PROJECT TITLE:

IoT Based Safety Gadget for Child Safety Monitoring & Notification

TEAM MEMBERS :

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CHAPTER 1

INTRODUCTION

Recently, all over the world, crime against children is increasing at higher rates andit 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 children. 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 smartdevices, which are able to take decisions by sensing the environment around the device. The purpose ofthis 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 an 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 theycan monitor the actual condition of children at anytime and anyplace. Therefore, the focus of this paperis 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.

1.1 INTRODUCTION TO IoT

Internet of Things (IoT) is a set of systems and devices interconnected with real-world sensors and actuators to the Internet, according to. It is able to make decisions via detecting the surrounding environment without human interaction . In this research, IoT is applied to propose a wearable smart band which helps parents to monitor and get known of their child's condition at anywhere and anytime even if they are not by their children side. Via the IoT smart band, children safety is guaranteed, and crime rate is reduced as immediate actions can be taken in case the child is in danger. Besides, unlike existing smart band, which is less focusing on child security aspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be identified. The use of IoT in this device is motivated by the need of child security system in Malaysia due to child safety issues resulting from increasing cases on child related crime. In fact, 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 . The heart and soul of IoT is its connectivity. Connectivity means the establishment of a connection between different devices (or nodes) so that they can communicate on their own. In IoT, various devices, sensors, computers, and data busses need to interact and communicate with each other. A fast, safe, and secure connection is a must for IoT to be of any business use. IoT also connects devices with cross-domain technology like cloud computing, artificial intelligence, and blockchain technology. We can connect them over radio waves, Wi-Fi, Bluetooth, or wires.

1.2 SALIENT FEATURES OF IOT

The most important features of IoT on which it works are **connectivity, analyzing, integrating, active engagement**, and many more . After connecting the IoT devices, it needs a high speed messaging between the devices and cloud to enable reliable, secure and bi-directional communication. **.**IoT has ten major features, and they are- scalability, connectivity, artificial intelligence, security, dynamic nature, endpoint management, integration, analyzing, and compact nature of devices.

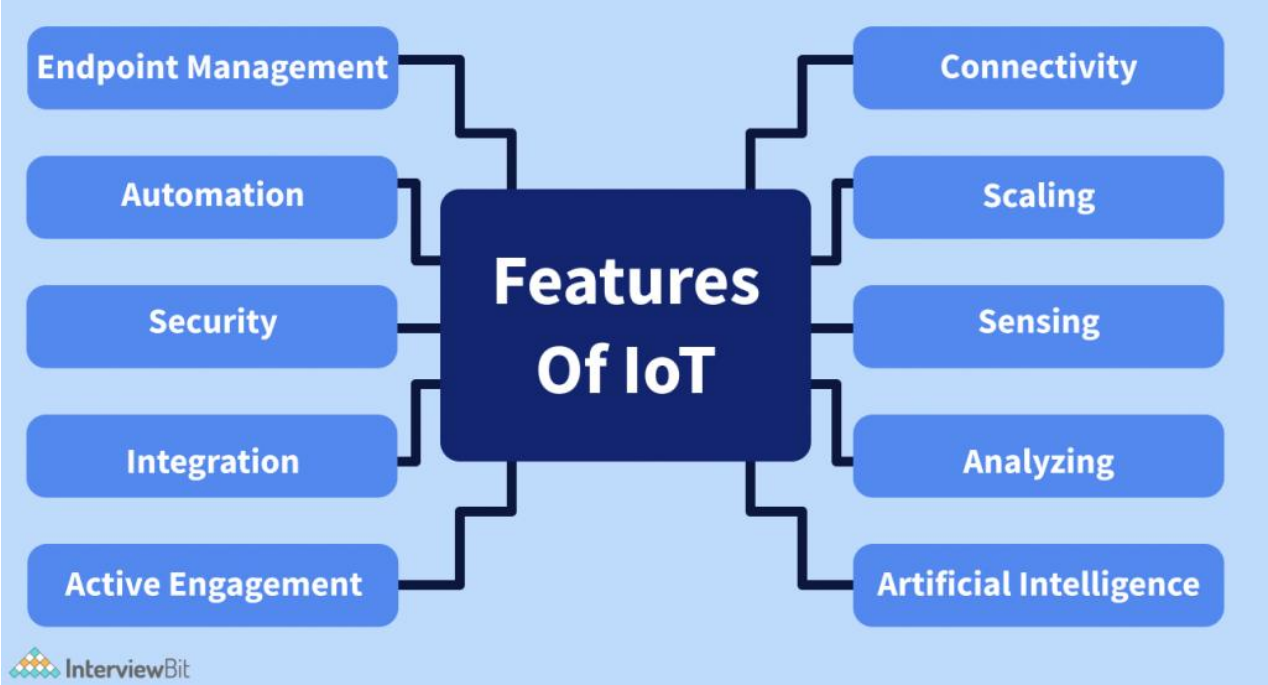


Fig. 1.1 features of IOT

IoT applications in everyday life include smart wearables, smart health monitoring, traffic monitoring, IoT in agriculture with many sensors, smart devices, robots .

3.3 ROLE OF IOT IN SECURITY

IoT security is the technology segment focused on safeguarding connected devices and networks in the internet of things (IoT). IoT involves adding internet connectivity to a system of interrelated computing devices, mechanical and digital machines, objects, animals and/or people. Each "thing" is provided a unique identifier and the ability to automatically transfer data over a network. Allowing devices to connect to the internet opens them up to a number of serious vulnerabilities if they are not properly protected.

IoT security refers to the methods of protection used to secure internet-connected or network-based devices. The term IoT is incredibly broad, and with the technology continuing to evolve, the term has only become broader.

CHAPTER 2

LITERATURE SURVEY

[1] M Nandini Priyanka, S Murugan K. N. H. Srinivas, T . D . S. Sarveswararao, E Kusuma Kumari , "Smart IoT Device for Child Safety and Tracking." Published in : 2019

Methodology :

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 completesolution for child safety problems.

[2] Aditi Gupta, Vibhor Harit , "Child Safety & Tracking Management System by using GPS." Published in: 2016.

Methodology :

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 behavior of child.

[3] Dheeraj Sunehera, Pottabhatini Laxmi Priya. "Children Location Monitoring on Google Maps Using GPS and GSM" Published in: 2016.

Methodology :

This paper provides an Android based solution for the parents to track their childrenin 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.

[4] Asghar Pasha , Bi Bi Khatija, M. Shaista Tarannum, K. R. Harris, Nida Sayedi, Aseema Sultana

"Child Safety Wearable Device" Published in: 2019

Methodology:

In Today's world, the wearable gadgets comprise an increase in market provisioning, wider openings for extemporized authority over security issues for kids in day care and schools. Likewise, women security keeps on being one of the most vital issue that can be addressed today, consequently security of women at working environments, public places is progressively noteworthy issue. This undertaking means to give a total start for secure and wellbeing framework.

[5] Senthamilarasi, Divya Bharathi, Sangavi, Ezhilarasi

"Child Safety Monitoring System Based on IoT" Published in 2019

Methodology:

A. RFID-based System for School Children Transportation Safety Enhancement. The overall percentage of child abusements filed nowadays in the world is about 80%, out of which 74% are girl children and the rest are boys. For every 40 seconds, a child goes missing in this world. Children are the backbone of one's nation, if the future of children was affected, it would impact the entire growth of that nation. Due to the abusements, the emotional and mental stability of the children gets affected which in turn ruins their career and future.

