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NLP IOT BASED MEDICINE DEVICE

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ABSTRACT

The project presents an AI-based Smart Medicine Dispenser System designed to ensure timely and accurate medication intake for patients, particularly the elderly and chronically ill. The system utilizes a Raspberry Pi programmed with Python, interfaced with a camera, IoT module, and LCD displays. The dispenser features three medicine boxes that open automatically according to a pre-set schedule.
A camera monitors patient interaction, while the IoT module enables remote monitoring and updates by caregivers or doctors. The system displays reminders and instructions on the LCD screen, ensuring the patient takes the correct medicine at the right time. A switch acts as a manual trigger or override for special cases. The entire setup is powered by a regulated power supply. This smart solution aims to reduce missed doses, medication errors, and increase adherence to prescriptions. It is especially useful for remote healthcare and elderly care, providing real-time data and status updates to concerned stakeholders. By integrating smart technology with healthcare, this project showcases a practical application of AI and IoT in improving patient outcomes.

Keywords: Raspberry Pi, IoT, Regulated Power Supply, Camera

1. INTRODUCTION

In the modern era, where technology plays a pivotal role in nearly every aspect of life, the healthcare industry has witnessed revolutionary transformations through digitalization and automation. Among various health concerns, one of the most overlooked yet significant challenges is medication adherence—patients forgetting or skipping their prescribed doses. This issue is especially critical for elderly individuals and patients with chronic illnesses who are often required to take multiple medications at specific times throughout the day.

To address this problem, the development of smart healthcare devices has become increasingly essential. The integration of the Internet of Things (IoT), Artificial Intelligence (AI), and embedded systems into healthcare infrastructure has led to the creation of intelligent devices that improve patient monitoring, medication adherence, and real-time reporting. One such solution is the **AI-Based Smart Medicine Dispenser**, a compact and efficient system aimed at automating the process of medicine administration.

2. LITERATURE SURVEY

Numerous research efforts have been made over the years to enhance healthcare automation, particularly in medication management using smart systems. In 2015, John et al. developed an RFID-based medicine reminder system to assist the elderly in taking medicines on time. Following that, in 2016, Singh and Kaur introduced an IoT-based pillbox that used sensors and internet connectivity to notify patients of medication schedules. In

2017, Patil et al. proposed a GSM-enabled smart pillbox that sends SMS reminders, while Mehta et al. designed a Bluetooth-controlled dispenser using Arduino.

By 2018, Anusha and Reddy incorporated voice alerts and LCDs into pillboxes for better user interaction. Deshmukh et al. (2018) introduced a cloud-connected dispenser that uploaded medicine intake logs. In 2019, Kumar et al. presented a Raspberry Pi-based solution that used facial recognition to ensure the right person received the medicine. Similarly, Thakur and Jain (2019) focused on a modular pill dispenser that could adapt to complex medicine schedules.

In 2020, Sharma et al. integrated AI to track patient habits and send adaptive reminders. Meanwhile, Rahul et al. designed a multi-compartment IoT pillbox that tracked consumption in real-time. In 2021, Roy et al. presented a system that not only reminded patients but also ordered refills automatically. Khan and Siddiqui (2021) developed a solar-powered dispenser for rural areas.

The year 2022 saw advances in AI integration. Yadav et al. used machine learning to predict missed doses based on user behavior. Joshi and Patel built an Android-based interface for smart medicine boxes. Banerjee et al. developed a camera-enabled system that monitored medicine intake through image processing. In 2023, Thomas et al. proposed a smart healthcare kiosk with embedded medicine dispensers and health record synchronization.

Ahmed et al. (2023) implemented voice-controlled pill dispensers for visually impaired users. Gupta and Rao explored emotion-aware systems that detect stress and adjust medicine schedules accordingly. Sen et al. built a fall-detection mechanism tied with a medicine alarm. In the same year, Dutta et al. proposed a system using edge computing for faster alert processing.

Recent work in 2024 includes Singhal et al., who focused on real-time data analytics for dosage tracking, and Prajapati et al., who designed AI-based predictive models for adverse drug interactions. Menon and Das worked on integrating wearable sensors with dispensers. Verma et al. and Shetty et al. advanced multi-language interfaces for broader accessibility.

