Chapter 1

INTRODUCTION

National Council on Disability (NCD) found that more than 90%, of those 65 or older use at least one medication per week, 40% take five or more, and 12% use ten or more. The older people population is also increasing in the world due to availability of medication facilities. And also, it is more often found that most of the people are forgetting either taking the medicine or at on time. People can overcome this problem with the help of assistive systems which can remind the medication timings and the medicines to be taken at the particular time of the day. NCD also found that 80 percent of older adults who used assistive technology were able to reduce their dependence on others. In the existing set ups reminders can be implemented.

According to World Health Organization (WHO), Cardiovascular iseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Over three quarters ofCVD deaths take place in low- and middle-income countries. Out of the 17 million prematuredeaths (under the age of 70) due to noncommunicable diseases in 2019, 38% were caused by CVDs. It is important to detect cardiovascular disease as early as possible so that managementwith counselling and medicines can begin. According to the WHO, CVDs cause roughly 17.9million deaths on a yearly basis across the world. Furthermore, it is believed that 31% of deathsare caused by this condition.

Concerns about the safety and well-being of elderly are constantly increasing. We currently assist, all over the world, to a growing number of elderly and questions on how to take good care of them start to arise as their sons and daughters' generation seem to lack the time needed to provide their parents with a good accompaniment. In this context, and to reinforce this idea, Dara-Abrams refers to the field of Geon technology, developed in the late 1980s, that combines gerontology with new technologies to help elderly.

Those technologies are present in several domains, as stated in, such as health and self-esteem, housing and daily living, mobility and transport, communication and governance, work and leisure. As the need to help elderly increases, we should be aware of how we can assist them. The bio parameters like heartbeat, temperature can be continuously monitored and if in case of any uncertain conditions are observed it will send the alert message to the care taker as

well as to the regular medical practitioner.

According to the World Health Organization (WHO), over 80% of the people above the age of 50-60 years are prescribed medicine, that are to be fed 2-3 times in a day. With the increasing of many vascular diseases and diabetes among the elderly person, proper medicine taking has become the first priority to live healthy. But among this people, 40-60% are having an issue of forgetting to take medicine on right time. In Hospital or in home, the patients have to take the right doses in appropriate time. Even young people who are used to take care of elderly people in home forget due to different problems. So, it may cause prolong period to recover from the diseases. Sometimes old people take wrong medicine and wrong doses that may cause severe problem. Henceforth it is necessary for the patient to take proper medicines at precise quantity and time. Developing of electronic device can be efficient solution to solve the above problems in this era of technology.

In the current scenario home healthcare is evolving since IoT is playing an efficient role in improving the medication management system for elderly people and people who are suffering from chronic diseases .These patients needs consume pill in daily basis and also need a constant supervision ,traditionally dispensing medications is done by the patienthimself or if the patient is aged the responsibility is assigned to care taker. Sorting out different medicines is found to be difficult when the number of pills is many and specifically when a care taker is assigned too many patients with different medical record. To address this problem an intelligent and safe medication box is proposed which is designed with the idea ofhandling and sorting six different pills also the medication box contains the Bio-sensor for supervision of temperature and heartbeat.

Patient monitoring and management in critical care environments involve estimating the status of the patient and reacting to events that may be life threatening. It is impossible to keep a tab on every patient throughout the day. New solutions are needed in this field to help the doctors and the nursing staff to monitor the patients. A critical element of this is the medicine administration and monitoring. This has been achieved by the patient medicine reminder system. This system consists of Arduino, GSM Module. This system is driven by a program that inputs predefined parameters which is processed based on the input variables entered via a user interface device such as the PC. The logic for the processing is built into the embedded program to initiate the alert through an audio alarm. Not only does it have an alarm system, but

also gives indication when medicine is not taken at the reminder time.

Medication management is medical treatment system that monitors the medication therapy of a patient to confirm that the patient is complying with a medication regimen. It also ensures that the patient is avoiding potentially dangerous drug interactions and other complications . This is important for patients taking large numbers of medications to address chronic illnesses and multiple diseases. Taking numerous medications is known as polypharmacy and it is particularly common among older adults, as they are more likely to need medications to manage an array of chronic conditions.

Global Positioning System (GPS) based person location and tracking system provided effective, real time person location, mapping and reporting this information value and add by improving this level of service provided. The GPS based human tracking system is designed to find out the exact location of a person and intimate the position to the concerned authority about through an SMS. The system includes a GPS modem that it retrieves the location of a person in terms of its longitude and latitude.

The Alzheimer Disease is the most common type of dementia, which is caused by various diseases and conditions that result in damaged brain cells or connections between brain cells. As stated by the authors in, dementia becomes a serious issue when patients start to wander. Although first identified more than 100 years ago, only in the last 30 years research on symptoms, causes and treatment had gained momentum. Currently, the Alzheimer Association estimates 5.4 million Americans of all ages have Alzheimer diseases in 2011. Mostly driven by memory loss a0nd confusion with time or places, and in order to act upon them, a low cost GPS tracking system specifically oriented for Alzheimer patients, with greatflexibility regarding configurations and with a low cost investment.

Now in current days the method to monitor the patients in hospitals is such that it keeps the patients tied to their beds, and monitoring by this method is uncomfortable for patients. Building a Heart rate monitoring system that will allow patients to be mobile in the surrounding environment is the aim of this system. The heart attack causes death in first attempt or may be in third attempt. It is because blood flow reduces to the heart muscles. In India it is major problem within our research. So for safety and comfort point of view of patient designing of the patient monitoring system. In this paper design of the system that continuously monitoring human pulse rate and temperature is proposed. It receive signalfrom body and send

SMS to t their family member so at the time of heart attack treatment canbe provide within time. Life is precious many people among us loss their life to heart attack. By using this system and checking our health on daily basis it is possible to reduce the chance of heart attack.

A heart rate monitor is simply a device that takes a sample of heartbeats and computes the beats per minute so that the information can easily be used to track heart condition. Current technology consists of optical and electrical monitors. The electricalmethod provides a bulky strap around one's chest. The optical method does not require the strap and can be used more conveniently than the electrical method. Heartbeat sensor provides a simple way to study the function of the heart which can be measured based on the principle of psycho-physiological signal used as a stimulus for the virtual- reality system. The amount of the blood in the finger changes with respect to time. When it comes to your heart, timing is everything. Without a strong heartbeat, your blood cannot get to where it needs to go, and to have a strong heartbeat, it must be steady. Even if you're not an athlete, knowledge about your heart rate can help you monitor your fitness level and it might even help you spot developing health problems. Your heart rate, or pulse, is the number of times your heart beats per minute. Normal heart rate varies from person to person. Knowing yours can be an important heart-health gauge. As you age, changes in the rate and regularity of your pulse can change and may signify a heart condition or other condition that needs to be addressed.

Chapter 2

LITERATURE SURVEY

The current knowledge of theoretical and methodological contributions of many topics is contained in the literature survey. It gathers information about the project's progress. A detailed critical and brief summary effort has been kept under observation and contributes to project knowledge.

2.1 literature survey

Palak Patel *et al* [1] proposed paper on " Medication Reminder and Healthcare– An Android Application "Many Medication Reminder Systems have been created for various platforms. Many of these systems necessitate the use of specialized hardware to remind patients of medication ingestion times. Purchasing new hardware equipment becomes more expensive, as well as time and money intensive. So, in the presented work, an attempt has been made to implement a system that is cost-effective, easy to use, and increases medication adherence. Medication non-adherence lowers treatment effectiveness and places a financial strain on health-care systems.

Lindsey Dayer *et al* [2] reported in “Smartphone medication adherence apps: Potential benefits to patients and providers” Medication non adherence is a common, complex, and costly problem that contributes to poor treatment outcomes and consumes health care resources. Non adherence is difficult to measure precisely, and interventions to mitigate it have been largely unsuccessful.

P.A.Harsha Vardhini *et al* [3] proposed paper on “IOT based Smart Medicine Assistive System for Memory Impairment Patient”- For elderly patients, having a problem of remembering the schedules for their medicine intake, proposed medicine assistive system keeps in track of the medication schedule reminds the intake at the specified time. Cost effective smart medicine box is designed and implemented that even illiterates, elderly and poor people can also afford and easily make use of it. A low cost smart medicine box that costs lesser is designed and implemented for the elderly and memory impairment patients. This system provides ease in use for the illiterates too.

S. Kiruthiga *et al* [4] proposed paper on "The design of an IOT based medication system" is established and it can be used by patients as well as caretakers in sequence to monitor and ensure that the correct amount of each medicine is being taken at the exact time. This provides audio communication to aware the user when a confirmed medicine is to be taken. Furthermore, a software application is used to send messages and email alerts to the patient and the caretaker. The proposed design consist of different sections to store different sort of medications, within a compact zone. The system gets atomized by Arduino and can monitor the patients medication status by using open source software application. In future work, a high voltage battery can be used as a power supply for the system to get portable.

K. Bhavya *et al* [5] "A Smart Medicine Box for Medication Management using IoT" achieved that in accordance to current technology this project endeavors to make a "Smart Medicine Box" for medication with multiple compartments to assist the patient to take medicine at right time through alarm reminder. This compartment-edbox maintains temperature by means of adaptive cooling method. We propose this system withadditionally added features to medicine box such as high security, emergency alert through SMS and automatic opening and closing of lid of the box. The vital parameters are recorded, uploaded to cloud and reviewed by the clinicians using IoT system. This helps the clinicians to gain knowledge about their patient's health condition for further treatment analysis.

B. Pradeepa *et al* [6] studied a paper "Social media, health care, and social networking" in which health concern had been decreasing dueto lack of awareness of growing high risk death factors seated in food and surroundings. Eventhough many new developments in medicine had been invented or discovered to step-down the death rates, people fail to follow their drug schedule. Normal people forget to take their medicine due to their hectic work condition, stress, carelessness. Also patients are with disability to remember events for a period of time, often due to brain injury or the effects of drugs or alcohol. The factors like ageing, stress or lack of sleep also cause memory loss. Thismakes a severe condition to be focused and help for aging patients suffering from gradual lossof memory to gain benefit of clinician prescribing drugs. Ambient Assisted Living (AAL) designs a framework that helps the older people to live independent in doing their routine activities as fSar as possible.

M Saravanan *et al* [7] ,"MEDIBOX – IoT Enabled Patient Assisting Device" implemented a system of new device MEDIBOX which aims atassisting a patient completely

with a compact and user-friendly manner. It reminds the patientto consume the medications and provides a suitable storage condition for the drugs. Storage ofmedications intake details can assist the doctor for future references i.e. the effectiveness of drugs on the patient can be found through the history of medication intake helping him to prescribe accordingly to the patient.

Viral Doshi *et al* [8] " Design of Arduino ATmega based pill reminder" proposed the design of Arduino ATmega based pill reminder which will help the patients to take their medicines in the correct quantity and at the prescribedtime. Assistive technology is one such technology which can help an individual tremendously.But today only 2 out of 50 people are using assistive technology due to high cost, lack of knowledge on the subject and availability. By 2050, every 10 out of 20 households will need one assistive product with many elderly needing 2 or more. It is also seen that people give more attention to work than health. This system aims to reduce this problem by reminding them to take the medicine on time within the prescribed time. It is a combination of physical and digital reminder for a patient that will be helpful for people of any age, but especially helpful for geriatrics who forget taking their medicines. The main aim is to keep the system easy to handle and make it cost-efficient.

