Smart Medicine Reminder

Setty Rashmika
VIT,Chennai
Setty.rashmika2018@vitstudent.ac.in

Kuraparthi Thanmayee
VIT,Chennai
Kurparthi.thanmayee2018@vitstudent.ac.in

Papudesi Umapathy Sonia
VIT,Chennai
Papudesi.umapathysonia2018@vitstudent.ac.in

V Chandana Priya
VIT,Chennai
V.chandanapriya2018@vitstudent.ac.in

Badam Koushil
VIT,Chennai
Badam.koushil2018@vitstudent.ac.in

Abstract: **This project present a smart Medicine Reminder (SMR) prototype. The main purpose of this technique is to assist the patients, primarily seniors, take their medications on time in a simple way without the likelihood of missing pills, also this will reduce the risk of taking over dosage or under dosage. Not taking medications correctly can have serious consequences like delayed recovery, illness and even death. The Smart Medicine Reminder could solve such problems by informing and alerting the patients to require the acceptable dose at the proper time before anything happens out of control. This is an Android-based application during which an automatic alarm ringing system is implemented. There is no need for patients to remember their medicine dosage timings as they can have an option to set an alarm on their dosage timings. The alarm can be used for multiple medicines and timings including time, date and also medicine description. A notification is going to be sent to them through email or message inside the system preferably chosen by the patients. They can search doctor disease wise. The patients will get the details of the doctors as per their availability. Also the users can see the different articles associated within medical fields and health care tips. The system focuses on easy navigation and also in good user interface. Many such Medical Reminder Systems are developed where replacement hardware is required but in our work we've made an effort to develop a system which is economical, time-saving and supports medication adherence.**

I. INTRODUCTION

1.1 OBJECTIVE AND GOAL OF THE PROJECT

Our Motivation is to provide a solution to Old-age people who forget to take their medicines on-time which might affect their physical as well as mental health. We are going to send remainders to the person to take their medicine and also a popup message will appear to confirm their status. Like they need to click yes or no, if the reply to message is yes then remainder will appear for next medication if not then the popup message will be appearing for the time interval which we set by this we can know the status of the person. This is a working model of a Smart Medicine Reminder using with Arduino which helps patients keep track of their medicine consumption on daily basis and reminds them to take medicines on time and also refill the medicines on weekly basis via an Audio-Visual Stimuli. We are going to develop an app and also implement it practically.

1.2 PROBLEM STATEMENT

As pills have taken such an important role in everyday life there has been the past years an increase in the number of medical neglect cases related to incorrect medication given to patients, such as the case of the nurse who gave a patient a paralytic instead of an antacid that was prescribed by the doctor, causing the patient's death. After seeing so many of these cases it is evidently crucial that the correct pill is taken by the correct person at the correct time, otherwise taking an incorrect one or not taking one at all may expose the patient to several dangerous situations, ranging from mild health issues up to death. finally there are situation where taking an incorrect amount of pills is a matter of the patient's inexperience and/or ignorance. no matter the cause, it has been proven that there is a significant risk of people ending up swallowing the incorrect medication or dose.

1.3 SOCIETAL IMPACT

We all know that it is difficult for old age people to remember about their medication and take it on time, for that we may need to assign someone for taking care of them which will be difficult in this busy life. So, we are thinking of implementing this system which will notify them whenever the time for the medicine is up, they will be notified and they only have to take their medicine during that time, and no other time. If this is implemented properly, it may drastically

decrease the overdose of medicines due to forgetfulness and therefore the patients will be reminded to in take their medicines. Other cases of wrong pills being ingested by patients are caused by patients themselves, especially at an elderly age. This fact is definitely explained once we understand that a lot of skills like sight, memory or logical capabilities tend to decrease during the proportional way to age once human beings have entered old stage, making it difficult for them to remember which medicine to take at the correct time, remembering to take them or confusing one pill with another because the person might not be ready to distinguish one from another because of their decreased sight also because the similarity within the pills forms and colors . These are the major reasons which had made up our mind to do this project.

II.LITERATURE SURVEY

1. Medicine pill box(2018),Diaa Salama Abdul Minaam Information Systems Department, Faculty of Computers and Informatics, Benha University, Egypt, Mohamed Abd-ELfattah Information Systems Department, Faculty of Computers and Informatics, Benha University, Egypt.Many medical errors are due to the fact that people in charge of patient or elder's medication have to deal with sorting huge amounts of pills each day. This medication pill box is focused on patients who frequently take medications or vitamin supplements, or attendants who deal with the more seasoned or patients.

