IOT BASED CHILD SAFETY MONITORING AND NOTIFICATION GADGET

Submitted by

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in partial fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

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MONITORING AND NOTIFICATION

RECORD OF WORK DONE BY

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……..... (Internal Examiner)

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LIST OF ABBREVIATION

S.NO		Abbreviation
1	IoT	Internet of Things
2	GPS	Globally Positioning System
3	IDE	Integrated Development Environment
4	GSM	Global System for Mobile Communication
5	PCB	Printed Circuit Board
6	RTD	Resistance Temperature Detector

ABSTRACT

The main aim of the project is to provide security to the child. Nowadays, parents are working and are unable to manage and keep a track of various activities of their children. For this to be achieved, the proposed system will be very useful for parents. The Internet of Things refers to the set of devices and systems that stay interconnected with real world sensors and actuators to the internet. The main motive this wearable gadget comes from the increasing need of safety for little children as well as for special child in current times. Most of the wearable's available today are focused on providing the location, activity, health etc. of the child to the parents via Wi-Fi and Bluetooth. The platform on which this project will be running on is the IoT, Arduino uno and functions of sending and receiving SMS which id provided by the GSM module using the GSM network. Parental android app is developed to manage and track the device anytime. The GPS module will utilise to access their present location of the little child and special child. Wearable gadget which tracks the security and health conditions of the child using temperature, heartbeat and send notifications to parents. As a result, this strategy is perceived as sending an SMS from the children's wearable gadget to their parents or guardians. By this, parents know what is happening remotelu and can take actions if something goes wrong.

CHAPTER 1

INTRODUCTION

Recently, all over the world, crime against children is increasing at higher rates and it is high time to offer the safety support system for the children. In this project, the main focus on implementing children tracking system for every child. Internet of Things(IoT) plays a vital role in every day to day life. The major difference between IoT and embedded system is that a dedicated protocol/software is embedded in the chip in case of embedded system, whereas, IoT devices are smart devices, which are able to take decisions by sensing the environment around the device. The purpose of this device is to help parents locate their children with ease. Also, to show the child's actual data with reference values. 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 a mutable medium of communication between the parent and child. To develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace. Therefore, the focus of this paper 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 development of sensors technology, availability of internet connected devices; data analysis algorithms make IoT devices to act smart in emergency situations without human interventions.

CHAPTER 2

2.1. Literature Survey

Authors: M Nandini Priyanka, S Murugan K. N. H. Srinivas, T . D . S. Sarveswararao,

Title: Smart IoT Device for Child Safety and Tracking. Published in: 2019.

The system is developed using Link-It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. The novelty of the work is that the system automatically alerts the parent/guardian by sending SMS, when immediate attention is required for the child during emergency. The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis and results are plotted for the same. To implement the IoT device which ensures the complete solution for child safety problems.

Authors: Aditi Gupta, Vibhor Harit. Published in: 2016.

Title: Child Safety & Tracking Management System by using GPS.

This paper proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its current location via short message services. The advantages of smart phones which offers rich features like Google maps, GPS, SMS etc. This system is unable to sense human behaviour of child.

Authors: Dheeraj Sunehera, Pottabhatini Laxmi Priya.

Title: Children Location Monitoring on Google Maps Using GPS and GSM. Published in: 2016.

This paper provides an Android based solution for the parents to track their children in real time. Different devices are connected with a single device through channels of internet. The concerned device is connected to server via internet. The device can be used by parents to track their children in real time or for women safety. The proposed solution takes the location service provided by GSM module. It allows the parents to get their child’s current location via SMS. A child tracking system using android terminal and hoc networks. This device cannot be used in rural areas.

CHAPTER 3

3.1. Proposed System

In this project, the main concept is to create a device that may be used to check health and as a safety system. Most parents care about their children safety, so we propose an idea to solve the problem. We invent the device in this project Smart gadget for children. And put some sensors in it. The sensors will detect children's status then send text message. They check the children status on mobile phone.

