on 'embedded systems', digital information technology that is embedded in our environment. More than 98% of processors applied today are in embedded systems, and are no longer visible to the customer as 'computers' in the ordinary sense. An Embedded System is a special-purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale. The increasing use of PC hardware is one of the most important developments in high-end embedded systems in recent years. Hardware costs of high-end systems have dropped dramatically as a result of this trend, making feasible some projects which previously would not have been done because of the high cost of non-PC-based embedded hardware. But software choices for the embedded PC platform are not nearly as attractive as the hardware.

Typically, an embedded system is housed on a single microprocessor board with the programs stored in ROM. Virtually all appliances that have a digital interface -- watches, microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program. In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

2.2 Definition

Embedded system is defined as, for a particular/specific application implementing the software code to interact directly with that particular hardware what we built.

Software is used for providing features and flexibility, hardware = {Processors, ASICs, memory,..} is used for Performance (& sometimes security).There are many definitions of embedded system but all of these can be combined into a single concept. An embedded system is a special purpose computer system that is used for particular task.

2.2 Features

The versatility of the embedded computer system lends itself to utility in all kinds of enterprises, from the simplification of deliverable products to a reduction in costs in their development and manufacture. Complex systems with rich functionality employ special operating systems that take into account major characteristics of embedded systems.

Some embedded systems have to operate in extreme environment conditions such as very high temperature & humidity. For high volume systems such as portable music players or mobile phones, minimizing cost is usually the primary design consideration. Engineers typically select hardware that is just good enough to implement the necessary functions.

2.3 The Characteristics

Embedded computing systems generally exhibit rich, complex functionality is usually the reason for introducing CPUs into the design. However, they also exhibit many non-functional requirements that make the task especially challenging:

- Real-time deadlines that will cause system failure if not met.

• Low manufacturing cost, which often means limited code size.

Workstation programmers often concentrate on functionality. They may consider the performance characteristics of a few computational kernels of their software, but rarely analyze the total application. They almost never consider power consumption and manufacturing cost. The need to juggle all these requirements makes embedded system programming very challenging and is the reason why embedded system designers need to understand computer architecture.

2.4 An Overview

Every Embedded system consists of a custom-built hardware built around a central processing unit. This hardware also contains memory chips onto which the software is loaded. Fig. 2.1 depicts layers which are involved in a typical embedded system.

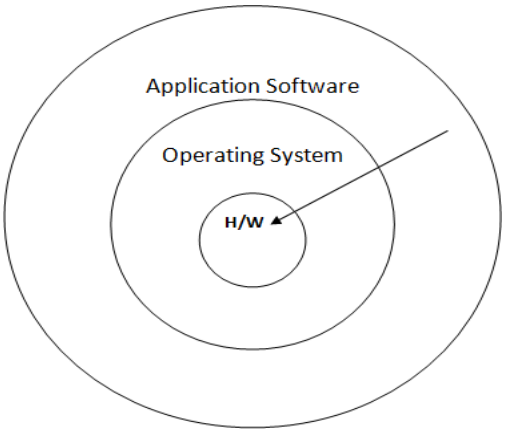

Fig. 2.1 Typical Embedded System

The operating system runs above the hardware and the application software runs above the operating system. The same architecture is applicable to any computer including desktop computer. However these are significant differences. It is not compulsory to have an operating system in every embedded system. For small applications such as remote control units, air conditioners, toys etc.

3. HARDWARE AND SOFTWARE REQUIREMENTS

3.1 Block Diagram

An A Tmega328p microcontroller controls the system architecture of the wearable with an Arduino Uno boot- loader. The Fig. 3.1 illustrates the architecture of the child safety wearable device, which depicts the various technologies and technological standards used.