This paper consists on the conception, design and creation of a pillbox prototype intended to solve this deficiency in the medical area as it has the ability of sorting out the pills by itself as well as many other advanced features, with this device being intended to be used by hospitals or retirement homes.A canny pillbox is proposed and actualized in this paper. It illuminates the elders to take medication. It productively controls the season of senior citizens to take medication. It additionally diminishes the proportion that patient misses and defers taking medication. The remote user interface joins with the RoboRemo software programming so that the parental figures can help the patient. Which adds more functionality by applying more usability through networking locally or using the internet if it is available.

2. Android based medicine reminder(2015),Deepti Ameta is currently pursuing B.E. in Computer Engineering from Gandhinagar Institute of Technology, Gujarat Technological University, India. Kalpana Mudaliar is currently working as an Assistant Professor in Gandhinagar Institute Of Technology, Gujarat Technological University, India. Palak Patel is currently pursuing B.E. in Computer Engineering from Gandhinagar Institute Of Technology, Gujarat Technological University, India.This is an Android-based application in which an automatic alarm ringing system is implemented. It focuses on doctor and patient interaction. Patients need not remember their medicine dosage timings as they can set an alarm on their dosage timings. The alarm can be set for multiple medicines and timings including date, time and medicine description. A notification will be sent to them through email or message inside the system preferably chosen by the patients. They can search doctor disease wise. The patients will get the contact details of doctors as per their availability. Also the users can see different articles related to medical fields and health care tips.The system focuses on easy navigation and good user interface. Many such Medical Reminder Systems have been developed where a new hardware is required but in our work we have made an attempt to develop a system which is economical, time-saving and supports medication adherence.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.

3. Pills Reminder(2017),Sanjay Bhati UG Student Department of Electronics & Communication Engineering SAL Institute of Technology & Engineering Research, Ahmedabad.Old age patients suffer from problems of forget to take pills on proper time which causes certain health issues for patients having Permanent diseases like diabetes, blood pressure, breathing problem, heart problems, cancer diseases etc. Based on these problems they made smart medicine box which solve these problems by Setting up time table of prescribed medicines through push buttons as given in prescription.Present time will be saved in RTC module and notification time will be saved in EEPROM. Therefore at the time of taking medicine system generate Notification sound and display the Bright light in certain pill boxes. So, patient can know the specific number of box from which he has to take out medicines. All pill boxes are preloaded in the system which patient needs to take at given time. And our system has quality that it can sense if the patient had taken out pills from the box or not.The goal of the project is to provide healthy and tension free life to those users who are taking regularly pills and to provide this product at affordable cost also. This project is useful for those people who are taking pills regularly, prescription of medicine is very long and hard to remember for those users. This project is also reusable by exchanging those other medicine box that has only alerting system and are nonusable or unaffordable compare to their product.

4. Medicine reminder using GSM module(2018),Nidhi Solanki, DR. P. H. Zope Dept. of Electronics and Telecommunication, SSBT's COET, Jalgaon Maharashtra.To take proper medicine at proper time is necessary to become a healthy but failure of that can create big trouble for a patient. This is specially for the elderly patient who had problem in keeping track of their medicine. . Hence, this Smart Medicine Box will remind the patient to take right dosage of right medicine at the right time. The basic idea for this paper is integrating the principle of Alarm clock with Light based slot sensing on a normal pill box.To make it more state-of-the-art, it is inbuilt with a GSM module for alerting the patient and also the chemist at the needed instant. By using GSM, system also send SMS to the patient for the medicine reminder. These simple efficient techniques are supported by advancements like GSM technology to bridge the gap in communication between the supplier or the chemist and the customer or patient, thus aiding the patient.This device can help and give advantage to the nurses. The main objective for this innovation is to monitor the consumption of medicine intake for intrinsic patients. It is practical in the morning and evening but also can be used at night.This device is controlled by using GSM system, so the nurse does not need go to the personal ward to give the medicine. This system is a very good to apply in the hospital because it can make the nurse job easier besides making the patients more comfortable to stay at the hospital.