Specific Objective

- To track and get exact location of children.
- It increases the interaction of families with their children.
- Family's feeling safe about children.
- To store and retrieve the necessary data on the parent's mobile phone using sensors.
- Allows a parent to more easily locate the troubled child.

Requirement Analysis

The requirement of the project is categorized under hardware and software tools required as follows:

I. Operating System (Windows 10)

II. Arduino IDE

3.2 Software Interface

Operating System:

Windows 10 is a Microsoft operating system for personal computers, tablets, embedded devices and internet of things devices. Anyone adopting Windows 10 can upgrade legacy machines directly from Windows 7 or Windows 8 to Windows 10 without re-imaging or performing intrusive and time-consuming system wipes and upgrade procedures. To upgrade from a previous version of Windows 10, IT or users run the Windows 10 OS installer, which transfers any applications and software on the previous OS, as well as settings and preferences over to Windows 10. Organizations and users can pick and choose how they will patch and update Windows 10. IT or users can access a Windows 10 upgrade through the Windows Update Assistant to manually begin an upgrade or wait for Windows Update to offer an upgrade when it is set to run.

Arduino IDE :

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio The Arduino project provides the Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java.

Figure 1. Arduino IDE

3.2 Hardware Interface

3.2.1 Arduino UNO

The Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller, at a cost that was a considerable expense for many students. In 2003, Hernando created the development platform wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the Processing language. The project goal was to create simple, low-cost tools for creating digital projects by non-engineers. The Wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on Processing, and library functions to easily program the microcontroller. In 2003, Massimo Banzi, with David Mellis, another IDII student, and David, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they forked the project and renamed it Arduino.

Early boards used the FTDI USB-to-serial driver chip and an ATmega168.The Uno differed from all preceding boards by featuring the ATmega328P microcontroller and an ATmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010.The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits .The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo.

The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes with a boot loader that allows uploading new code to it without the use of an external hardware programmer. While the Uno communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are

distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL) permitting the manufacture of Arduino boards and software distribution by anyone.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project. Arduino/Genuine Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a ACto-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

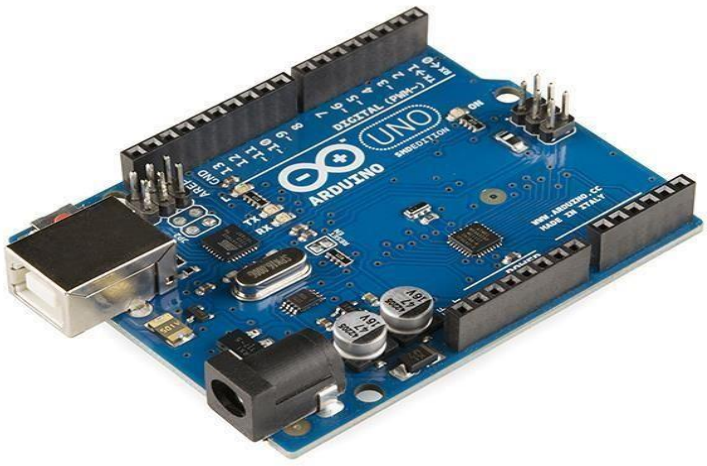

Figure 2. Arduino UNO

3.2.2 GPS Module

The Global Positioning System (GPS) is a satellite-based navigation system that provides location and time information. The system is freely accessible to anyone with a GPS receiver and unobstructed line of sight to at least four of GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites. GPS is nowadays widely used and also has become an integral part of smart phones.

Figure 3. GPS Module with RS232

The GTPA010 module is easy to use, having RS232 as well as USB interface. It operates over 3.2 to 5V supply range thus enabling interfacing with microcontrollers with 3.3V as well as 5V. The module outputs GPS data in NMEA0183 format. Each of message string starts with '$' and then the message identifier. Each parameter is separated using a comma so that the message can be parse with the help of the commas. GPS modules are compatible with Arduino and Raspberry Pi, making it easy for you to start to try out. The Air 530 Module in **Grove - GPS(Air530)** is a high-performance, highly integrated multi-mode positioning and navigation module. It supports GPS / Galileo / QZSS / SBAS, which makes it suitable for GNSS positioning applications such as car navigation, smart wear and drone. And Air530 module is also supporting NMEA 0183 V4.1 protocol and compatible with previous versions.

