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Smart Medicine Box using IoT with Alarm and SMS Notification

Deepak Divakar*, Saurav Kumar Singh, Fedina Dkhar*****

**School of Engineering & Technology, Sharda University, Greater Noida, Uttar Pradesh, India.*
Email: 2019527655.deepak@pg.sharda.ac.in

***School of Engineering & Technology, Sharda University, Greater Noida, Uttar Pradesh, India.*
Email: sauravsinghraz@gmail.com

****School of Engineering & Technology, Sharda University, Greater Noida, Uttar Pradesh, India.*
Email: 2019001444.fedina@pg.sharda.ac.in

Abstract

In this generation, the possibility of developing a health problem has increased. Environmental changes cause many elderlies, young people, men, and women to become ill. They also tend to forget to take their prescribed prescription since they are preoccupied with school, and work, and elderly individuals, tend to forget, especially those suffering from mental illnesses such as dementia, which is frequent in the elderly. Also, because some patients are unaware of the differences between medicines, this smart medication box is created to make it easy for patients to take their prescription on time and schedule, ensuring that they do not miss a single dose. Because even missing a single dose can have a significant impact. The IoT (Internet of Things) tools are being used to create the smart medicine box. Arduino, GSM module, buzzer, and other relevant IoT tools are among the various types of IoT tools used to finish this project. In addition, if the patient fails to take their medicine, the GSM module sends an SMS message to the registered number. The message is only sent if the buzzer is not heard more than three times. The nurse or caretaker can also use this smart medicine box to ensure that the patient's medicine is taken.

Keywords: IoT, Buzzer, Arduino, GSM Module, RFID Smart Pill Box

Introduction

IoT is defined as sharing and getting important input from devices on the network to a high-security service level the internet of thing IoT can also be defined as a wireless network as it connects all the devices on the planet that are linked to one another to exchange data and information to get new ideas and also to create new things all this data and information are being recorded and analyzed for future use real-time data collection and patient database recording the use of IoT this has become simple. One-third of elderly persons are on medications that require them to take more tablets each day, individuals are admitted to hospitals, according to the British Pharmacological Society as a result of dangerous drug responses induced by dose errors. Patients may forget to take a tablet as a result of the large number of tablets recommended. Adults over the age of 50 are the most likely to develop illnesses such as high blood pressure, dementia, back discomfort, and a variety of other ailments. As a result, the patient will be able to take their prescription on time with the help of the smart medicine box. It is a well-connected, user-friendly IoT device. Also attached is an alarm buzzer that serves as a reminder and delivers a message to the user if the alarm is ignored, this box is divided into compartments where the user can select timings according to their needs. This box is a low-cost pharmaceutical container.

Literature Survey

We'll look at some similar works based on the smart medicine box in this section. They develop an SMB that sends a graphic and audio alert to the registered user number when it's time to take or refill a prescription in the paper "Design of a Smart Medicine Box" (Zeidan, et al., 2018). Furthermore, a mobile device is set up to deliver SMS and email messages.

The patient, as well as the professional, will be alerted. The Smart pillbox was designed and built using the

Arduino open-source hardware and software platform, as well as photo resistors to detect whether pills are still in their compartments, LEDs, and Piezo buzzers for alarms. When patients forget to take their pills, the Smart Pillbox sends tweets to caregivers via Twitter and an Ethernet Shield. The final pillbox prototype for the system is designed in Autodesk Inventor 3D modeling software and printed on a 3D printer.

An IoT-based smart medicine box (Bhati et al., 2017) this paper the suggested architecture is a smart medicine dispenser based on the Internet of Things. Each patient will be given an RFID tag with a 12-digit code that is unique to them. The database will be updated with the patient's name, total dosage taken, and total dosage missed (if any) in one month. According to the RFID tag code. IoT is used to generate this database. This database will be updated in real-time.