[6] Senthamilarasi, Divya Bharathi, Sangavi, Ezhilarasi

"Monitoring and Prevention of Child Abuse Using IoT"
Published in 2022

Methodology:

The word future has a similar meaning to the word children. Today's children are tomorrow's youngsters, and it is vital to preserve their dreams and lives for the future, as Dr. A.P.J. Abdul Kalam said, "Youngsters are the future pillars of one's nation." As a result, every parent should look after their own children. Without allowing them to descend into the abyss of abuse

[7] Lai Yi Heng1, Intan Farahana Binti Kamsin

"IoT-based Child Security Monitoring System" Published in 2021

Methodology:

Nowadays, crime rate associated with children keeps increasing due to which draws peoples' attention regarding child safety. This research is conducted to propose a child security smart band utilizing IoT technology.

CHAPTER 3

EXISTING SYSTEM

To overcome all such problems the recent innovations and technologies are recommended to improve the safety measure on children security. The Smart watches for kids can provide maximum services what parents need to know from their children place. But it can give only main areas which found in the GPS system. Hence, few more features to be improved with the smart watch to provide updated information about the children visited the different places in the school campus. The smart watch should sense system should connect with child school ID card for sensing and tracking the children movements inside the school campus using RFID tags. This can be achieved when RFID tag connecting module integrates with children smart watches. Then the smart watch can observe the movement of the child whenever the RFID scanning device communicates with the kids smart watches. The dedicated module in smart watch will process the signal, and it sends the details to parents with associated attribute fields. The above attributes are collected through Smart watch and those will be sent to the parent‘s smart phone. In the parent‘s smart phone the respective mobile app will process the incoming data and generates the result according to the users expectation.

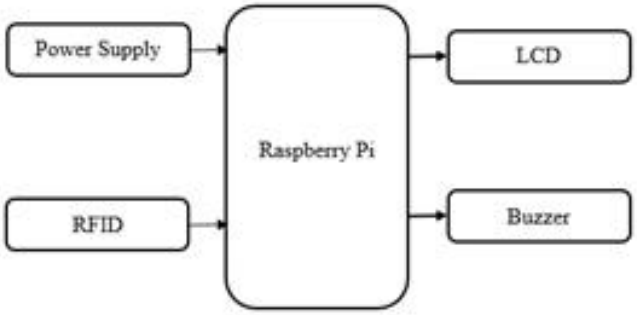


Fig. 3.1 Existing system

DRAWBACKS

- Manual operation
- No direct communication with children

PROPOSED SYSTEM

In this project, the main concept is to create a device that may be used to check health and as asafety 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.

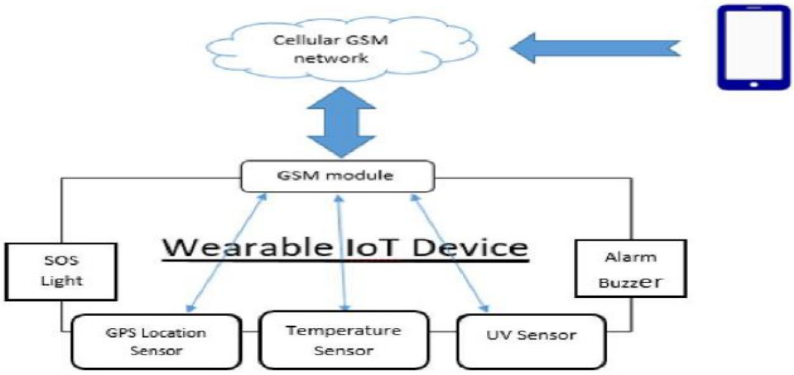


Fig. 3.2 Proposed system

3.1 Specific Objective

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

3.2 Requirement Analysis

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

- Operating System (Ubuntu)
- VMware virtual machine
- Arduino IDE

CHAPTER 4

BLOCK DIAGRAM

4.1 BLOCK DIAGRAM DESCRIPTION

It consists of inbuilt Wi-Fi, GSM, GPS and Bluetooth modules. The link it one board is similar to the Arduino board and it is termed as all-in-one prototyping board for safety and IoT devices. The link it one is a robust development board for the hardware and also used for industrial applications. Different components such as temperature sensor, heartbeat sensor, panic button, contact switch are connected to the link it ONE board along with built in GSM, GPS modules.

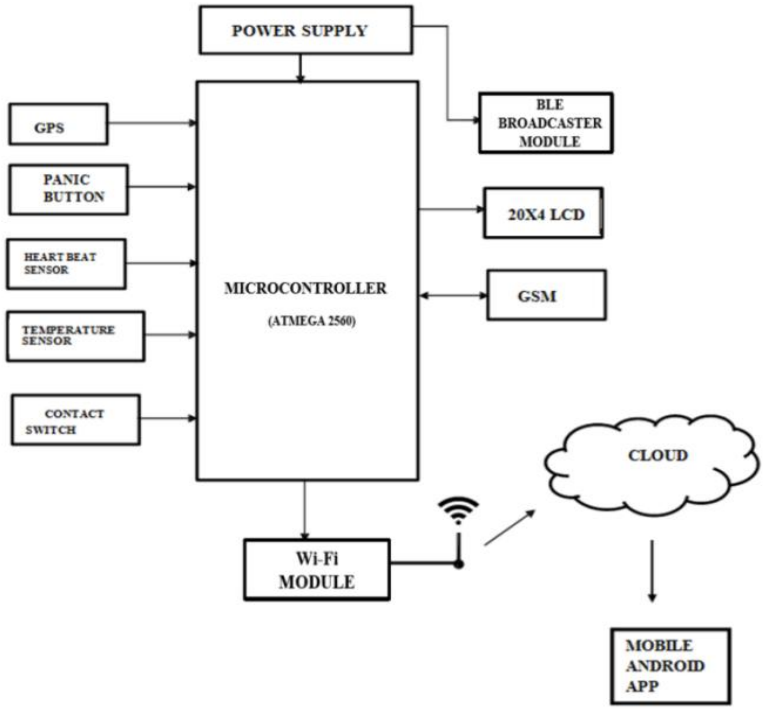


Fig. 4.1 Block diagram of proposed System

GSM network consists of mobile station, base station subsystem network and operation subsystem. The GPS module is provided for identifying the location of the child. GPS module receives the signals from satellites. The latitude and longitude of the location can be identified by the GPS module. The device sends the monitored parameters data such as temperature and pulse rate to cloud. If any abnormalities occurs in temperature or pulse rate readings, a SMS and call triggers to the parent/caretaker mobile phone immediately and also updated to the mobile app only for the registries mobile no. it uses mobile application, cloud and database as the back end of storing and retrieving information and also a device for monitoring.

4.2 FLOW DIAGRAM

The GPS position of the women is to transfer to this 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 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. Atthe same time of instance the LCD display shows the GPS value of the child location . GPS is installed on gadget to track its current location can be tracked on android app and via SMS request sent from parent phone to safety gadget.