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3.2.3 GSM Module

GSM (Global System for Mobile Communications, originally Groupe Special Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI). It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories.

A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here.

These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. With the help of this GSM/GPRS Module, we can do the following tasks.

- Make, receive or reject voice calls
- Send, receive or delete SMS messages in the SIM Card
- Add, read and search the contacts in the SIM Card
- Send and receive data to / from the GSM/GPRS Network through GPRS

All the above mentioned tasks can be accomplished with the help of Commands or AT Commands. AT Commands are a part of Hayes Command Set, which are defined originally for a modem. GSM Network also implements a similar AT like commands for its GSM Modules.

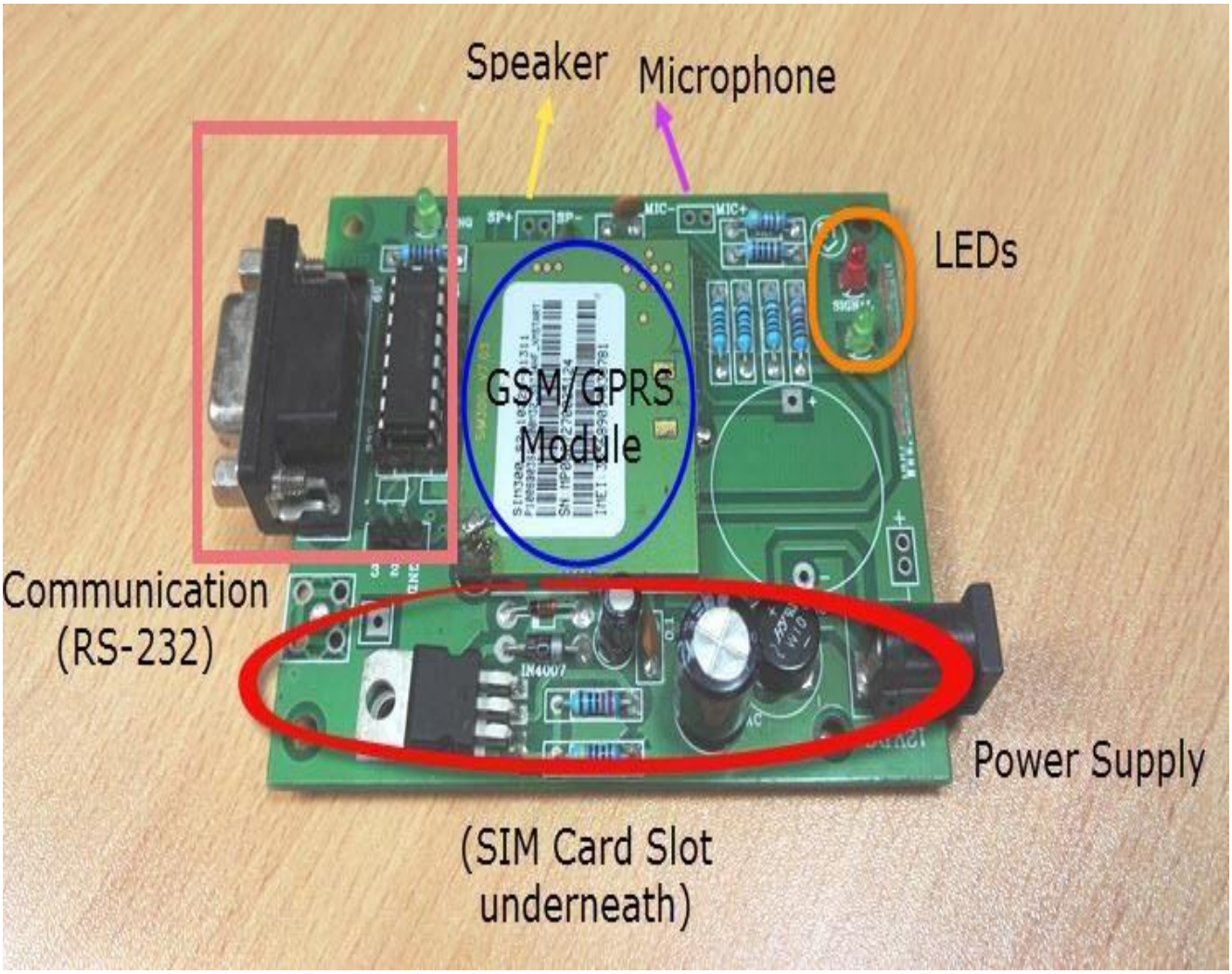


Figure 4. GSM Module

Radio spectrum being a limited resource that is consumed and divided among all the users, GSM devised a combination of TDMA/FDMA as the method to divide the bandwidth among the users. In this process, the FDMA part divides the frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. The processor or controller to which the GSM/GPRS Module is connected to, is responsible for sending the AT Commands to the module. In response, the GSM Module performs command specific tasks like answering a phone call, send an SMS Message, etc.

Each BS is assigned with one or multiple frequencies, and each of this frequency is divided into eight timeslots using a TDMA scheme. Each of these slots are used for both transmission as well as reception of data. These slots are separated by time so that a mobile unit doesn't transmit and receive data at the same time.

3.2.4. Temperature Sensor

A temperature sensor is a device, typically, a thermocouple or resistance temperature detector, that provides temperature measurement in a readable form through an electrical signal. A thermometer is the most basic form of a temperature meter that is used to measure the degree of hotness and coolness. Temperature meters are used in the geotechnical field to monitor concrete, structures, soil, water, bridges etc. for structural changes in them due to seasonal variations.

