Smart Medicine Remainder

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Abstract: Uncontrolled medicine administration can always show unpropitious effects on the health of the patients. The proposed system is designed to help the patients to take the required medicine in the right quantity at the right time. The basic ideology is, integrating the principle of LCD, messaging system, buzzer along with motor driver circuit on a normal pill box. To make it more state-of-the-art, it is inbuilt with a GSM module for alerting the patient at the needed instant. This project presents a Smart Medicine Reminder Box (SMR) prototype. The main purpose of this system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills, also reduce the risk of over or under dosing accidentally. Not taking medications correctly can have serious consequences such as delayed recovery, illness and even death. The smart medicine Reminder Box (SMR) could solve such problems by informing and alerting the patients to take the appropriate dose at the right time. Also, it provides direct communication between the patients and the care givers as it will immediately notify the care giver in case the patient missed his/her pill. In addition, SMR provides the user with a touch interface available as an application on their smartphone which will allow them to remotely manage and control pill schedules and usage data.

Keywords: SMR. GSM, medication adherence, pill box, motor driver circuit, medication

I. INTRODUCTION

Technology has become a part of our daily life and as a result the living as well as individual demands have increased. People who are taking medications on daily basis represent a significant proportion of the community all over the world. With such a large amount of prescribed medicine, the probability of forgetting to take medications at a particular time or according to the amount prescribed is high. The American Society of Health System Pharmacists found that about one third of older adults are prescribed to take eight or more medications each day. With such a large amount of prescriptions, the consequences of forgetting to take medications at a particular time or, worse, accidentally taking the same medication twice are significantly high. The British Pharmacological Society noted that greater than 80 percent of elderly are hospitalized due to harmful drug reactions caused by dosage errors.

While prescription bottles have strict instructions covering their surfaces, all of these reminders are futile in patients struggling with memory pathologies, such as Alzheimer Based on a report from the United Nations in Ageing and Development 2009, the average annual growth rates of population aged 60 or over are very high. Many of old people live alone, some of them are suffering from disability, making it harder to take care of themselves. Any delay or ignorance such as forgetting to take medicines or even taking medicines at the wrong time may cause or raise potential health issues. It is also difficult for the nurses to know recent information regarding the number of pills remaining and the need to refill some medications. Therefore, there is an increasingly desperate need for something that can improve life quality for elderly people. For example, smart devices that are invented to detect vital signs of a person, or to send emergency messages to a healthcare professional when urgent help is needed, or to diagnose and determine the causes of certain diseases after ingesting into patients" bodies.

I. PROBLEM SPECIFICATION

In this paper, the design of a Smart Medicine Box (SMB), is introduced. The SMB can be used by either the patient or even by nurses who are taking care of a patient or older people. The SMB contains separate compartments that can be programmed for different user"s needs. SMB helps the user or caregiver by specifying the required pill quantity, the exact time to take the pill each day, and the need to refill some pills.

An application has been developed to support different categories of users such as patients who have either chronic diseases, old people who have scheduled medications, or nurses who take care of those patients. There can be a lot of individuals out there who need constant help it may be our elderly people, family members, the ones who have special needs. Elders are more affected by the timing of taking a certain drug than others, in order to prevent any dysfunction or illness timing is a must. But as with aging comes poor eyesight and poor memory, what if the patient has a dementia

like Alzheimer. Some people may forget to take the medicines at the correct time and can forget the medicines which they have to take.

In order to eliminate the factors of always needed observation like nurses or taking a risk of a missed dose, we had to find an easy, portable and efficient solution. Pill boxes already exist but most of them are either has limited use, doesn't fit for elder ages or even has a big size that makes it not suitable to take it with you anywhere. In order to make a really useful smart pillbox it had to be easily integrated with the recent sweeping smart technologies. While at the same time it had be fit for the elders and their limited knowledge and experience to implement the ease of use. Size and portability was also an important fact that we had to keep in mind .For it to be called smart, its connected through a wireless network, which enables it to be connected to the internet for future applications and integration, also its distinguished by the wide range of the Wi-Fi instead of a Bluetooth or any other field communication, and erase the need for any wires or wired connection which enables portability in the first place. Through that same network its connected to the mobile phone, which with it you can set the timing interval for the dose and also notifies you by many ways when the dose time comes. Also, we added a buzzer with a LED to make a type of physical warning, so that it leaves you no choice but to remember the pill time and take it.