B.Mendoza *et al* [9] proposed paper on "Tracking System for Patients with Alzheimer's Disease in a Nursing Home"- The proposed device can detect the exact location of the lost patient, which exacts accuracy. There is a small difference between the devices detected location and the exact location detected by Google Earth which is about 5 meters or less. The Application can pinpoint the patient's location in about 18-25 seconds. After the patient goes out of the Xbee's range, the application pinpoints the location of the patient on the built in map. The Application responds in about 1-3 seconds when the patient returns to the nursing home. The response time to receive the emergency text message, without the consideration of network problems, results in a response time between 10-15 seconds.

Jian Shi *et al* [10] reported on "A Smart Low-consumption IoT Framework for Location Tracking and Its Real Application" We assume that GPRS are always available and all location data are transmitted over GPRS. When devices are not able to access Internet, location data can be transmitted through SMS. App first requests location via SMS, then devicereplies with its current position. To prevent from replying data to an unauthorized user, deviceshould only answer incoming SMS from an authorized number. Since GPRS network is not available,

authorized number should be stored in device's memory in advance.The process ofsetting authorized number to device can be the same process. Another concern is the fee of SMS. Sending SMS for every control command can be uneconomical. Using TCP connectionto send command message can significantly lower the cost. In our original design, device willclose TCP connection after sending location data to server. Therefore, the server cannot send any message to device once the connection is closed. The key to this problem is using heartbeattechnique to keep the connection alive after a TCP connection has been established from deviceto the server.

Ng Ming Fung *et al* [11] proposed paper on "Elderly Fall Detection and Location Tracking System Using Heterogeneous Wireless Networks". Elderly fall detection system proposed this allows caretaker to reach out to elderly within time if there are accidents. The prototype is developed and tested. It proved that the proposed system is able to send emergency SMS and Email via GSM and cloud server, respectively. Moreover, the proposed system has stored the fall event details on cloud server and display on a webpage. The proposed system is beneficial to elderly person who are living alone and need a constant monitoring in case any fall event happens.

Polaraju K *et al* [12] proposed paper on *"*Prediction of Heart Disease using Multiple Linear Regression Model" This proposed working model can also help in reducing treatment costs by providing Initial diagnostics in time. The model can also serve the purpose of training tool for medical students and will be a soft diagnostic tool available for physician and cardiologist. General physicians can utilize this tool for initial diagnosis of cardio-patients. There are many possible improvements that could be explored to improve the scalability and accuracy of this prediction system. The performance of the health's diagnosis can be improved significantly by handling numerous class labels in the prediction process.

Ramesha M *et al* [13] proposed paper on "IOT based Remote Patient Health Monitoring system". In this system parameters such as body temperature, blood pressure, pulse sensor, and GPS to track the patient's current location in this project. Use Arduino Board as aprocessor where the collected data is sent to Arduino and is processed further and the WIFI module to transmit data over the internet for analysis. This analyzed data is stored and used for flexible purposes.

Rui Wang *et al* [14] proposed paper on "Design and Implementation of an elderly tracker system", a solution of an elderly tracker (hereinafter referred to as the terminal) is introduced to acquire the current location information of the aged through GSM/GPRS functional module SIM900 and GPS functional module SIM28. Moreover, SOS key is set up to inform their children by dialing an emergency call. BP neural network algorithm is applied to analyze a frequented place of the aged by using the cloud server and to remind them by playing the warning beep at the accident prone location. In addition, the frequented location information of the aged can be provided for elderly service agencies, so as to help these agencies to provide service quality.

Anum Shakeel *et al* [15] proposed paper on "A Study and Application Development on Monitoring Cardio-Vascular Attack using Internet of Thing (IoT)" research is related to Internet of Things (IoT). A sensor based mobile application that has the capability to detect heart rate; where the detected pulse rate are imputed into the system that performs some computations to decide whether the human is in a normal state or needs certain medical assistance. The primary motivation behind this research is to comparatively analyze different existing technologies and to develop an application that can build a strong research background to aid researchers in the establishment of an early heart attack detection and prevention system.

A Rajani *et al* [16] reported on "IoT Based Wearable Monitoring structure for detecting Abnormal Heart". Continuous monitoring of the Heart of high-risk patients may havea major role in preventing coronary heart disease in recent decades. If any change of the health condition from their normal is observed, then it will be transmitted it to a health center for earlyand further analysis and preventative actions. This saves the life of the patients from Heart attacks. It uses a three wireless electrodes. The first move is to set up a portable ECG system utilizing the electrodes of the product click into the body region of the patient. Bluetooth will attach this lightweight ECG to mobile device like a cell phone. A mobile Java device will thenbegin data collection and conversion. A desktop device may be enabled. In the case of emergencies, the existing program often activates a professional alert warning device. This ECG monitoring systems are very useful for elderly patients having severe heart problems.

Nikunj Patel *et al* [17] presented the idea in IJIACS "Heart Attack Detection and Heart Rate Monitoring Using IoT" Nowadays numerous persons are mislaying their life owing to heart attack and shortage of medical attention to patient at correct stage. Hence, in this project we are implementing heart rate monitoring and heart attack recognition system using IoT. The patient will carry hardware having sensors with android application. The heartbeat sensor will allow checking heart beat readings and transmit them over the internet. The user may set the high and low level of heartbeat limits. Once these limits are set the system can start monitoring the patient's heartbeat and as soon as the heart beat readings goes above or below the limit set by the user the system will send an alert about high or low heartbeat as well about chances of heart attack.

Dr. A.Gurjar *et al* [18] presented a framework in paper" Heart Attack Detection By Heartbeat Sensing using Internet Of Things : IoT" implemented a heart beat monitoring and heart attack detection system using the Internet of Things. The sensor is then interfaced to a microcontroller that allows checking heart rate readings and transmitting them over Internet. The user may set the high as well as low level of heart beat limit. After setting these limits, the system starts monitoring and also alerts for lower heartbeats. For this the system uses two circuits. One is the transmitting circuit which is with the patient and the other is the receiver circuit which is being supervised by the doctor or nurse. The system makes use of heart beat sensor to find out the current heart beat level and display it on the LCD screen.

2.2 Problem Statement:

Old age people suffering from disease are not able to carry out their regular medication activities due to decline memory. Taking the correct medicines at regular slots is a challenging task for them. GPS tracking has become so advanced and simple with various upcoming technologies. But the cost effectiveness and its implementation have become high. Theproblem lies in maintaining high grade servers to back up the data for tracking human and theuse of internet to track this person. Although real time tracking of person through internet givesan overall advantage in person tracking, the system fails to provide less cost of investment and maintenance. Proposed System The proposed medication assistive system is designed to remind the elderly people by ringing a buzzer at the time of medication and continues until a person attends and presses the button. The medication timings can also be changed during runtime.

Once the current time is matched with the any of the medication timings stored in serverthen the micro controller alerts the people by ringing a buzzer. The buzzer will stop only if a person attends the system and presses the button. The bio parameters are monitored continuously and hosted on the blynk app for the notice of caretaker. This system is very muchuseful for the elderly parents living independently. Global Positioning System to determine theprecise location of an old age person and intimate the position to the concerned authority.

2.3 Objective:

The objectives of the proposed system are:

- The proposed system assists older people in reminding medication timings.
- In order to continuously monitor the health conditions and take necessary action if any uncertain condition takes place (Tachycardia, Bradycardia, Hypothermia and Hyperthermia).
- It also reduces the dependency of old people on younger generations.
- GPS based human tracking system gives the precise location of an old age person and intimate the position to the concerned authority by sending alert message.
- The person is tracked by wearing a smart band. GPS works in any weather conditions, anywhere in the world, 24 hours a day. This device receives the GPS data and sends the data at regular intervals to the server. Then the server analyses the data. Then to receive the signals from the satellite the GPS device is turned on.

Chapter 3

METHODOLOGY

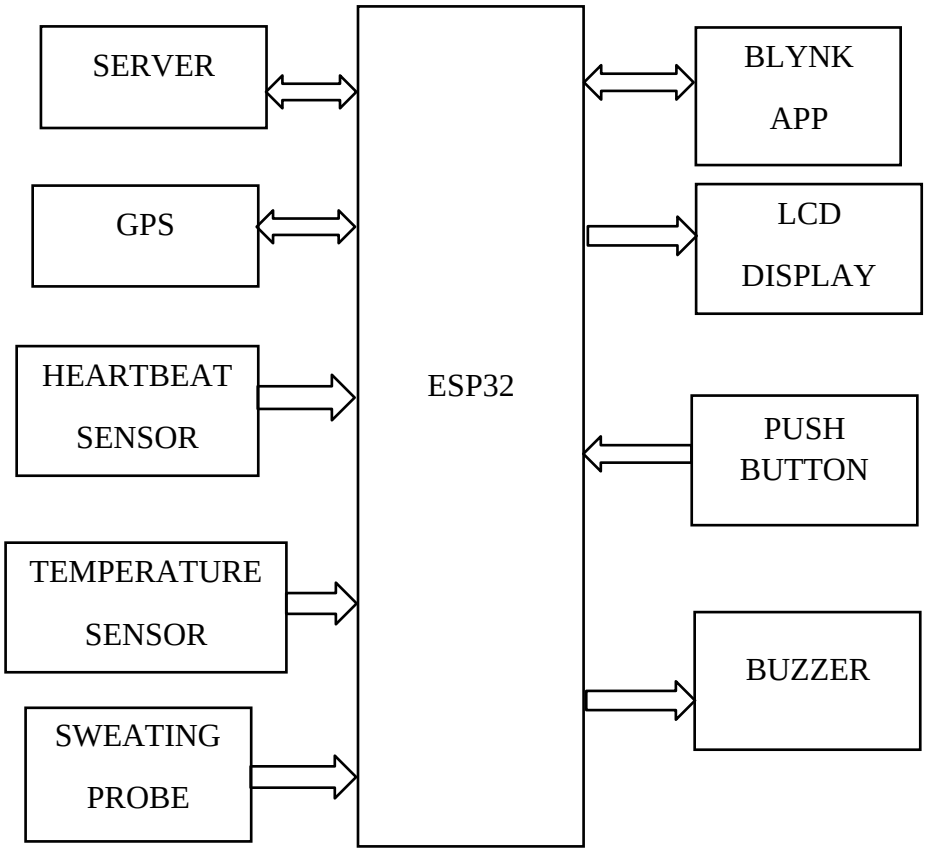

Figure 3.1: Block diagram of proposed system

Above diagram shows various functional units of the project, ESP32 module plays key role in the proposed project, it connects with server through wi-fi and receives information about scheduled events and takes respective actions, fetches information from things like GPS and sensors and populates them on Blynk server for the notice. Since it has built in ADC reads analog signals from sensors without requiring external ADC's, all status of transactions are displayed on LCD too. All units communicate with esp32 module to implement the said objectives of the project.