If medication is taken or missed. Inside the medicine dispenser, an RFID reader is installed. The device is a compact box divided into 21 parts that would hold medications for up to three people for a week. The box is connected to an RTC module, and the main microcontroller, an Arduino AT mega 2560, monitors and distributes work as and when peripheral devices make requests. Each patient receives an RFID tag. The drug will be given when it is brought close to the reader. RTC is used to compare the time of the dosage with the present time.

In their paper, D. Nurmiza Binti Othman et al., produced a prototype model of a smart pill dispenser with an alert via smartphone notification by combining the hardware and software aspects. A 5V power supply, a Real Time Clock (RTC) module that gives time and date information, an IR sensor that counts the medicine as it is poured from the container, and a button that the user presses make up the input portion.

Except for the button, all electronic components are connected to the power supply. Second, the button is made up of five different buttons: "up," "down," "choose," "back," and "dispenser." All of the buttons serve as the primary input for configuring the system. The liquid crystal display (LCD) shows the time and date, the servo motor to open the gate to dispense the medicine, the relay module to control the on and off of the circuit in the model, and the vibration motor to vibrate the medicine to fall out of the container make up the output section.

Also, in the IoT-based Smart Medicine Assistive System for Patients with Memory Impairment (Vardhini, et al., 2020) the authors come up with a low-cost medical system. In this project, a NodeMCU with a 5V supply is employed that connects to the hardware modules and local wireless. NodeMCU say as the backbone of the project, and the electric read movement is employed due to safety.

Node also contained dual LDR sensors, which were work as determine whether the victim had taken all of his or her medications. Through node MCU, the system connects to a local wireless network. This procedure is first required for subsequent design.

Through NodeMCU. The system establishes a connection with a local wireless network. This procedure is first required for subsequent design. It first reads the electret read movement, and NodeMCU magnetic Area, NodeMCU stay put. Any single sensors are outside of the magnet field, the motor will switch on and open the appropriate medication box lid. The sensor determines whether or not the drug has been taken. When the medicine has been consumed, the lid of the box will close. If not, the box will be closed after a 30-second time slot loop. The medication's status is updated and displayed on the website. If the magnet read sensor isn't in a magnetic field, it won't work. The process repeats. The L293D driver module is in charge of the motors. The pharmaceutical boxes' lids should be opened and closed. The LDR sensor detects light in most cases. The LDR sensor is activated when any of the drug box lids are opened while the system is functioning.

Proposed Method System design

As we have seen, people are becoming sicker as a result of various forms of pollution, and people are also working to support their daily lives, resulting in a shortage of free time to care for patients at home. In this scenario, a smart medication box is introduced to make it easier for both the caregiver and the patient to remember to take their prescription while their caregiver is unavailable. Our main goal is to assist the patient in remembering to take their medicine, easing the burden on the caregiver, tracking whether the medicine is taken or not, and reducing the risk of not taking medicine. Because skipping a dose can have a variety of negative consequences for the patient's health. Especially for patients who require ongoing

treatment or who are suffering from a serious illness. In this scenario, a smart medication box is introduced to make it easier for both the caregiver and the patient to remember to take their prescription while their caregiver is unavailable. A more explanation about how this project will work is given below in detail.

Hardware

Hardware is the physical part of any System, Computer, and Device which physically exists in any of the existing devices in the real world.

Used Components

Arduino UNO

Three work-steeps are linked to the Arduino UNO. This has 12 digital pins that are labeled D2 through D13. There are 8 analog pins, numbered A0 to A7. Analog voltage can be passed by analog pins, and these pins can also be used to read voltage. The voltage fluctuates over time. Input and output are also done with analog pins.

The Arduino board has a 5 V pin; if the voltage is regulated, it may be directly connected to the 5 V pin and the Arduino board can be readily operated. There is a reset pin on the board. It can easily stop or reset the Arduino with the help of software. There is a pin named V In it is known as the V Input. If a user wants to pass 7 to 12 Volt current then the user can pass it using this pin. When the user passes a 7 to 12 V current through the AMI 1117 regulator, the AMI 1117 regulator produces a 3. 3 Volt current. The board also has a 3. 3 V pin that is coupled to the AMI 1117 regulator inside. It will provide a 3. 3-volt output to which you may attach any additional components.

