

Chapter One

Introduction

1. Introduction

Internet of Things (IoT) is regarded as the next big thing in the global technological development after the Internet. In the current scenario, any physical thing has the potential to be connected to the internet and there has been a lot of demand in the fields of agriculture, health and industries. The development of technology in healthcare systems is increasing day-by-day at the same time many new diseases are being found to be spreading.

Today, in-home 24-7 healthcare monitoring and supervisory facilities demand a great amount of money and human labor. This, added with the innate forgetfulness of the human mind can result in grave irregularities, often leading to negligence, critical situations and despair.

Often we cannot comprehend the harm we inflict on our body by not taking pills at the right time, delaying intake or leaving it midway altogether, or even erroneously taking the wrong dosage.

While automation and technology has helped in some of the key sectors to remove human error and achieve a desired level of efficiency, taking pills at the right time is still not seen as an area which could be synchronized by modern technology.

Currently, the monitoring of patients is hospital-centered which is a tedious and disturbs their daily schedule. Hence, a home-centered monitoring solution is proposed.

In this system, the patient can send status of his health condition with the help of bio-sensors like electrocardiogram (ECG), blood pressure (BP), body temperature through a wireless communication network. This data is sent to higher level system using end-to-end encryption and stored in a database, where it is analyzed and stored securely.

1.1 Problem Statement

- This is a simple IOT device using a Micro controller to receive inputs and send outputs. In the proposed system IOT were used to intimate the patients to take medicine on time by using a buzzer sound and the name of the medicine is displayed on the LCD screen along with the dosage of the medicine. This system gets the external input from the IOT devices and the system is used to relay the buzzer supply for informing the patients. This system also alerts if the body condition is normal to the user and their relatives or doctors for further action. These systems provide such a module that supports text message service as well as WhatsApp message facility in addition with LCD display information and this design uses a Bluetooth bracelet to cooperate with the reminder machine. The bracelet will sound and flash to remind the user to take pills or medicine.

1.2 Aim and Objective

- The main aim of this project is reduces the risk of failure of taking wrong medicines.
- It eliminates the unnecessary involvement of care person and work and medicine.
- Enhance the accuracy and assurity of medicine intake without any care person.
- Smart system that can be used for numerous patients in hospitals

1.3 Advantages and Disadvantages

Advantages:

- can easily monitor patients activity and regulate their medication upon their health condition.
- Reduced cost of nurses and care person.
- Increased efficiency.
- Real time data captured.
- Reduced workig time.

Disadvantages:

- Uses redundant systems will result in a greater cost.
- Usues live streaming so it is hard to monitor 24x7.
- There may be fear of loosing connectivity.

Chapter Two

Literature Review

2. Literature Review

All patients face difficulty to adhere to the prescribed medication plan. This is particularly tough for elder people. Medication adherence needs a healthy connection between the patient and the medicine prescriber. The useful medical prescription should have i.e. the management plan, future advantages unfavorable effect and expenses. Elder persons are not adhering to medications commonly. The primary reasons differ among patients

An electronic device such as mobile phone any other portable device as a reminder to remains the medicine. Making use of the existing electronic gadgets the user will be alerted about their medicine .The electronic gadgets acts is used as a self care device

Mei-Ying Wang et.al, introduced Wedjat, which can be used to remind its users to take the correct medicines on time and maintain the record of medicines and other things to review for healthcare professionals.

Guanling Chen,et.al. proposed Mobile-phone based Patient Compliance System (MPCS) that can minimize the time-consuming and error-prone processes of existing selfregulation practice for helping facilitate self-reporting, noncompliance detection, and compliance reminders.