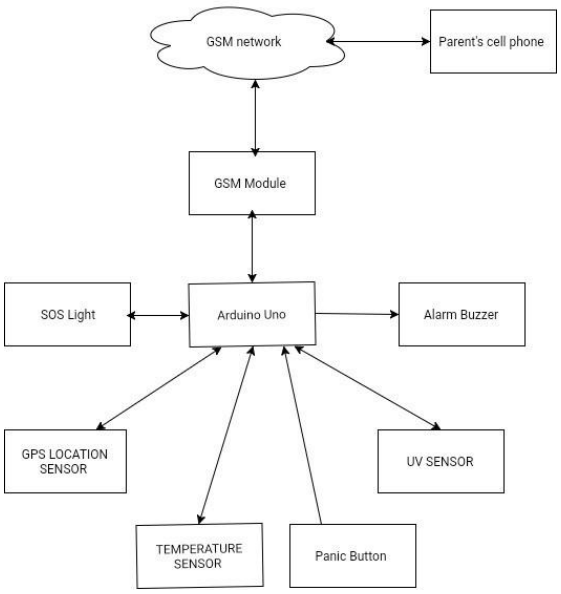


Fig. 4.2 flow diagram

Panic alert system on gadget is triggered during panic situation, automatic call and SMS are triggered to parental phone.The alert is also updated to the cloud for purpose of app monitoring .Stay connected feature is used to trigger call and pre-defined SMS anytime from gadget to parental phone by just pressing a button and also parent can make SMS and call to the gadget anytime. Health monitoring system is implemented using heart beat sensor, temperature sensor which is updated to the cloud and also can be monitored via app. The current value of sensors can be obtained using SMS request sent to gadget from parent

CHAPTER 5

5.1 Software Interface

Operating System :

Ubuntu is a Linux distribution based on Debian and composed mostly of free and open-source software. Ubuntu is officially released in three editions: Desktop, Server, and Core for Internet of things devices and robots. All the editions can run on the computer alone, or in a virtual machine.

Configure UBUNTU with VMWARE workstation :

Step 1 – install VMWARE workstation
https://www.vmware.com/in/products/workstation-pro/workstation-pro-evaluation.html

Step 2 - Configure UBUNTU with VMWARE workstation

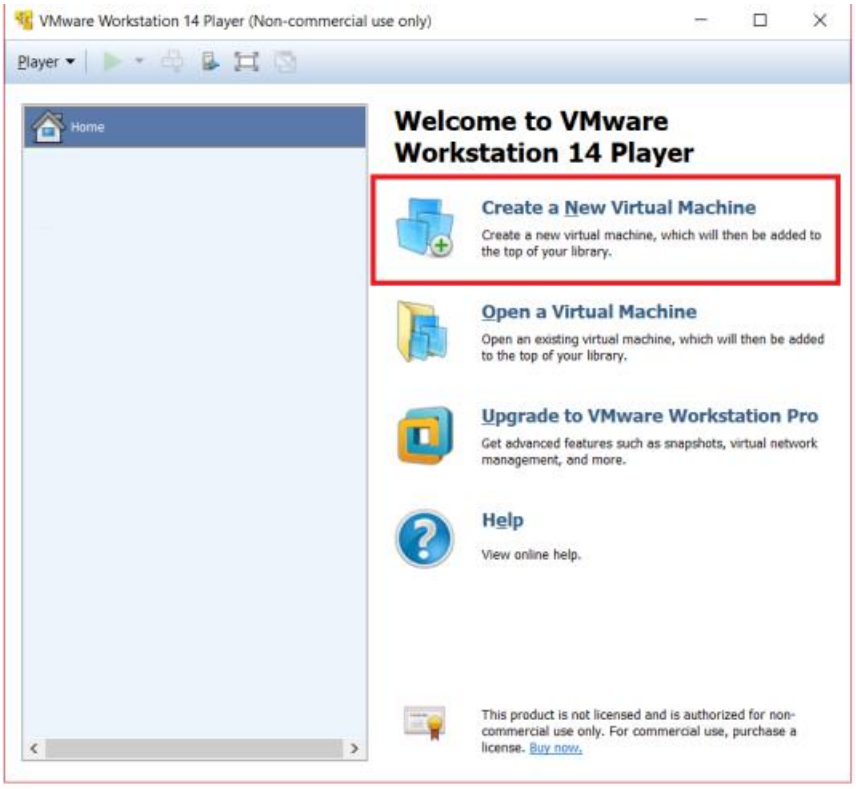


Fig. 5.1 Configure VMware workstation

Step 3 - Choose “Installer disc image file(iso)” option and browse and select the downloaded ubuntu

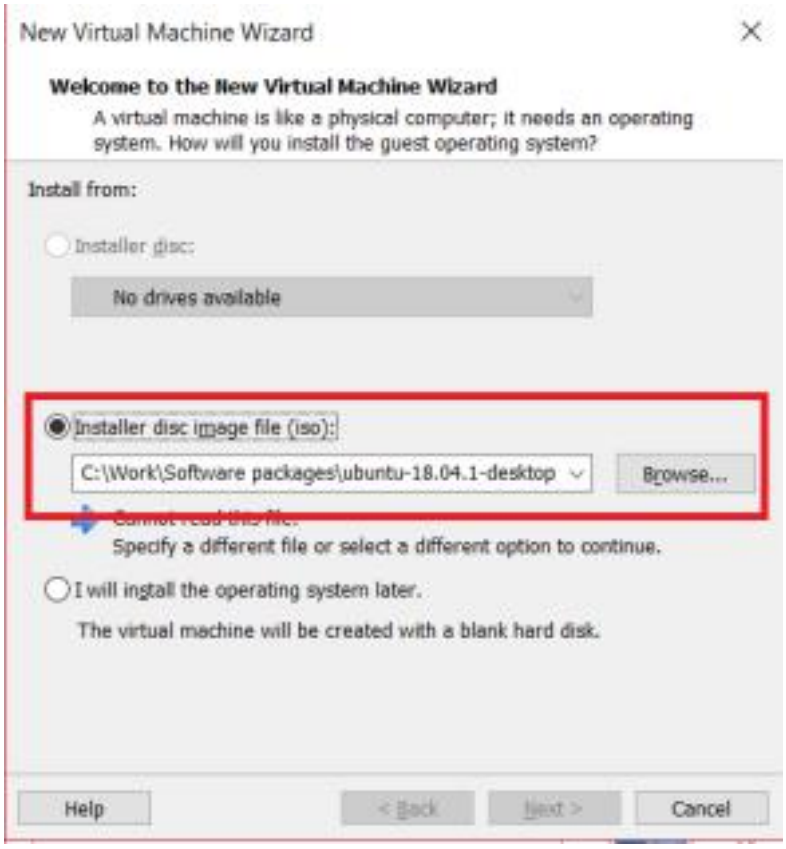


Fig. 5.2 Choose Disc

Step 4 - Key in minimum 100 GB for “Maximum disk size(GB)” and select “Split virtual disk into multiple files” option.