III.REQUIREMENT SPECIFICATION

3.1   Hardware Requirements
• Arduino Uno with USB cable :
    Operating Voltage: 5 Volts
    Input Voltage: 7 to 20 Volts
• RTC DS3231 module :
    To get real time clock
• Buzzer B-10 :
    Gives reminder sound
• Breadboard
• Push Button :
    For setting multiple reminders and stopping the buzzer sound.
• Resistor 10K
• Jumper Wires
• Single stand wire 2mt

3.2   Software Requirements
    Arduino IDE – 1.8.16 (recommended): The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.This is programmable platform for Arduino.
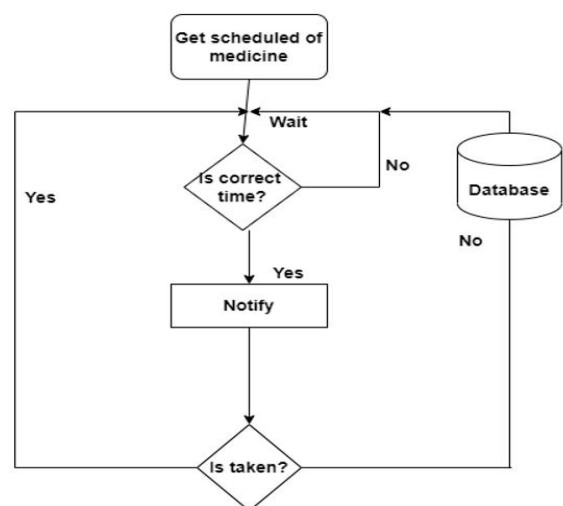   Android Studio - For Android App.

IV. SYSTEM DESIGN

The code provided in the appendix is implemented in Arduino IDE.Circuit is designed and we tried implementing the setup with   multiple reminders(once/day,twice/day,thrice/day)according to user requirement.

(a)Architecture Diagram for Hardware
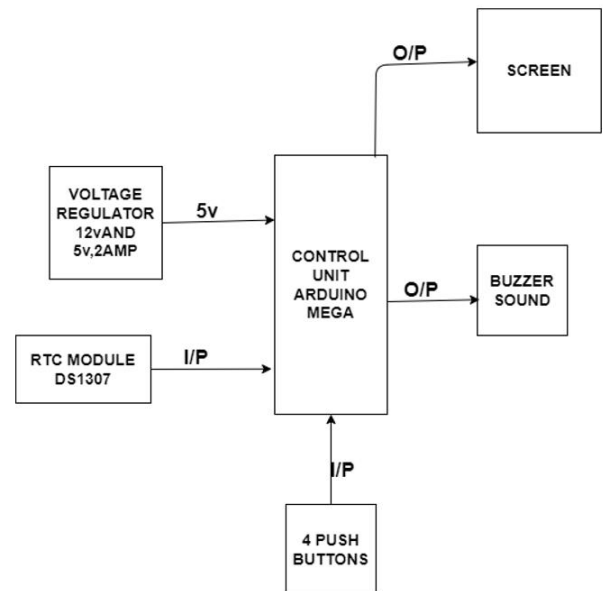
(b)Architecture Diagram for Android APP

V. IMPLEMENTATION OF SYSTEM
(a)   Hardware
In this Medicine Reminder Project, RTC DS3231 is interfaced through I2C protocol with Arduino Uno. You can also use RTC IC DS1307 for reading the time with Arduino. RTC DS3231 also has inbuilt 32k memory which can be used to store additional data. RTC module is powered through the 3.3V pin of Arduino uno.Serial

monitor is used for displaying. A buzzer is used to alert and remind that it's time to take medicine. Four push buttons are used where each has distinct select feature. The first push button is used for reminding to take medicine once per day. The second push button is used to remind twice per day and the third push button is used to remind thrice per day. The fourth push button is used to stop the buzzer when user has heard the alert.

The Pill Reminder Alarm is powered using 5V supply. When it first boots up, it shows a welcome massage as "Welcome to Medicine Reminder".In serial monitor 1st shows massage as "Stay Healthy, Get Well Soon",then second is a help screen which tells to press select push button to select any one time-slot to remind (once/twice/thrice in a day). The time slot is changeable in program and can be configured accordingly. Right now we have fixed this into three duration's i.e. 8am, 1pm, and 21pm.