A thermocouple (T/C) is made from two dissimilar metals that generate an electrical voltage in direct proportion with the change in temperature. An RTD (Resistance Temperature Detector) is a variable resistor that changes its electrical resistance in direct proportion with the change in the temperature in a precise, repeatable and nearly linear manner.

A temperature sensor is a device that is designed to measure the degree of hotness or coolness in an object. The working of a temperature meter depends upon the voltage across the diode.
The temperature change is directly proportional to the diode's resistance. The cooler the temperature, lesser will be the resistance, and vice-versa. The resistance across the diode is measured and converted into readable units of temperature (Fahrenheit, Celsius, Centigrade, etc.) and, displayed in numeric form over readout units. In geotechnical monitoring field, these temperature sensors are used to measure the internal temperature of structures like bridges, dams, buildings, power plants, etc. The basic principle of working of the temperature sensors is the voltage across the diode terminals. If the voltage increases, the

temperature also rises, followed by a voltage drop between the transistor terminals of base and emitter in a diode. It primarily consists of a magnetic, high tensile strength stretched wire, the two ends of which are fixed to any dissimilar metal in a manner that any change in temperature directly affects the tension in the wire and, thus, its natural frequency of vibration.

The temperature sensor's applications include:

1. The temperature sensors are used for verifying design assumptions that will promote safer and economical design and construction.
2. They are used to measure the temperature rise during the process of curing concrete.
3. They can measure rock temperatures near liquid gas storage tanks and ground freezing operations.
4. Temperature sensors can also measure water temperatures in reservoirs and boreholes.
5. It can be used to interpret temperature related stress and volume changes in dams.
6. They can also be used to study the temperature effect on other installed instruments.