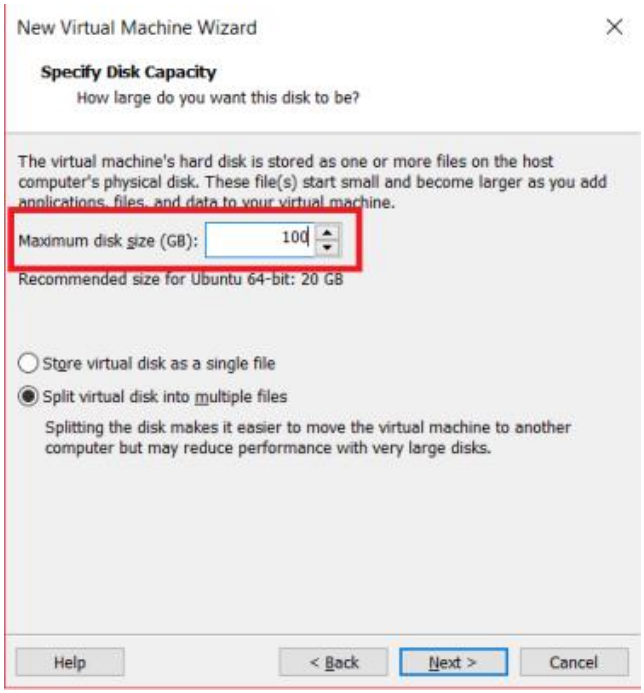


Fig. 5.3 Select disc size

Step 5 - Then a New Virtual Machine wizard will appear. Click “Customize Hardware”.

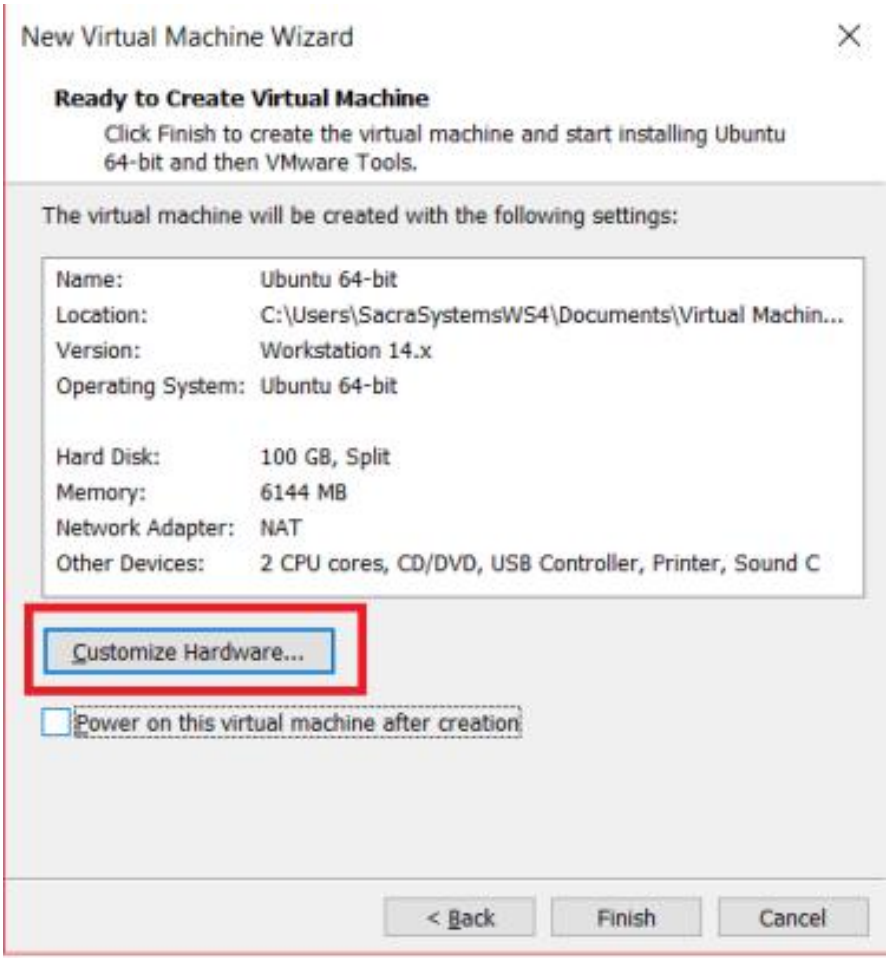
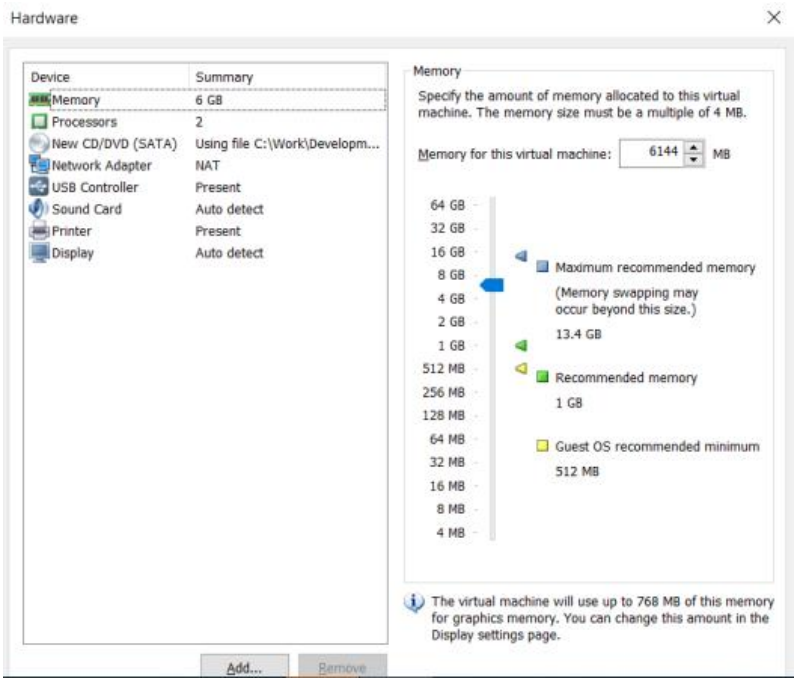


Fig. 5.4 Customize hardware

Step 6 – Setup virtual machine



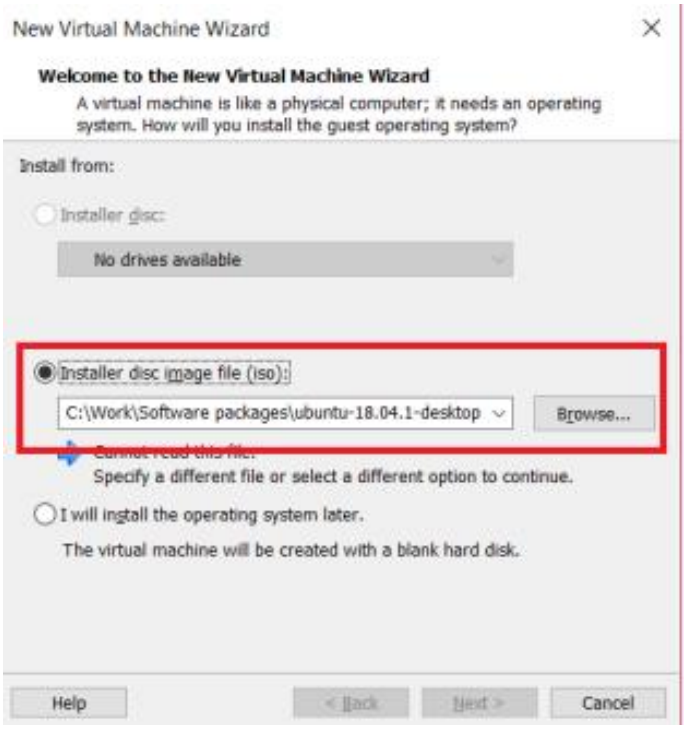


Fig 5.5 Setup virtual machine

Step 4 – install Arduino ide in UBUNTU

```
$ sudo snap install arduino
```

Step 5 – Start Arduino

```
$ arduino
```

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.