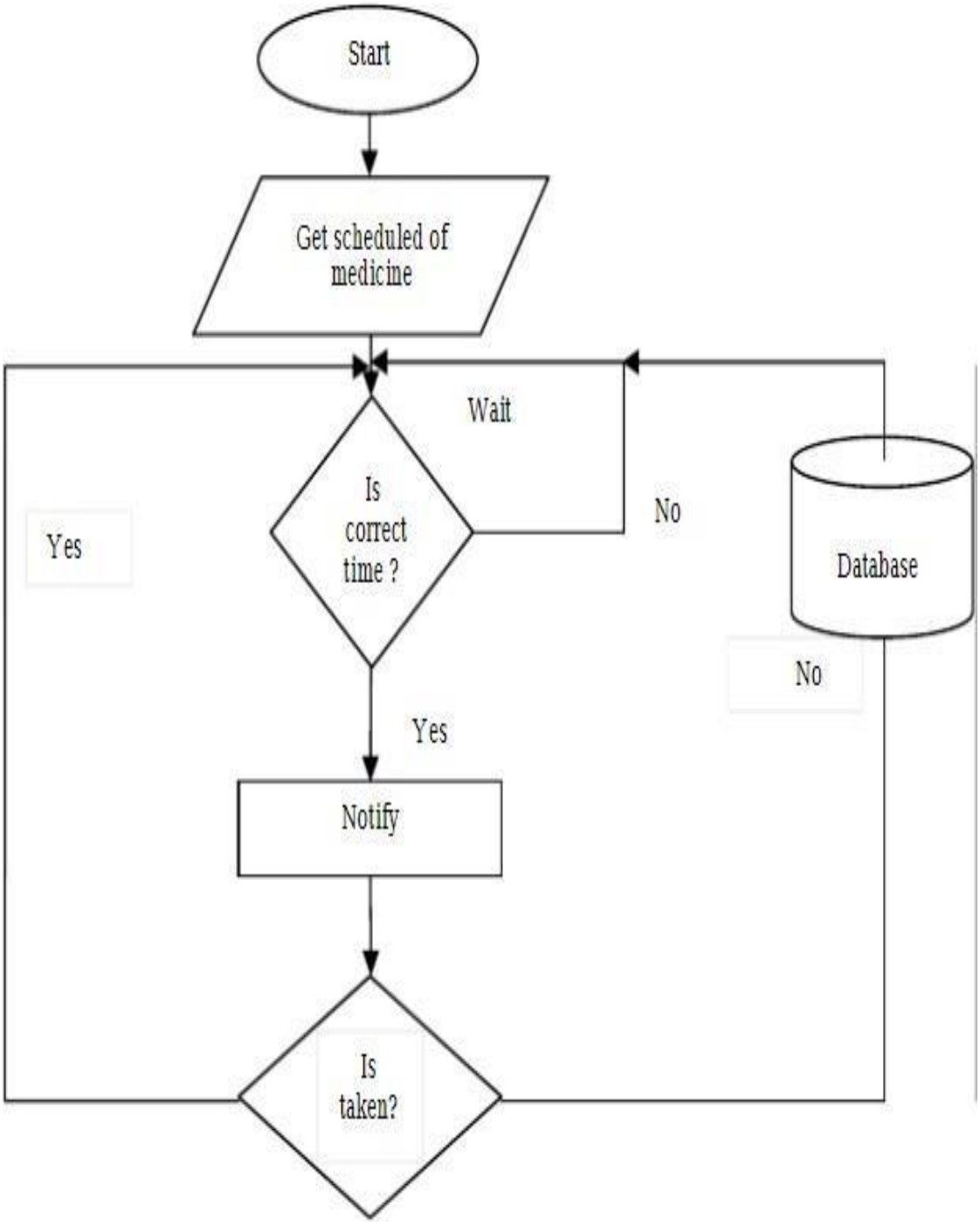

Figure 3.2: Working flowchart of Medication Reminder

Chapter 4

SYSTEM REQUIREMENTS AND SPECIFICATIONS

4.1 Software Requirements:

- Operating System - Windows 10 or Any Compatible
- IDE - Arduino
- Application - Blynk
- Web server - Apache web server
- Server scripting - PHP
- Database - Mysql
- Adding Libraries

SOFTWARE COMPONENTS REQUIRED

1. OPERATING SYSTEM

An operating system (OS) is system software that manages software resources, and provides common services for computer programs. Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources.

2. ARDUINO IDE

In this project this IDE is used to write, test and deploy C code to hardware circuit, program written using this IDE are called as sketch, each sketch is written in C or C++, this ide allowsto communicate with the circuit boards connected to USB port of the development computer.The sketch can be compiled and loaded to device connected to the pc, if code has any errors they get displayed for user's reference. Processing is an open-source computer programming language and integrated development environment (IDE) built for the electronic arts, new media art, and visual design communities with the purpose of teaching non-programmers the fundamentals of computer programming in a visual context. TheProcessing language builds on the Java language, but uses a simplified syntax and a GUI.

The parts of IDE are:

Compile: Before you program "code" can be sent to the board; it needs to be converted into instructions that the board understands. This process is called compiling.

Stop: This stops the compilation process.

Create new sketch: This opens a new window to create a new sketch **Open existing sketch:** This loads a sketch from a file on your **computerSave sketch:** This saves the changes to the sketch you are working on.

Upload to board: This compiles and then transmits over the USB cable to board.

Tab button: This lets you create multiple files in tour sketch. This is for more advanced programming then we will do in this class.

Sketch editor: This is where you write or edit sketches.

Text console: This shows you what the IDE is currently doing and is also where error messages display if you make a mistake in typing the code (syntax error) .

Line number: This shows you what line number your cursor is on. It is useful sincethe compiler gives error messages with a line number.

Figure 4.1.1: Arduino IDE

3. BLYNK APPLICATION

Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device. After downloading the Blynk app, you can create a project dashboard and arrange buttons, sliders, graphs, and other widgets onto the screen. The main focus of the Blynk platform is to make it super-easy to develop the mobile phone application. As you will see in this course, developing a mobile app that can talk to your Arduino is as easy as dragging a widget and configuring a pin. WithBlynk, you can control an LED or a motor from your mobile phone with literally zero programming. This is actually the first experiment that I will demonstrate in this course. But don't let this simplicity make you think that Blynk is only useful for trivial applications.

Blynk is a robust and scalable tool that is used by hobbyists and the industry a like. You can use it to monitor the soil humidity of your vegetable garden and turn on the water, or openup your garage door, with your phone. You can also use it to control smart furniture that can learn from your routines, or embed IoT and AI to traditional industrial products such as a boiler, or for improving the integrity and safety of oilfields. Blynk is free to use for personal use and prototyping. Their business model generates profits by selling subscriptions to businesses that want to publish Blynk-powered apps for their hardware products or services.

Figure 4.1.2: Blynk application

4. APACHE WEB SERVER

The Apache HTTP server is web server which we used to run our project and this server provides the built in MySQL there is no need of using command prompt. Apache web server we need to install then only we can execute the project. Apache web server provides local host to run our project. Apache web server is web server which provides web applications. Apache plays an important role in our project execution. It is the most important and most popular server which provides World Wide Web growth. It works for millions of web sites.

Apache web server is mainly handled by Apache Foundation. Apache web server provides service to number of working systems including UNIX, LINUX, and Microsoft Windows. Apache server is very good server which provides very good service to our chosen platforms and Apache is well comfortable with PHP language and works well with PHP language and even server-side scripting language is used in this to perform and develop the project.

Apache supports the different features to perform the operation and even Apache server isalso supported by some graphical user interface and Apache server also implements the security and digital certificates security. It is just one component that is needed in a web application stack to deliver web content. One of the most common web application stacks involves LAMP, or Linux, Apache, MySQL, and PHP. Linux is the operating system that handles the operations of the application. It is the web server that processes requests and serves web assets and content via HTTP. MySQL is the database that stores all yourinformation in an easily queried format. PHP is the programming language that works with Apache to help create dynamic web content.

Throughout the last few decades, Apache has proven to be a staple in many popularstacks and the backbone of the early internet year. Apache HTTP web servers are used by over 67% of all web servers in the world. Apache web servers are easy to customize environments, they're fast, reliable, and highly secure. This makes Apache web servers a common choice by best-in-class companies. While it's popularity is declining and the options of web server choices are increasing, Apache still plays a pivotal role in many technology stacks and companies system infrastructure.

5. PHP

PHP stands for Hypertext Pre-processor. It is a programming language used for create active web pages. Program written in PHP must be saved with file extension .PHP in the root directory of the web server, to execute PHP programs we need a web server called "Apache Web Server". User communicates with dynamic web page so that they get the customized information. MySQL access the data generated by using a dynamic web page.HTML can alsocombine/embed PHP tags .PHP language is a user friendly and coding of PHP language is easy compare to other language. PHP is close to Perl and JavaScript; PHP arrays are differentfrom other language and are then introduced by a description of PHP's function and their parameter passing mechanisms. PHP is at the present urbanized, disseminated, and supportedas an open- source product. PHP code is usually processed on a web server by a PHP interpreter implemented as a module, a daemon or as Common Gateway Interface (CGI) executable. On a web server, the result of the interpreted and executed PHP code – which may be any type of data, such as generated HTML or binary image data – would form the whole or part of an HTTP response. PHP code can also be directly executed fromthe command line.

A PHP processor is now resident on most web servers. It is a server-side scripting language is of course used for kind managing and information entrée. Information entry has been a first-rate focus of PHP development as a result, it's driver support for fifteen totally special information system. PHP supports the general electronic message protocol POP3 and IMAP. It conjointly spread object architecture COM and CORBA. Once a browser request associate degree XHTML document that has PHP script, the net server that gives thedocument includes PHP script by the extension. once the PHP processor finds XHTML codeit input data, it merely copies it to the computer file.

PHP is typically strictly taken, as is that the case by JavaScript. Fresh PHP implementation`s do some recompilation, a minimum of on advanced script, that will increase the speed of understanding. there's an oversized assortment of functions for making and manipulate PHP's array. PHP supports each procedural and object-oriented programming. several of predefined functions area unit want to give interfaces .

6. MYSQL

It is accessible for all wide used computing platforms. MySQL software package and documentation n are often downloaded from http://www.mysql.org. Some UNIX system distributions, like the one from Red Hat, embrace MySQL. Once you've got with success logged into MySQL, it's able to receive command. If the MySQL, info to be accessed alreadyexists however its name wasn't enclosed once work into they use command are often accustomed concentrate on the info of interest. If a replacement info is to be created, the infoitself should be created initial so the tables that may create the tables. the opposite MySQL commands that are required here- INSERT, SELECT, Drop, Update and Delete- are all the implementations- of the matching SQL -commands. There are several -tools accessible to assist in info administrations example MYSQL administrator may be a program that performs configuring, monitoring, beginning and stopping`, a My-SQL server, organization user and associations, playing backups`, and a number of other body tasks.

MySQL is based on a client-server model. The core of MySQL is MySQL server, which handles all of the database instructions (or commands). MySQL server is available as a separate program for use in a client-server networked environment and as a library that can be embedded (or linked) into separate applications.

MySQL operates along with several utility programs which support the administration ofMySQL databases. Commands are sent to MySQL Server via the MySQL client, which is installed on a computer. It was originally developed to handle large databases quickly. Although MySQL is typically installed on only one machine, it is able to send the databaseto multiple locations, as users are able to access it via different MySQL client interfaces. These interfaces send SQL statements to the server and then display the results.

