



Integrated Drug Dispenser for Efficient Medication

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Abstract –

Proper medication intake is a major concern, particularly for elderly individuals and patients suffering from long-term illnesses. Missing doses or consuming incorrect medication can lead to severe health complications and increased medical risks. This paper proposes an Integrated Drug Dispenser system that automates the process of medicine distribution while improving patient safety and adherence.

The system is built using a Raspberry Pi as the central controller and incorporates components such as servo motors, a GSM communication module, LCD display, ultrasonic sensor, and health monitoring sensors including SpO2 and temperature sensors. It delivers medication at predefined times and alerts the user through visual and sound notifications. If the medication is not taken within a specific duration, an alert message is automatically sent to the caregiver.

Additionally, a camera module integrated with MotionEye software enables remote monitoring. The proposed solution is cost-effective, reliable, and suitable for home healthcare applications, especially for elderly care.

Keywords- Smart Medication System, Automated Drug Dispenser, Raspberry Pi, GSM Aler, Healthcare IoT, Elderly Assistance

INTRODUCTION

Ensuring timely and correct medication intake remains a significant challenge in modern healthcare. Elderly individuals and patients with chronic diseases are often required to follow complex medication schedules involving multiple drugs at different times of the day. Failure to follow these schedules can reduce treatment effectiveness and may lead to serious health issues.

Traditional solutions such as pillboxes and mobile reminders offer limited assistance, as they still depend on user interaction and memory. To overcome these limitations, there is a need for an automated system that can manage medication schedules efficiently without continuous human involvement.

This paper presents an Integrated Drug Dispenser designed to automate medicine delivery and notify caregivers in case of missed doses, thereby improving overall patient compliance.

LITERATURE REVIEW

Various automated medication systems have been developed to improve adherence. Many existing devices provide basic alarm-based reminders or compartment-based dispensing mechanisms. However, these systems often lack advanced features and are relatively expensive.

Recent research has explored the use of microcontrollers, IoT-based devices, and wireless communication technologies to enhance functionality. Some systems include mobile applications or cloud-based monitoring, allowing remote supervision. Despite these advancements, most existing solutions do not combine all essential features such as automated dispensing, real-time alerts, health monitoring, and remote surveillance in a single unit. The proposed system addresses this gap by integrating multiple functionalities into a compact and affordable device.

METHODOLOGY

The proposed system is developed using a Raspberry Pi as the primary control unit. It integrates several hardware components including a servo motor, GSM module, ultrasonic sensor, LCD display, and buzzer.

Initially, the system is configured by setting medication schedules using a keypad interface. A real-time clock continuously tracks the current time and compares it with the programmed schedule. When the scheduled time is reached, the servo motor activates and dispenses the required medication. Simultaneously, the system alerts the user through a buzzer and light as well as shows a reminder message on the LCD display. An ultrasonic sensor detects whether the medication has been collected. If the medicine is not taken within the defined time, the GSM module sends an SMS notification to the caregiver.

Table 1 – Hardware Components

Sr.No	Component	Purpose
1	Raspberry Pi 4	Main controller
2	Servo Motor	Dispense medicine
3	GSM Module	Send SMS alerts
4	Ultrasonic Sensor	Detect pill removal
5	LCD Display	Show system status
6	SpO2 & Temperature Sensors	Health monitoring

PROJECT FIGURES



Figure no .1
(Top compartment with indicator)

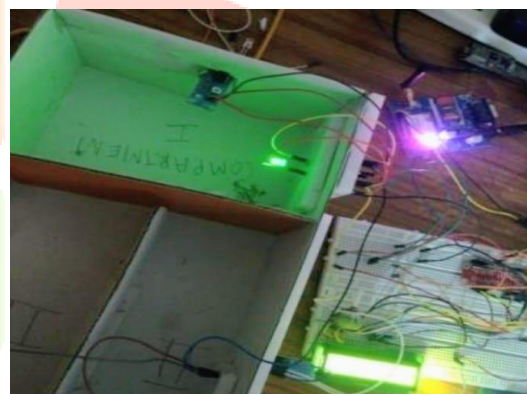


figure no .2
(Base compartment with
LCD indication)

DESIGN

The system architecture consists of a Raspberry Pi connected to multiple input and output modules. The dispensing mechanism is controlled by a servo motor, which releases medication at scheduled intervals. The GSM module enables communication by sending notifications to caregivers in case of missed doses. The ultrasonic sensor is positioned near the dispensing area to confirm whether the medication has been taken. Health monitoring sensors provide additional data regarding the patient's condition. The system is powered through a regulated power supply with battery backup to ensure uninterrupted operation.

CONCLUSION

The proposed Integrated Drug Dispenser offers an effective solution for automated medication management. It ensures accurate and timely delivery of medicines while reducing dependency on manual intervention. The system enhances patient safety by providing alerts and notifying caregivers in case of non-compliance. The inclusion of health monitoring and remote surveillance features further improves its usefulness in home healthcare environments. Future enhancements may include mobile application support, cloud-based data storage, and advanced AI-based health analysis. This system has strong potential to improve medication adherence and overall healthcare quality for elderly and chronically ill patients.

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