It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple oneclick mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extensionion.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executablecyclic executive program with the GN tool chain, also included with the IDE distribution. The Arduino IDE employs the program argued to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

5.2 HARDWARE INTERFACE

Arduino UNO

The word "uno" means "one" in Italian and was chosen to mark the initial release of ArduinoSoftware. 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 preprogrammed with a bootloader 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.

Developer: Arduino

Manufacturer: Many

Type: Single-board micro controller

Retail availability: https://store.arduino.cc/usa/

Operating system: None

CPU: Microchip AVR (8-bit)

Memory: SRAM

Storage : flash , EEPROM

Early arduino 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 preprogrammed 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 boards are available commercially in preassembled form, or as do-it yourself kits. 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 AC-to-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.

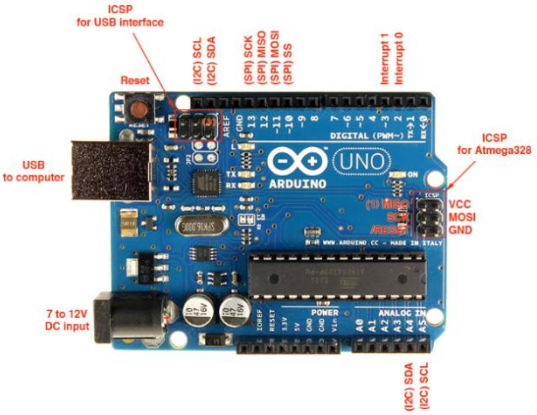


Fig. 5.6 Arduino uno

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.

The GTPA010 module is easy to use, having RS232 as well as USB interface. It operates over 3.2 to 5Vsupply 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 statelite positioning and navigation module. It supports GPS / Beidou / Glonass / 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 withprevious versions.

Fig. 5.7 GPS module

GSM Module

GSM (Global System for Mobile Communications, originally Groupe Spécial 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 ATtention 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. 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.

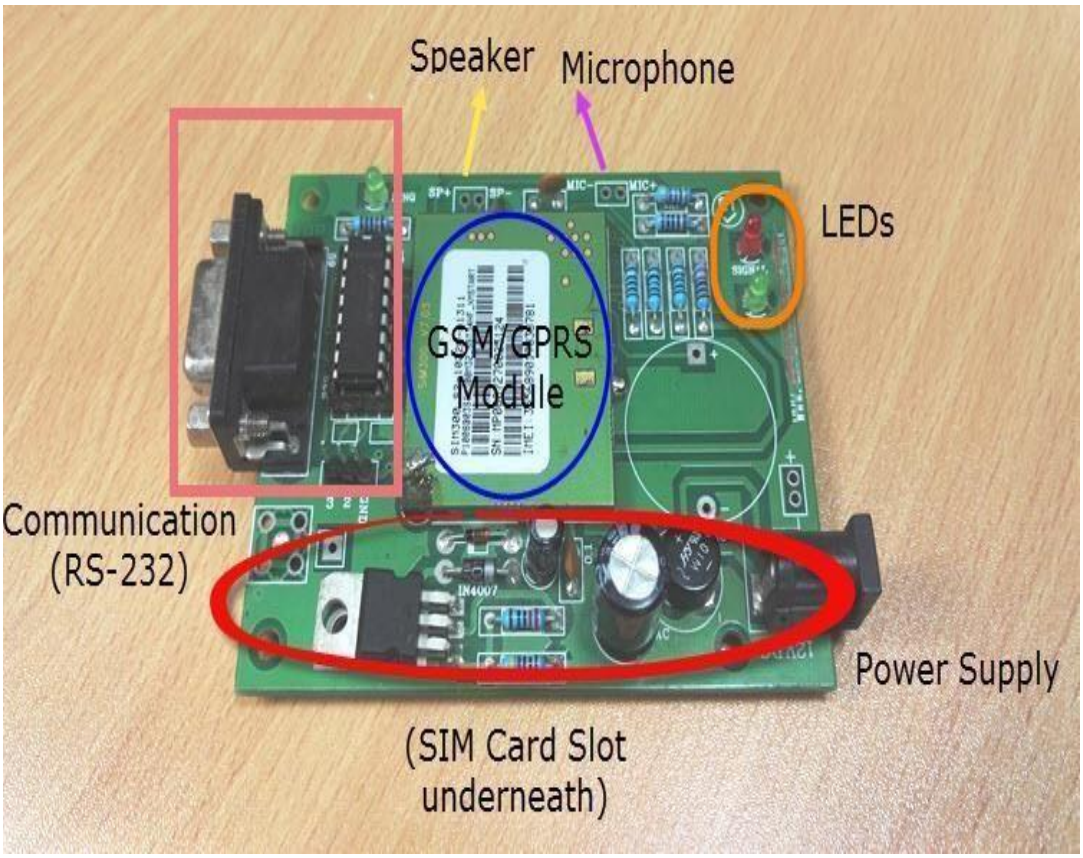


Fig 5.8 GSM module

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.

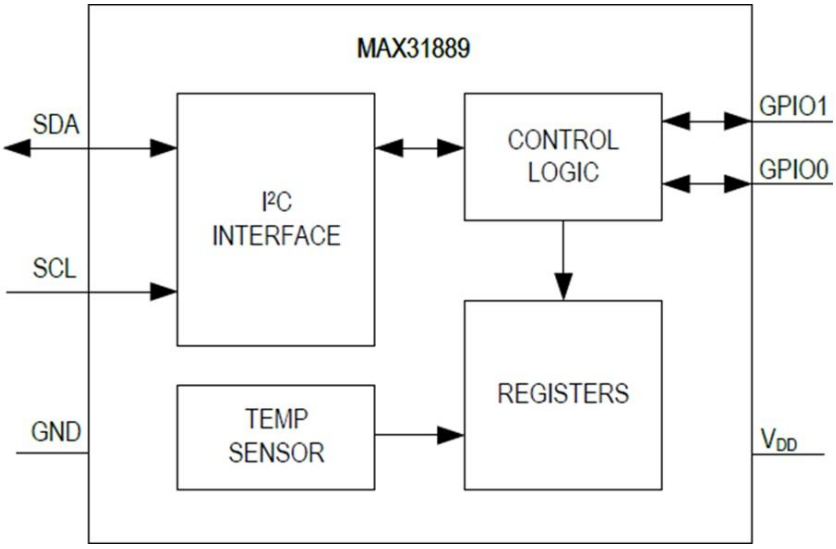


Fig. 5.9 Temprature sensor block diagram

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.

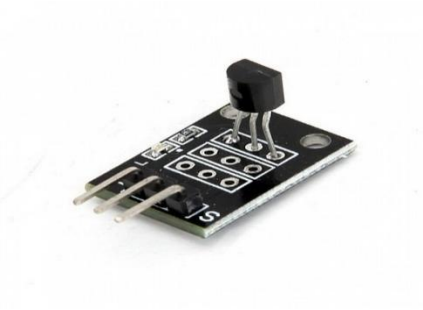


Fig. 5.11 Temperature sensor

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 WeatherLink Live; or in an ENE Node, reporting to an EnviroMonitor 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.