MySQL enables data to be stored and accessed across multiple storage engines, including CSV and NDB. MySQL is also capable of replicating data and partitioning tables for better performance and durability. MySQL users aren't required to learn new commands;they can access their data using standard SQL commands.

a. Adding Libraries

Processing 3.0 includes a set of features to make it easier to install, update, and remove libraries , tools , modes , and examples .Add a contributed library by selecting "Add Library..." from the "Import Library.." submenu within the Sketch menu. This opens the Library Manager. Next, select a library and then click on Install to download it. Add a contributed tool by selecting "Add Tool." from the Tools menu, then select a Tool to download from the Tool Manager. Add contributed modes by selecting "Add Mode..." from the Mode menu in the upper-right corner of the PDE, then select a Mode to install. Add contributed Examples by first opening the "Examples." submenu from the File menu. Click on the Add Examples button to open the Examples Manager.

4.2 Hardware Requirements:

1. Liquid Crystal Display
2. Buzzer
3. GPS
4. Sweating probe
5. Temperature
6. Heartbeat sensor
7. Esp 32 module
8. Push button

HARDWARE COMPONENTS REQUIRED

1. LCD

LCD is a type of flat panel display which uses liquid crystals in its primary form of operation. 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 ina 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.

LEDs have a large and varying set of uses cases for consumers and business, as they canbe commonly found in smartphones, televisions, computer monitors and instruments panels. LCDs were a big leap in terms of the technology they replaced, which include light- emitting diode and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight. The LCD screen is more energy-efficient and can be disposed of more safely than a CRT can. Its low electrical power consumption enables it to be used in battery-powered electronic equipment more efficiently than a CRT can be. By 2008, annual sales of televisions with LCD screens exceeded sales of CRT units worldwide, and the CRT became obsolete for most purposes.

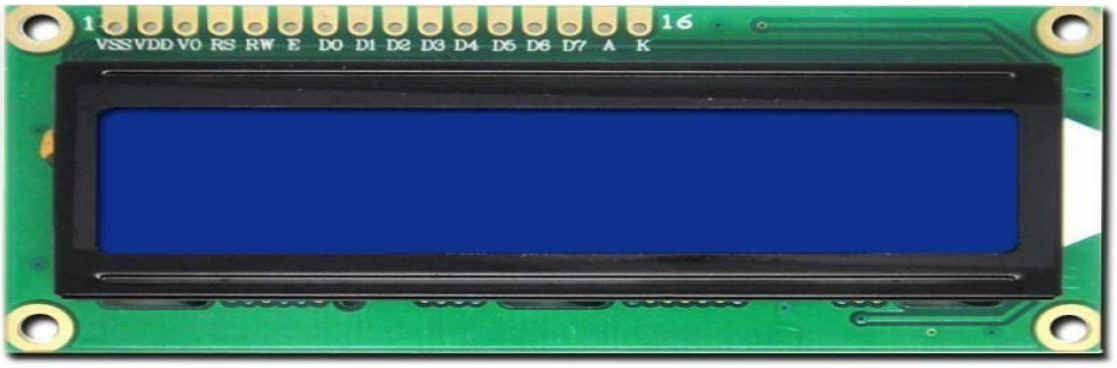

Figure 4.2.1: Liquid Crystal Display

Each pixel of an LCD typically consists of a layer of molecules aligned betweentwo 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. The chemical formula of the liquid crystals used in LCDs may vary. Formulas may be patented. An example is a mixture of 2-(4-alkoxyphenyl)-5-alkylpyrimidine with cyanobiphenyl, patented by Merck and Sharp

Corporation. The patent that covered that specific mixture expired. Most color LCD systems use the same technique, with color filters used to generate red, green, and blue subpixels. The LCD color filters are made with a photolithography process on large glass sheets that are later glued with other glass sheets containing a TFT array, spacers and liquid crystal, creatingseveral color LCDs that are then cut from one another and laminated with polarizer sheets. Red, green, blue and black photoresists (resists) are used.

2. BUZZER

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. The pin configuration of the buzzer includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-' symbol or short terminal and it is connected to the GND terminal. Buzzers can be categorized as active and passive ones (see the following picture). Turn the pins of two buzzers face up, and the one with a green circuit board is a passive buzzer, while the other enclosed with a black tape is an active one.

Figure 4.2.2: Buzzer

The difference between an active buzzerand a passive buzzer is, an active buzzer has a built-in oscillating source, so it will make sounds when electrified. But a passive buzzer does not have such source, so it will not tweetif DC signals are used; instead, you need to use square waves whose frequency is between 2K and 5K to drive it. The active buzzer is often more expensive than the passive one because of multiple built-in oscillating circuits. The working

principle of a buzzer dependson the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors. Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

3. GPS

The Global Positioning System (GPS), originally Navistar GPS, is a satellite-based radio navigation system owned by the United States government and operated by the United States Space Force. Obstacles such as mountains and buildings can block the relatively weak GPS signals. The GPS does not require the user to transmit any data, and it operates independently of any telephonic or Internet reception, though these technologies can enhance the usefulness of the GPS positioning information.

Figure 4.2.3: GPS Module

The GPS provides critical positioning capabilities to military, civil, and commercial users around the world. The United States government created the system, maintains and controls it, and makes it freely accessible to anyone with a GPS receiver. The GPS receiver calculates its own four-dimensional position in spacetime based on data received from multiple GPS satellites. Each satellite carries an accurate record of its position and time, and transmits that data to the receiver. The satellites carry very stable atomic clocks that are synchronized with one another and with ground clocks. The satellite locations are knownwith great precision. GPS receivers have clocks as well, but they are less stable and less precise.

Since the speed of radio waves is constant and independent of the satellite speed, the time delay between when the satellite transmits a signal and the receiver receives it is proportional to the distance from the satellite to the receiver. At a minimum, four satellites must be in view of the receiver for it to compute four unknown quantities (three position coordinates and the deviation of its own clock from satellite time).

4. SWEATING PROBE

Sweat is a biological fluid — like blood, saliva and urine — that contains metabolites, electrolytes, proteins and hormones. The levels of these vary depending on a person's health. Wearable sweat sensors have been developed to track users' health condition and monitor the levels of these substances (known as analytes) in sweat.

Lactate is considered an important biomarker thanks to its involvement in anaerobic metabolism. The undesired accumulation of lactate in muscles can result in fatigue, so changes in the concentration of lactate in sweat can be used to monitor fatigue. At Simon Fraser University's Additive Manufacturing Laboratory, we have developed a flexible sensor for sweat lactate.

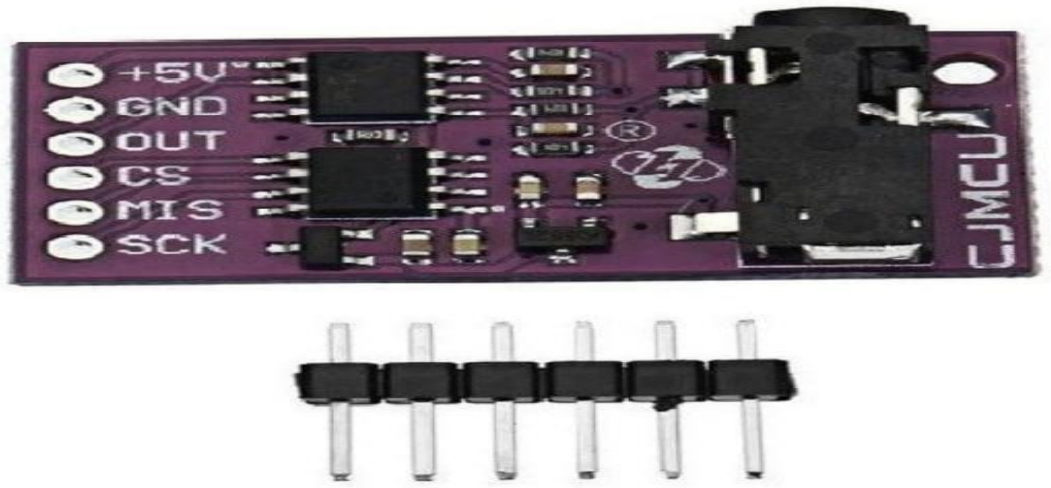

Figure 4.2.4: Sweat Probe

The benefit of using wearable sweat sensors is the capability for real-time, non-invasiveand continuous monitoring of sweat. However, there are still challenges that must be overcome for practical biomedical applications such as diagnosis of health conditions.

Users can specifically monitor targeted analytes in real-time by non-invasive sweat

sensing. This can save time, energy and resources by helping people avoid painful and inconvenient invasive tests, improving health and living standards, and receiving medical assistance in a timely manner.

Wearable sweat sensors are a powerful solution for monitoring daily health, and could support the prevention, diagnosis, treatment and prognosis of diseases.

5. TEMPERATURE SENSOR

Temperature sensors enable accurate non-contact temperature measurement in medical applications. Temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature or the temperature of solid matter. There are different types of temperature sensors available and they each use different technologies and principles to take the temperature measurement. The most common applications for this type of temperature sensor is measuring ear temperature, forehead temperature, or skin temperature. The sensing element is composedof multiple thermocouples on a silicon chip to measure an object's infrared energy.

Figure 4.2.5: Temperature sensor

TE packages and customizes thermopiles in various package sizes and with different wire lengths to accommodate customer needs. When selecting a temperature sensor for use in your application you should take the following into consideration; Temperature range -different temperature sensors can measure different rangesand might be more accurate over a certain range. Make sure you check the range of the temperature sensor and the expected range of your application before purchasing. Accuracy and stability- our application may require a certain degree of accuracy; thermocouples have a higher variance in long term stability compared to thermistors and RTDs, so this is something to be aware of. The temperature sensor with the

highest accuracy tends to be the glass coated NTC thermistors.

6. HEARTBEAT SENSOR

It is used to measure the heart rate i.e., how many times the heart beats (speed). Generally, body temperature is measured with a thermometer, and blood pressure is measured with Sphygmomanometer. Nowadays, heartbeat sensors are used in smartwatches, smartphones. Heartbeat rate can be monitored in two ways. By checking the pulse and by using a heartbeat sensor.

Figure 4.2.6: Pulse Sensor

This sensor can be monitored using Arduino. Most of the athletes, patients are worriedabout their heartbeat. This monitoring is to determine the condition of the heart. Checking heartbeat using a heartbeat sensor is the updated one. It is easier to monitor the heart rate by using this sensor.

The main principle involved in a heartbeat sensor is Photoplethysmography. The change in volume of blood in an organ is measured by the change in the intensity of the light which is passing through the respective organ. IR LED is the source of light used in the heartbeat sensor. An LDR, Photodiode, and phototransistor are the detectors used. The sensor can be attached to the finger or ear. With the light source, the transmissive sensor is arranged. In this sensor, the light source and the detector are facing each other and the finger of the person must be placed in between the transmitter and receiver. The reflective sensor has the light source and detector are adjacent to each other andthe finger must be placed in front of the sensor.

7. ESP 32 MODULE

The ESP32 is a very versatile System On a Chip (SoC) that can be used as a general purpose microcontroller with quite an extensive set of peripherals including WiFi and Bluetooth wireless capabilities. It is manufactured by Shanghai-based Espress if Systems, and costs less than $5. Although the ESP32 is a SoC, most users will not start by using just the ESP32 chip itself. While it is possible to design a product using the ESP32 SoC, this is not a common approach. Instead, most ESP32-based designs use pre-made modules that consist of an actual ESP-32 SoC, external flash memory, and a crystal and pre-tuned PCB antenna or an IPEX antenna connector.