We have divided time slots into three modes. Mode 1 selects to take medicine once/day at 8am when user presses 1st push button. Mode 2 selects to take medicine twice/day at 8am and 21pm when user presses 2nd push button. Mode 3 selects to take medicine thrice/day at 8am, 1pm and 8pm if user presses 3rd push button. When user selects desired slots by pressing push buttons, the user input is recorded and the time is taken from RTC. When time is matched with selected time slot then the buzzer starts buzzing. User can stop the buzzer by pressing STOP button. The same process continues for the next slot reminder.
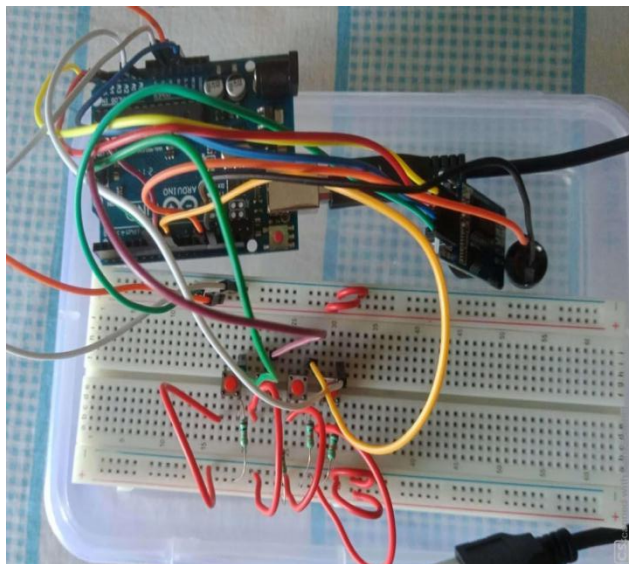

Figure 1: Final Circuit

(b) Software

It is very easy to write program once you have thought of the ways to remind taking the pills. It also have option to select three time slots (once/twice/thrice per day) and when time will reach it start alerting the patient by buzzing the buzzer. Then the whole system will look like following:

User gets help instructions on display > User selects time slots (once/day, twice/day, thrice/day) > Print confirmation message on display > Time keeping started > Buzzer starts when time matches with user selected slot > User stops by pushing a stop push button > End

We can change the program and hardware if we want to add more features. To understand in much simpler way, we have broken down program into small functions. The functions are easy to understand and implement.

Since, we have used RTC DS3231, so we first have to **include libraries f**or that. Library required are as following:

```
<RTClib.h>

<EEPROM.h>

<Wire.h>
```

The EEPROM library is used to keep the track of user select input if Arduino is not turned on. And when user power on the Arduino it gets the previous state of push buttons using EEPROM library. The Wire.h library is used since the RTC DS3231 module is communicated using I2C.

Always **check if the RTC is properly wired or it is not damaged**, since RTC will play an important role in time keeping of the whole reminder system.

```
if (! rtc.begin()) {            // check if rtc is connected

    Serial.println("Couldn't find RTC");

    while (1);

}

if (rtc.lostPower()) {

    Serial.println("RTC lost power, lets set the time!");

}
```

The time adjustment can be done in two ways, either automatically using system compile time or by entering it manually. Once we have set the time, comment the below lines unless you want to change the RTC time again.

```
rtc.adjust(DateTime(F(__DATE__), F(__TIME__)));

//rtc.adjust(DateTime(2021, 11, 25, 1, 42, 00));
```

This **switch statement is used to read the previously saved state of the push button** and resuming the state for appropriate and accurate reminder time.

and two push buttons is used and if we need three alarms to be set in a day we need use one, two and three push buttons. Fourth push button is used to stop the buzzer.

VI. RESULTS AND DISCUSSION
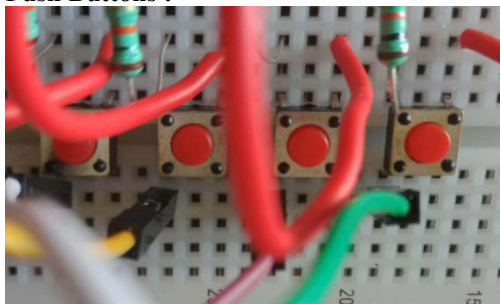### (a) Hardware Modules(Using Arduino)

RTC Module:

This RTC is used to set the timing for getting the reminder. We connect this rtc with the arduino to get the output. Using this we can get alarm in either 24 format or 12 hr format.

Buzzer :

Buzzer is the output in our project where we get the sound when reminder occurs. This will be controlled by the push buttons.

Push Buttons :

We have used four push buttons for setting the alarm and control it. If alarm needs to be set once in a day first push button is used, if we need two alarms in a day one

Arduino Uno Output :
We will get this ouput in Ardiuno IDE serial monitor

This is the welcome screen we get firstly in the project. Where we some information and says to press buttons for reminder..

Here we have set the output for getting reminder three times in a day. We get the reminder by buzzer and in the system it shows us to take medicine for every second. Till we stop the working and buzzer.