Mark Donnellyet et.al.developed such a system in which the ability to deliver reminders at different times of the day as a series of static audio messages like ,,,take lunch"" and ,,,visit the doctor."" This system is designed to offer support through control

for the environment as well as delivery of reminders via touch-screen device embedded in the home. Chihwen Cheng et.al, designed prototype of a Sickle cell disease Reporting as well as Monitoring Telemedicine system (Sickle REMOTE), focusing to resolve limitations of conventional monitoring diaries.

sadvantages are explained in following table respectively;

All patients face difficulty to adhere to the prescribed medication plan. This is particularly tough for elder people. Medication adherence needs a healthy connection between the patient and the medicine prescriber. The useful medical prescription should have i.e. the management plan, future advantages unfavorable effect and expenses. Elder persons are not adhering to medications commonly. The primary reasons differ among patients

Automatically dispensing the pills is used where the patients will get the pills out of the storage compartment , twelve storage compartment are kept vertically with pre loaded medicine. It has pills to be taken for 24 hours automatically the pills will the dispensed and the patient will have the pills once it is dispensed

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The ineffective or wrong medication is the main cause for health failure, so a method is proposed like the hospital suggestions are given to the patients based on the heal condition and promotes the medical care by avoid giving wrong drug .

The current trend in the medicine remained with electronic medications were analyzed and discussed the use of new technology in the heal care challenges .

Use of mobile app for the medications were proposed where the mobile app is developed an automatic medication reminder is given to the patients mobile phone . This is mainly applicable for urban population .Because most of the people living their will not have time to take the medicine on time due to their busy work .

Marilyn McGee-Lennon et.al, discusses the prevention solution Tuberculosis (TB)in Indonesia with the help of a system which is designed to accept mobile cloud computing technologies, so TB organization can have access and take more benefited information technology resources which can be used for major investment, Including for patients to get immediate treatment from users mobile devices very easily.

Ljilja Ruzic Kascak et.al, devolped Mobile technology which is used to increase the life style of older persones in another level through via health monitoring, memory aids which consist of medicine reminders as well as personal data management not only social but also communication assistance.

Alexander Batrakov et.al , devolped the MRAAGILE, which is a device designed for monitor and medication consumption as well as improve the healthy daily regimen for those who live independently. The device gives interactive reminder messages to influece users to follow directiones.

Ilias Maglogiannis et.al , proposed a multimodal reminder system, as part of an assisted living application. The main

functionality of the system involves the creation of reminders using a PC or their Android device, which are stored in a Cloud infrastructure.

Souad Sadki et.al , presented such a system which can access patients for their sensitive medical data while using their mobile devices based on an smart phone application which predicts their privacy preferences easily. Their solution aims to help patients to make preferences concerning the disclosure of their sensitive data.

There are some research works done on “Autonomous Pill Dispenser” till now. Some key techniques with its advantages and disadvantages are explained in following table respectively;

TITLE OF PAPER	TECHNIQUE	RESULTS	ISSUES
“Smart Medication Dispenser”	Arduino Controlled system	Alarm system reminds the patient to consume the medicine	Pill dispensing is not automated
“Smart medication dispenser: design, architecture & implementation ”	Embedded System	New functions can be added without modifying the dispenser control structure	Not portable, cannot be monitored from anywhere around the
“GSM Based Automatic Pill	Global System for	SMS is generated to the	Portability issues,

AUTOMATIC MEDICINE REMINDER USING RASPBERRY

Dispenser”	Mobile communication	caretaker using GSM module	network disruption issues.
“A Smart Pill Box with Remind and Consumption using IOT”	Internet Of Things	Reminder is set to help improve on time medication	Portability issues, application compatibility issues

“Medi-Kit: Developing a Solution to Improve Attention on Medical Treatment”	Real Time based Clock mechanical dispensing	Prototype used reduces delay in dispensing and consuming pills	No alert system, no fully automated dispensing mechanism, portability issues
“Avion - The Intelligent Medicine Box”	Mobile Application	Tray separation based on the size of the pills	Improper data exchange , lack of reminder system
“Smart Medicine Reminder Box”	Internet Of Things	Sensing capability that can detect the consumption of medicines	Medication cannot be monitored through an application by a family member from

			anywhere
“Medication Adherence Monitoring Using Modern Technology”	RFID-based systems	proximity sensing-based systems for medication adherence	-- -

Our Findings

- Android app users are increasing day by day hence it is useful to use android as communication between system and user
- There is no system of notifying user via whatsapp which is very large app used by till now
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Methodology

Automate the process of reminding of intake of medicine and easily monitor on the schedule of medicines by Automatic medicine reminder using wireless network.