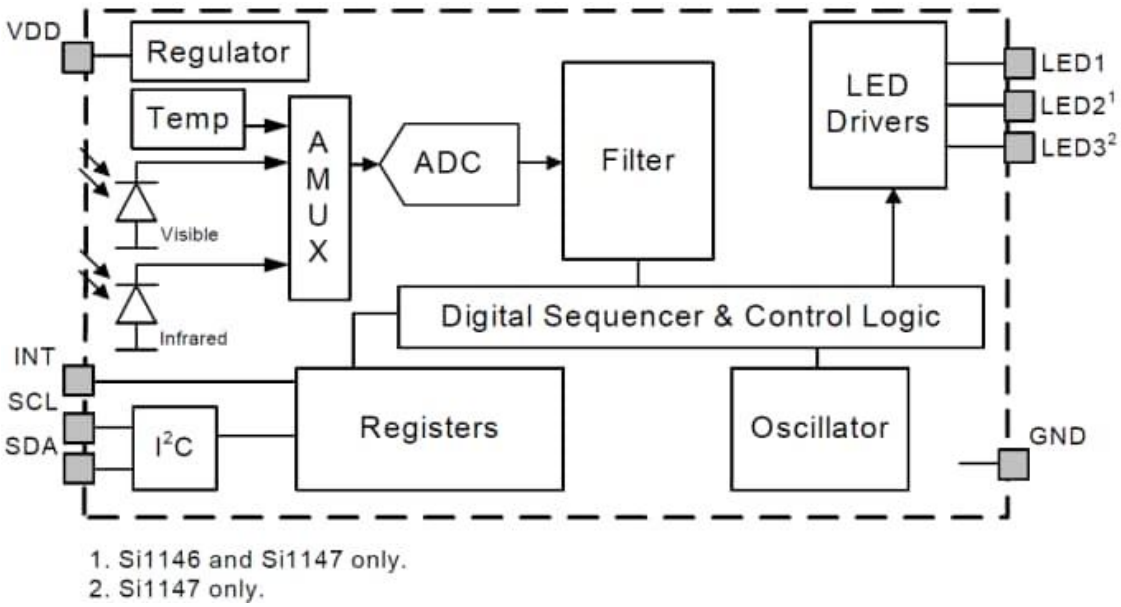


Fig. 5.11 UV sensor block diagram

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.

Fig 5.12 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 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.

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 Labor 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.

Beacon

Bluetooth beacon likes a smart lighthouse: it repeatedly transmits a single signal that other devices can see. Instead of emitting visible light, though, it broadcasts a radio signal that is made up of a combination of letters and numbers transmitted on a regular interval of approximately 1/10th of a second. A Bluetooth-equipped device like a smartphone can “see” a beacon once it’s in range, much like sailors looking for a lighthouse to know where they are. Check Bluetooth beacon solution .The Internet of Things (IoT) is a term describing the interconnectivity of machines or computing devices (like beacons) via the internet, allowing the beacons to not only detect information, but also convey that information by sending and receiving data with other devices.

For example, a beacon in a cold case can not only detect that the temperature in the cold case has become too warm — signaling a problem, but using IoT, it’s able to send that information to another device. For example, it might be set up to convey the information via an email or text message to the store manager’s phone, so the manager receives an alert, allowing them to check and see whether door has been left ajar or if there is a maintenance issue.

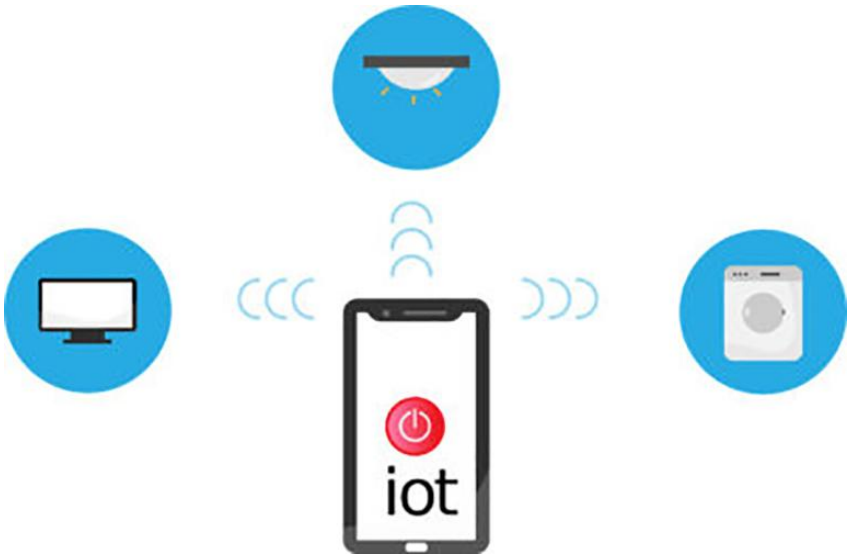


Fig. 5.13 Beacon module

Smart beacons, also known as 'bluetooth beacons' 'BLE beacons', or just 'beacons', are small, wireless bluetooth device that transmit a signal that other bluetooth devices such as smartphones can 'see'. Beacon devices don't transmit random signals.

BLE

Bluetooth Low Energy (BLE) is one of the most widely applicable low-power connectivity standards. This is in no small part thanks to the explosion of the Internet of Things, which gave rise to a slurry of smart personal devices that needed common and efficient means of communication. But don't be fooled; it's not just your smart band that has BLE. There are many commercial and business applications for this standard that made it so popular.

Bluetooth Low Energy is a wireless, low-power personal area network that operates in the 2.4 GHz ISM band. Its goal is to connect devices over a relatively short range. BLE was created with IoT applications in mind, which has particular implications for its design. For example, IoT devices tend to be constrained and require extended battery use, so BLE favors low power consumption over continuous data transfer. In other words: when not in use, it goes into sleep mode to conserve energy.

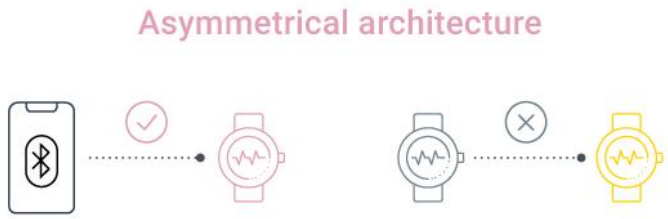


Fig. 5.14 BLE block diagram

The device mode should not be confused with its Generic Attribute Profile (GATT), where a device can either act as a server or a client. Once two devices establish a connection, the one that sends out the data is the server, and the one that receives it is the client. So if a smart band sends, let's say, heart rate monitor readings to the smartphone, then it acts as a server. But if the smartphone sends a software update to the smart band, then the smartphone is the server.

Distress Alarm Buzzer

In the scenario, if a child is separated from his/her parents. The parent can findout 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. Commercial burglar alarms are critical to preventing theft and vandalism after hours. But what about during the day, when your doors are open to the public?

Anything from a disruptive nuisance to a serious threat could walk into your lobby at any time, and they won’t set off any of your door or window sensors.

If you'll ever need emergency services at your doorstep at a moment's notice, you want to consider getting security panic buttons. Emergency alert buttons aren't standalone – they're integrated into your burglar alarm system and use the same technologies to report a security breach.