(b) Software modules(Android App)
The reminder system consists of two parts
- Setting alarm
- Getting notification

- **Set alarm module:**
    It helps in reminding about the medications. User can add details of his dosage schedules. Using the data field one can enter the starting and ending dates between which he has to take medicines. The time field shows the time of dosage and on the time of alarm we will get ring. The user can add the description of the medicine, including name,

purpose and other related descriptions. All the information will be saved. This makes anytime availability of the patient's record. They can also change the ringtone of the alarm from the ringtones stored in the devices.

- **Get notification module:**
Once the alarm is set then the user gets the notification. The user can activate or deactivate this accordingly. If he does not require the notification he can turn off it. If he requires this system then a notification will be sent into his device.
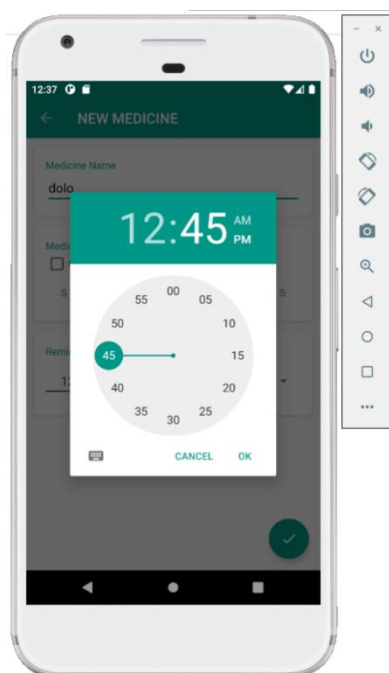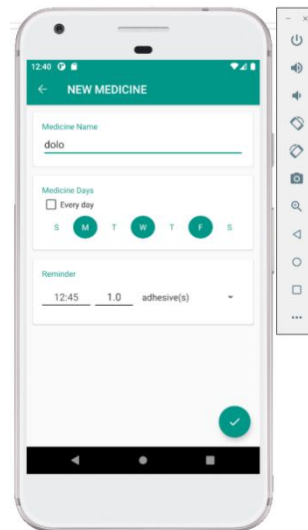
Output screenshots:

Initial homepage
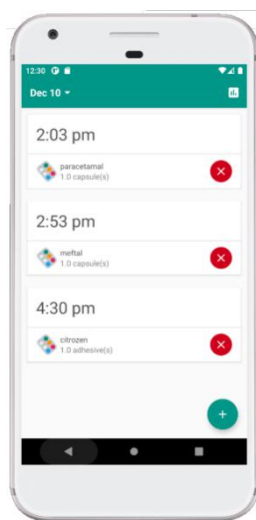
Here we get all the alarms that are set previously and in present. All are displayed in the homepage.
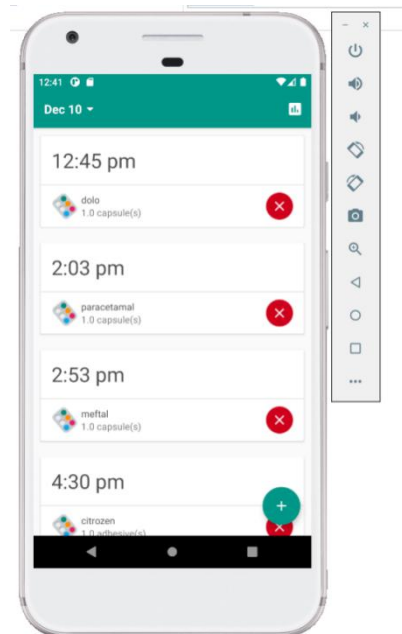
Set alarm module:

We can set the alarms in 12 hour format am and pm. This is easy to use just moving the clock and setting the time.

Adding details of medicine

Here we can add the details of the medicines and set the days in which they want the alarm. They can also give further information of the medicine for reference.

All the information is saved

In the history all the reminders will be saved. We can view the previous reminders and also it shows tick mark if medicine is taken and wrong mark if not taken.

Notification module:

Getting notification

We get the notification ringtone that is set when reminder time occurs. This shows option of taking medicine or not.

VII. CONCLUSION AND FUTURE WORK

We have created a smart medicine reminder system and an app which will be useful for patients to take their medications on time and stay healthy. In our hardware project we have used four push buttons where people can set one or two three reminders per day. The reminder we get is a buzzer and message shown on screen i.e., Welcome screen and indicates the information saved in the Arduino uno. It can be carried anywhere by setting the timer. And also we have

created an app for people who don't carry our reminder. In the app we have created an user friendly interface, it will be easy to navigate also. They can set reminders in it.In future,we will work on connecting the Arduino Uno hardware part with an Android App so.that we will have common users for our system.

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