Figure 5. Temperature Sensor

3.3.1 UV Sensor

A UV sensor is an excellent piece to add to your arsenal of weather sensors. A UV radiation sensor is useful for those who wish to reduce exposure to UV radiation, but it is also a necessity in certain testing environments. For companies that make products that are sensitive to UV light, a UV light sensor is a helpful tool used to create optimal product storage environments. Davis Instruments UV index sensor measures the sunburning portion of the UV spectrum. It measures global solar UV irradiance: the sum of the components of solar UV transmitted directly and those scattered in the atmosphere. It reports the UV index, dose rate, and daily and accumulative doses of UV light. This sensor is an excellent addition to the Vantage Pro 2 weather station. In addition, it can be installed on a Sensor Transmitter, reporting to a Live; or in an ENE Node, reporting to Gateway. The sensor collects UV light and converts it to an electrical signal. Two types of light sensors are available. One uses a photodiode and the other uses a photoresistor. The UV index sensor uses a hermetically sealed silicon photodiode. Silicon is the material of choice for applications where sensitivity and stability are important. Silicon also has a fast response and is efficient at collecting the charge created on the surface of the diode when light strikes it.

Photodiode technology continues to develop in response to challenges in the solar panel field, and sensor technology will benefit from these innovations, too. Davis instruments keeps pace with these changes and strives to offer the most advanced systems and state-of-the-art technology possible in its UV detectors. Whether you need a UV sensor for your weather station or part of a manufacturing process, Davis Instruments' sensors will provide many years of accurate data collection.

Figure 6. UV Sensor

Panic Button

A **panic alarm** is an electronic device designed to assist in alerting somebody in emergency situations where a threat to persons or property exists.

A panic alarm is frequently but not always controlled by a concealed **panic alarm button**. These buttons can be connected to a monitoring center or locally via a silent alarm or an audible bell/siren. The alarm can be used to request emergency assistance from local security, police or emergency services. Some systems can also activate closed circuit television to record or assess the event.

Panic buttons are an essential occupational safety technology that goes by many names: duress alarm, emergency signal, SOS alarm, personal alarm, alert button, panic alarm, and most commonly, panic button. There are so many names and monikers for this safety device because they are so widely used in a wide range of industries and work. Regardless of what they are called, they all are intended to do one thing: raise the alarm in emergencies when an employee requires immediate help.

These devices can help protect workers in many different industries – from security workers and farmers to community healthcare workers and hotel and hotel housekeeping staff who face physical and verbal abuse and sexual harassment, and assault.

According to the Bureau of Labour Statistics (BLS) Census of Fatal Occupational Injuries (CFOI), out of the more than 5,000 fatal workplace injuries in the United States in 2019, nearly 800 were due to assault by another person. In OSHA's factsheet on workplace violence, about 2 million people are victims of workplace violence every year in the United States.

According to the BLS, more than 20,000 workers in the private industry experienced trauma from nonfatal workplace violence in 2019; these incidents required days away from work.

They also found that of those victims:

- 68% were female
- 65% were aged 25 to 54
- 70% worked in the healthcare and social assistance industry

There are industries more prone to violence, like hotel workers as well as taxi drivers who are "over 20 times more likely to be murdered on the job than other workers." Not only do panic buttons request help before the situation escalates and the employee gets hurt, but they also provide valuable peace of mind for both the employer and the employee that they have a safety solution in place to protect them.

Workplace violence can harm the employee not only physically but also emotionally, traumatizing them for years after the incident. If your team is at risk of violent situations, big or small, the employer's moral responsibility is to protect them as effectively as possible.

Figure 7. Panic Button

3.3.2 Distress Alarm Buzzer

In the scenario, if a child is separated from his/her parents. The parent can find out the location of the child by alarm sound in a very loud alarm using this wearable device. In order to achieve this, a piezoelectric buzzer is utilized, and this is responsible for emitting a strong tone upon the output being HIGH.