The aim of this study is to build a Smart Pill Box for Medicine Reminder and Monitoring System. When the pill time has been set, the pillbox will remind clients or patients to take pills utilizing sound and light. The warning of pills should be taken will be shown by an android application which is held by the patient. Contrasted and the conventional pill box that requires clients or attendants to stack the crate each day or consistently.

Problem Statement

As pills have taken such an important role in everyday life, in past few years there has been an increase in the number of medical neglect cases. Hence there is a need of automation in pills disbursement . This work will solve above mentioned problem by design and implementing a automatic pill reminder and dispenser setup using IOT that can remind the medicine to consume at right time, which help the people to cope up with their busy life as well as makes the people to stay fit and safe .

Objectives

The following the Objectives of the study:

1. To create a sophisticated pill box to load the pills on daily/weekly basis
2. To create an interface/webpage to record time and date when pills have to be taken/took.

A documentation regarding how the SMR box will work. To implement the RTC mechanism in pill box which dispenses the pills automatically.

3. To develop a mechanism to deliver status messages/buzzer/reminder to registered mobile number.
4. Design a box to store the pills and dispense according to the time.

II. DESIGN AND IMPLEMENTATION

The block diagram is shown in Fig 1. The block diagram shows the overall view of the system. The blocks that are connected here are Arduino Microcontroller, Bluetooth, GSM, Power supply, Servo motor, LED, Buzzer and 16*2 LCD, Battery with charging circuit, RTC timer, IR Sensor etc. All the devices are connected to a power supply.
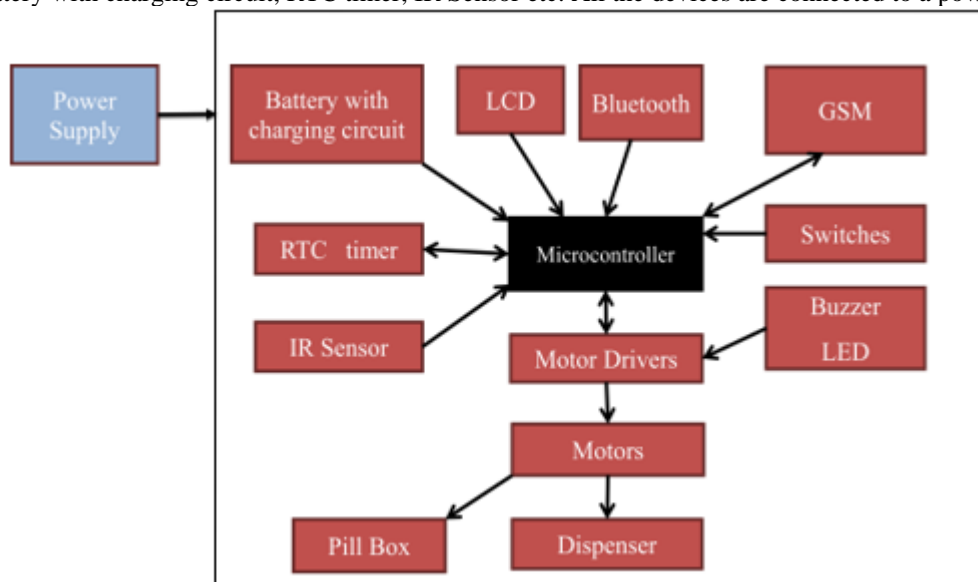

Fig 1: Block Diagram of Pill Dispenser

A. WORKING:

The following steps will explain working module of the designed Pill Box.

- The project consists of Bluetooth and GSM module with a micro controller. The whole system is attached to the dispenser.
- The Project basically starts with the Asp timer. As we set the time of the dispenser at which the pill has to get down.
- The time is displayed on the screen. When the time reaches the limit depending on the requirement that which pill has to be given the servo motor opens the respective gate for the pill.
- We have arranged two pill boxes through which the pill comes out. If the person don't want to take the pill one can snooze the process using the switches we have given in the model.
- All the process is displayed on the LCD screen which we have connected to the Arduino microcontroller simultaneously the message of the whole process is sent to the caretaker.