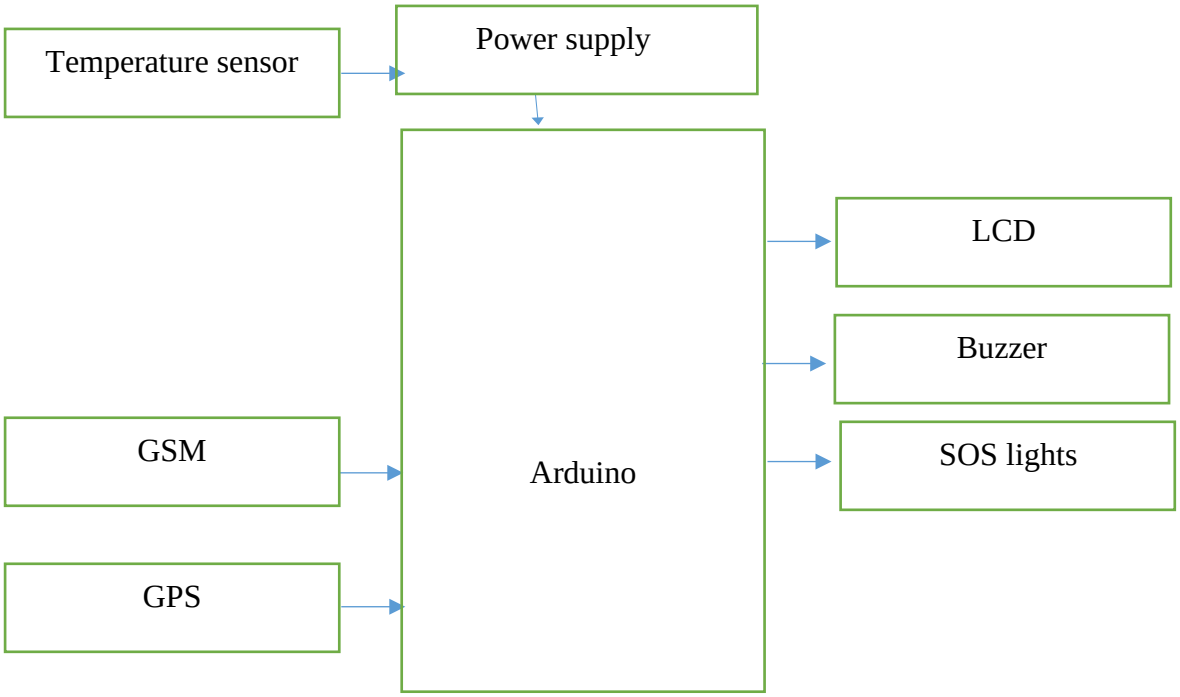

Fig. 3.1 System overview of the wearable device.

3.2 System Overview

An A Tmega328p microcontroller controls the system architecture of the wearable with an Arduino Uno boot- loader.

The Arduino Uno collects various types of data from the different modules interfaced to it, such as the GPS module upon being triggered by the Arduino GSM shield. The GSM shield is used as an interface to send the data received by the Arduino Uno via SMS or MMS to a smartphone over GSM/GPRS. The GSM shield functions as a trigger for the Arduino Uno to request data from its various modules. If an SMS text with distinct characters is sent to request the current location or GPS coordinates is sent to the Arduino GSM shield via the user's smartphone, then the GSM shield triggers the Arduino Uno to request the current GPS coordinates.

The GSM shield uses digital pins 2 and 3 for the software serial communication with the MIO. Pin2 is connected to the MlO's TX pin and pin 3 to its RX pin. The Ml 0 is a Quadband GSM/GPRS modem that works at GSM850Mhz, GSM900Mhz, DCS1800Mhz, and PCS1900Mhz. It also supports TCPIUDP and HTTP protocols through a GPRS connection. Once the Arduino Uno has received at the coordinate infonnation, it will process this infonnation and transfer it over to the GSM shield, which then via SMS sends the coordinates to the user's smartphone. The user can just tap on the coordinates which will open up the default GPS application installed on the phone and will show the user the distance between the child and the user.

3.3 The Hardware Requirements

- Power supply
- Arduino
- Temperature sensor
- GSM
- GPS
- LCD
- Buzzer
- SOS lights

3.3.1 Power Supply

In mains-supplied electronic systems the AC input voltage must be converted into a DC voltage with the right value and degree of stabilization. In these basic configurations the peak voltage across the load is equal to the peak value of the AC voltage supplied by the transformer's secondary winding. For most applications the output ripple produced by these circuits is too high. However, for some applications - driving small motors or lamps, for example - they are satisfactory. If a filter capacitor is added after the rectifier diodes the output voltage waveform is improved considerably. The section b-c is a straight line. During this time it is the filter capacitor that supplies the load current.

The slope of this line increases as the current increases, bringing point c lower. Consequently the diode conduction time (c-d) increases, increasing ripple. With zero load current the DC output voltage is equal to the peak value of the rectified AC voltage. Figure shows how to obtain positive and negative outputs referred to a common ground. In particular they are helpful in determining the voltage ripple for a given load current and filter capacitor value. The value of the voltage ripple obtained is directly proportional to the load current and inversely proportional to the filter capacitor value. The below Fig. 3.2 shows the circuit diagram of the regulated power supply system.

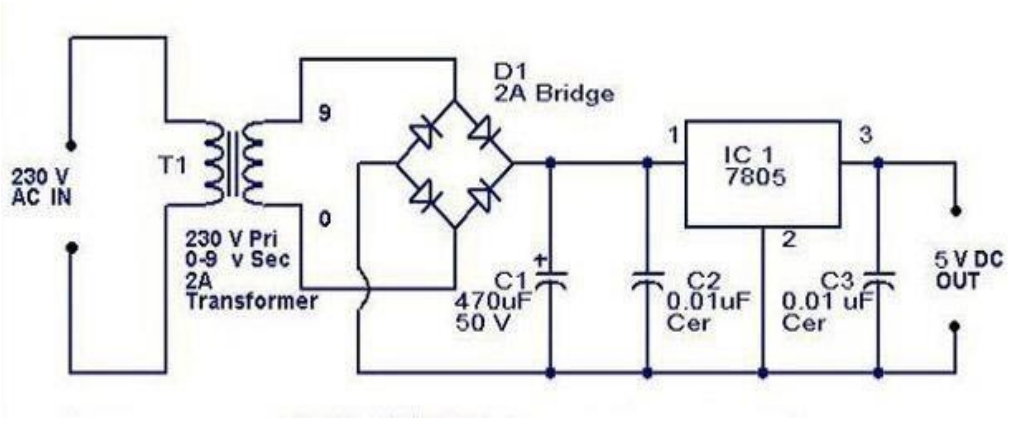

Fig. 3.2 Circuit diagram of regulated power supply section

3.3.2 Arduino

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega microcontroller essentially a complete computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip.

