



IoT Based Smart Medication Management And pill Dispenser System Form Medical Adherence

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Abstract – This project presents an IoT-based Smart Medication Management and Pill Dispenser System designed to promote medication adherence through automation, tracking, and remote supervision. The system ensures that patients receive the right dose at the right time, minimizing human errors and noncompliance. It integrates IoT technology, sensors, and cloud connectivity to automatically dispense medication, monitor intake, and alert both patients and caregivers. A companion mobile application provides real-time updates, reminders, and visualization. By bridging healthcare with smart automation, the system improves patient safety, enhances treatment outcomes, and supports the growing demand for digital healthcare management.

Keywords- Internet of Things (IoT), Smart Medication System, Pill Dispenser, Medication Adherence, Automated Drug Delivery, Health Monitoring, Embedded Systems, ESP32.

INTRODUCTION

Medication adherence plays a vital role in ensuring the effectiveness of medical treatments. Despite this, many patients—especially the elderly or those with chronic illnesses—fail to take their medications as prescribed. Forgetfulness, confusion, and lack of supervision are common factors leading to missed or incorrect doses. The proposed IoT-Based Smart Medication Management and Pill Dispenser System automates dispensing accurately and on time. When the patient misses a dose, alerts are automatically sent to caregivers through mobile notifications or SMS. This smart integration of IoT and healthcare simplifies daily medication routines and enhances patient well-being. Overall, this smart solution represents a step toward more reliable, efficient, and patient centered healthcare management. medication scheduling, dispensing, and monitoring (IoT), It uses sensors, a microcontroller, and a cloud connected interface to ensure pills are properly Scheduled.

In recent years, the integration of Internet of Things (IoT) technology with embedded systems has provided promising solutions in the healthcare domain. IoT-enabled devices allow real-time monitoring, data collection, and remote accessibility, improving overall patient care. The proposed IoT-Based Smart Medication Management and Pill Dispenser System utilizes the ESP32 as the core controller to automate the dispensing process and monitor essential health parameters. The system is designed to deliver medication at predefined intervals while simultaneously collecting physiological data such as body temperature and heart rate.

LITERATURE REVIEW

The literature survey provides an overview of existing research and technological advancements related to smart healthcare, medication management, and IoT-based monitoring systems. It helps in understanding the evolution of similar systems, their methodologies, advantages, and limitations.

Several researchers have developed smart pill dispensers and IoT-enabled health monitoring devices aimed at improving patient adherence. These systems generally focus on aspects such as automatic dispensing, medication reminders, and remote health monitoring through wireless communication. However, many of these solutions either lack real-time data transmission, integration of vital sign monitoring, or user feedback mechanisms.

Sr. No	Title Of Paper	Year	Publisher	Methodology	Conclusion
1.	Enhancing Healthcare using m-Care Box (Monitoring non-Compliance of Medication)	2022	IEEE	The Automated dispensing minimizes the risk of incorrect dosages and missed doses.	Beneficial for elderly or chronically ill patients, allowing them to manage their health independently with minimal supervision
2.	A Comprehensive Approach for A Smart Medication Dispenser	2021	IEEE	Utilized ESP-32 wi-fi module for time-time monitoring of patient vitals .	Integrates vital sign monitoring with medication management, providing a holistic approach to patient care.
3.	Adversial Attack To Machine Learning – Based Smart Healthcare System	2021	IEEE	Combined IoT devices with wi-fi for rapid indoor health data transfer.	Demonstrated low range, low cost communication for time to time patient monitoring.

METHODOLOGY

The development of the IoT-Based Smart Medication Management and Pill Dispenser System follows a structured approach that combines both hardware and software components to ensure accurate and reliable medication delivery.