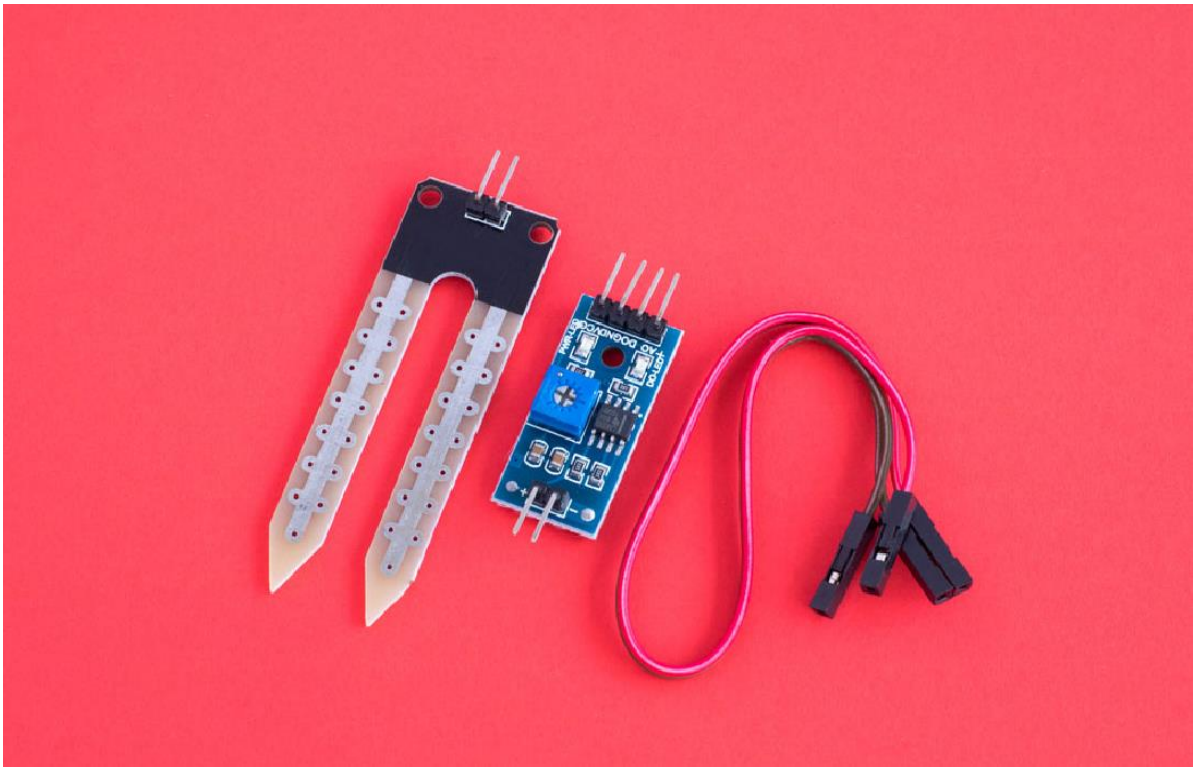
Figure 8. Distress Alarm Buzzer

Moisture Sensor

On Moisture Sensor, If you want to detect the moisture level in the soil or recognize when you need to water your plants easily, you will use the moisture sensor. The device is also helpful for carrying out experiments in environmental science, soil science, biology, horticulture, agricultural science, and botany.

The measure the amount of water in the soil by following the capacitance to measure the volumetric content of water. It also helps users to understand climatic conditions as they change. Also, the moisture sensor help to protect vital water resources.

A moisture sensor is straightforward to use. All you will do is insert the sensor into the target soil, and it will show you the data in percentages. There are other ways you can check the moisture with the sensor.



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Hooking up your moisture sensors is very simple. There are just three pins that you have to connect: GND, SIG, and VCC. You have to power the GND and VCC while the SIG's analog signal that you will join ADC pins on your choice microcontroller. It is important to note that the voltage powering the moisture sensors also affects the value which the SIG will show.

The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil. The sensor averages the water content over the entire length of the sensor. There is a 2 cm zone of influence with respect to the flat surface of the sensor, but it has little or no sensitivity at the extreme edges.The Soil Moisture Sensor is used to measure the loss of moisture over time due to evaporation and plant uptake,evaluate optimum soil moisture contents for various species of plants,monitor soil moisture content to control irrigation in greenhouses and enhance bottle biology experiments.