Looking at the board from the top down, this is an outline of what you will see Starting clockwise from the top center:

- Analog Reference pin (orange)
- Digital Ground (light green)
- Digital Pins 2-13 (green)
- Digital Pins 0-1/Serial In/Out - TX/RX (dark green) - These pins cannot be used for digital i/o (DigitalRead and DigitalWrite) if you are also using serial communication (e.g. Serial.begin).
- Reset Button - S1 (dark blue)
- In-circuit Serial Programmer (blue-green)
- Analog In Pins 0-5 (light blue)
- Power and Ground Pins (power: orange, grounds: light orange)

- External Power Supply In (9-12VDC) - X1 (pink)

- Toggles External Power and USB Power (place jumper on two pins closest to desired supply) - SV1 (purple)

- USB (used for uploading sketches to the board and for serial communication between the board and the computer; can be used to power the board) (yellow)

The Fig. 3.3 shows a detailed labelled picture of every part of an Arduino board.

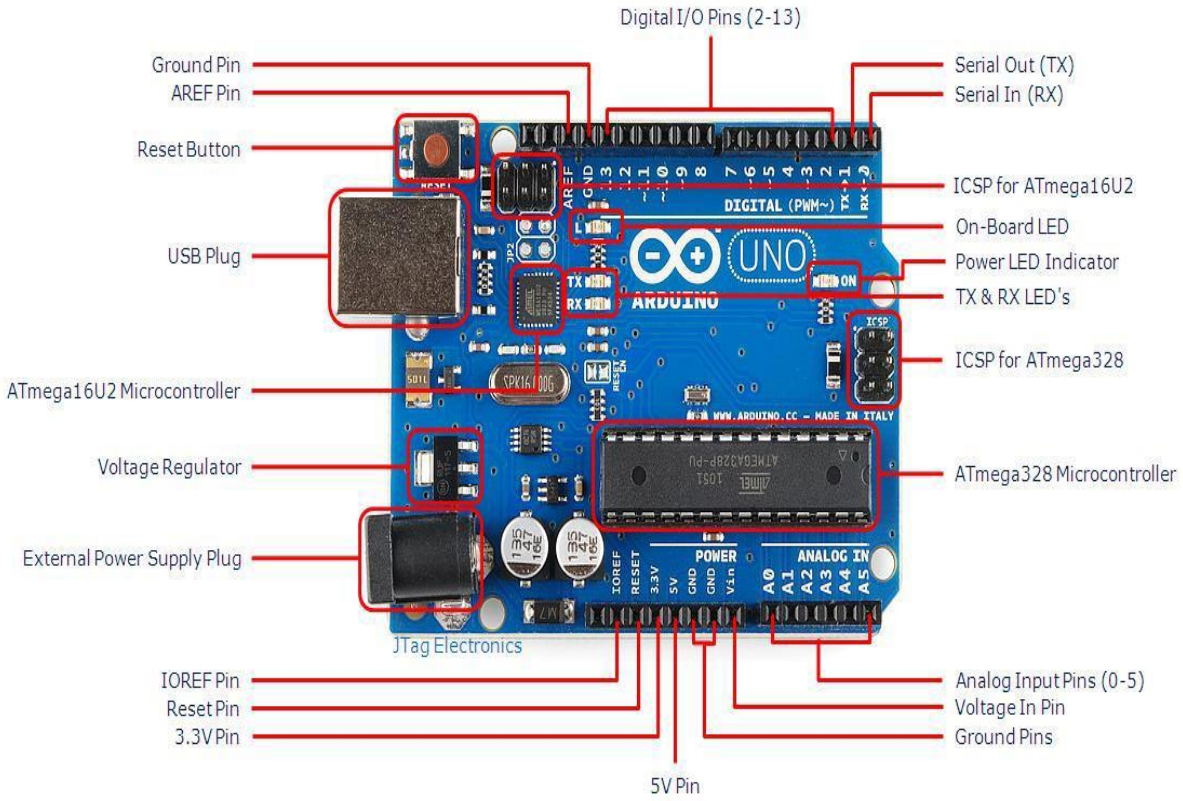

Fig. 3.3 Arduino Board

3.3.3 Temperature Sensor

Temperature is the most often-measured environmental quantity. This might be expected since most physical, electronic, chemical, mechanical, and biological systems are affected by temperature. Certain chemical reactions, biological processes, and even electronic circuits perform best within limited temperature ranges. Temperature is one of the most commonly measured variables and it is therefore not surprising that there are many ways of sensing it. Temperature sensing can be done either through direct contact with the heating source, or remotely, without direct contact with the source using radiated energy instead. There are a wide variety of temperature sensors on the market today, including Thermocouples, Resistance Temperature Detectors (RTDs), Thermistors, Infrared, and Semiconductor Sensors. Below Fig. 3.4 displays a typical LM35 Temperature sensor.

