

MedBox Alert: AI and IoT-Powered Smart Pill Assistant for Intelligent Healthcare

**Prof. Varhade. R. V, Ms. Sandbhor Nidhi, Ms. Thakurdesai Priya,
Ms. Said Mansi, Mr. Hiwarkar Rishikesh**

JCEI's Jaihind College of Engineering Kuran, Maharashtra, India
nidhisandbhor2103@gmail.com, priyathakurdesai2003@gmail.com
,mansaisaid544@gmail.com, hrishikeshhiwarkar17gmail.com

Abstract: *In today's modern world, people are leading fast-paced lives, often juggling work, studies, and personal responsibilities. In such a busy routine, many patients — especially the elderly, people with chronic diseases, or those living alone — forget to take their medicines on time. Missing doses or taking the wrong pill can lead to serious health problems. To address this issue, our project proposes a MedAlert Box, an IoT-based smart medicine dispenser that automatically reminds users to take their medication at the right time, dispenses the correct dose, and notifies family members or caretakers if the dose is missed. This system uses a combination of hardware (sensors, actuators, microcontroller) and software (mobile app, database, and IoT connectivity) to manage medicine schedules efficiently. It also sends alerts for low stock or medicine expiry to ensure continuous safety. The main goal of the project is to create a reliable, user-friendly, and affordable system that supports patients in maintaining their health independently while keeping family members informed in real-time.*

Keywords: Internet of Things (IoT), Smart Healthcare, Medicine Reminder, Automatic Pill Dispenser, Wireless Communication, Mobile Notification System, Real-Time Monitoring, Voice Alert System, Cloud Connectivity, Sensor-Based Automation

I. INTRODUCTION

The MedAlert Box is a smart healthcare device designed to simplify the medicine intake process for patients who tend to forget or confuse their prescriptions. Traditional reminder methods like phone alarms or manual pill organizers are often unreliable because they depend on human attention and consistency.

This system provides automated control over the medicine distribution process. Using IoT (Internet of Things), the box connects with a mobile application or web dashboard, where users can schedule their medicine timings. At the exact time, the box activates a voice alert and buzzer, and dispenses the pill automatically using a servo motor mechanism. If the medicine is not taken within a certain time, the system sends an alert message or notification to the patient's phone and their family or caretaker. It also continuously monitors the stock using a load cell sensor, checks expiry dates, and warns when refilling is required.

This smart system makes life easier for patients by ensuring they take their medicine correctly and consistently without depending on anyone else.

II. OBJECTIVES

- To create an automated system that dispenses medicine at scheduled times
- To provide real-time alerts through voice, buzzer, and mobile notifications.
- To provide an easy-to-use mobile app or dashboard for setting schedules.
- To notify family members or caregivers if a medicine dose is missed.
- To improve patient safety and promote independent living.



III. LITERATURE SURVEY

In recent years, researchers have explored several Internet of Things (IoT) and automation-based technologies to improve healthcare systems, especially in the domain of medicine management and adherence monitoring. Traditional medication tracking methods, though effective, are largely manual and dependent on patient memory or caregiver supervision. This has created the need for smart, automated, and connected systems capable of reminding, dispensing, and monitoring medicines in real-time with minimal human effort.

R. Sharmila and K. Kousalya (2024) presented an IoT-enabled smart pill dispenser system that reminds patients to take their medicines at pre-scheduled times and automatically sends SMS alerts to caregivers when doses are missed. Their system used an Arduino microcontroller integrated with GSM and RTC modules to maintain accurate timing and communication. The project demonstrated that IoT-based healthcare devices can significantly improve medication adherence, especially among elderly or chronically ill patients [1].

S. P. Balasubramani and D. V. Bharathi (2023) proposed an automatic medicine dispenser equipped with a load cell sensor for weight-based pill detection. The device was capable of identifying remaining stock levels and sending refill alerts through a GSM network. Their design featured an LCD display and buzzer for real-time reminders. The study emphasized that automation and weight-based tracking can enhance efficiency and reduce human error in medicine management [2].

T. T. Srujana, K. Naresh, and O. Saritha (2024) developed a smart IoT-based pill reminder system focusing on remote supervision and caregiver communication. Their prototype used Wi-Fi connectivity to synchronize with a mobile app that logs medication schedules and alerts. The system achieved high reliability in real-time notifications and was well-suited for home healthcare and telemedicine applications [3].

