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Rasberry PI Medicine Reminder E-Mail Alert Using IOT

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ABSTRACT
Medication mix-ups are extremely dangerous, to avoid this Linux based Speaking Medication Reminder can help to prevent these life-threatening mistakes. This paper proposes a smart pillbox system with remind and consumption function which is used to give alerts to the user to take pills at the scheduled time. The pills to be consumed are popped out of the pillbox at that time. Smart pill box can reduce the guardian's responsibility of giving the correct medicines at the prescribed time. This system sends a purchase order to a medical shop when the medicines are about to get over. It first allows users to enter reminder inputs. System takes input through keyboard to accept various reminders with date and time and dosage. It then reminds patients to take the right medication at the right time. System allows users to store their medication dates and time using raspberry pi. Also users are allowed to enter dosage of each reminder. On set time the system gets the details and converts text to speech. System now speaks out the medication reminder at fed time intervals. This allows for a fully automated medication reminder system for patients. Here single board system i.e. raspberry pi 3 is used in which the database is made for the reminder time and the dose of pills with time and date. Also text to speech using an ESPEAK module in the Linux system make the work easier.

Keyword: Smart pillbox, Elderly, Meditation Safety, Internet of Things , Medication schedule.

INTRODUCTION

In day to day life, people face trouble remembering the pills that need to be consumed. Many times the problem is that the time required to take the medicine is not printed on the packaging of medicine. People also have a habit of forgetting to take pills. Sometimes medicines go beyond their expiry date. Pervasive healthcare is the next generation form of healthcare and distributed, patient-centric and self-managed care. It is an alternative to the traditional hospitalized, staff and professional-managed care. Pervasive healthcare is based on emerging technologies like the Internet-of-Things (IoT).

Health informatics is a developing area to advance health problems, mainly deals with the acquisition, transmission, processing, storage, retrieval, and use of different types of information in the health field. The main acquisition technologies of health information is sensing.

Most patients with chronic diseases need to take medications over a prolonged period of time in order to stabilize their conditions. Ensuring that the patients consume the right medication at the appropriate time becomes crucial. This project deals with the time at which the patient needs to take pills. The timing is set to the system initially and it can be changed by the patient according to his/her requirement. The system will start an alarm at that particular time. To make the user-friendly system, a LCD and a keypad is connected to the system, this helps to change pill timings. After having pills, the user will have to put the number of pills removed from the box. When the number of pills left reach a certain number an order for that particular pill is sent by the system to a medical shop through GSM system. Therefore, it is helpful to user to get the pill at particular time and avoid confusion among pills.

RELATED WORK

A pill box based on a MCS-51 micro-controller was proposed; that pill box can send out medicine using a stepper motor at a scheduled time, but there was no provision to record the time when the patient actually took the medicine. Apart from the above mentioned disadvantages, the other disadvantages of these previous systems are as follows: The family members or patients need to fill the medicine in the pill box manually;

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this is an additional responsibility for family members of the elderly, or even the patients Manually filling the medicine in the pill box may cause the medicine to dampen easily.

An intelligent pill box (IPB) was proposed. The IPB is based on the medicine bag system, and the IPB sends a medicine bag out of the box at the appropriate time. If the patient does not take the medicine bag away, the IPB would notify the caregivers via Skype. The IPB system improves the interactivity between patient and caregivers, but it works well only if an internet connection is available. An electronic pillbox called MedTracker was proposed; in the MedTracker, the time at which each lid was opened or closed is recorded, and transmitted to PC via a Bluetooth link. However, the MedTracker does not provide any remind or confirm functions.

One Dose Packaging is a solution from traditional packaging industry to address the medication noncompliance problem. It packetizes the tablets or capsules of one dosage into one small box of bag. It neither improves the compliance nor prevents from noncompliance, it just makes medication more convenient for patients. Smart Medical Refrigerator offers noncompliance detecting and recording capability. These are the afterward checking measure and not preventive measures and they have complicated operations because of which they are only usable for trained caregivers instead of the elderly, disabled, and patients.