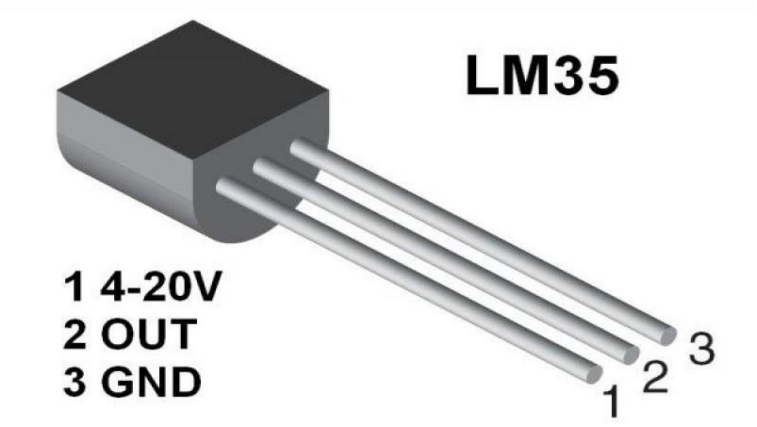

Fig. 3.4 Temperature Sensor

Features of LM35 Temperature Sensor

- Calibrated directly in ˚ Celsius (Centigrade)
- Rated for full l −55˚ to +150˚C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Low self-heating,
- ±1/4˚C of typical nonlinearity

Operation of LM35

The LM35 can be connected easily in the same way as other integrated circuit temperature sensors. It can be stuck or established to a surface and its temperature will be within around the range of 0.01˚C of the surface temperature.

This presumes that the ambient air temperature is just about the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature of the LM35 die would be at an intermediate temperature between the surface temperature and the air temperature.

The temperature sensors have well known applications in environmental and process control and also in test, measurement and communications. A digital temperature is a sensor, which provides 9-bit temperature readings. Digital temperature sensors offer excellent precise accuracy, these are designed to read from 0°C to 70°C and it is possible to achieve ±0.5°C accuracy. These sensors completely aligned with digital temperature readings in degree Celsius.

3.3.4 GSM

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. Fig. 3.5 is the GSM module used in our project.

Fig. 3.5 GSM Module

GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

There are various cell sizes in a GSM system such as macro, micro, pico and umbrella cells. Each cell varies as per the implementation domain.

There are five different cell sizes in a GSM network macro, micro, pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

GSM Architecture

A GSM network consists of the following components:

- **A Mobile Station** It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network.
- **Base Station Subsystem** It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. It also consists of the Base Station Controller which controls the Base Transceiver station and acts as a interface between the mobile station and mobile switching centre.
- **Network Subsystem** It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc. It also consists of the Home Location Register and the Visitor Location Register which provides the call routing and roaming capabilities of GSM. It also contains the Equipment Identity Register which maintains an account of all the mobile equipments wherein each mobile is identified by its own IMEI number. IMEI stands for International Mobile Equipment Identity.

Features of GSM Module

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management

The security strategies standardized for the GSM system make it the most secure telecommunications standard currently accessible. Although the confidentiality of a call and secrecy of the GSM subscriber is just ensured on the radio channel, this is a major step in achieving end-to- end security.

Working of GSM Module

From the below circuit, a GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone send that data to the MC through serial communication. While the program is executed, the GSM modem receives command 'STOP' to develop an output at the MC, the contact point of which are used to disable the ignition switch. The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over 16×2 LCD display. The Fig. 3.6 shows how GSM module works.

Fig. 3.6 Working of GSM Module

3.3.4 GPS

GPS or Global Positioning System is a satellite navigation system that furnishes location and time information in all climate conditions to the user.

GPS is used for navigation in planes, ships, cars and trucks also. The system gives critical abilities to military and civilian users around the globe. GPS provides continuous real time, 3-dimensional positioning, navigation and timing worldwide. Fig. 3.7 is the GPS module which helps finding the location.

Fig. 3.7 GPS Module

How GPS Determines a Position

The working/operation of Global positioning system is based on the 'trilateration' mathematical principle. The position is determined from the distance measurements to satellites. From the figure, the four satellites are used to determine the position of the receiver on the earth. The target location is confirmed by the 4th satellite. And three satellites are used to trace the location place. A fourth satellite is used to confirm the target location of each of those space vehicles. Global positioning system consists of satellite, control station and monitor station and receiver. The GPS receiver takes the information from the satellite and uses the method of triangulation to determine a user's exact position.

Using a GPS Receiver

There are several different models and types of GPS receivers. While working with a GPS receiver it is important to have:

- A compass and a map.
- A downloaded GPS cable.
- Some extra batteries.
- Knowledge about the memory capacity of the GPS receiver to prevent loss of data, decrease in accuracy of data, or other problems.

Fig. 3.8 is how GPS positioning is done.