B. ALGORITHM

Smart_Pill_Reminder(No_of_days, interval)

Step 1: Turn on the power supply.

Step 2: LCD displays a welcome message.

Can check the battery voltage.

Step 3: Initializing GSM module.

Receive Ok message by sending four AT commands.

Step 4: Feed the data based on user requirement.

Step 5:Buzzer rings when pills need to be taken.

Pills will be dispensed.

If pills are taken, message will be sent to the caretaker and message will be displayed on LCD.

If pills are not taken, it waits for 10min then message will be sent to caretaker and message will be displayed on LCD.

Step 6: Repeat the step 5 until all the pills are consumed and go to
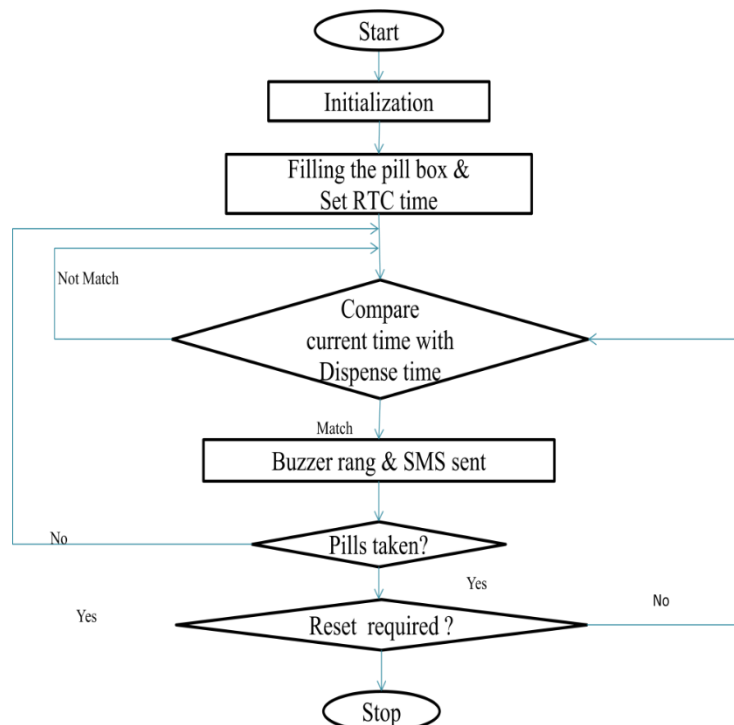
C. FLOWCHART

Fig 2 depicts the flowchart of the application.

D. EXPERIMENTAL SETUP

At the initial stage we are going to place all the components and connect those according to the circuit diagram by using jumper wires and there will be a push buttons which must be switched off .Then we have to give power supply to the GSM module and a sim card must be attached to the GSM and we have to give the care taker mobile number in the

code so that whenever the patients takes his tablet the message will be sent to care taker .In the next step the code must be dumped to Arduino nano. Once the Arduino is connected to the laptop the dispenser system gets switched on and it will be displaying welcome and then med dispenser waiting for alert and even the servo motor will be in its resting position and after the connection is given it triggers and sets its position. This will be initial steps that must be done before we continue further and in this the time that we set is manual and we can set the days hours and minutes.

III. RESULTS AND ANALYSIS

A. RESULTS

This section contains snapshots of the system designed.

Fig 3: Mobile screen to set time & date for week.

Fig 4: Shows message displayed.

Figure 3 shows the mobile screen where we can set particular time and date for weeks. In figure 4, we can see that the conformation will be displayed in the LCD when the data is fed in the App. Then on the LCD it will be displayed as "DATA RECEIVED".

Fig 5: LCD displaying as time to take pills

Fig 6: LCD displaying as pills taken.

