Medicine Box Using Arduino Uno

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***Abstract*— The Medicine Box is a microcontroller-based automation system designed to help individuals, especially elderly or chronically ill patients, take their medication on time. This project utilizes an Arduino Uno, a DS3231 Real Time Clock (RTC), 16x2 LCD display, EEPROM, buzzer, LED indicators and push buttons to build an intelligent medicine reminder system. An ESP8266 Wi-Fi module is also included to extend functionality by sending medicine alerts to cloud platforms such as Telegram. The system allows users to set up to three different medicine reminder times using buttons. These times are stored in EEPROM so they are not lost during power outages. The RTC module continuously tracks the time and compares it with the scheduled reminders. When a match is detected, a buzzer and corresponding LED are activated and the LCD displays the reminder message. A stop button is provided to turn off the alert once the user has taken the medicine.**

In addition to local alerts, the ESP8266 sends reminder logs, including time, box number and medicine information, to an online Telegram. This enables remote monitoring by family members or caregivers. The system combines hardware automation with internet-based logging, offering a reliable and user-friendly solution to ensure timely medication and enhance patient safety

***Index Terms*— Arduino Uno, RTC DS3231 Module, ESP Module, LCD Display, Buzzer, LEDs, Push Buttons, Power supply**

I. INTRODUCTION

In today's fast-paced world, many people, especially the elderly and patients with chronic illnesses, struggle to remember their medicine schedules. Missing doses or taking the wrong medicine at the wrong time can lead to serious health issues. To solve this problem, the Medicine Box project has been developed using Arduino technology. This system aims to automate medicine reminders and ensure timely medication intake. The Medicine Box includes an Arduino Uno microcontroller, a Real Time Clock (DS3231) module to keep accurate time, a 16x2 LCD for alerts and buttons to set the time and stop the alarm. The project also uses EEPROM to store medicine schedule data even after power loss. Furthermore, an ESP8266 Wi-Fi module is integrated to send real-time messages or updates, like logging medicine intake data to Google Sheets or notifying users remotely.

This system works by checking the current time against preset schedules. When it matches a scheduled time, it alerts the user through sound and lights, displays a message on the LCD and can even send a notification over the internet. This improves medication adherence, reduces human error and provides a reliable solution for healthcare automation.

II.SYSTEM MODEL

The Medicine Box is an Arduino-based system designed to remind patients to take their medicines on time using a combination of real-time clock, buzzer, LEDs, LCD and an ESP8266 Wi-Fi module. It is especially helpful for elderly or busy individuals who might forget their medication schedule. The system uses a DS3231 RTC module to keep track of the current time, which is displayed on a 16x2 LCD screen along with the date. When the system powers on, it initializes all components including the RTC, LCD, EEPROM (for saving schedules), buttons and communication with the ESP8266 module via Software Serial. The user can set up to three medicine reminder times by pressing the "Set" button. For each reminder, the user selects the hour and minute using the "Increment" and "Next" buttons. These times are stored in the Arduino's EEPROM, allowing the system to remember them even after power loss.

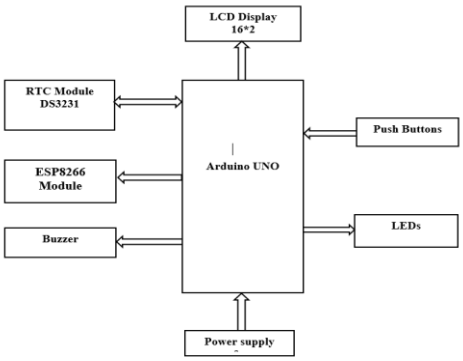

Fig. 1 Block Diagram

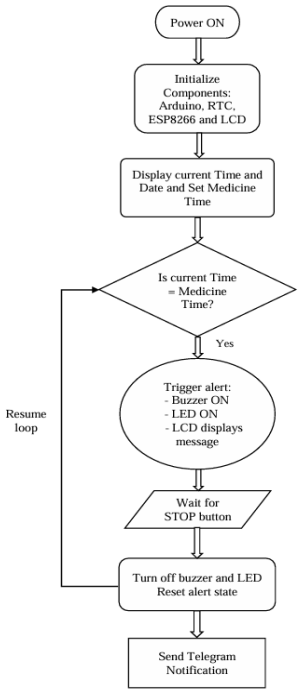

Fig. 2 Flow Chart

The flowchart outlines the operation of a smart medicine reminder system using Arduino and ESP8266 with Telegram notification support. The system begins by powering on and initializing components such as the LCD, RTC module, buzzer, LEDs, buttons, and the ESP8266 Wi-Fi module. After initialization, it displays the current date and time on the LCD, and allows the user to set medicine times.