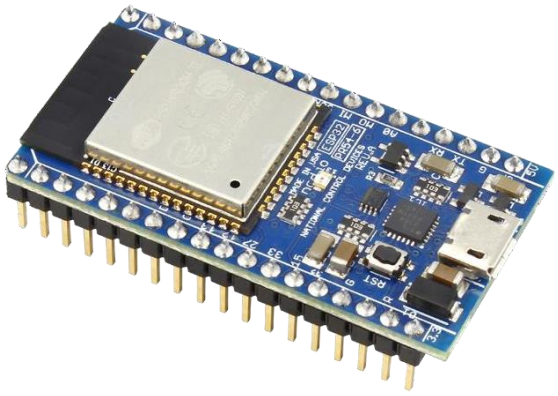

Figure 4.2.7: ESP 32 module

The whole assembly is then placed under a shielded can (figure 2). This module is made by Espressif itself, and this link shows several versions. One big advantage to using this module instead of designing from scratch is that Espressif has already pre-loaded the low-level device drivers, the wireless protocol stacks for WiFi b, g, n, Bluetooth and BLE, and free RTOS as the base OS.

In addition, a bootloader has also been loaded to allow for relatively easy downloading of user applications. It allows direct connection to a desktop PC that can then be used to compile, download, and run programs directly on this module. Figure 3 shows two such development modules from different manufacturers.

8. PUSH BUTTON

A push-button (also spelled pushbutton) or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state.

Figure 4.2.8: Push Button

Chapter 5

IMPLEMENTATION

5.1 GPS TRACKING

- For monitoring GPS Location we will use Blynk Application.
- Setting Up Blynk Application:

Figure 5.1.1: Blynk Installation

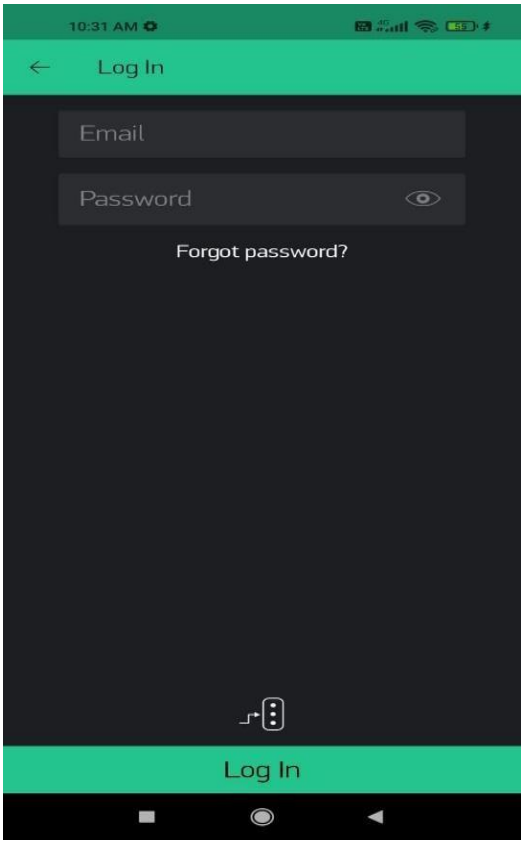

Figure 5.1.2: Creating an account

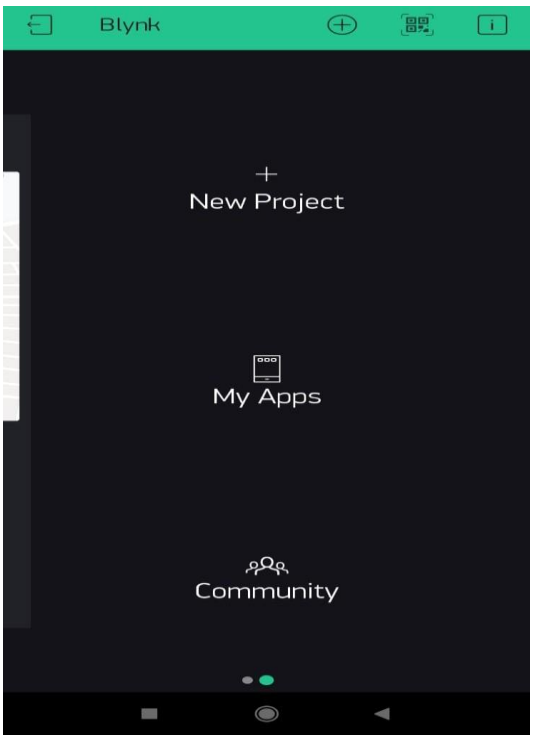

Figure 5.1.3: Dashboard

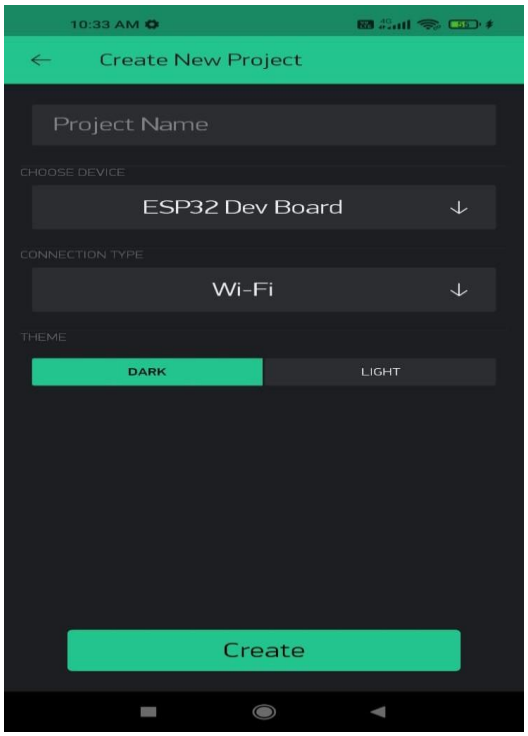

Figure 5.1.4: Creating a project

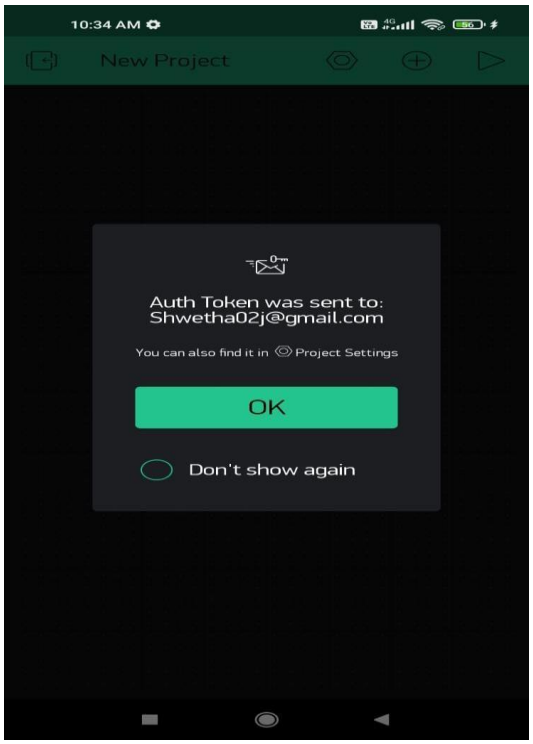

Figure 5.1.5: Authentication ID

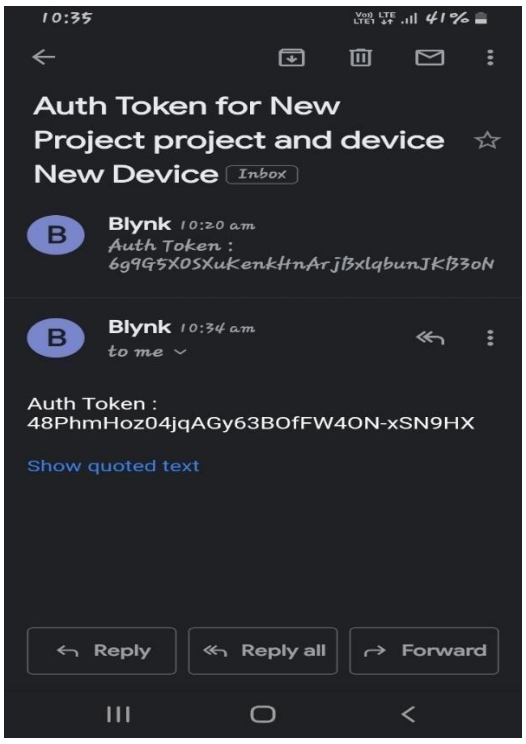

Figure 5.1.6: Authentication token in mail

- The code for GPS Tracking System is written in Arduino IDE. The code is written by combining TinyGPS Library example and Blynk example code.
- We need following two libraries for the code compilation. You can download these libraries and add it to the Arduino Library Folder.

  TinyGPS++ Library BlynkSimpleEsp32.h Library

```
char auth[] = "************************";          //Blynk Authentication Token
char ssid[] = "************************";          // WiFi SSID
char pass[] = "************************";          // WiFi Password
```

- After uploading the code, open Serial Monitor. The ESP32 will try connecting to the WiFi Network. Once it connects to the WiFi Network, the GPS Module will start scanning the nearest Satellite. It might take time to retrieve location based on your indoor-outdoor condition.

INTERFACING GSM MODULE TO ARDUINO

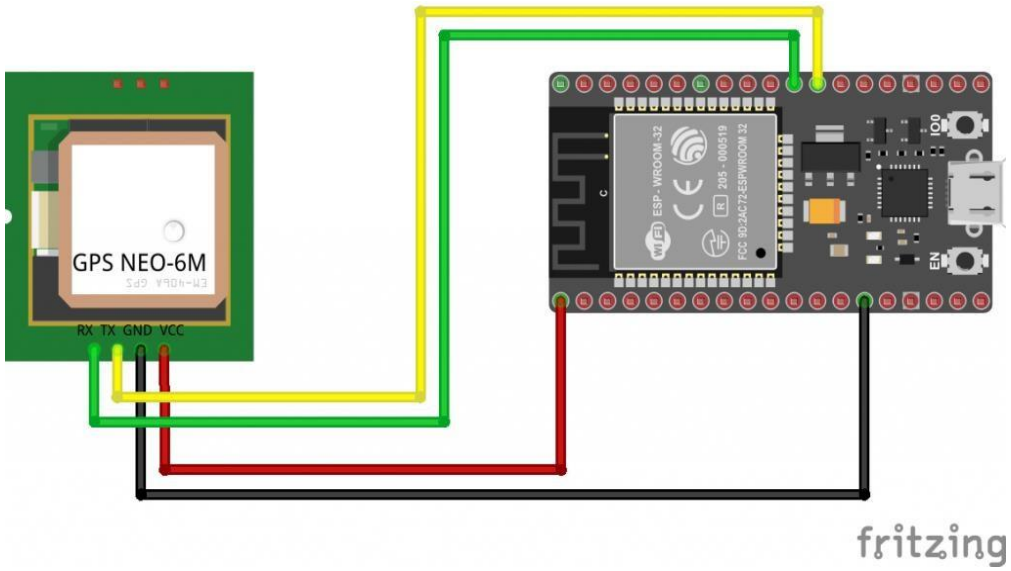

Figure 5.1.7: Interfacing GPS module to ESP 32

Connect the GPS ground pin to the ESP32 ground pin. Now, connect the RX pin of the GPS module to the TX pin of the ESP32. Similarly, connect the TX pin of the GPS module to theRX pin of the ESP32 (RX and TX pins of the ESP32 are defined in the software). Last, connect your ESP32 to the computer through a USB cable.