Chapter Three

System Analysis and Design

3. System Analysis and Design

3.1 Requirement Analysis

i) Hardware:

- RASPBERRY PI 3
- LCD
- CAMERA Sensor
- SD CARD
- BUZZER
- JUMPER WIRES
- BUTTON

ii) Software:

Out of all of the technologies that will be used in the development of the IoT-Based Smart Medicine Reminder Device mobile application, the language that will be implemented will be one that plays the biggest role. Without the right programming language, the IoT-Based Smart Medicine Reminder Device mobile application may not be fully developed as to how the team has envisioned it to be. There is obviously a wide variety of software which allows for the team to use multiple languages for developing the IoT-Based Smart Medicine Reminder Device mobile application. But for the ease of development for all team members, the team will be sticking to a maximum of two programming languages to be implemented during the development process.

For this IoT-Based Smart Medicine Reminder Device, two languages which be used to develop the program, which are Java [9] and Python [10].

Java has long been a programming language that most developers, especially application developers, have been using to develop programs, especially heavy applications. Java separates itself from most programming languages as programs that are written on Java can also run on other types of computers, and not just the one that it was developed on. This is very much suitable for the development of the IoT-Based Smart Medicine Reminder Device. Java is able to do so because Java runs in a runtime environment, which is another program that is separate which allows for the interpretation of the Java code [11].

Any computer that contains a Java runtime environment can run Java code, which is if the runtime environment on the receiving device supports the version of the code that the program was written on.

Python programming language is needed to program on the Raspberry Pi. This programming language is considered as a very powerful programming language compared to all the other programming languages that is currently available. It also uses the “object-oriented” [12] method of programming which allows for more versatility and ease of use and understanding by developers.

Possessing a reasonably simple syntax, this programming language is very much suitable for beginner developers to test the waters of the IoT wave.

3.2 Description of All Components

I) RASPBERRY PI

Features

- CPU: 1.2GHz quad-core 64-bit ARM cortex A53
- Ethernet : 10/100 (Max throughput 100Mbps)
- USB: Four USB 2.0 with 480Mbps data transfer
- Storage: MicroSD card or via USB-attached storage
- Wireless: 802.11n Wireless LAN (Peak transmit/receive throughput of 150Mbps), Bluetooth 4.1
- Graphics: 400MHz VideoCore IV multimedia
- Memory: 1GB LPDDR2-900 SDRAM
- Expandability: 40 general purpose input-output pins

- Video: Full HDMI port
- Audio: Combined 3.5mm audio out jack and composite video
- Camera interface (CSI)
-
- Display interface (DSI)

Working

The Pi's official Raspbian OS is packed with software to help users learn how to program, including the drag-and-drop coding offered by Scratch, and various tools for writing and debugging using the Python programming language.

via the row of pins at the top edge of the board (of the 40, 26 are GPIO pins). By attaching hardware like LEDs, sensors and motors to these pins you are able to interact with them using the Pi. Writing simple programs will allow you to send signals via the pins to control the attached hardware--for example making an LED flash-- or to read a signal sent from the attached hardware via the pins--for example to take a measurement from a sensor.

Diagram

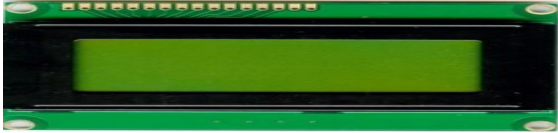


II) LCD

Features

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. In our project 16x4 LCD is used to display the information about pillbox such as the number of medicines in each sub-box to be consumed when the alarm rings.

Diagram



III) BUZZER

Features

The buzzer rings when both timing i.e. pill timing and RTC timing matches. It is embedded with all the system with the micro controller. The micro controller send the message to Buzzer and alerts the user with a



Figure: - BUZZER

IV) Power Supply

Features

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to

an output load or group of loads is called a power supply unit. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

Working

A power supply is used to reduce the mains electricity at 240 volts AC down to something more useable, say 12 volts DC. There are two types of power supply, linear and switch mode. A linear power supply uses a transformer to reduce the voltage. A switch mode supply works by turning the mains electricity on and off very quickly to reduce the voltage.