U. G. S. Reddy and H. M. Patel (2025) introduced a cost-effective IoT-based medicine reminder and dispenser using GSM and Bluetooth modules. Their design provided both SMS alerts and in-app notifications, enabling the system to work efficiently even in areas with limited internet access. The combination of wireless modules and voice alerts made it particularly useful for elderly users, who may not always operate smartphones efficiently [4].

V. A. S. Sreedevi and A. Kumar (2023) proposed an IoT-based medicine monitoring and reminder system using an ESP32 microcontroller. Their model integrated load cell sensors and RTC for accurate stock and time tracking. Real-time notifications were sent via Wi-Fi to a connected mobile device, while the system also logged data for performance evaluation. Their research demonstrated that combining IoT connectivity with smart sensors ensures both usability and scalability [5].

K. Vijayalakshmi and R. Divya (2023) developed a multi-functional smart medicine box incorporating cloud storage and environmental sensing. The device not only reminded users about dosage timing but also monitored storage temperature and humidity to maintain medicine quality. The project showed that environmental monitoring can play a vital role in pharmaceutical management within IoT ecosystems [6].

IV. SYSTEM ARCHITECTURE

The real-time blood group detection system The "Med Box Alert" system is meticulously designed to streamline medication management, effectively combining a user-friendly mobile application with robust cloud infrastructure and an intelligent physical dispensing device. This integrated architecture revolves around four key components: the User, the KivyMD Mobile App, Cloud Services, and the Med Box Device, all working in concert to ensure optimal medication adherence.

The user initiates interaction through the KivyMD Mobile App, a Python-based application that offers a comprehensive Graphical User Interface. Here, users can log in or sign up, and then proceed to manage their medication schedules by performing operations such as adding new medicines, updating existing details (like dosage or time), or deleting entries. All this schedule data is then communicated and stored securely within Cloud Services, primarily utilizing the Firebase Realtime Database. Firebase acts as the central repository, facilitating real-time synchronization of user profiles and medication schedules between the mobile app and the physical Med Box Device. Complementing this, the Twilio API is integrated to send crucial WhatsApp or SMS reminders to the user's registered mobile number whenever a medication is due, adding an essential layer of proactive alerting.



The physical component, the Med Box Device, is powered by a Microcontroller (such as Raspberry Pi or ESP32) running custom Python scripts. This device is responsible for obtaining the latest medication schedules by syncing with Firebase via its integrated Wi-Fi module. It leverages APScheduler and a Real-Time Clock (RTC) to precisely manage and trigger medication events. At the appropriate times, the device activates a Pill Dispensing Motor to release the medicine, while Weight or IR Sensors confirm successful dispensing. Local audio alerts (buzzer/speaker) and visual cues (LEDs) provide immediate feedback to the user, who can also interact with the device via push buttons (e.g., to confirm intake). All these components are housed within a protective enclosure and powered by a reliable 5V/2A adapter, completing a holistic system for effective medication management.

Med Box Alert System Architecture (Simplified)

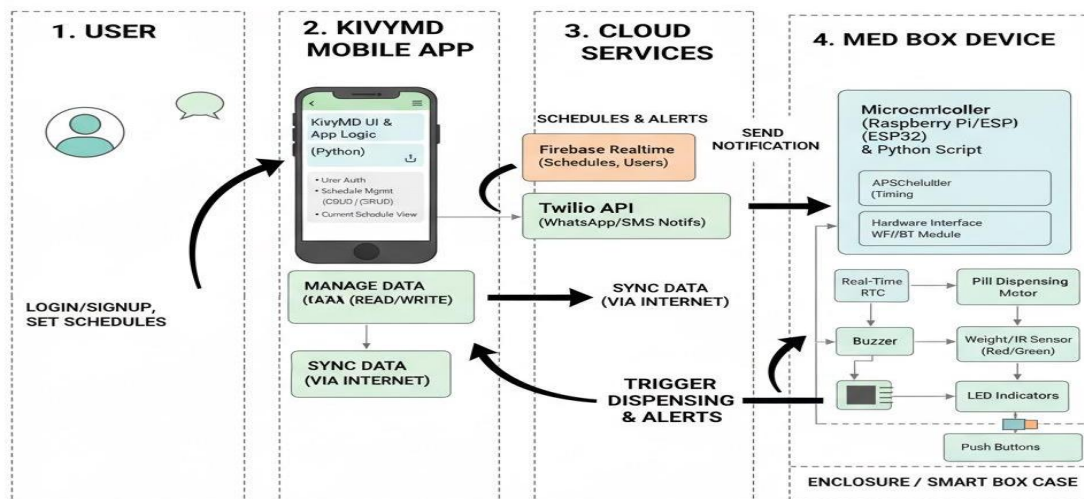


Fig. 1. System Architecture of Blood group Detection System

IV. COMPARATIVE RESULT

To analyze the efficiency of the proposed MedAlert Box, a comparison has been made with previously existing IoT-based medicine reminder systems.