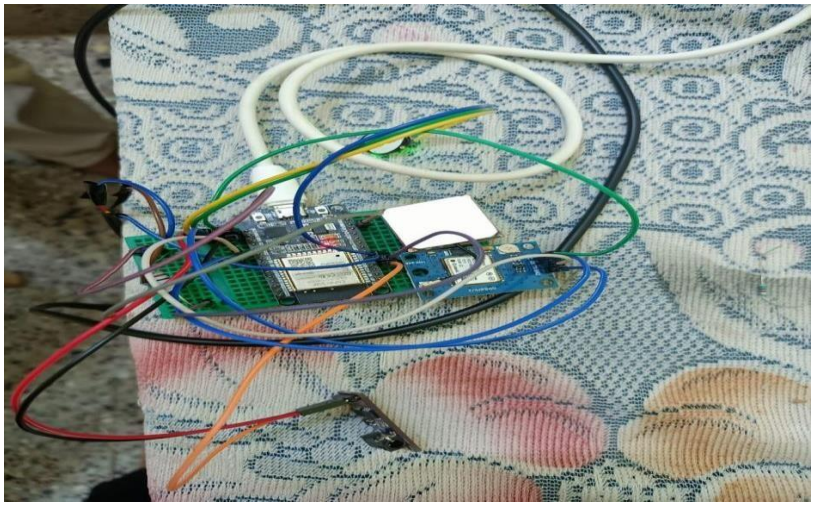

Figure 5.1.8: Implemented model of GPS tracking

5.2 HEART BEAT MONITORING

Installing Pulse Sensor Library

- Open your Arduino IDE and go to File > Examples > Pulse Sensor Playground > Getting Started Project. The program code will open.
- Inside the setup() function, the serial connection is opened at a baud rate of 115200.

```
Serial.begin(115200)
```

- Inside the loop() function, first by using analog Read() on the A0 pin the ADC signal data will get saved in the 'val' variable.

```
int val=analogRead(inputpin)
```

- Next, print this value in the serial monitor/serial plotter for debugging purposes and can also be used to set the threshold value.
- The following lines of code will check whether the value saved in the val variable is greater than the set threshold value. If it is, then an alert message will pop-up in blynk app**.**

```
if( val > 50 )
{
    Blynk.notify("BPM changing
            abruptly")
}
```

- Upload the code to ESP32.Once the code is uploaded to board, place finger on the sensor. Now if the heart beat is greater than the threshold then an alert message will be given in blynk app to the authorized person.

INTERFACING ESP 32 TO PULSE SENSOR

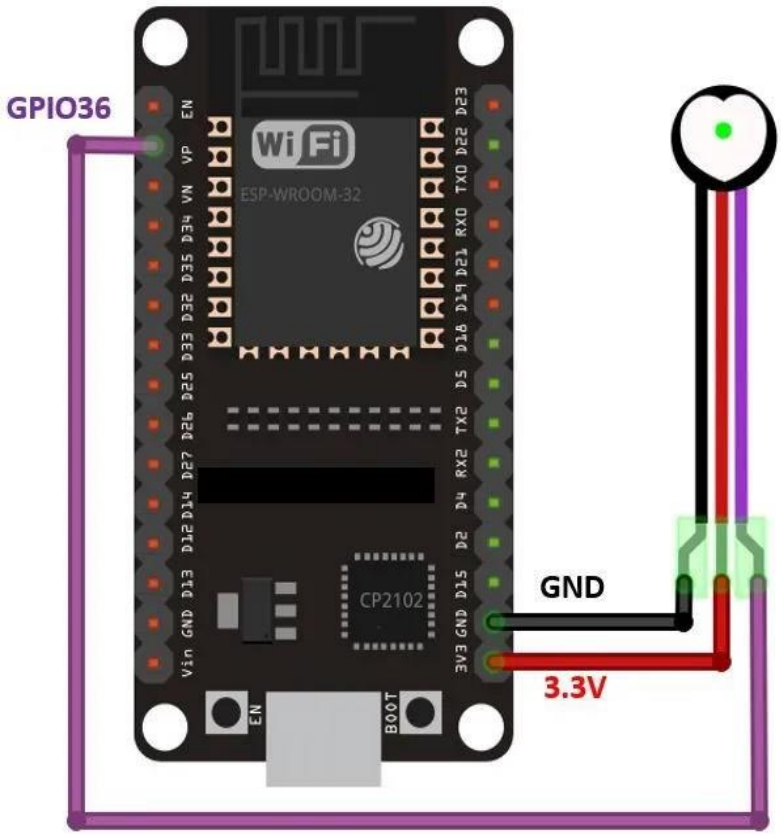

Figure 5.2.1: Interfacing ESP 32 to Pulse Sensor

As the pulse sensor requires an operating voltage in the range of 3.3-5V hence we will connect the VCC terminal of the sensor with 3.3V pin of the ESP32 board. Both the grounds will be in common. Additionally, the analog signal pin of the sensor will be connected with ADC_CH0 pin i.e. GPIO36 of the ESP32.

5.3 MEDICATION REMINDER

INTERFACING ESP32 TO BUZZER

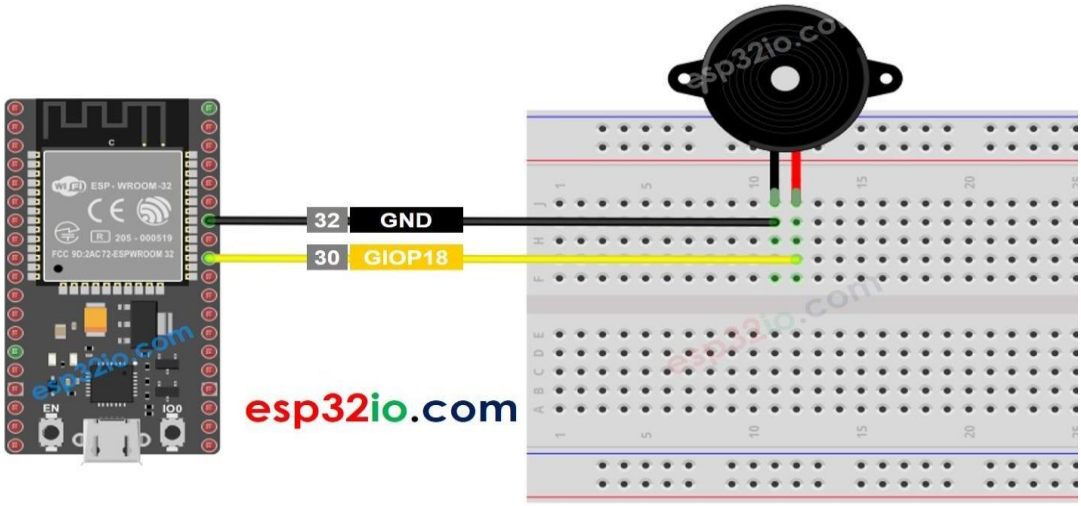

Figure 5.3.1: Interfacing ESP32 with Buzzer

Start the wiring by connecting the 3V3 pin of the ESP32 microcontroller to the positive pole of the buzzer. The negative pole of the active or passive buzzer is connected to the ground.