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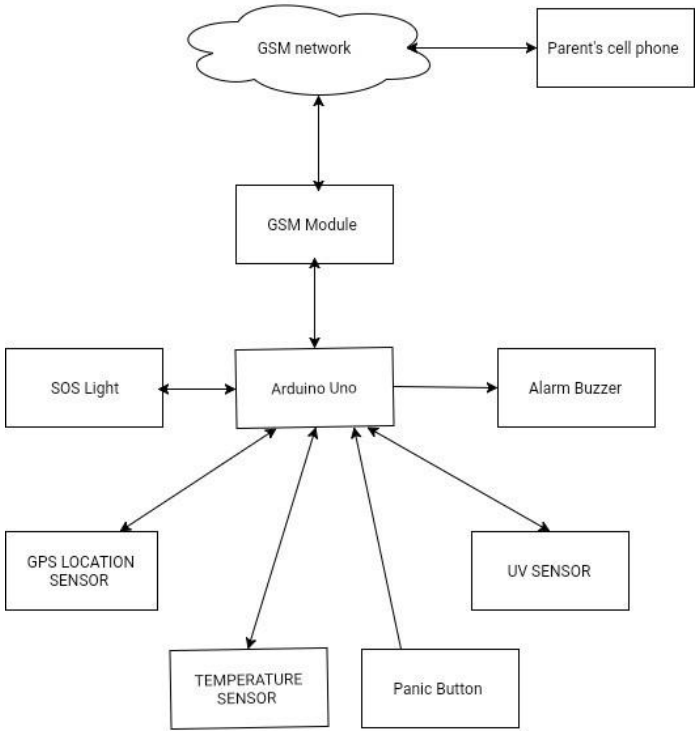
3.4 Block Diagram

In this project system, the GPS position of the women is to transfer to the concerned guardian and nearby station. This project consists of Bluetooth module, GPS module, arduino controller, GSM module, LCD display. In our system, we automatically track and monitor the child in real time using Internet of Things(IoT) with the help of GSM, GPS and Arduino UNO



Block Diagram of the proposed method

If woman feel unsafe then she have to say help on the mobile. The mobile is connected to the safety kit. The message 'help' is send to the controller using Bluetooth module. If the controller receives the concerned message then the controller gets the current GPS value using GPS module. This message is send to the guardian using GSM module. At the same time of instance the LCD display shows the GPS value of the child.

CHAPTER 4

4.1. Existing System

IoT has been applied in domains such as smart home, smart city, smart factory, supply chain, retail, agriculture, lifestyle, transportation, emergency, health care, environment, energy, culture and tourism. However, it is seldom used to monitor child's safety. There are many more previously e systems of IoT-based safety gadgets for child safety monitoring and notification. In the existing system, we use a voice recognition module in which the alert commands from the child are stored and kept for further reference. If the same child delivers the same command, it will compare with the alert command which was previously stored and sets an emergency level according to the alert command. The GSM has a SIM which is used to send an alert message or an alert call to the trusted peoples. GPS is used to track the live location and it is used when needed. The server will search the respective device ID from the database and search for respective contacts according to that device ID and helps in alerting the registered guardians. The Wearable device must be waterproof and also without electric shock. .

The disadvantage of this project are,

i. The child could not produce the exact alert command during a panic condition.
ii. The command produced may not match with the previously stored command.
iii. This project requires manual intervention. iv. children might have the chance of misuse the wearable device, when they are not aware.

CONCLUSION

In today's fast-moving world driven by globalisation and technological advances smart solution are required to tackle daily life issues. This voice controlled robotic vehicle is a simple demonstration of the fact. With the advent of speech recognition systems, we are able to explore new avenue to data sharing and processing. The ability of this project to be controlled from a safe distance allows it to be of potential use in many promising sectors. This simple robot can find applications in various fields like Hands free delivery of essential commodities to high-risk areas in cases of catastrophes like COVID 19 outbreak, earthquake or flood, Military Operations, Surveillance, Recreational Activities.

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