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Automated Medicine Dispenser

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ABSTRACT: The Physical Health of the patients will be adversely affected if the prescribed medicines are not taken on time. This paper describes a system that was developed to overcome the effect of untimely intake of medicine. This system assists the patients in a timely intake of correct proportions of medicines at the prescribed time. The automated medicine dispenser is featured with the availability of an automated alert system which reminds patient to take a tablet on time and in correct proportion. It provides a direct link between the doctor and patient for emergency assistance. It also provides convenient reminding for a proper refill of the medicine. The box is connected with the Wi-Fi module, which helps the patients to take the tablet when they are far away from the device.

KEYWORDS: Medicine, Dispenser, reminder, alarm, buzzer

I. INTRODUCTION

Currently, the healthcare services and routine medical checks are set to move from the hospital to the home environment. This increases the ease at which the patients get health care especially in case of emergencies.

Moreover, this reduces the task of the hospitals by shifting the caretaking task, which is possible and easy to the home environment. This reduces the cost of the treatment and reduces the burden on the patients.

Many diseases can be cured with just the intake of new and advanced medicines that have emerged with the boom in medical technology. Due to the lifestyle of the people and the current environment, diseases have increased. This has increased the intake of medicines by an individual. Remembering to take medicines at the prescribed time has become a tedious task due to the work that the individual is engrossed with or due to health or age-related problems. It is possible to avoid the condition of the patients becoming worse by taking the right medicines at the right time. Medication adherence is a major hurdle for patients.

Remembering the count of the pills to be taken becomes troublesome for most of the people. Audible sound will be generated to alert the patients to take medicines. The sound generated will be loud enough to cater to the needs of the partially hearing-impaired people.

If a patient has to take medicine at the prescribed time, a buzzer reminds the patient to take medicine. Facility is also provided to assist the patients in case of emergency.

II. RELATED WORK

In the previous work carried out, intake of medicine by the patient was ensured by an IR sensor. IR sensor will detect if the medicine is taken or not and it will record the data. If the person did not take the pill then an alarm for every 30 min will be sent from the Skype software to the caregiver. This used a spiral architecture to dispense the medicine which can be complicated[1]

A smart pillbox using a barcode was developed. Each medicine bag had a matrix barcode imprinted on it. The barcode included information about the patient namely name, identification(ID) of the patient, ID of the hospital, medicine name, ID, prescribed time, and other relevant information about the bag containing the medicine. A camera was placed inside the cover to identify the barcode and the bag. The outer surface of the cover contained the user interface which provided functions like remind and alarm. The task of the patient is only to scan the barcode of the pillbox with the help of the camera and all the medicine related information will be loaded into the box. After the completion of the scanning, the medicine bags will be placed in the pillbox without dispensing the medicine into the cell. This system is suitable for the elderly and as well as other patients who do have or cannot access the internet. Barcode scanning can become a disadvantage for elderly patients[2]. In case the patient fails to take medicine, a signal will be sent to the monitoring entity to take care of the situation. The system is developed using a PIC microcontroller[3].

In the next system, an E-pill dispenser was designed and developed using Arduino. It consisted of a keyboard which helped the user to manually schedule the pills. LCD was also used to display the scheduling information. The generation of alarm alerted the patients. Messaging service was provided to alert the caregiver in case of failure by the patients to consume the medicine. [4]. Doctor was added to the system to help in case of emergency and hospital monitors the details of medicine intake which is not very efficient [5].

In this paper, a medicine dispenser with containers circular in shape was designed. Medicines are dispersed at the right time from the compartments in which they are stored. The system is designed to have seven circular containers each containing compartments. Since the system has seven containers it can be used as a weekly pill dispenser. Each container has compartments for the pills of a particular day. The working of the containers is driven by a stepper motor controlled by a microcontroller. The alarm will alert the patient to take medicine which has been released at the prescribed time [6].

This paper gives insight about a smart technology that is with medication regarding too many diseases. Intelligent medicine box is a smart device which provides medicines based on the scheduled time. Mobile application was used for medicine management and this makes the design complicated[7].

III. METHODOLOGY

The Automated Medicine Dispenser will help the patients to take their medicines regularly without any assistance. Initially the tablets will be manually sorted and placed in different compartments which will be dispatched at the prescribed intervals as specified by the user. Based on the timing specifications for each compartment, microcontroller will dispatch the medicines contained in those compartment. Accordingly the microcontroller makes use of a RTC to monitor the time. When the time matches the input which was specified by the user, microcontroller will trigger the buzzer. The patient has to manually attend to turn off the alarm and take the medicine from the medicine box. Now the patient can take the medicine without any confusion. If the patient does not respond to the alarm within the prescribed time, a reminder message will be sent to him/her to the registered mobile number to take the medicine. Through Wi-Fi module, database is added. Node MCU will send the message to IFTTT (If This Then That) application. This app provides web based services and performs the task based on the trigger. Through IFTTT app Google calendar will be automatically updated according to the current time. Here current time acts as the trigger. After 5 minutes system will automatically send the notification message to the patient mobile number through IFTTT app. Further user has to come and press the hex keypad button to take the previous medicine.