INTERFACING ESP 32 TO LCD

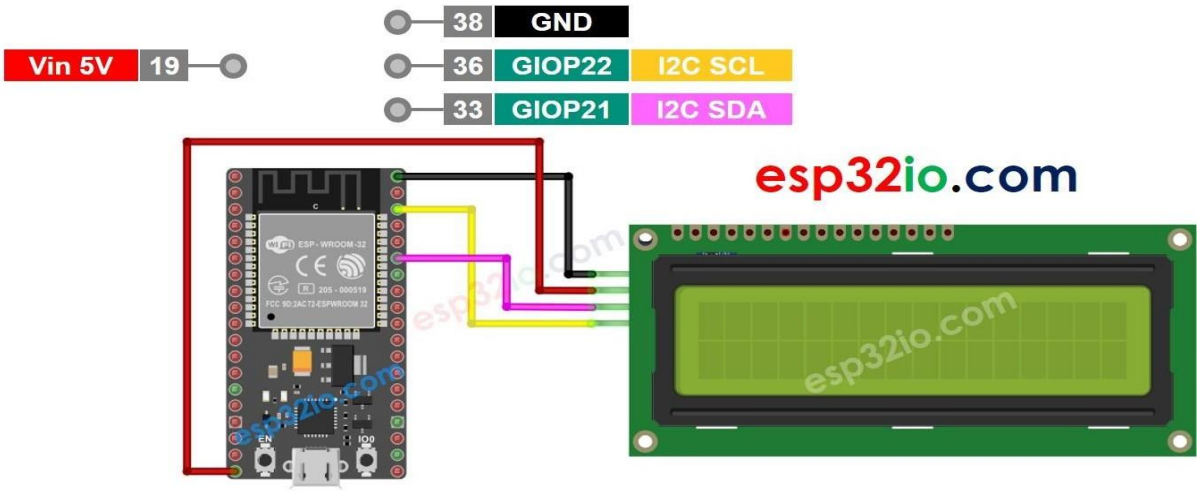

Figure 5.3.2: Interfacing ESP32 to LCD

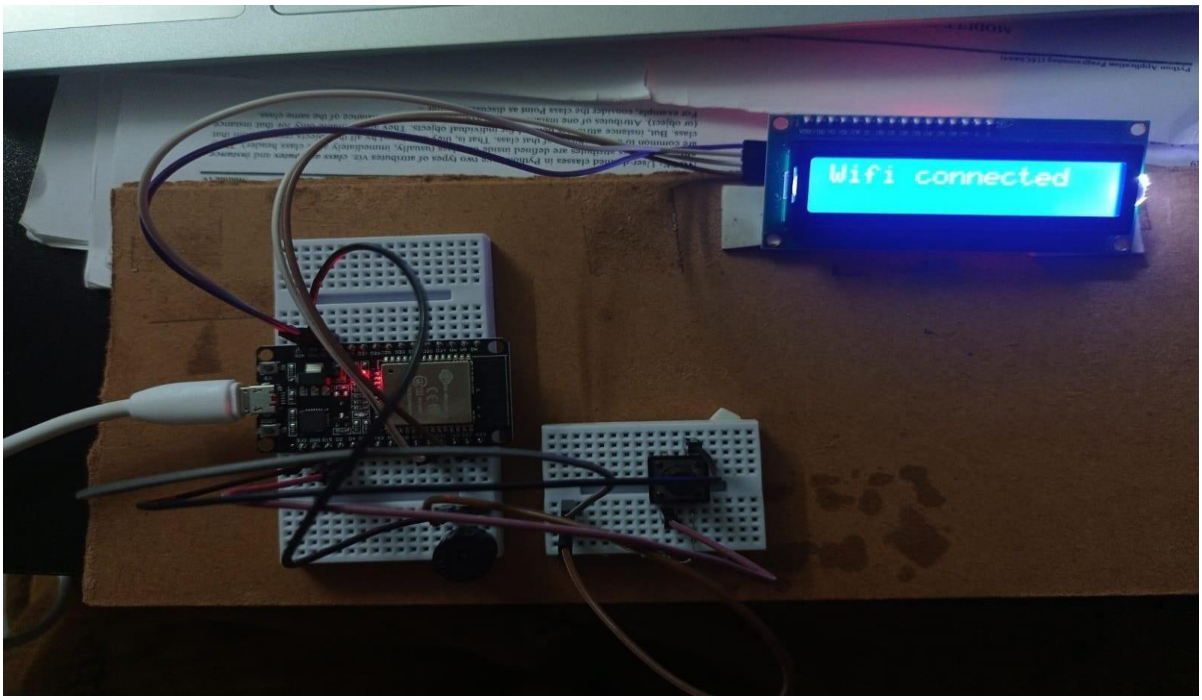

Figure 5..3.3: Implemented model of Medication Reminder

Chapter 6

RESULT ANALYSIS

6.1 MEDICATION REMINDER DASHBOARD RESULTS

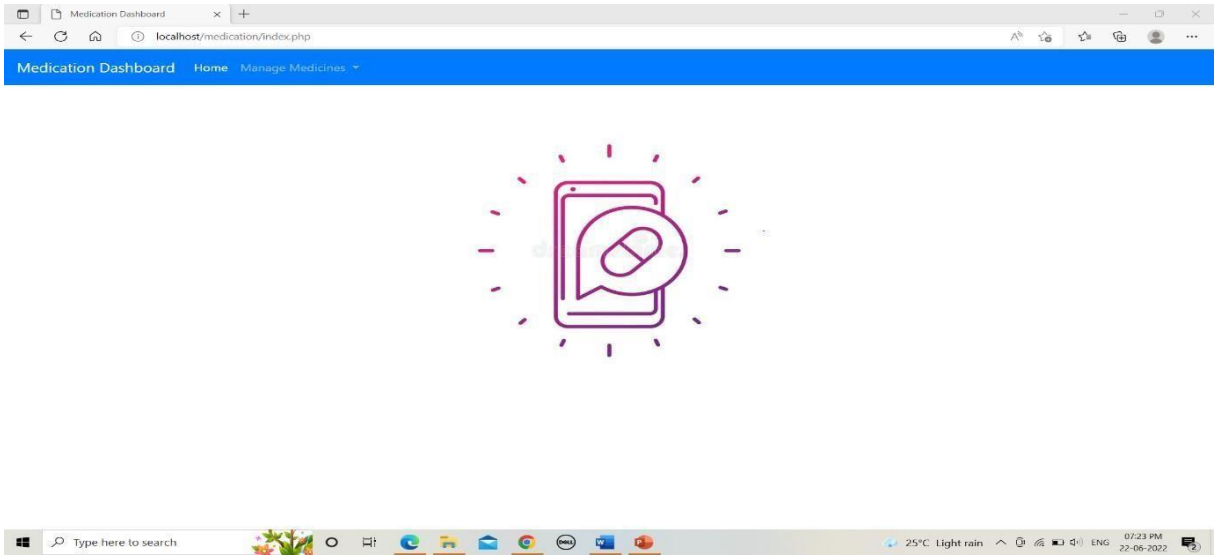

Figure 6.1.1: Dash Board

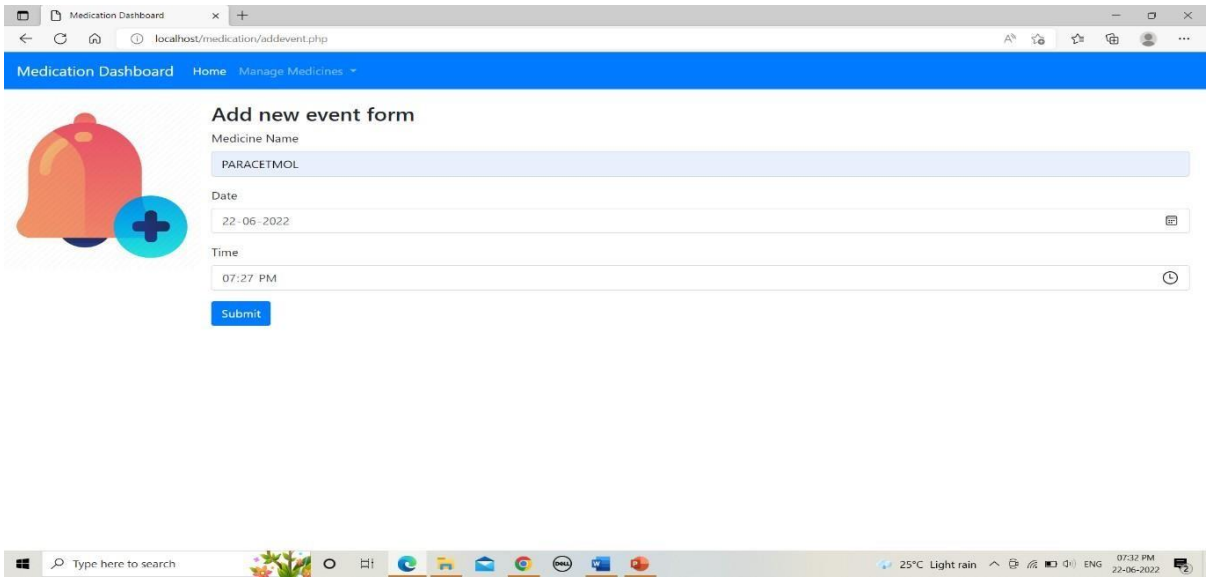

Figure 6.1.2: Add new event page appears by selecting add new event frommanage medicine downtag.