Panic buttons come in a variety of shapes and sizes, but they all serve the same purpose: they allow you to summon the authorities immediately. Like verified alarms, the police treat panic alarms as calls-in-progress. Other alarms sent out by your burglar alarm aren't as likely to get a high-priority response as an emergency alert because they're more likely to be a false alarm

Fig 5.15 Buzzer

WIFI MODULE :

WiFi modules (wireless fidelity) also known as WLAN modules (wireless local area network) are electronic components used in many products to achieve a wireless connection to the internet. There are two main categories of WiFi modules for IoT: A "single" solution where the MCU runs the WiFi stack and the host application in one chip. A "host processor + WiFi module" solution where the wireless connectivity solution contains the WiFi stack, and a separate processor runs the host application .

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

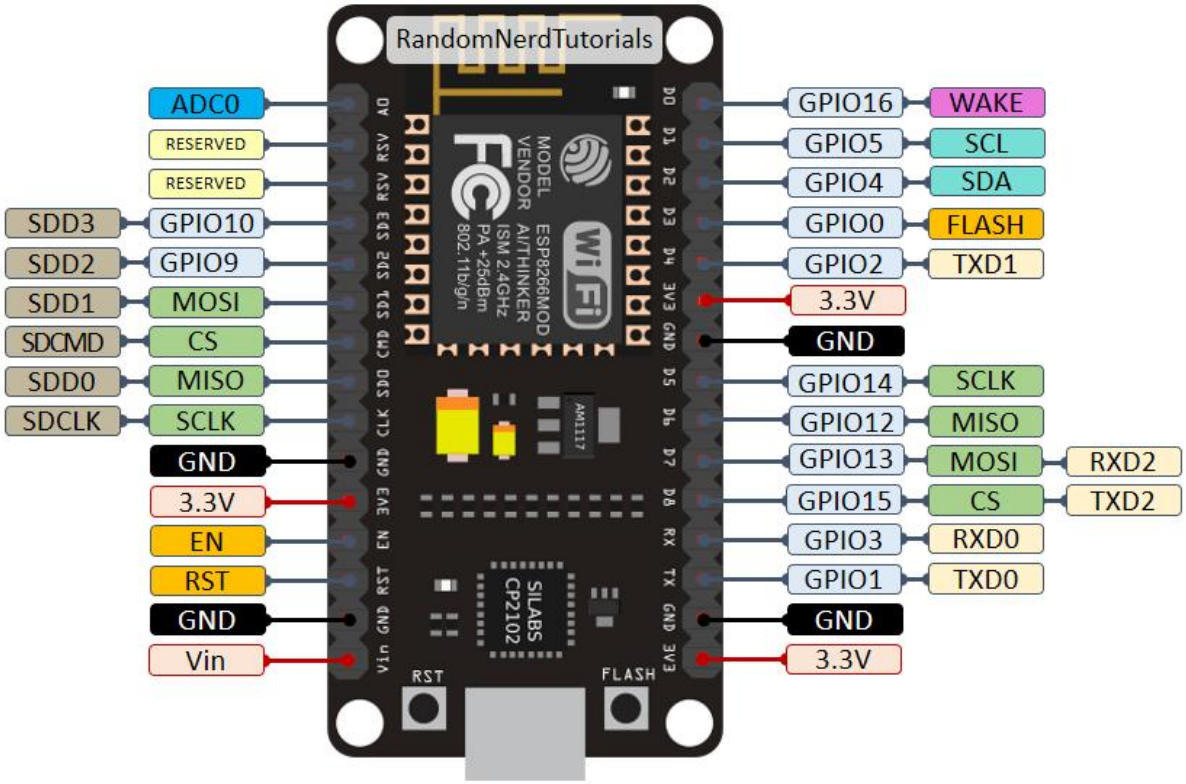


Fig. 5.16 ESP8266

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existance interfaces, it contains a self-calibrated RF allowing

it to work under all operating conditions, and requires no external RF parts.

HEART BEAT SENSOR :

Heart beat sensors are designed to give digital output heart beat when a finger is placed on it. When the heart beat detector starts working, the light emitting detector (LED) blinks simultaneously for every heartbeat.

The heartbeat sensor is based on the principle of photoplethysmography. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ (avascular region). In the case of applications where the heart pulse rate is to be monitored, the timing of the pulses is more important. The flow of blood volume is decided by the rate of heart pulses and since light is absorbed by the blood, the signal pulses are equivalent to the heartbeat pulses.

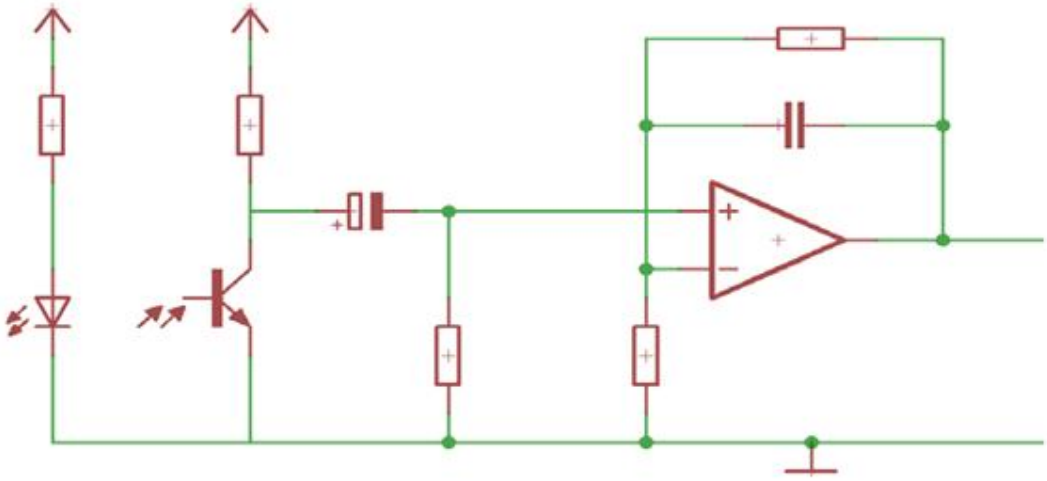


Fig. 5.17 Heart beat sensor circuit

Pulse sensors using the photoelectric pulse wave method are classified into 2 types depending on the measurement method: transmission and reflection.

Transmission types measure pulse waves by emitting red or infrared light from the body surface and detecting the change in blood flow during heart beats as a change in the amount of light transmitted through the body.

This method is limited to areas where light can easily penetrate, such as the fingertip or earlobe.

POWER SUPPLY

A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).

All Arduino boards need electric power to function. A power supply is what is used to provide electric power to the boards and typically can be a battery, USB cable, AC adapter or a regulated power source device.

There are different ways to power your Arduino board. The most common way is through the USB connector available on every board, but there are a few other possibilities to power your board. If you like to know more about this, the different ways to supply power to your board are listed below:

USB

Arduino boards can operate satisfactorily on power that is available from the USB port. It provides 5V DC voltage and can be sourced from the port from a PC, wall socket adapter or portable power bank.

AC socket

Some Arduino boards like UNO, MEGA and DUE, come with an AC socket that can be used to power the boards and to supply additional voltage if needed. A power supply adapter that provides from 7 to 12V (Volts) of DC (Direct Current) is required. The adapter is plugged onto the wall socket and the other end goes directly onto the board’s AC socket.

Typical working of GSM module is 12 v . The SIM900A GSM module has an operating voltage of 3.4V – 4.5V. It draws high current upto 2A when transmitting data,

LIQUID CRYSTAL DISPLAY

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden. For instance: preset words, digits, and seven-segment displays, as in a digital clock, are all good examples of devices with these displays.