V) SD CARD

Features

SD card which is volatile storage used to load raspbian official os for raspberry and class 10 of storage capacity 16 gb



SD CARD

VI) Jumper wires

Features

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

Working

The term "jumper wire" simply refers to a conducting wire that establishes an electrical connection between two points in a circuit. You can use jumper wires to modify a circuit or to diagnose problems in a circuit. The following steps outline how you can safely use jumper wires in different electrical applications.

Diagram



jumper wires

VII) Bread Board

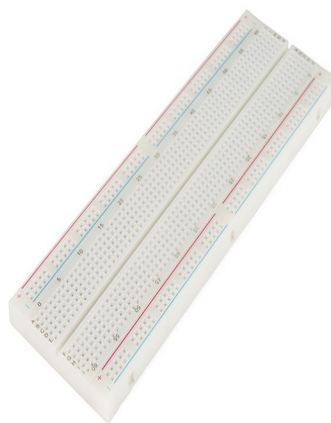
Features

It allows you to temporarily connect electronic components together quickly and easily, without the need for permanent soldered connections. Breadboards come in many shapes and sizes; however they all share a few common characteristics. Each breadboard has a number of holes across its surface.

Working

Breadboards are designed to work with through-hole electronic components. These components have long metal leads that are designed to be inserted through holes in a printed circuit board (PCB) that are plated with a thin copper coating, which allows the components' leads to be soldered to the board.

Diagram

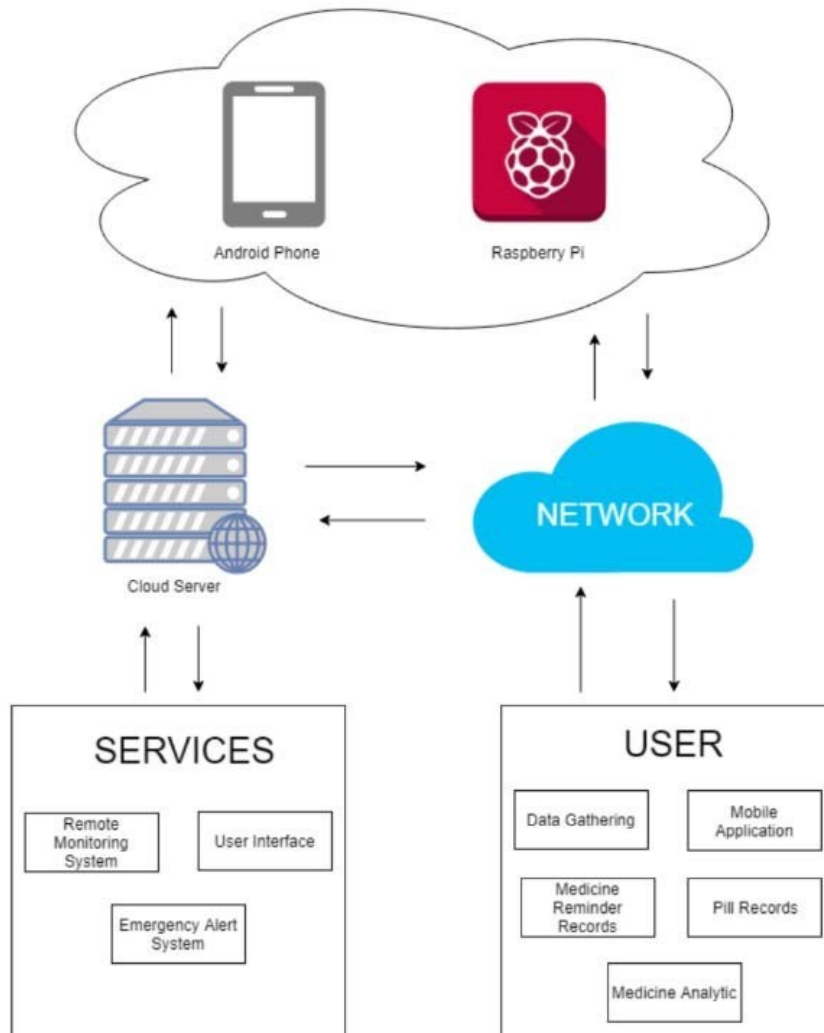


bread board

3.3 Web interface details:

The web Cloud servers will be used for the development of the IoT-Based Smart Medicine Reminder Device mobile application. By using cloud servers, it is able to save more cost and it is also safer than using a traditional server. Mininetworks will be developed so that the hardware is able to communicate with each other to allow the function to work as intended. Refer to Fig. 2 for the Architecture of the proposed IoT-Based Smart Medicine Reminder Device.