SYSTEM SCHEME

The system consists of two parts, first is the medicine box, and second is the watch part. In the paper, WSN health care system structure was described, via GPRS/GSM and the intelligent gateway. Messages of medicine consumption by patient can be sent to guardians and hospital care and accordingly the database is uploaded. In case of emergency, the location message can be sent so that the public security organization can rescue the patient in time. The health care system with intelligent gateway can inform the guardians about the situation of pills consumption.

THE PROPOSED SYSTEM

In order to reduce the responsibility of family members of dividing the medications in the pillbox, we assume that the medicine the patients need to take at particular times has been packed into the pill box.

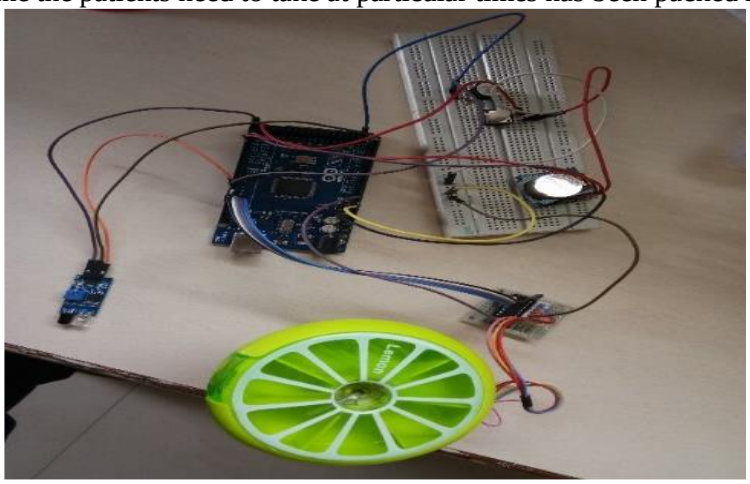

Fig. 1: Implementation of the Proposed System

In this system we have to set the pill time for required medicine by using input system. We can set the different time for different pills. If more than one pill is required at a time, give the box nos. to the system to get required pills. We also set the number of pills we are inserting in the system. The real-time clock gives continuous time as an output. The system monitors the time continuously using a real-time clock to identify the pill time. If the system time matches with pill time, the system shows that that it is time to take a pill.

It is necessary to alert the user to take pills at a particular time. When the system time match with pill time, the buzzer start continuously until the push button is not pressed. When the push button pressed, the buzzer

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stops and the pills required to take at that time comes out to the user to avoid confusion among medicines. As the pills are removed by the user, it is necessary to put the number of pills removed by the user. Multiple times a user requires more than one pills of same medicine or more than one person are using the same system. So it is required that the number of pills removed is inputted by the user

Age	Gender	Medicine	Dosage Time of Day
28	Male		
60	Female		
11	Male		

Table 1: Attributes used in ID3 Algorithm. The System Counts Number of Pills in the System by Using the Total Number of Pills and the Pills Used By the Patient. When The Number of Pills Remaining is Less, A Purchase Order is sent to a Medical Shop.

On the basis of below attribute we are using the ID3 algorithm and display result.