They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. For example, a character positive LCD with a backlight will have black lettering on a background that is the color of the backlight, and a character negative LCD will have a black background with the letters being of the same color as the backlight. Optical filters are added to white on blue LCDs to give them their characteristic appearance.

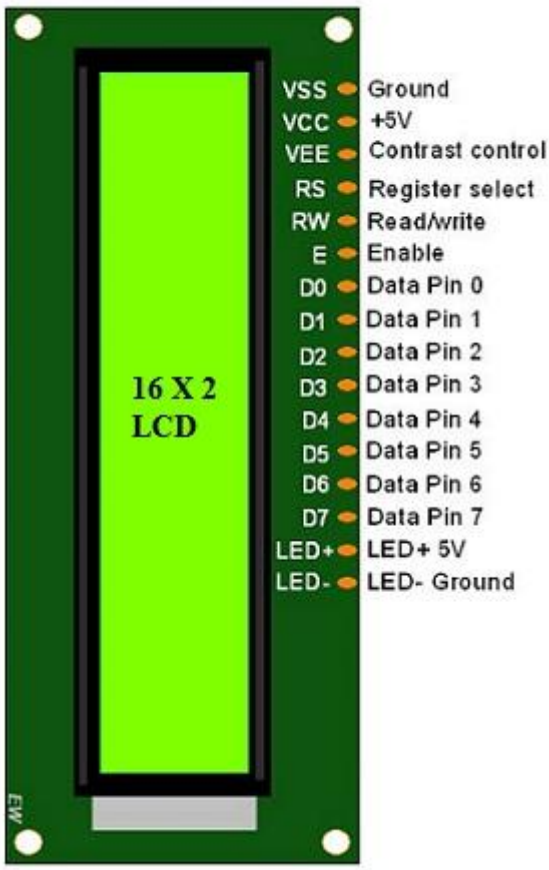


Fig. 5.18 LCD pin diagram

LCDs are used in a wide range of applications, including LCD televisions, computer monitors, instrument panels, aircraft cockpit displays, and indoor and outdoor signage. Small LCD screens are common in LCD projectors and portable consumer devices such as digital cameras, watches, digital clocks, calculators, and mobile telephones, including smartphones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. LCD screens have replaced heavy, bulky cathode-ray tube (CRT) displays in nearly all applications.

Each pixel of an LCD typically consists of a layer of molecules aligned between two transparent electrodes, often made of Indium-Tin oxide (ITO) and two polarizing filters (parallel and perpendicular polarizers), the axes of transmission of which are (in most of the cases) perpendicular to each other. Without the liquid crystal between the polarizing filters, light passing through the first filter would be blocked by the second (crossed) polarizer. Before an electric field is applied, the orientation of the liquid-crystal molecules is determined by the alignment at the surfaces of electrodes. In a

twisted nematic (TN) device, the surface alignment directions at the two electrodes are perpendicular to each other, and so the molecules arrange themselves in a helical structure, or twist. This induces the rotation of the polarization of the incident light, and the device appears gray.

ROLE OF SENSORS IN IOT

An IoT sensor is a physical device that is used to collect data about a physical object and then transmit that data to a central location. IoT sensors are typically small, lightweight, and battery-powered so that they can be easily attached to or embedded in the object they are monitoring.

The way they work is that they use a variety of sensing technologies to collect data about the object they are attached to. This data is then transmitted wirelessly to a central location, where it can be analyzed and used to make decisions or complete various tasks.

Additionally, IoT sensors often come equipped with a variety of features, such as the ability to transmit data in real-time, the ability to store data locally, and the ability to operate offline. It's important to note that not all IoT sensors have all of these features; it just depends on the specific sensor and what it is being used for.

APPLICATIONS

There is a wide range of IoT sensor applications across industries, and the specific application will dictate the type of sensor that is used.

Environmental Monitoring

IoT sensors can be used to monitor a variety of environmental factors, such as temperature, humidity, air quality, and light intensity. This data can be used to make decisions about the environment, such as adjusting the temperature in a room or turning on the lights in a dark area. This data can also be used to monitor environmental conditions in

real-time and take action if there is a problem, such as an air quality sensor that triggers an alarm when the air quality drops below a certain level.

Industrial Monitoring

IoT sensors can be used to monitor industrial processes, such as production line speeds, machinery operation, and inventory levels. This data can be used to make decisions about the operation of the business, such as adjusting the production line speed to match customer demand or reordering inventory when it gets low. Additionally, this data can be used to monitor the status of the business in real-time and take action to provide viable solutions if there is a problem, such as a machine that stops working or an inventory level that drops below a certain threshold.

Building Automation

IoT sensors can be used to automate the operation of a building, such as controlling the lights, temperature, and security system. This data can be used to make decisions about the operation of the building, such as turning off the lights when no one is in the room or setting the security system to arm when everyone leaves for the day.

CHAPTER 6

CONCLUSION

This research demonstrates Smart IoT device for child safety and tracking, to help the parents to locate and monitor their children. If any abnormal readings are detected by the sensor, then an SMS and phone call is triggered to the parents mobile. Also, updated to the parental app through the cloud. The system is equipped with GSM and GPS modules for sending and receiving call, SMS between safety gadget and parental phone. The system also consists of Wi-Fi module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on parental phone. Panic alert system is used during panic situations alerts are sent to the parental phone, seeking for help also the alert parameters are updated to the cloud. Boundary monitoring system is implemented on safety gadget with the help of

BEACON technology, as soon as the safety gadget moves far away from the BLE listener gadget an alert is provided to itself.

6.1 FUTURE WORK

This system can be further enhanced by installation of minicamera inside smart gadget for better security so that live footage can be seen on parental phone during panic situations. The system can be modified by installation of small solar panels for charging the battery of smart gadget to gain maximum battery backup.

REFERENCES

[1] Authors: M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari. Published in: 2019.
"Smart IoT Device for Child Safety and Tracking".

[2] Authors: Aditi Gupta, Vibhor Harit. Published in: 2016.
"Child Safety & Tracking Management System by using GPS".

[3] Authors: Dheeraj Sunehera, Pottabhatini Laxmi Priya. Published in: 2016.
" Children Location Monitoring on Google Maps using GPS and GSM".

[4] M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari,
Published in: 2019
"Smart IoT Device for Child Safety and Tracking" .

[5] Dheeraj Sunehera, Pottabhatini Laxmi Priya, Published in: 2016
"Children Location Monitoring on Google Maps Using GPS and GSM".

[6] Anwaar Al-Lawati, Shaikha Al-Jahdhami, Published in: 2015
"RFID-based System for School Children Transportation Safety Enhancement".

[7] Sarifah Putri Raflesia, Firdaus, Dinda Lestarini, Published in: 2018
"An Integrated Child Safety using Geo-Fencing Information on Mobile Devices".

[8] Pramod, M Uday Bhaskar, Ch. V and Shikha, K. Publish in: 2018
"'IoT wearable device for the safety and security of women and girl" .

[9] Nitishree, Published in: 2016
"A Review on IOT Based Smart GPS Device for Child and Women Safety".

[10] Asmita Pawar, Pratiksha Sagare, Tejal Sasane, Kiran Shinde Publish in: 2017
"Smart security solution for women and children safety based on GPS using IoT'.

Projectdemolink:https://drive.google.com/file/d/1d-hTklVsnOcibnW27EoixsxGKsAQJmZb/view?usp=share_link