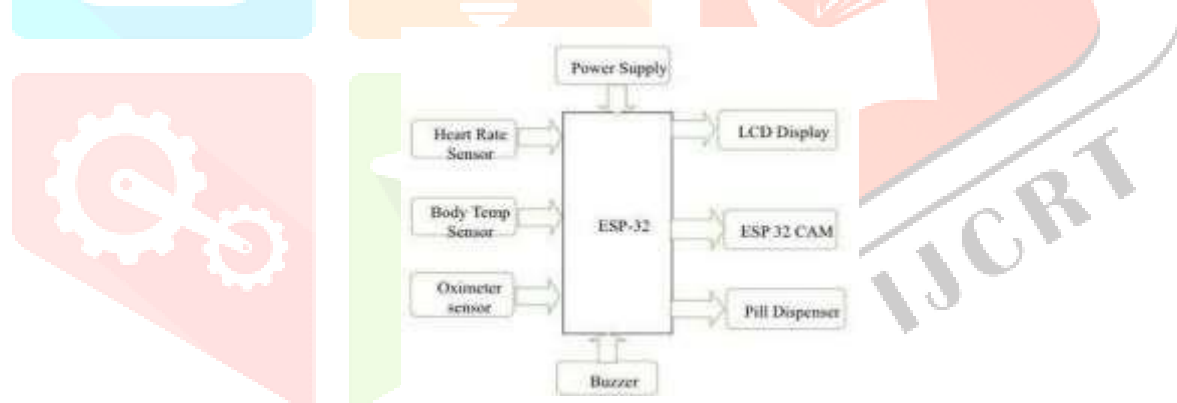


Fig : Block Diagram

The proposed IoT-Based Smart Medication Management and Pill Dispenser System is developed using a structured approach that combines embedded systems, sensors, and cloud connectivity to ensure accurate and timely medication delivery. The system is built around the ESP32, which acts as the central controller for processing data and managing operations. Various sensors are integrated to monitor health parameters, while a servo motor mechanism is used to dispense pills at predefined intervals. The software is programmed using embedded C/C++ to continuously read sensor data, compare it with preset conditions, and trigger appropriate actions such as alerts or dispensing. The system is connected to an IoT platform like ThingSpeak through Wi-Fi, enabling real-time data storage, monitoring, and remote access. An alert system is implemented to remind users about medication schedules and notify them in case of abnormal readings. The complete system is tested for accuracy, reliability, and performance before deployment, ensuring efficient operation and improved medication adherence for users.

RESULT

The developed system was tested under various operating conditions to evaluate its performance and reliability. The results demonstrate that the proposed solution is capable of dispensing medication accurately at predefined time intervals. The servo motor mechanism operated precisely, ensuring correct delivery of pills without error.

The integrated sensors successfully monitored physiological parameters such as body temperature and heart rate, providing real-time data acquisition. This data was effectively transmitted to the cloud using the ESP32, enabling remote monitoring. The cloud platform, such as ThingSpeak, displayed the collected data accurately and consistently.

Additionally, the alert system functioned as intended by generating timely reminders for medication intake, thereby minimizing the possibility of missed doses. The overall system exhibited stable and reliable performance throughout testing. The implementation significantly improved medication adherence and contributed to enhanced patient safety and healthcare management.

Condition	Trigger Value	Action Taken
High Temperature	> 38°C or > 100.4°F	Buzzer + Notification
High Heart Rate	> 100 BPM	Alert to Caregiver
Low SpO ₂	< 95%	Emergency Alert
Missed Dose	No intake	Reminder Notification

Fig : Result



DESIGN

The system is designed using the ESP32 as the main controller, which receives input from sensors and controls a servo motor to dispense medicine at scheduled times. The device connects to the cloud for monitoring and sends alerts to ensure proper medication adherence.

$$V_{out} = k \times \text{Sensor Reading}$$

CONCLUSION

The IoT-Based Smart Medication Management and Pill Dispenser System presents an effective and practical solution to the common problem of medication non adherence. By integrating automation, real time monitoring, and user-friendly interfaces, the system ensures that patients receive the right medication at the right time with minimal effort. The use of the Internet of Things enables seamless communication between the device, application, and caregivers, improving overall

reliability and accessibility. The developed system not only reduces the risk of missed or incorrect doses but also supports caregivers in remotely tracking patient activity. Its consistent performance, accuracy, and ease of use highlight its potential for real-world healthcare applications. In conclusion, this smart solution contributes to better health outcomes, enhances patient independence, and represents a significant step toward modern, technology-driven healthcare management.

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