3.4 Architecture diagram:



Chapter Four

Implementation & Results

4. Implementation & Results

4.1 Working Module and Results

I) Working:

Smart The IoT-Based Smart Medicine Reminder Device mobile application will be linked to a pillbox. The following requires that there be the design and development of an IoT device along with a mobile application. The project will contain six (6) modules. Modules 1-4 are for the mobile application while 5-6 are for the pillbox.

The first module is the Information Collection Module. This module manages the data that is input by the users into the IoT device. This module will collect information from the customer and the pill information from the mobile device. The users will be able to sign up, view and make changes to the information that was inputted for this module. The information that is required from the customer includes basic details such as name, house address, and their actual age.

The information that is required for the pill include its' name, the details and the required quantity of consumption for that patient. Besides that, the medication consumption record and pill quantity data will be taken from the IoT device too. The medicine consumption record feature will record whenever the user consumes medicines from the pillbox. The data will be able to be viewed by the user themselves.

The second module, the Clock and Time Module, is the module that manages the features for schedules and timing in the mobile application. This module consists of features that includes the medication reminder setting and medicine consumption record. The medication reminder setting feature will allow the user to set, view, and make edits to the alarm setting of the IoT device and the mobile devices. The medication consumption record feature will allow the user to record the time that the medicine was consumed by the patient.

The third module, the Interface Module, is the module that manages the interfaces and the interactions between the users and the mobile device that has the application downloaded on it. This module consists of the design of the mobile interface, an alarm system, and a pill restocking alert system. In this module, the alarm system feature include notifications on the mobile devices along with the phone ringing. While this is happening, crucial information will be displayed such as the medicine doses, name of pills, current time, dates, and the patient's future status of medications. The pill restocking alert system is a feature which will display information about the pill that is at a dangerously low-level quantity and will be required to be restocked.

The fourth module, the Connection Module, is the module that connect the mobile devices and the IoT device in use. This module consists of the emergency alert system and the connection of the IoT device to the patient's mobile device. The Emergency Alert System will allow the user to connect with their family or their caretakers, which ensures them to receive messages in the case that the user presses the emergency button on the IoT device or when

the user does not take their medication on time. This module is also important as it will ensure that the IoT devices are able to work well with the interface on the mobile device.

The fifth module, the Pillbox Detection Module, is the module that manages the detection feature on the IoT device. This module consists of the weight detection system which is available on the IoT device. The weight detector detects changes in the initial weight of the medicine compartment whenever the alarm function is triggered. Whenever the system detects a change in the weight, this will mean that the user has consumed medicine(s) from the pillbox.

The sixth module, the Pillbox Interaction Module, is the module that manages the interaction between the application and the IoT devices. In this module, there will be the vibrating system, lighting system, alarm system, and the emergency button system. The above will be triggered whenever a reminder goes off.

II) Result:

- The proposed system overcomes this problem. They deal with the pill taken time for particular patients. Initially the need to set pill timing in the system and it can be change by patient according to his requirement.
- The system will start alarm at that particular time. To make user friendly system, the LCD screen shows the timing. After having pills, the system will update the pill no.

- Also the check the pill count, if the box pills remains very few, the order for particular pill is send by system automatically to medical shop through SMS system.