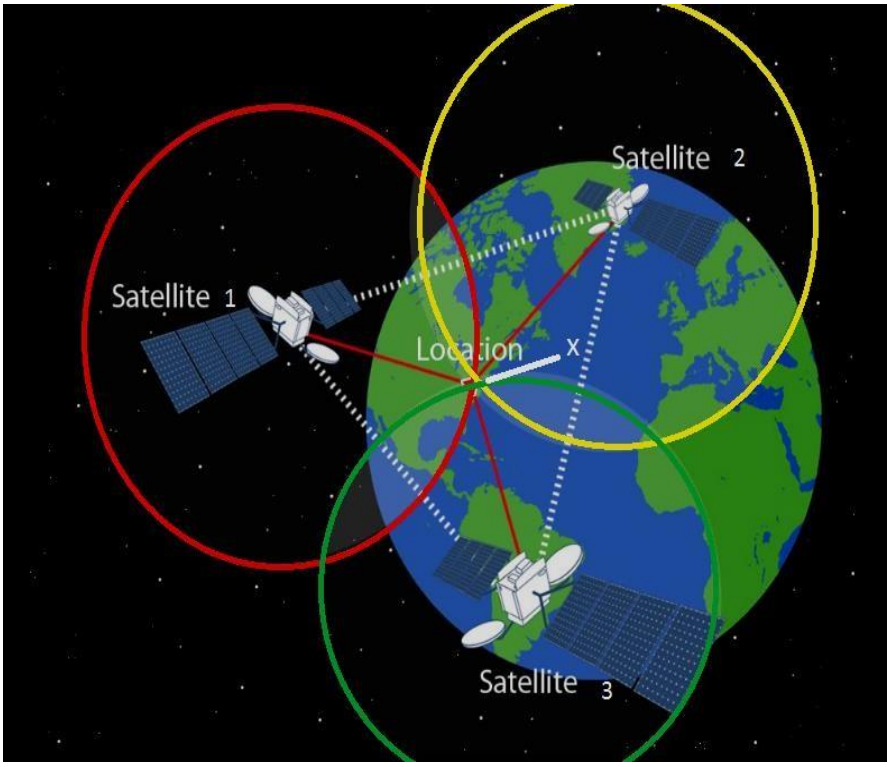

Fig. 3.8 GPS Positioning

- An external antenna whenever possible, especially under tree canopy, in canyons, or while driving.
- A set up GPS receiver according to incident or agency standard regulation; coordinate system.
- Notes that describe what you are saving in the receiver.

GPS Error

There are many sources of possible errors that will degrade the accuracy of positions computed by a GPS receiver. The travel time taken by the GPS satellite signals can be changed by atmospheric effects; when a GPS signal passes through the ionosphere and troposphere it is refracted, causing the speed of the signal to be different from the speed of a GPS signal in space. Another source of error is noise, or distortion of the signal which causes electrical interference or errors inherent in the GPS receiver itself.

The information about satellite orbits will also cause errors in determining the positions, because the satellites are not really where the GPS receiver "thought" based on the information it received when it determine the positions. Small variations in the atomic clocks on board the satellites can translate to large position errors; a clock error of 1 nanosecond translates to 1 foot or .3 meters user error on the ground. A multipath effect occurs when signals transmitted from the satellites bounce off a reflective surface before getting to the receiver antenna. During this process, the receiver gets the signal in straight line path as well as delayed path (multiple paths). The effect is similar to a ghost or double image on a TV set.

3.3.5 LCD

This is an example for the Parallel Port. This doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if no all Parallel Ports. It however doesn't show the use of the Status Port as an input.. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen,

setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Fig. 3.9 shows LCD module.

Fig. 3.9 LCD

LCD Pins

Fig. 3.10 is a detailed picture of the LCD and its pins.

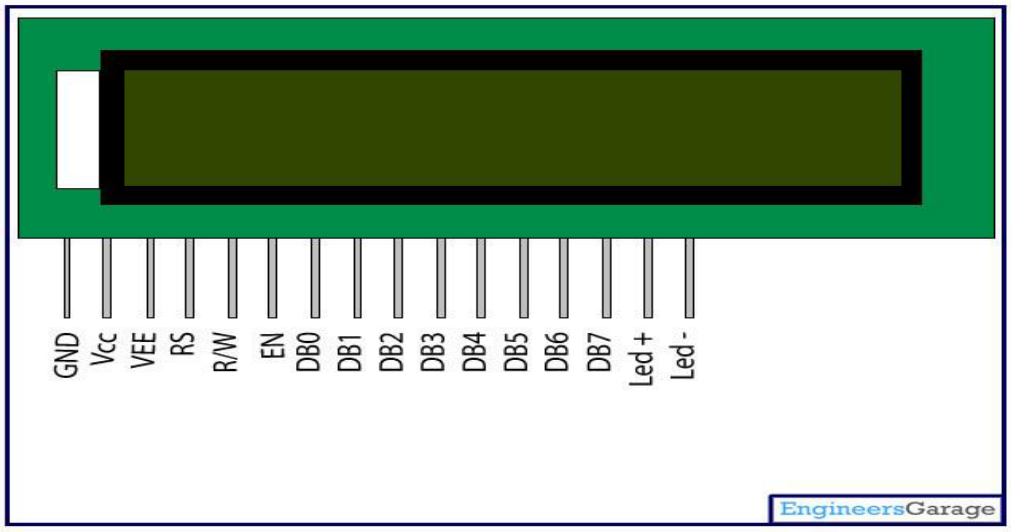

Fig. 3.10 LCD Pins

Pin Description

Pin No:	Name	Function
1	**VSS**	This pin must be connected to the ground
2	**VCC**	Positive supply voltage pin (5V DC)
3	**VEE**	Contrast adjustment
4	**RS**	Register selection
5	**R/W**	Read or write

6	**E**	Enable
7	**DB0**	Data
8	**DB1**	Data
9	**DB2**	Data
10	**DB3**	Data
11	**DB4**	Data
12	**DB5**	Data
13	**DB6**	Data
14	**DB7**	Data
15	**LED+**	Back light LED+
16	**LED-**	Back light LED

3.3.6 Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. Fig. 3.11 depicts a buzzer.