In figure 5 and 6, we can see that message will be displayed on LCD, when it is time to take the pills. Then the pills will be dispensed. When pills are taken, on the it will be displayed as "PILLS TAKEN"

Fig 7 : LCD displaying pills not taken

Fig 8 : Mobile message from medicine box to care taker via GSM

In figure 7, we can see that message will be displayed on LCD, when the pills are not taken. Then the immediate notification is sent to the caretaker. In figure 8, we can see that pills taken, this happens when the patient take the tablet and sends message as pills taken, then the message will be sent to the care taker in this format. And then if the patient does not take the pills and it sends message as pills not taken.

Fig 9: Designed model

The interface is built using components like microcontroller, RTC, LED, LCD, GSM, buzzer, Bluetooth HC 05, sensor, pill box, motor drivers and so on. In this Smart Medicine Reminder Project, RTC DS3231 is interfaced through I2C protocol with Arduino nano and we can also store additional data. The pill box is powered using 12V supply. When it first boots up, it shows a welcome message as "Welcome to Smart Medicine Reminder". Since our smart pill box is programmable that enables the caretaker or clients to determine the pill amount and timing to take pills through mobile application. Pill box contains 21 separate sub-boxes. In this manner caretaker can set data for 21 distinct pills.

At that point when the time is matched with time set in the mobile, the buzzer start buzzing and LED starts blinking. When the patient doesn't take the medicine buzzer snooze for 10min, even if the pills are not taken it sends the message to caretaker.

The same process continues for the next week. Since power supply is key to working of device, mentioned apparatus will be connected to power supply. Hence it is possible to make the device portable. All other communications will be done, whether using Bluetooth or GSM.

B. TESTING THE MODEL
The following are the tests done to check the working of the final Model.

i. Unit testing:
First we set a single time and date and we check if the system is working fine along with buzzer and LCD display. LCD interface is checked by I2C protocol.

ii. Integration Testing:
In Arduino code an array of size 21 is taken and checked for 21 date and time using conditional statements.

iii. SMS Delivery Testing:
Here GSM interface is tested. Receiver's number is stored and checked if the message is delivering or not.
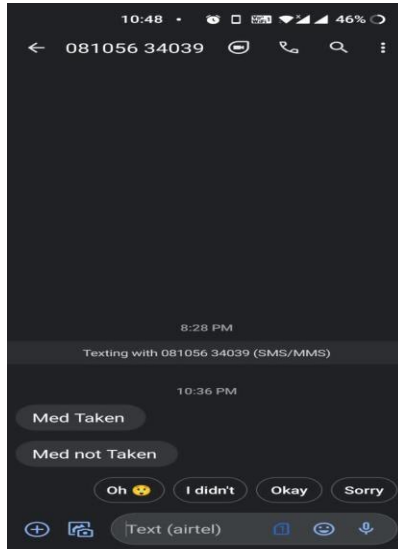
Fig 10: Testing SMS Delivery

iv. Rotation of Pill Box :

Here testing of two motors is done i.e D C motor and Servo motor. D C motor is tested for rotational purpose and Servo motor is tested for dispensing.
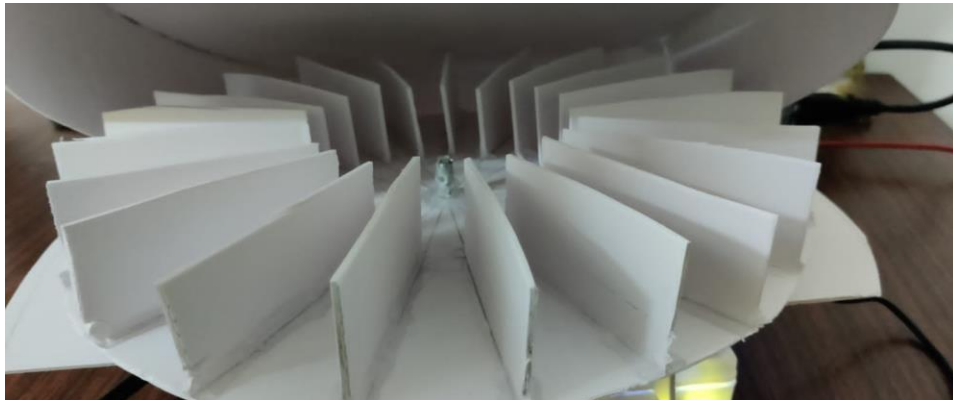

Fig 12: Rotation and Configuration of Pill Box

v. Android App Testing:

Here first we have designed an app and it is connected to the hardware through bluetooth and checked.