4.3 Images and Videos

I) Images

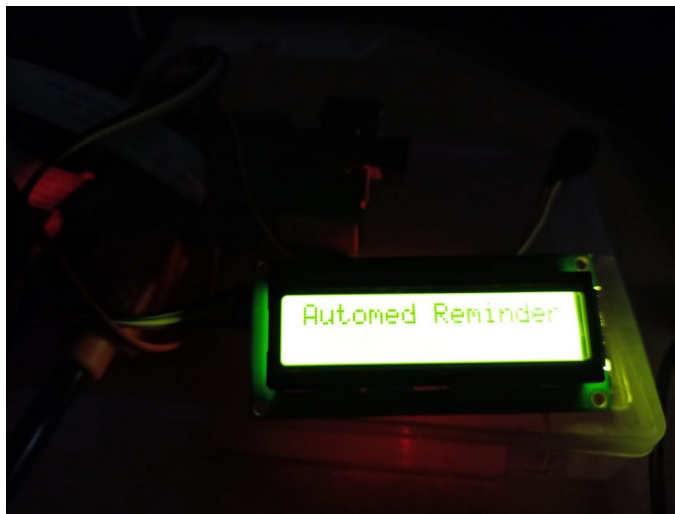


fig 1

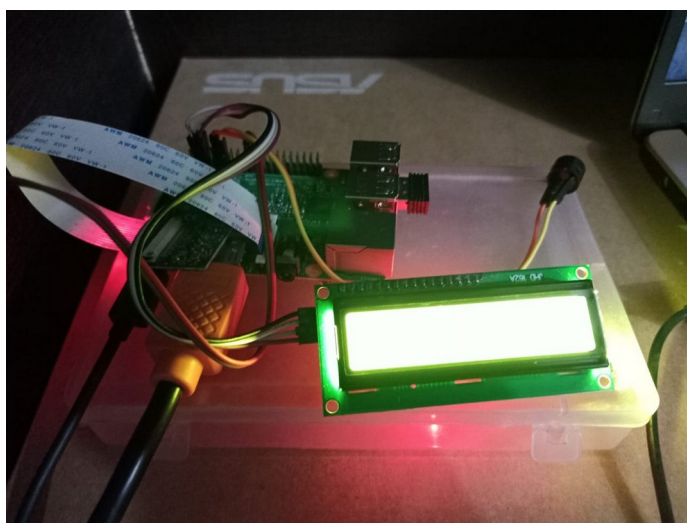
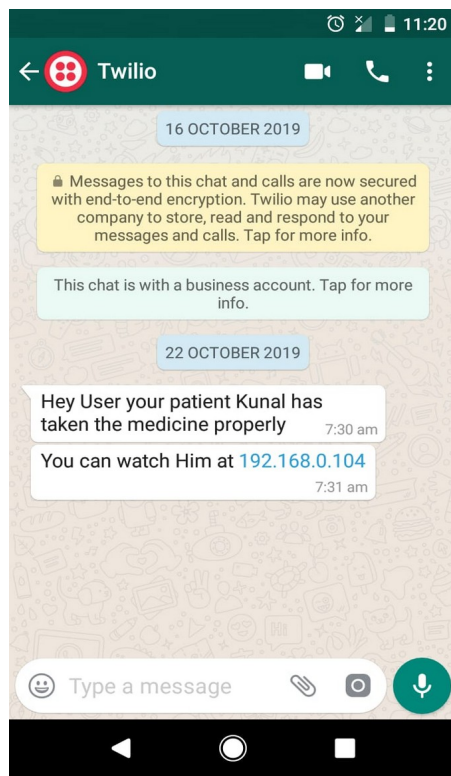
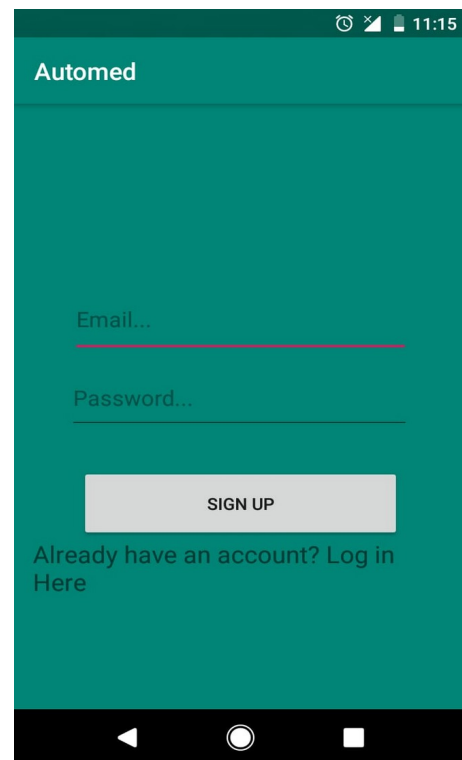