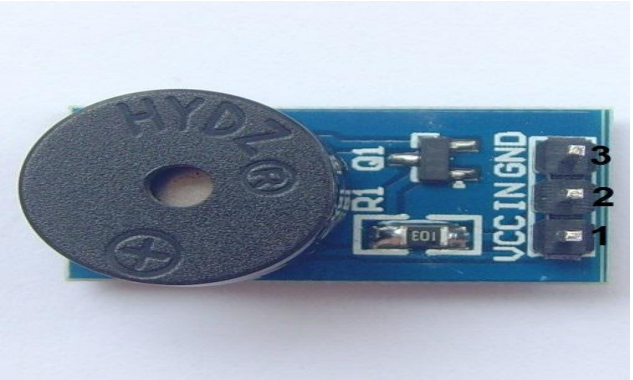

Fig. 3.11 Buzzer

Buzzer is an integrated structure of electronic transducers, DC power supply, widely used in computers, printers, copiers, alarms, electronic toys, automotive electronic equipment, telephones, timers and other electronic products for sound devices. Active buzzer 5V Rated power can be directly connected to a continuous sound, this section dedicated sensor expansion module and the board in combination, can complete a simple circuit design, to "plug and play."

- On-board 8550 triode drive
- Can control with single-chip microcontroller IO directly
- Working voltage: 5V
- Board size: 22 (mm) x12 (mm)

Pin Configuration

1. VCC
2. Input
3. Ground

3.3.7 SOS Lights

Another theory that this paper focusses on is that bystanders are the fust mode of help for a missing child. The purpose of the SOS light is to be able to alert the people nearby that the child might be in distress since the light will be flashing the universal SOS light symbol which many people nowadays know for to be a sign for help. This can be activated by the parent itself by sending an SMS text with the keyword "SOS" to the child's wearable which will activate the SOS light flashing. The SOS light works on the principal of Morse code in which "S" stands for three short dots and the "O" stands for three long dashes. Since a very long time, the SOS signal has been universally known for being the sign of distress and help. The SOS signal is referred to by all security personals, who if find the child to be missing can act and help locate the parents with surplus resources present at their disposal. The SOS Light is connected to the pin 13 of the base shield.

Fig. 3.12 SOS Light

3.4 Software Required

3.4.1 Download Arduino

You'll need to download the Arduino Software package for your operating system from the Arduino download page.

When you've downloaded and opened the application you should see something like this:

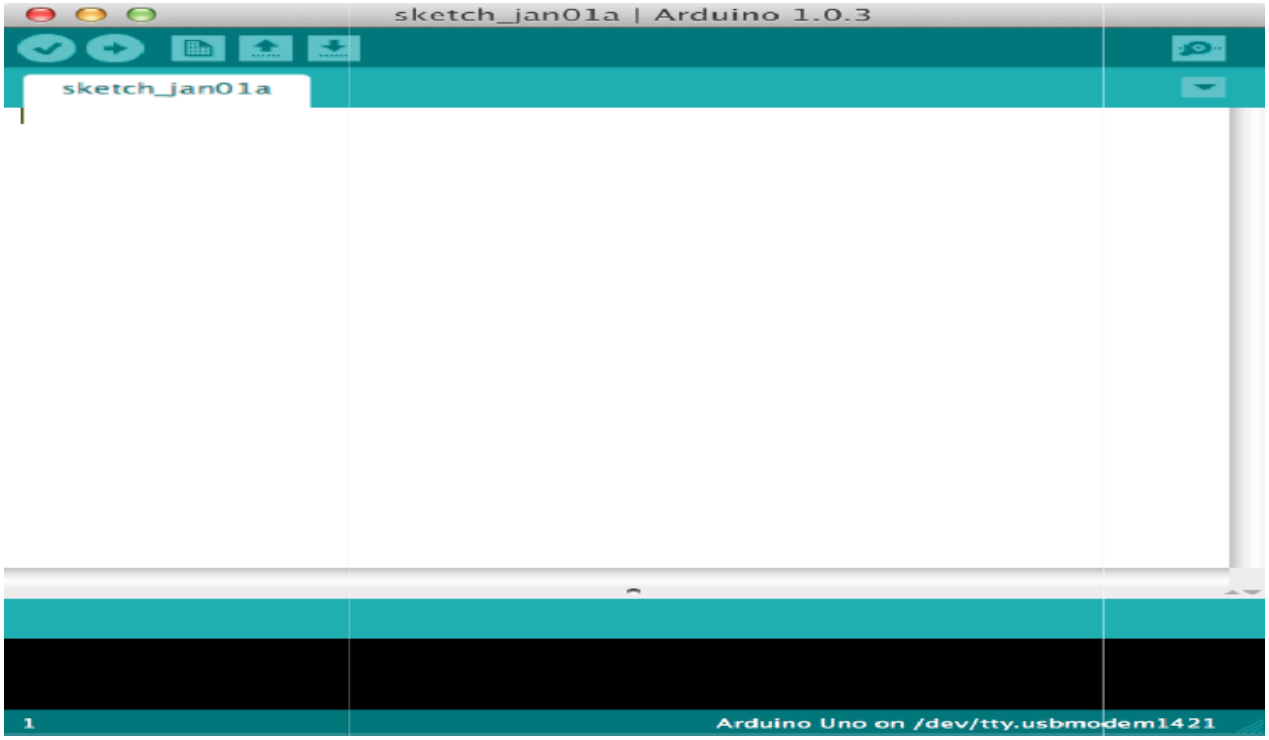

Fig. 3.13 Arduino IDE

3.4.2 The Initial Setup

We need to setup the environment to **Tools** menu and select **Board** as shown in Fig. 3.14