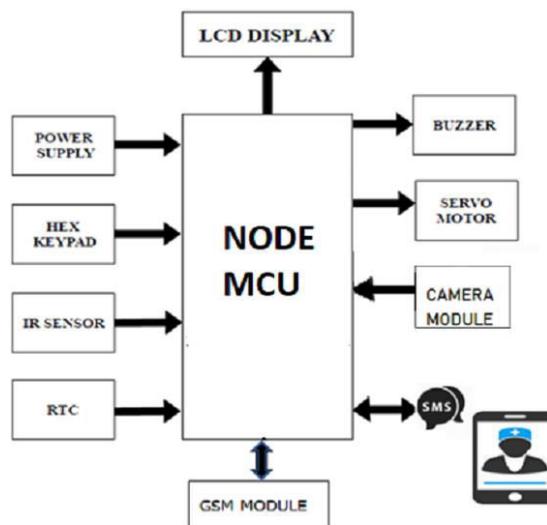


Fig. 1. Block diagram of Automated Medicine Dispenser

A switch is specially placed for emergency situations. When the patient feels his/her condition is going critical he/she can make use of the switch to send the message which will be conveyed to the contact number of the family physician from the smart medicine box so that the doctor can attend to the condition of the patient. If the medicines are not available in the smart medicine box, an alarm is arranged to ring in order to remind to refill the smart medicine box. If

the patient has to go out before the prescribed time he/she can make use of the switch to manually take the medicine. Fig 1 shows the block diagram of Automated Medicine Dispenser.

Automated medicine dispenser dispenses the medicines at the prescribed date and time by making use of the RTC (Real time Clock) and motor. Sensor used ensures that the medicine is taken and the relevant messages will be sent to the care giver and the patient.

Fig. 2. shows the flow of working of the Automated Medicine Dispenser.

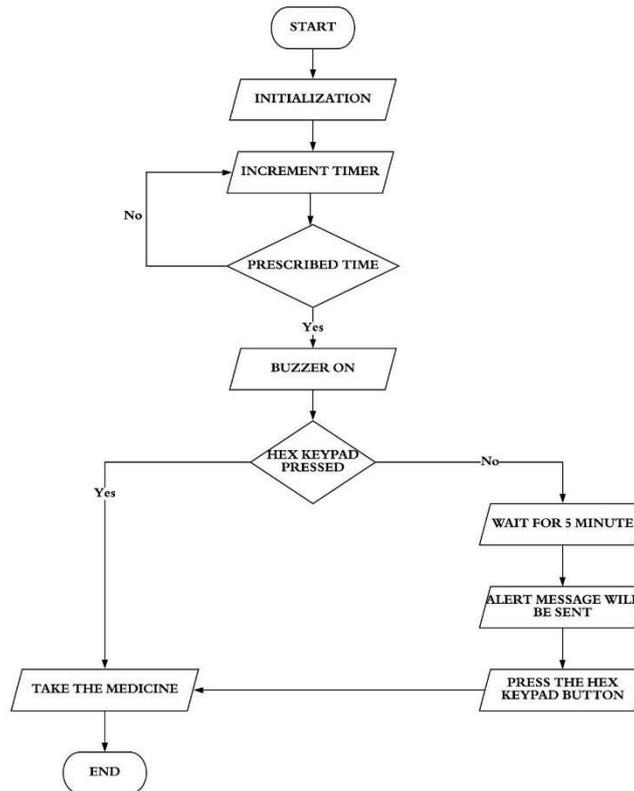


Fig. 2. Flow chart

Step 1: Initialization of various parameters

Step 2: Increment timer using RTC.

Step 3: Confirm is it a prescribed time

If “Yes” Go to Step 4.

If “No” Go to step 2

Step 4: Buzzer beep which reminds patient to take medicine for a prescribed time.

Step 5: Press key in hex keypad.

Key pressed: Take medicine from the box.

Key is not pressed: It waits for 5 minutes, then sends alert message to the patient mobile number.

Patient can press key in hex keypad and take the medicine.

Fig. 3 shows the working of the server unit which sends message to the patient. This sends alert messages to the patient. Workflow is as given below.

Step 1: Open web hook in IFTTT site. Sign in through the Google account and Copy the serial code. Create the event to notify the data using Google calendar, to send the message to patient and doctor mobile number.

Step 2: Enter the serial code from the IFTTT app, Wi-Fi name and password of the user mobile.

Step 3: Press key in hex keypad.

Key pressed: Take medicine from the box.

Key is not pressed: Node MCU will send the message to IFTTT app, through IFTTT app Google calendar will automatically update for the current time.

Step 4: After 5 minutes patient will get the alert message to his/her mobile number to take the medicine.

Step 5: When he/she reaches to the smart medicine box press key in hex keypad and takes the medicine. The dispenser can also operate in the manual mode in case the patient wishes to take medicine ahead of time due to some reasons.