fig 2

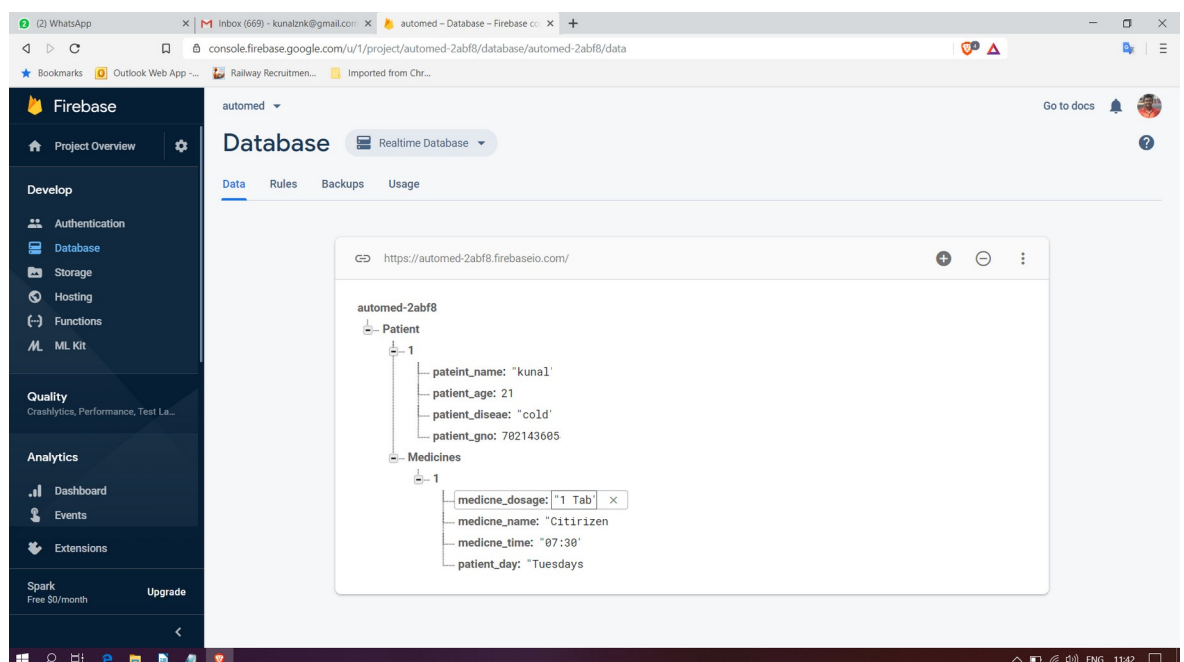
AUTOMATIC MEDICINE REMINDER USING RASPBERRY



Whatsapp notification



Automed



firebase Database

II) Videos

<https://youtu.be/tjLAjGi6O5Q>

https://www.youtube.com/watch?v=VUqxI43_Js4

Chapter Five

Conclusion

5. Conclusion

A model for the medicine remainder and also health monitoring for elderly persons at home is proposed using a simple electronic application. This systems can easily detect the abnormalities in the body condition and also remands of medicine to take through the buzzer and the LCD display. The user relatives or doctors were also informed about the abnormal conditions. The advantage of this is it is a convenient way to use by people of any age and people busy with their work will not forget to take medicine. It also takes care of the people health by alerting during abnormalities. Different messaging and various reminding of medicine techniques have been reviewed. Now we have proposed such system which is very useful for older persons who suffered with chronic diseases like Diabetic and also different types of cancer and for pregnant women as well By using the Raspberry Pi, there is scope to optimize different methodologies in reminding of medicines more users friendly and wide application areas. In future this system can be modified for showing the heart rate and also it will monitor

Chapter Six

Reference

6. Reference

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