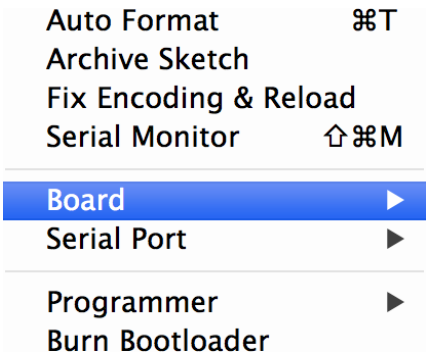

Fig. 3.14 Selecting Board from Tools menu

Tools Menu > Board

Then select the type of Arduino you want to program, in our case it's the **Arduino Uno** as shown in Fig. 3.15.

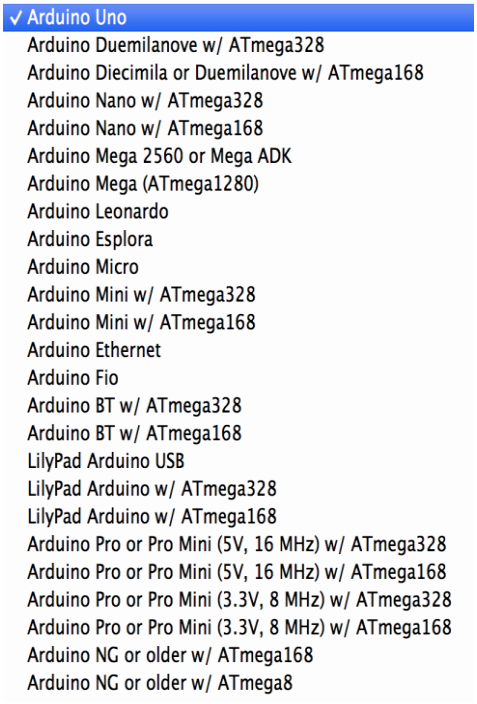

Fig. 3.15 Selecting type of Board as Arduino

4. RESULTS AND DISCUSSIONS

The below Fig. 4.1 shows temperature sent as text SMS when the command "#A.temp*" is sent to the wearable.

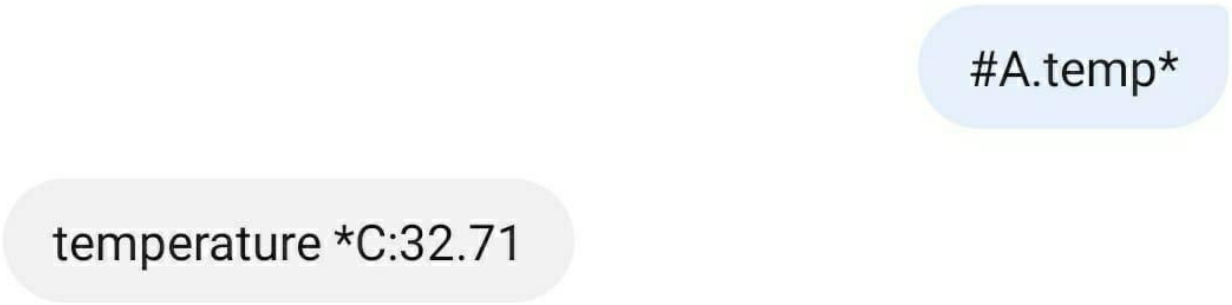

Fig. 4.1 Temperature received as an SMS

Fig. 4.2 shows the location received of the child when command "#A.location*" is sent through SMS.