The comparison highlights improvements in automation, alert system, communication, and monitoring features.

Features	Existing Systems	Proposed System (MedAlert Box)
Connectivity	GSM or Wi-Fi (only one mode)	Dual connectivity (GSM + Wi-Fi) for reliable alerts
Medicine Dispensing	Manual or semi-automatic	Fully automatic using servo motor
Reminder Type	Only buzzer or LED alerts	Voice alert + buzzer + LED + mobile notifications
Monitoring	Manual checking required	Real-time monitoring using load cell and RTC
Stock Detection	Not available	Automatic stock detection using load cell sensor
Data Storage	Local only	Cloud-based (Firebase) data storage
User Interface	No interface or simple display	Mobile app / web dashboard for user-friendly control
Environment Sensing	Not supported	Can include temperature & humidity sensors (future scope)
Scalability	Difficult to modify	Easily expandable and cost-effective
Suitable For	Mostly hospital	Homes, hospitals, old-age centers, remote care



V. APPLICATIONS

- Hospitals and Clinics– Can be used for patients who need to take multiple medicines at fixed times.
- Home Healthcare–Perfect for elderly people or patients living alone.
- Old Age Homes / Rehabilitation Centers–Ensures all residents get their medicines on time..
- Organ Donation and Transplant Centers – Useful for patients suffering from diseases like diabetes, hypertension, or heart problems where regular medication is critical.

VI. ADVANTAGES

- Automatic Medicine Reminder--The system gives voice, buzzer, and LED alerts automatically at the scheduled time, so patients never forget to take their medicines.
- Accurate Dose Dispensing– The device dispenses the correct pill at the right time, reducing human error in medication.
- Real-Time Notifications– Family members or caretakers receive instant mobile alerts if a dose is missed or if medicine stock is low.
- User-Friendly – Simple and easy to operate with minimal training.
- P Health Safety and Independenc – Patients can manage their medication on their own, promoting confidence and independence.

VII. CONCLUSION

The proposed he MedAlert Box is a smart, reliable, and user-friendly IoT-based system designed to help patients take their medicines correctly and on time. It successfully automates the entire medicine management process — from giving reminders, dispensing the right dose, monitoring stock levels, to sending alerts for missed doses or low supplies. By combining IoT technology, sensors, and automation, this system ensures better health management, especially for elderly people and patients with chronic diseases. It also reduces the workload of caretakers and provides peace of mind to family members by keeping them updated through real-time notifications. Overall, the MedAlert Box represents a modern, efficient, and affordable solution to a very common healthcare problem — medicine non-compliance.

REFERENCES

- [1]. S. P. Balasubramani and D. V. Bharathi, “Automatic Medicine Dispenser Using Load Cell Sensor and GSM Module,” International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE), vol. 11, no. 4, pp. 214–219, 2023.
- [2]. T. T. Srujana, K. Naresh, and O. Saritha, “Smart IoT-Based Pill Reminder System for Remote Supervision and Caregiver Communication,” International Journal of Scientific Research in Engineering and Management (IJSREM), vol. 8, no. 1, pp. 102–108, 2024.
- [3]. U. G. S. Reddy and H. M. Patel, “A Cost-Effective IoT-Based Medicine Reminder and Dispenser Using GSM and Bluetooth Modules,” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), vol. 12, no. 2, pp. 85–91, 2025..
- [4]. Reena V. A. S. Sreedevi and A. Kumar, “IoT-Based Medicine Monitoring and Reminder System Using ESP32,” International Research Journal of Modernization in Engineering, Technology and Science (IRJMETS), vol. 5, no. 8, pp. 1203–1210, 2023..
- [5]. K. Vijayalakshmi and R. Divya, “A Multi-Functional Smart Medicine Box with Cloud Storage and Environmental Sensing,” International Journal of Engineering Trends and Technology (IJETT), vol. 71, no. 9, pp. 45–51, 2023.