The board contains RX and TX pins, which allow the user to read and transfer data. The Arduino board contains an ATMEGA 328p microcontroller with a 16 MHz crystal. For resetting the Arduino, there is a manual switch on the board. The board has four LEDs connected to it, each of which is coupled to a 1K resistance to control the current.

The RX led blinks when reading data, the TX led blinks when transmitting data, the POW led starts after powering up the board, and the L led is internally connected to the D13, indicating that the Arduino is operational. The Led is primarily attached for testing purposes.

Source: Flipkart.

Fig. 1: A Figure of Arduino UNO

A Buzzer

A buzzer is a device that produces noises or signals when pressed. It converts signals into sound or audio. It is used in almost all electronic devices that require audio signals. When the buzzer is pressed, the user is reminded that it is time to take their medication. The buzzer is programmed to sound three times, and if no one responds, a text message is sent to their registered phone number.

Source: Flipkart.

Fig. 2: The Figure of Buzzer

LCD Display

The I2C Module's PCF8574 I2C chip converts I2C serial data to parallel data for the LCD. These modules' default I2C addresses are currently 0x27 or 0x3F. To determine which version you have, look at the black I2C adaptor board on the module's underside. If there are three sets of pads labeled A0, A1, and A2, the default address is 0x3F. The default address is 0x27 if no pads are present. A contrast adjustment pot is located on the dis play's underside. This may demand some changes to ensure that the text appears correctly on the screen. In LCD 16×2

I2C has 4p pins. Named As Ground (GND), Voltage at Common Collector (VCC), Serial Data Pin (SDA), Serial Clock Pin (SCL). The ground connection of the LCD has to be connected to the ground pin in Arduino. The VCC pin goes to 5 V in the Arduino Nano. The SDA pin is the I2C data that is connected to A4 in Arduino UNO and the SCL pin is the I2C clock that is connected to A5 in the Arduino Nano.

Source: Flipkart.

Fig. 3: The Figure of LCD

GSM Module

The GSM module is a circuit that facilitates communication from the smart medication box to the user's mobile phone. It is primarily developed for Short Messaging Service (SMS). The modem also has Bluetooth, USB, and GSM functions that allow configuration whenever an internet connection is available. In this article, the GSM module is connected to a smartphone through a SIM card to send an SMS notification message to the registered number.

Source: IndiaMart.

Fig. 4: A Figure of the GSM Module

LED

Because they are bright, efficient at emitting light, and compact, LEDs (Light Emitting Diodes) are widely used in electronics. The circuit must be perfectly connected for the remaining LED to work properly. LEDs are mostly employed in electronic equipment that requires small amounts of light, such as indicator lamps, billboard signs, or full-color banners. They use extremely little energy and endure for a long time because they use so little.

Source: Flipkart.

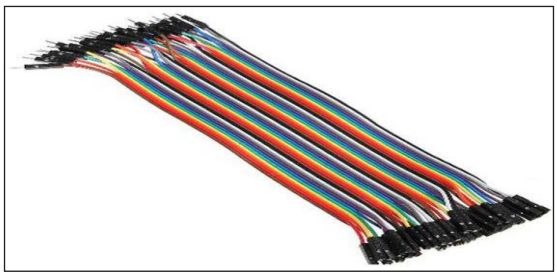
Fig. 5: The Figure of LED

RFID

Radio frequency identification (RFID) is still a wireless system made up of tags and readers. It has an Athena that receives signals from the tag. It is mostly used to communicate with people and products, but it can also store data pages, short data descriptions, and other types of information. The connection occurs when the antenna is connected to a network, as mentioned, and receives signals that activate tags via radio frequency waves.