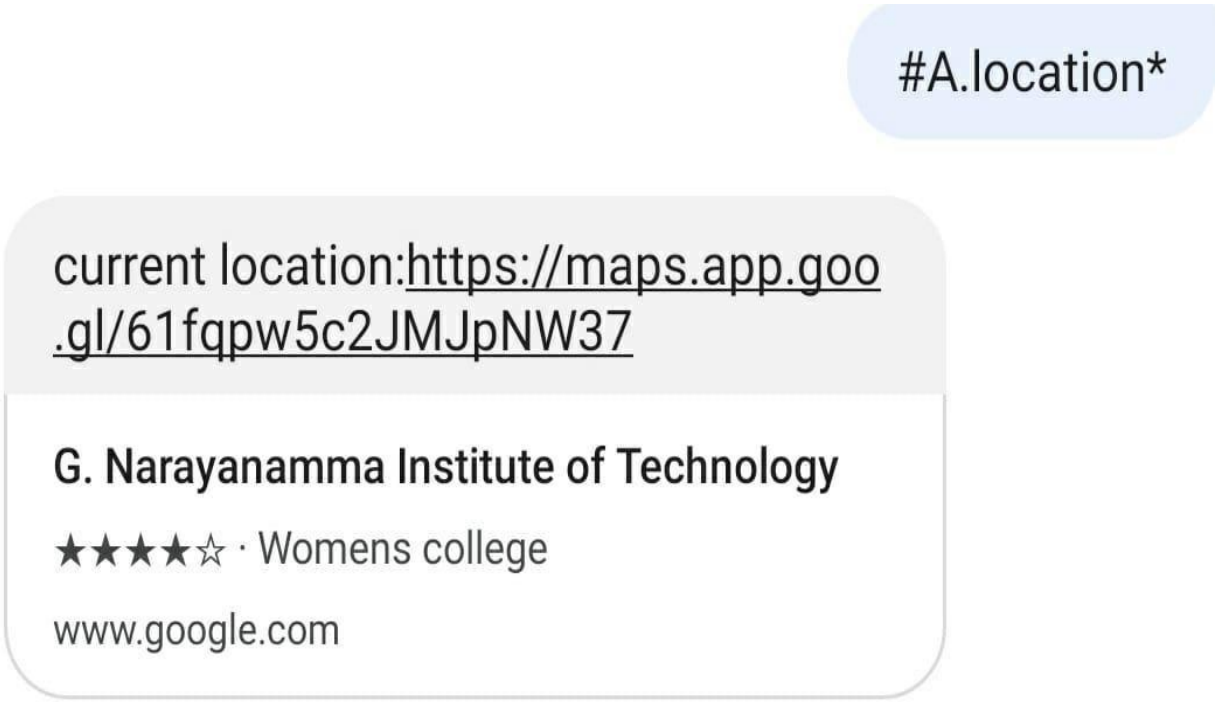

Fig. 4.2 Location received as an SMS

The below Fig. 4.4 displays the buzzer command “#A.light on*”

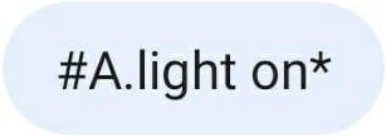

Fig. 4.4 SOS alert sent through SMS

The below Fig. 4.3 displays the buzzer command “#A.buzzer on*”

Fig. 4.3 Buzzer alert sent through SMS

Fig. 4.5 is where we can observe SOS lights get on due to the command sent to wearable.

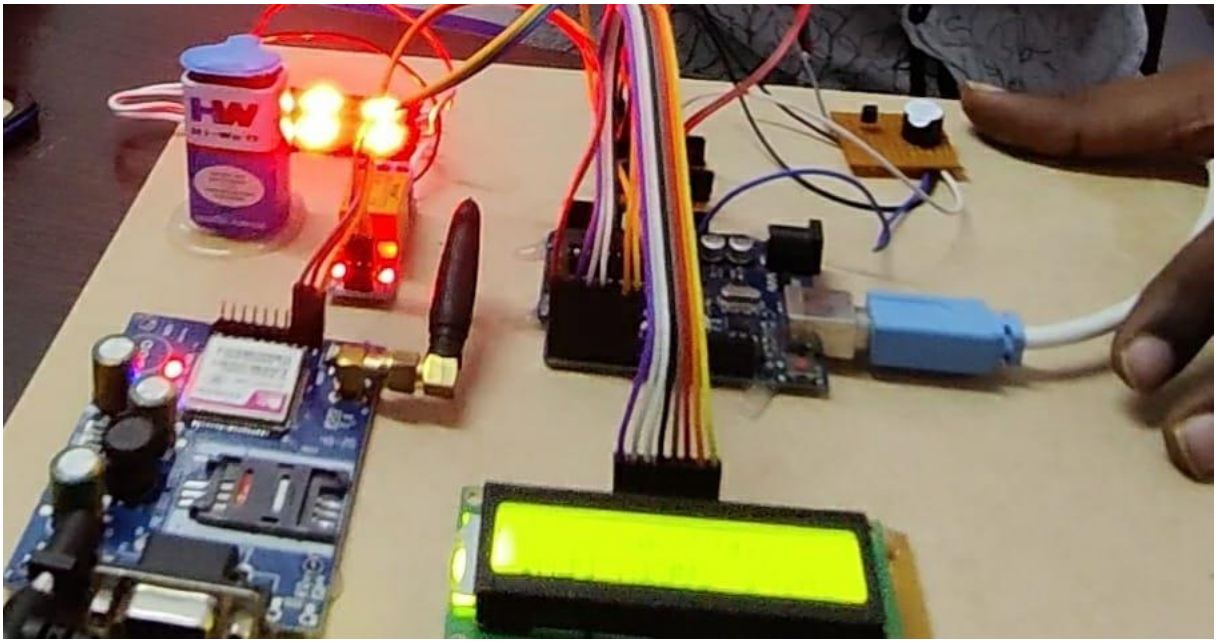

Fig. 4.5 SOS Lights activated

5. CONCLUSION AND FUTURE SCOPE

Most of the wearables available today are focused on providing the location, activity, etc. of the child to the parents via Wi-Fi and Bluetooth. But Wi- Fi and Bluetooth seem a very unreliable source to transfer information. Therefore, we have used SMS as the mode of communication between the parent and child's wearable device, as this has fewer chances of failing compared to Wi-Fi and Bluetooth. This paper reviewed the smart child safety wearable device. Firstly, various systems and devices available are defined. Basic child safety device comprises of a GPS, GSM, Arduino or any other microcontroller, panic button and the sensors to keep the track of child's movement, position, temperature etc. Design of the child wearable device is key factor for making the child wear the device happily. There are some important things to be considered like the limited range of devices, wearable or not, battery life and the most important, the cost.

6. REFERENCES

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