The system then continuously checks if the current time matches the preset medicine schedule. If a match is found, it triggers an alert by turning on the buzzer and LED while displaying a reminder message on the LCD. At the same time, the ESP8266 sends a Telegram notification to the user or caregiver with details about the scheduled medicine. Once the STOP button is pressed, the buzzer and LED are turned off, the alert is reset, and the system resumes checking for the next schedule. This setup ensures both local and remote reminders, enhancing user reliability.

(a) Arduino Uno

Fig. a Arduino Uno

The Arduino UNO is an ATmega328-based microcontroller board. There are 14 digital pins and 6 analogue pins on this board. a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button is present. It is an open source electronics platform which is easy-touse for beginners. It consists of both a physical programmable circuit board and a piece of software, or IDE which is Integrated Development Environment that runs on the computer this is used to write and upload computer code to the physical board.

(b) RTC Module

An RTC (Real-Time Clock) module is a vital component for projects like the medicine box. It allows accurate timekeeping, even when the Arduino is powered off, ensuring that medication reminders are always on schedule. RTC modules are specialized components used to maintain accurate time and date in electronic systems, even when power is turned off. This is achieved using a backup battery that keeps the clock running independently.

Fig. b RTC Module

(c) ESP8266 Module

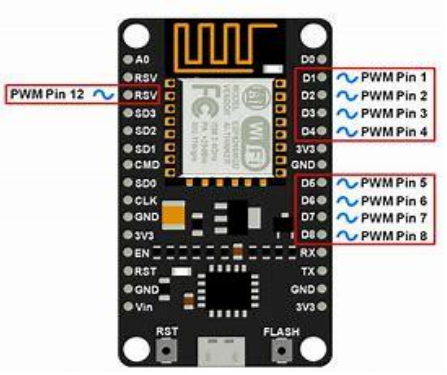

Fig. c ESP8266 Module

The ESP8266 is a highly integrated Wi-Fi System-on-Chip (SoC) designed by Espressif Systems. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host an application or offload all Wi-Fi networking functions

from another processor. Originally intended as a serial-to-Wi-Fi adapter for microcontrollers, its internal processor and memory allowed developers to use it as a standalone microcontroller with Wi-Fi functionality.

(d) Liquid Crystal Display

An LCD (Liquid Crystal Display) is an essential component for projects like the medicine box, as it allows users to visualize information, such as medication schedules, current time or notifications.Display Medication Schedule: Shows the time of upcoming doses and the name of the medicine (if programmed).

Fig. d LCD

Display Medication Schedule: Shows the time of upcoming doses and the name of the medicine (if programmed).

(e) Light Emitting Diodes

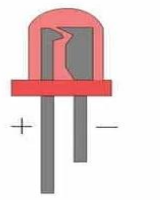

Fig. e LCD

LEDs (Light Emitting Diodes) are versatile components widely used in electronics projects, including your smart medicine box. They serve as visual indicators and enhance functionality. An LED is a semiconductor device that emits light when an electric current flows through it. LEDs are energy-efficient, have a long lifespan and come in various colours and sizes.

(f) Buzzer

Fig. f Buzzer

A buzzer is an audio signaling device commonly used in electronic circuits to produce sound alerts or tones. It converts electrical energy into mechanical energy to create sound waves through vibrations using an electromagnet and a diaphragm to generate a buzzing noise when powered.

(g) Push Button

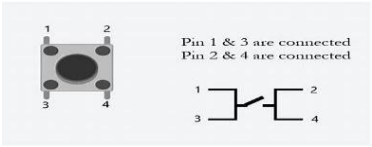

Fig. g Push Button

Push buttons are an essential component in electronic projects like the medicine box. They allow users to interact with the device, enabling functionalities like setting medication reminders, confirming alerts, or navigating through menu options on an LCD display.