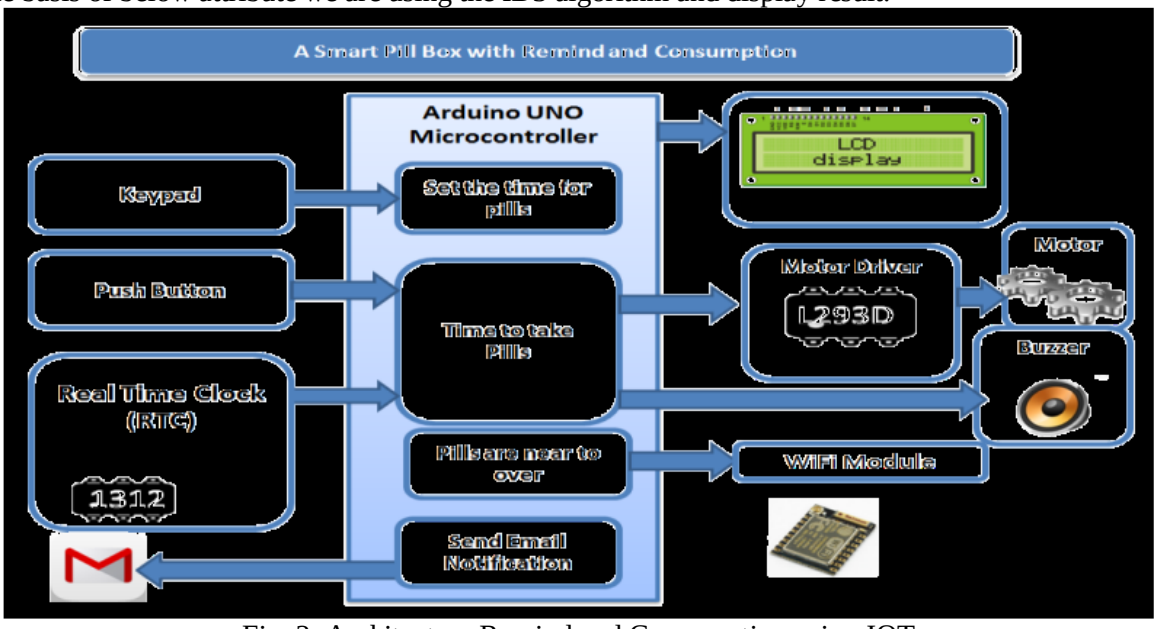

Fig. 2: Architecture Remind and Consumption using IOT

A.TIME FOR THE PILLS IS SET

Time of the pill can be set using the input system. Different time for different pills can be set. If more than one pill is to be consumed at a time, give the box numbers to the system so that different pills can be taken. Number of pills inserted in the system are also set.

B.REAL TIME CLOCK IS USED TO COMPARE TIME.

Output given by the real time clock is continuous time. By monitoring the time continuously using real time clock pill time can be identified. When the system time matches with pill time, the system alerts that it is time to take pill.

C. USER IS ALERTED TO TAKE PILLS

It is important to alert the user to take pills at a particular time. When the system time matches with the pill time, the buzzer starts continuously until the push button is pressed. When the push button pressed, the buzzer stops and the required pills come out of the box to avoid confusion among other pills.

D. OBTAIN FEEDBACK ABOUT PILLS FROM THE USER

As pills removed by user, it is necessary to mention the number of pills removed by the user. It is possible that a user requires more than one pill of the same medicine or more than one person is using the system. Hence it is important to specify the number of medicines removed by the user.

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E. PURCHASE ORDER IS SENT TO THE MEDICAL SHOP

The system calculates number of remaining pills in the system by using the total number of pills and the number of pills used by patient. When the number of pills remaining are less than a certain threshold, the purchase order is sent automatically to medical shop.

ARCHITECTURE

The Architecture of the system is shown in Fig. 2. At the medication time, the pill box will remind the elderly patients, to take their medication via alert sound, the sound is off only after push button is pressed. The medicine required by an elderly patient will come out of the box to avoid confusion between tablets. The count of no pills taken by the patient. The correctness of the medicine thus ensuring that the patient takes the right medicine appropriately. If the patient does not take the medicine, the alert sound is given continuously. And if pills near patient are over message is sent to the nearby medical shop.

A. HARDWARE RESOURCES

- Arduino UNO
- GSM 900
- RTC (Real Time Clock)
- LCD Display and Phone
- Buzzer, Push Button
- Motor