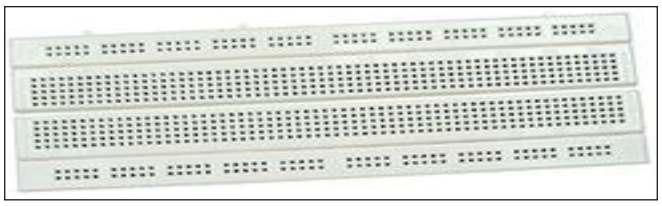
Bread Board and Jumper Wires

A breadboard is a reusable device that is used to build any prototype by connecting it with jumper wires. The connections that connect the breadboard to other prototype equipment are known as jump wires. Each jump wire contains pins on both ends, which makes connecting to changeable circuits simple.



Source: Flipkart.

Fig. 6: A Figure of Jumper Wires



Source: Flipkart.

Fig. 7: A Figure of Bread Board

Power Adapter

A source of electricity for electronic gadgets. Power adapters, often known as "AC adapters" or "chargers," plug into a wall socket and convert AC to a single DC voltage. Computers work with a variety of DC voltages, and the power adapter is the external element of a laptop's power source. Internal circuitry generates the additional DC volts. The power supply for desktop computers is contained within a single internal unit that converts AC to all DC voltages.

Source: Flipkart.

Fig. 8: Fig of Power Adaptor

Work Flow Diagram

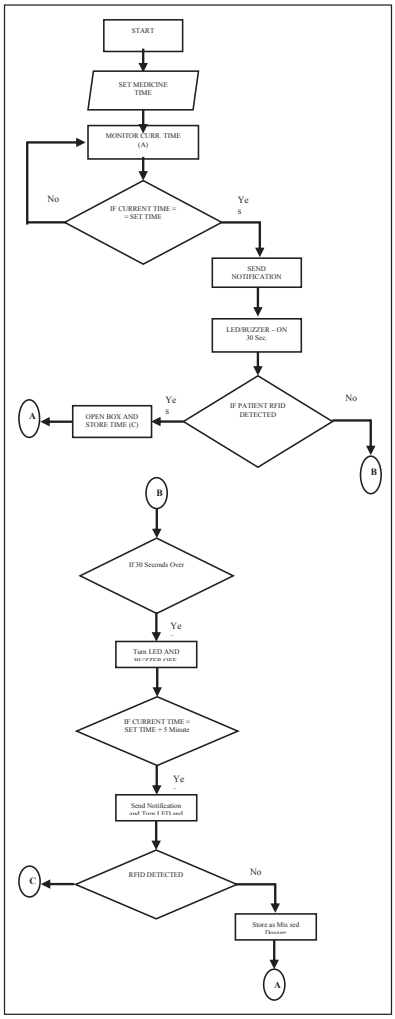


Fig. 9

Conclusion

As a result, we can observe that this paper concludes with the Internet of Things (IoT) and the tools that enable every connection from one place to another for this model to work. Also, without the programming language that was programmed, the actual command work would not have been done, therefore this is a very significant aspect of the model project. This paper indicates that this initiative will assist sick, elderly persons with chronic illnesses in remembering to take their medications, as many elderly people suffer from dementia, Alzheimer's, and other memory-related diseases. So, when this smart medication box is turned on, the user will set the timer for their exact slot time to take the prescription as prescribed by the doctor. When the exact moment has arrived, it will prompt the user with a buzzer, however, if the user does not answer the buzzer, it will only prompt three times before sending an SMS message to the registered number informing them that they have missed their scheduled dose. This smart medicine box is primarily based on its low cost, making it both pleasant and economical.

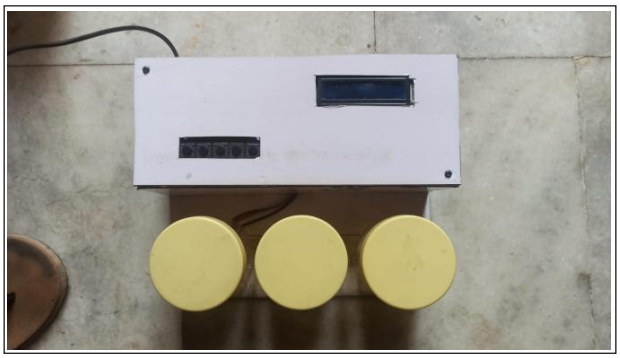


Fig. 10: A Figure from Live Project

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