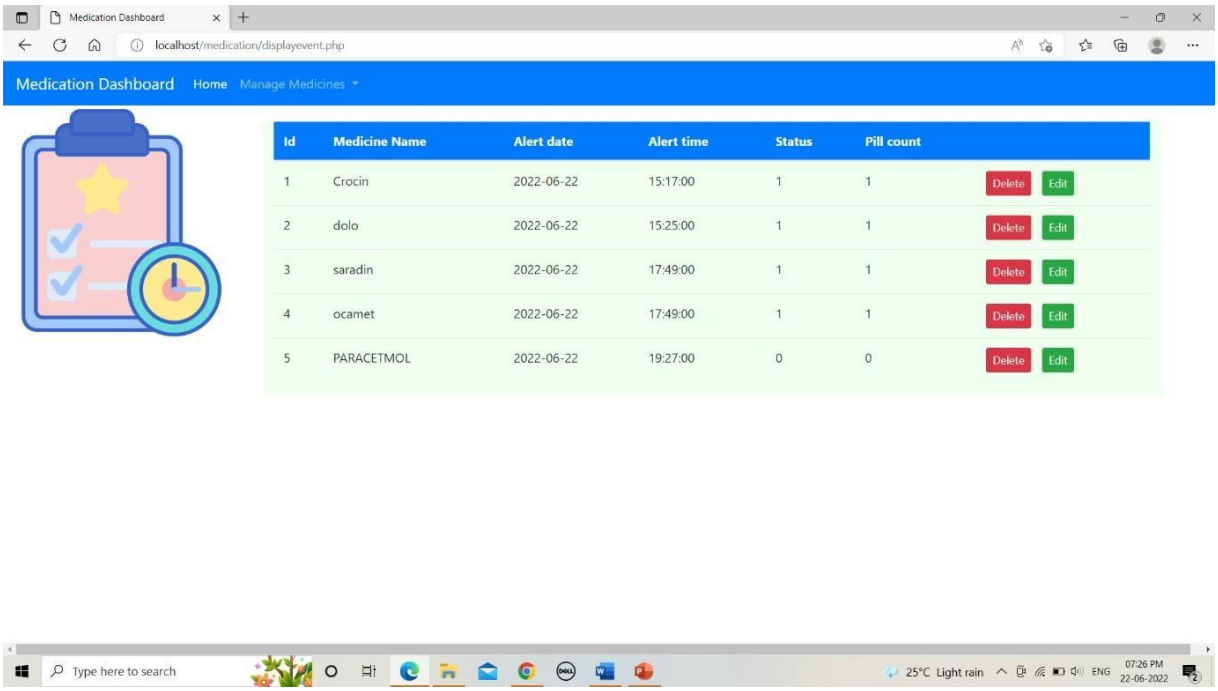

Figure 6.1.3: Event list page

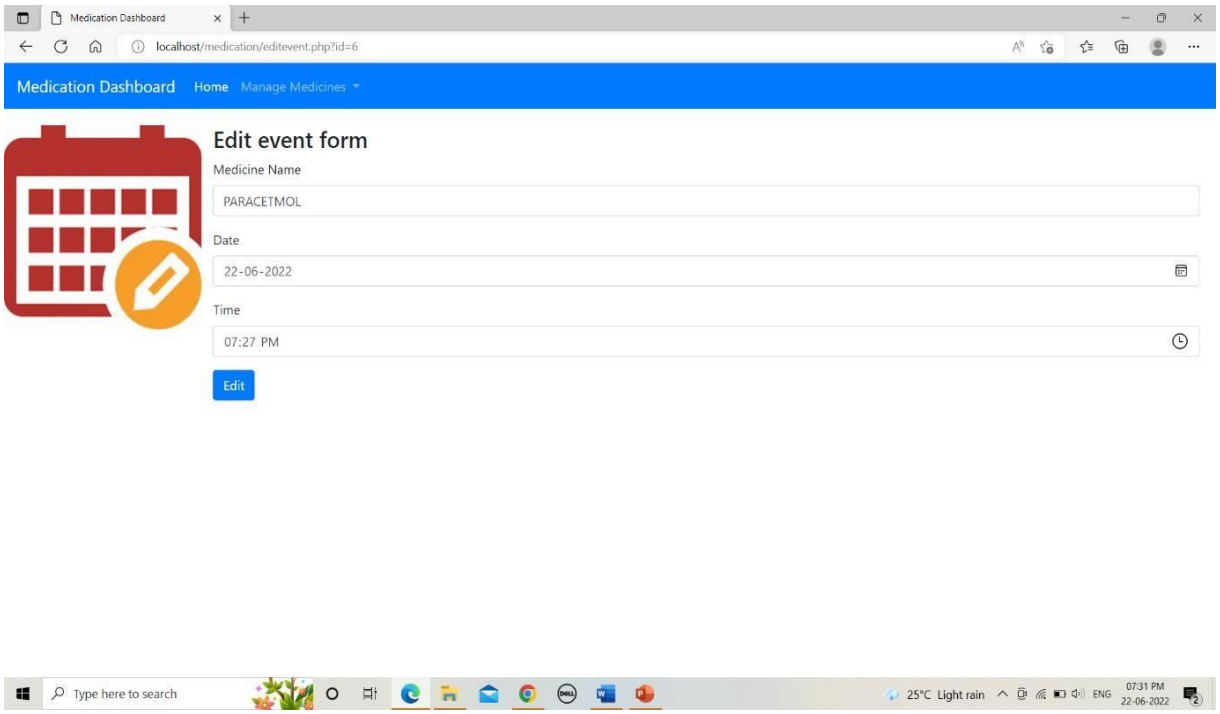

Figure 6.1.4: Edit event form page

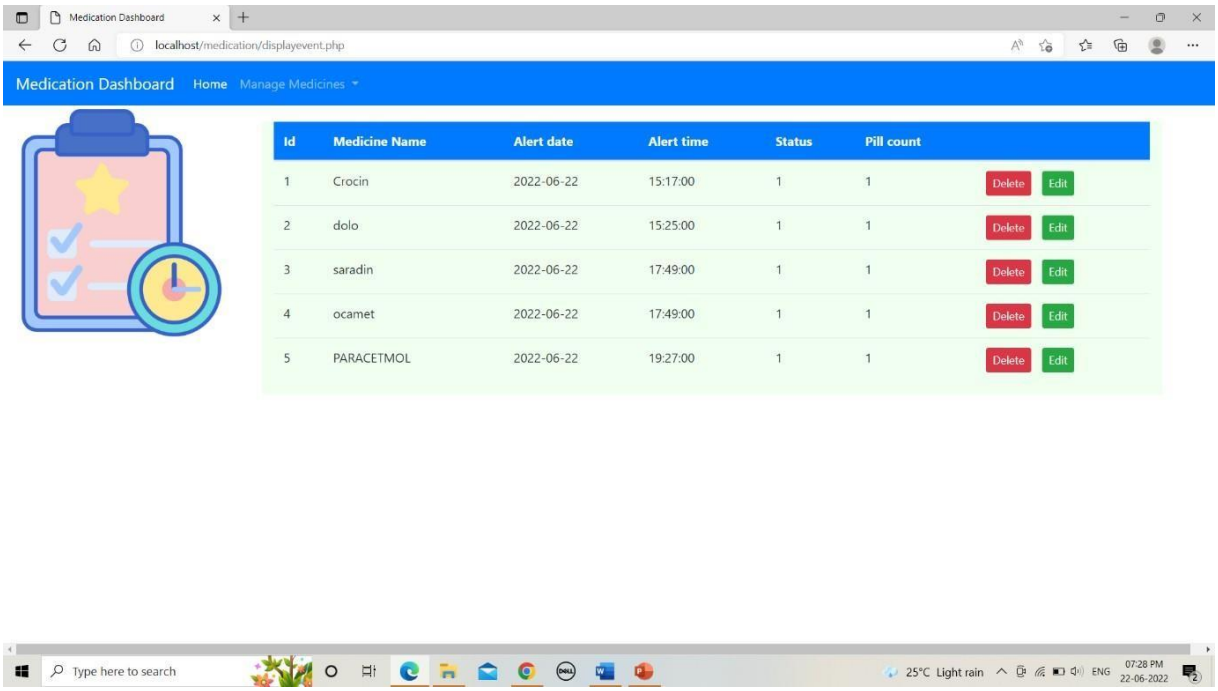

Figure 6.1.5: Status and pill count of the added medicine in the event list page is updated

6.2 MEDICATION REMINDER MODEL RESULTS

Figure 6.2.1: Initial display in LCD when power is ON

Figure 6.2.2: Display on LCD when no event is added

Figure 6.2.3: When the added event is displayed on the LCD with the Buzzer sound.

6.3 GPS TRACKING AND BLYNK APP RESULTS

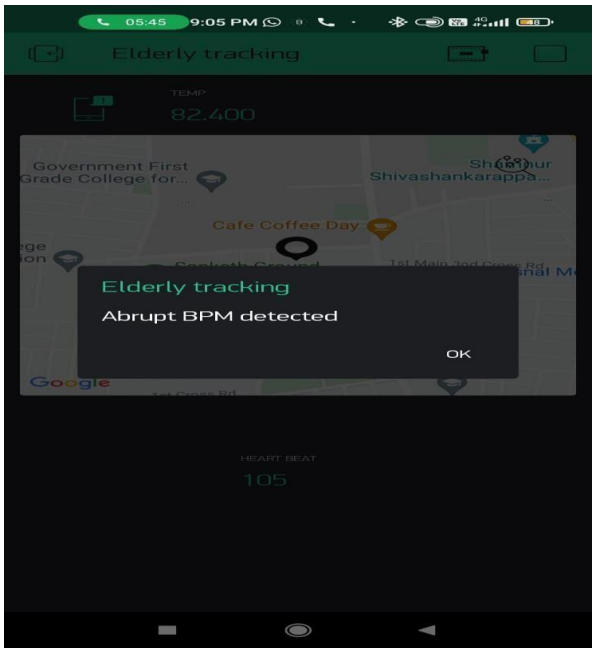

Figure 6.3.1: Abrupt BPM detected

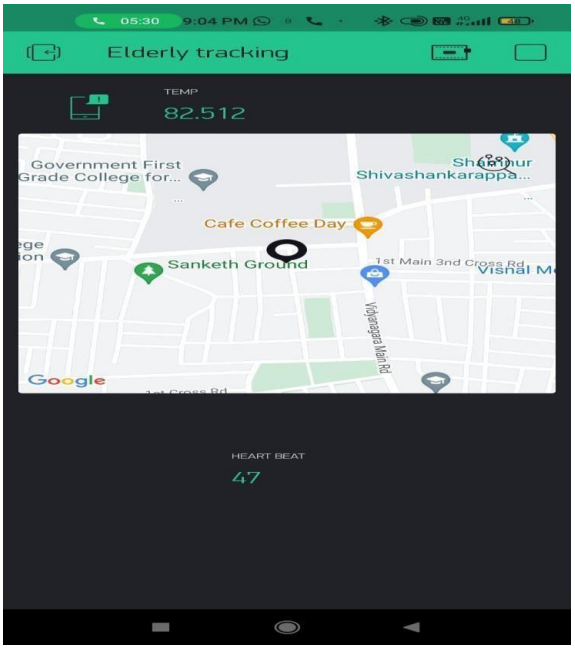

Figure 6.3.2: GPS location and temperature and heartbeat values are displayed in blynk app

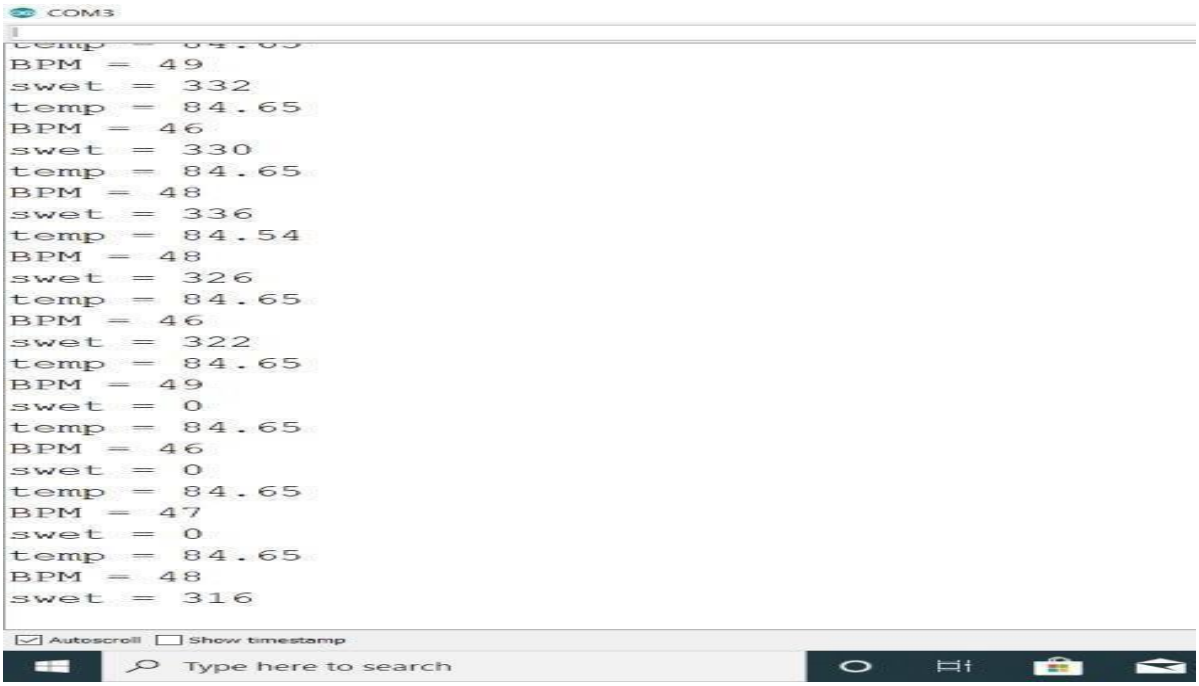

Figure 6.3.3: Serial monitor showing all the three values (temperature, BPM and sweat).

Chapter 7

ADVANATAGES AND DISADVANTAGES

7.1 ADVANTAGES

1. A medication reminder and organizer can help to prevent these life-threatening mistakes. They remind one to take the right medication at the right time.
2. The system focuses on improving the rate of attendance at healthcare appointments.
3. The personal phone notifications and reminders are a strong supporting tool in improving medication adherence strategies.
4. It supports an easy implementation as it is less expensive, reliable, scalable, accessible to anyone with smartphones, and do not require separate devices, packaging or extra hardware.
5. Navigation system which will allow users to locate the person precise location.

7.2 DISADVANTAGES

1. It is for limited purposes.
2. Needs industry level sensors for more accuracy.
3. It needs constant network facility.

Chapter 8

APPLICATIONS

1. The IoT enabled system will generate an alert so that the patient can take required medicine at proper time.
2. There is one confirmation key provided in the system, by pressing that key caretaker of the patient will come to know that the medicine has taken by looking at dashboard.
3. There are three sensors used for heartbeat measurement, temperature measurement and sweating measurement. If the values which are given by the sensors increases beyond the reference values then alert will be given to the caretaker of the patient and can get the precise location of the person.

Chapter 9

CONCLUSION AND FUTURE SCOPE

9.1 CONCLUSION

A design of an IoT based medication system is proposed which was designed to serve aged peoples and independently living patients, to notify about the medications that to be taken at different intervals. The system gets atomized by Arduino and can monitor the patients medication. The proposed system assist elderly to take medicines at right time and the caretaker can monitor using dashboard created. In any undesirable situations where the elderly person's temperature or sweating or heart beat increases then an alert message is sent to the caretaker and the precise location to the blynk app so that the abrupt situations can be avoided.

9.2 FUTURE SCOPE

Many Medication Reminder Systems have been developed on different platforms. Many of these systems require special hardware devices to remind the patients about the medicine in-take timings. Purchasing new hardware devices becomes costly and more time and money consuming. So in the given work an attempt has been made to implement a system which is economical, easily accessible and improves medication adherence. Medication non-adherence reduces the effectiveness of a treatment and imposes a financial burden on health care systems. The patients will get the schedule of medicine in-take time with medicine description, starting and ending date of medicine, notification through message or email, automatic alarm ringing system and navigation system. The scheduled reminder will not suggest any kind of medicine which is not prescribed by the doctor that will assure the safety of the patient and also will avoid wrong dosages. The patients can also search doctors disease wise (depending upon the specialization of the doctor), which provides easy searching facilityto the users and saves the time. Doctors can view all the fixed appointments along with date and time, which he fixed and through this he can make new appointment schedules. Also, interaction between patients and doctors through video calling and secure prescription will be focused upon. Some more ways to achieve medication adherence will be focused.

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