Fig 13: Design of android app

vi. Working with Battery:
Here external power supply connected and checked if the system is working fine or not.

C. ADVANTAGES OF THE SMR

i. Remind the Patient to Take the Right Medication and Right Dose at the Right Time, Every Day : People of all ages forget to take medication easily, especially those with busy lives and varying schedules. A Pill Dispenser will remember for you and remind you, so you will never forget to take your medications again!

ii. Prevent Medication Errors : It can be easy for you or a loved one has to take the wrong medication or skip doses. With an Automatic Pill Dispenser, the patient does not have to worry about if they are taking the correct meds since they are pre-sorted. If the patient can't remember if they have taken their medication, they can simply check by turning the dispenser upside-down. If pills do not fall out, the medication hasal ready been dispensed.

iii. Make the Patient and the Caregiver Feel Better : Not only will taking the medication more consistently make the patient feel better, but the caregiver will have peace of mind! One of our dispensers even calls, emails, or texts any number of caregivers if the patient has not taken their medication after an hour.

D. FUTURE ENHANCEMENT

From the time the pills were introduced in the medication industry the requirement of a device that can come as a substitute to the human being for delivery of medicine. No pill dispenser to today could replace could determine the person who to give a pill to, when to give a pill and the no. of pills to be given. There are many other problems that plague the home pill user, such as someone stealing pills, forgetting to take them or having the pills available to take too many. AMDR mechanism such that it works on the principle of MECHATRONICS that is it combines the mechanics as well electronics to dispense medicine. Therefore, chances of error are very less.

Following are some of the sector that can be made better by AMDR:

i. Hospitals: –The automatic pill dispenser can ease up the pill dispensing operation of the large as well as small health care centre. With the help AMDR, the medical staff, as well as a doctor, can reduce the amount of time as well frequent check-up of every patient. This will help the doctor to give time to those patients which are in critical condition or are in greater need for attention from the medical staff.

ii. Home: – Vitamins and another essential dietary supplement that is required every day before and after a meal can become a great area of interest for the use of an automatic pill dispenser. An individual keychain key can initiate the pill dispensing for the user's personal diet regime and a buzzer can remind them when the supplements need to be taken.

iii. Elderly: –The automatic pill dispenser is an excellent way for the elderly to be reminded when to take their pills and the current access key can be worn around the neck or on a bracelet.

III. CONCLUSION

The solution of this sophistication is supplemented by the development of an advanced technology supported pill dispenser called the GSM based automatic pill dispenser. 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 model summarized the major points about our SMB. In this project, we are using RTC timer which dispenses the pills automatically and Sophisticated pill – box is used to load the pills daily / weekly basis.

Elderly patients, especially ones with chronic and periodic medicine, will benefit the most for the SMB, since it will greatly increase their medicine adherence which will insure a better treatment effectiveness or even save their lives. It will help the people to live in a healthier lifestyle away from life threating accidents caused by forgetting to take their medicines on time or with the right dosage and in case of skipped pill, the Caretaker will get alerted almost instantly via SMS. Finally, the user interface which is the same on all the devices including the machine is intuitive, clear and easy to use, even for elderly patients. The design allows the user to add more containers or more pills per service.

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BIOGRAPHY

Girish Mantha, Assistant Professor from JNN College of Engineering Shivamogga, Karnataka. Completed M.Tech in Computer Science from VTU Belagavi and BE in Information Science from BVBCET Hubli, Karnataka. Research interests include IoT, Security of IoT applications using Block chain, Mobile Social Networks. Undertaken research project Funded by NewGen IEDC, Dept of DST, GOI, Applied and received funding from DST and GOI of about 20 Lakhs for various events. Awarded as Best Achiever award for Drafting 'JNNCE Green Policy' on the occasion of JNNCE Sneha Sammilana – 2019. Having interest in trekking, Trekked many Himalayan circuits and major south Indian peaks.

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