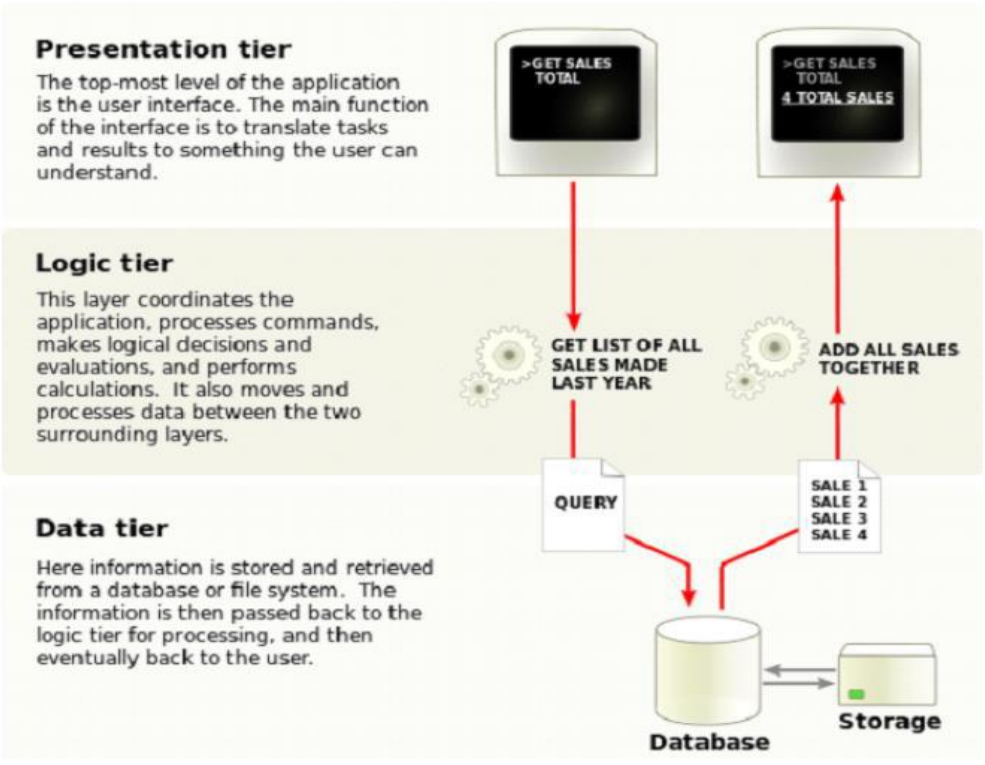

Fig3: Three tier Architecture

B. PRESENTATION TIER

It is the topmost level of the application. Information related to services as browsing merchandise, purchasing and shopping cart contents is displayed by the presentation tier. By communicating with other tiers it puts out the results to the browser/client tier and all other tiers in the network. In simple words, it is a layer which users can access directly (such as a web page, or an operating system's GUI).

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C. APPLICATION TIER

The logical tier is pulled from the presentation layer as its own layer. This layer performs detailed processing as it controls an applications functionality.

D. DATA TIER

This tier includes the data persistence mechanisms (database servers, etc.) and the data access layer. The data access layer provides an API to the application tier to expose ways of controlling the data without exposing or creating reliance on the data storage methods.

E. SET UP

An Arduino board is used as a control system in the pill box. It is used to control the data transmission, infrared detectors and the motor. Infrared sensors are used to detect movement, spring to secure the medicine packages, and connect the spring with the motor. A desktop computer which includes the SQL database system and can connect the Internet is the back-end system. To schedule the time for the pill box the user interface shown as figure 4 can be used. Zigbee is used to connect the pill box and the back end computer, which provides wireless communication ports.

When the scheduled time is up, the motor will be triggered. The installed infrared sensors are used to detect whether the patient takes the drug package away. The time will be recorded at the back-end database so that the delay time to take medicine can be computed.

CONCLUSION

To improve medication safety and to avoid confusion in taking tablet among the elderly, this paper proposed a smart pillbox with remind and confirm functions. The proposed pill box can reduce family member's responsibility towards ensuring the correct and timely consumption of medicines. Because the proposed pillbox contains an alert sound to the user for a particular time and real-time clock gives continuous time as an output.

The alerting system gives alert to the user to take pills at particular time. When the system time match with pill time, the buzzer start continuously until the push button is not pressed. When the push button pressed, the buzzer stops and the pills required to take at that time comes out to user.

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