III.METHODOLOGY

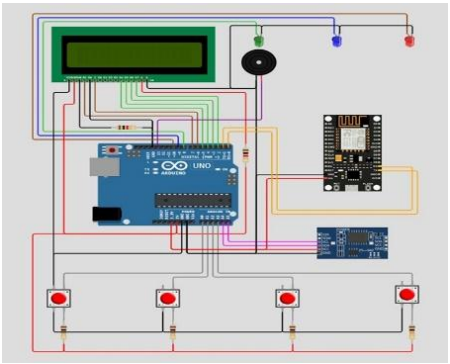

Fig. 3 Interfacing of Medicine Box

This circuit represents a smart medicine reminder system using an Arduino Uno, which is connected to several key components to monitor time, display schedules, provide visual/audio alerts, receive user input, and send notifications through an ESP8266 Wi-Fi module.

The setup includes a 16x2 LCD for displaying medicine schedules and real-time information, connected via standard parallel wiring. A DS3231 RTC module keeps accurate track of time, enabling the system to trigger alerts at specific hours. A buzzer and three LEDs (red, green, blue) act as alert indicators for different medicine slots or reminders. The ESP8266 module handles internet communication, allowing the device to send notifications via platforms like Telegram when it's time to take a medicine.

Four push buttons are used for user interaction — to set time, navigate between medicine entries, and stop the buzzer after acknowledgment. The buttons are typically used as "Next," "Set," "Increment," and "Stop." The entire circuit is powered through the Arduino, with appropriate connections to power and ground lines, and includes pull-down resistors to stabilize button inputs.

In action, the system continuously checks the current time from the RTC. When a match is found with a stored schedule, the corresponding LED and buzzer are activated, a message is displayed on the LCD, and a notification is sent via the ESP8266 to Telegram, reminding the user to take their medicine on time. Once the user presses the stop button, the buzzer and LED turn off, and the system resumes normal operation. This design ensures reliable, timely, and user-friendly medicine reminders.

IV. RESULTS

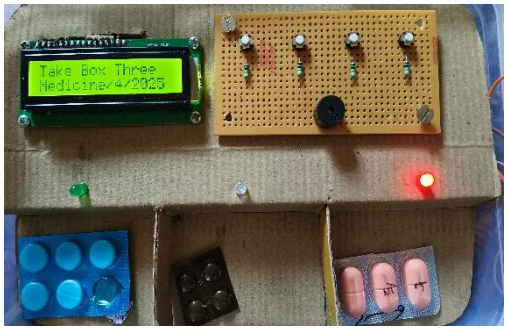

Fig. 4 Medicine Box

In the medicine box system, three individual boxes - Box One, Box Two and Box Three were used to manage and monitor different medicine schedules.

Fig. 5 Indication of Box One

Box One successfully alerted the user at the scheduled time with a buzzer sound and LED indication. The alert was only stopped after the user pressed the stop button, ensuring that no dose was missed.

Fig. 6 Indication of Box Two

Box Two followed a similar routine, with accurate time-based alerts using the RTC module and clear display of medicine name and time on the LCD. It also logged the reminder successfully to Telegram via the ESP8266 module, confirming real-time communication and data storage.

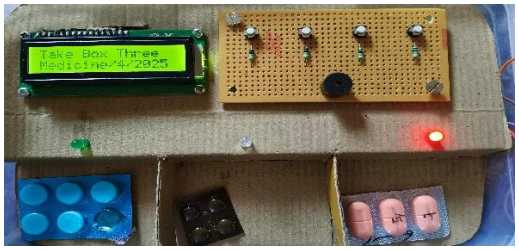

Fig. 7 Indication of Box Three

Box Three demonstrated flexibility by storing custom medicine times in EEPROM, even after power loss and sent a notification Telegram and logged data remotely. Overall, all three boxes functioned reliably, highlighting the effectiveness of the system in automating medicine reminders and improving patient compliance.

Fig. 7 Mobile Notification

When your medicine box sends a Telegram notification via the ESP8266, you'll receive a message directly in your Telegram chat or group, depending on how you've set it up. This message serves as a timely alert, reminding you to take your scheduled medicine.

V. CONCLUSION

The Medicine Box project successfully demonstrates how embedded systems and IoT technology can be used to improve medication adherence and healthcare

support. By integrating components like the Arduino Uno, RTC module, LCD display, EEPROM and ESP8266 Wi-Fi module, the system ensures timely reminders for patients to take their medicine through visual, audio and remote alerts. The inclusion of Telegram logging enhances remote monitoring and caregiver involvement. The project not only promotes better health management but also highlights the practical application of automation and communication in daily life. This solution can be further scaled or customized for different healthcare environments and user needs.

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