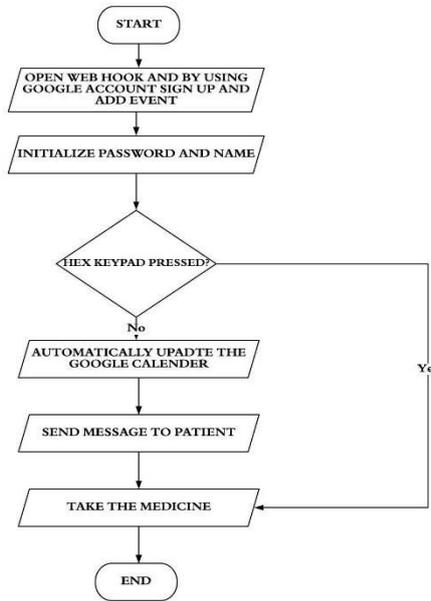


Fig. 3. Server unit

Fig. 4. shows the manual working mode of the dispenser.

- Step 1: Increment timer using RTC.
- Step 2: Press manual mode
- If “Yes” continue. Proceed to step 3.
- If “No”. Proceed to step 2
- Step 3: Press key in hex keypad.
- Key pressed: Take medicine from the smart medicine box.
- Key is not press: increment timer

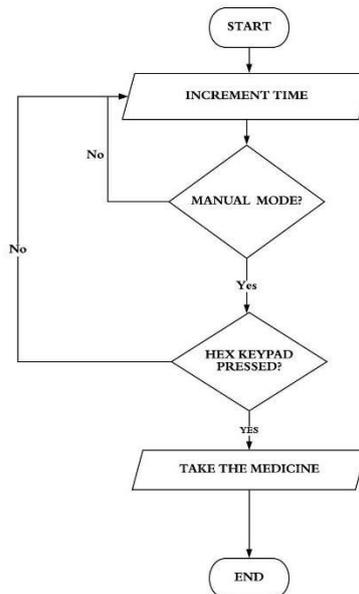


Fig. 4. Manual Mode

IV. EXPERIMENTAL RESULTS

When powered on, the LCD would display characters with the gentle yellow backlight, this allows the user to recognize the characters on the screen even in dark environment. With the implementation, the keypad responded promptly and accurately when pressed the buttons. The servo motor and IR sensor were placed inside the box. The buzzer was able to produce clear and loud synthesized sound when the comparison stage was triggered. IR sensor was placed inside the box to count whether the user consumed the medicine.

Fig. 5(a) shows the overall circuit. When the Real time is initialized it is displayed in the LCD as shown in Fig 5(b). Fig. 5(c) indicates the patients to take medicine in the morning before food and also displays time. Similarly it indicates take medicine at different times. If the user presses button C in hex keypad it means user don't have tablet for a particular session. Every day at the prescribed time buzzer will buzz and in LCD "take your tablet" message will be displayed. Fig. 5(d) indicates the patient responded to the buzzer within 5 minutes. The IR sensor will sense whether the "tablet was taken" from the box by the patient and the message will be displayed.



Fig.5(a) Dispenser



Fig.5(b) LCD Display



Fig. 5(c) Message displayed



Fig. 5(d) Message displayed



Fig. 5(e) Message displayed

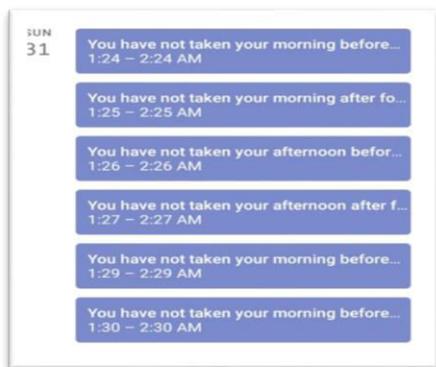


Fig. 5(f) Notification

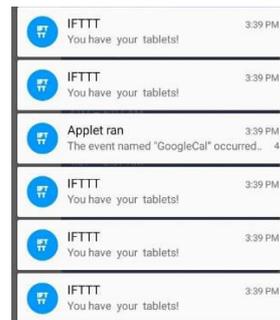


Fig. 5(g) Google Calendar Update

Fig. 5(e) shows the condition if the patient does not respond to the buzzer within 5 minutes, LCD will display “tablet was not taken”. Fig. 5(f) indicates when the patient does not respond to the buzzer within 5 minutes Google calendar will automatically update that tablet was not taken. Fig. 5(g) shows that the Google calendar was updated, through the IFTTT application and the notification message will be sent to the patient mobile number to take the tablet. There is also provision for emergency situation. If the patient presses “D” key in hex keypad “get an appointment” message will sent to the doctor by patient mobile number

V. CONCLUSION

Automated medicine dispenser box will help the patient to take medicine and become more independent in his/her daily life. This system is designed to take the medicine at the prescribed time. System is designed to alert the patient to take medicine, in such a way that it will reduce the responsibility of family member as well as care taker. It is simple in design and easy to use. It is also cost effective. The application can be linked to Med Carts. In case if the tablets are empty it directly sends a prescription message in the Med Cart, which helps the patient by delivering the prescribed medicine to the door step. Scanning the prescription to load the app can be done using image processing technology.

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