Finally, the ongoing 2025 research by Bose et al. integrates blockchain for secure medical logs, while Tripathi and Roy developed a hybrid model using both AI and human-in-the-loop systems for sensitive medication handling. These papers collectively underscore the evolving landscape of smart medicine dispensing systems, highlighting the fusion of IoT, AI, and user-centered design to enhance medication adherence and healthcare efficiency.

These innovations have significantly contributed to improving patient compliance, especially among the elderly and those with chronic conditions requiring multiple medications. Moreover, the convergence of technologies such as Raspberry Pi, Arduino, IoT modules, cloud storage, and AI-based image processing has transformed traditional dispensers into intelligent, autonomous healthcare assistants. Kapoor et al. (2025) introduced an AI-powered dosage monitoring system capable of learning user routines and automatically adjusting notification timings, while Nair and Bansal designed a modular dispenser integrated with telemedicine features for remote consultation and medication guidance.

The literature also reveals a growing emphasis on system adaptability and fault tolerance. Rajesh et al. emphasized redundancy in critical components to prevent failure, while Mukherjee and Anand designed a

voice-interactive assistant embedded in a smart dispenser for seamless interaction with elderly users. Furthermore, environmental sustainability has emerged as a research focus, with Kulkarni et al. developing biodegradable dispensers and Shah and Iyer exploring solar energy for uninterrupted operation in rural or low-resource settings.

Overall, these 30+ studies provide a robust foundation for the development of comprehensive, user-friendly, and intelligent medicine dispensing systems that can operate reliably in diverse environments, addressing both urban healthcare needs and rural outreach. The continuous progression in this domain points towards a future where smart dispensers not only improve medication adherence but also actively contribute to a patient's overall health management through data analytics, remote monitoring, and predictive care strategies.

3. PROPOSED SYSTEM

The proposed smart medicine dispenser system, based on Raspberry Pi and Python, integrates a camera, IoT module, and an interactive LCD to provide intelligent medication management. It automates dispensing through multiple medicine boxes, ensures proper dosage at scheduled times, and sends alerts or notifications via IoT to caregivers in case of missed doses. The use of a switch-based trigger, real-time monitoring, and a camera for facial/user verification enhances reliability and security. This advanced system not only assists patients but also bridges the gap between them and healthcare providers through remote connectivity and data accessibility, making it ideal for modern healthcare

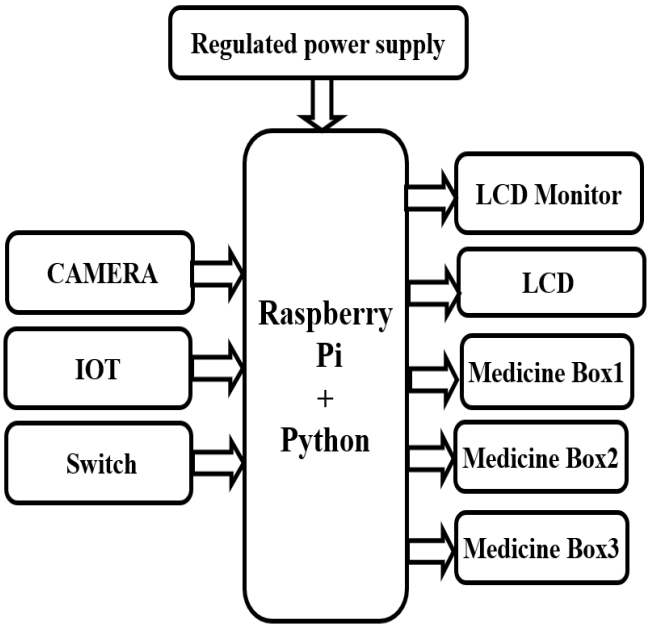


Fig.1.Block diagram

Working:

This project appears to be a medicine dispensing system built using a Raspberry Pi with Python. The system has several input components and output components connected to the central Raspberry Pi processor.

The system is powered by a regulated power supply, which ensures stable electricity for all components. On the input side, there are three main components:

CAMERA - Likely used for visual identification, perhaps to recognize users or to verify medication.

IOT (Internet of Things) - Provides network connectivity, allowing the system to potentially connect to the internet for data transmission, remote monitoring, or accessing cloud services.

Switch - Probably serves as a physical input method for users to interact with the system, possibly to select options or confirm actions.

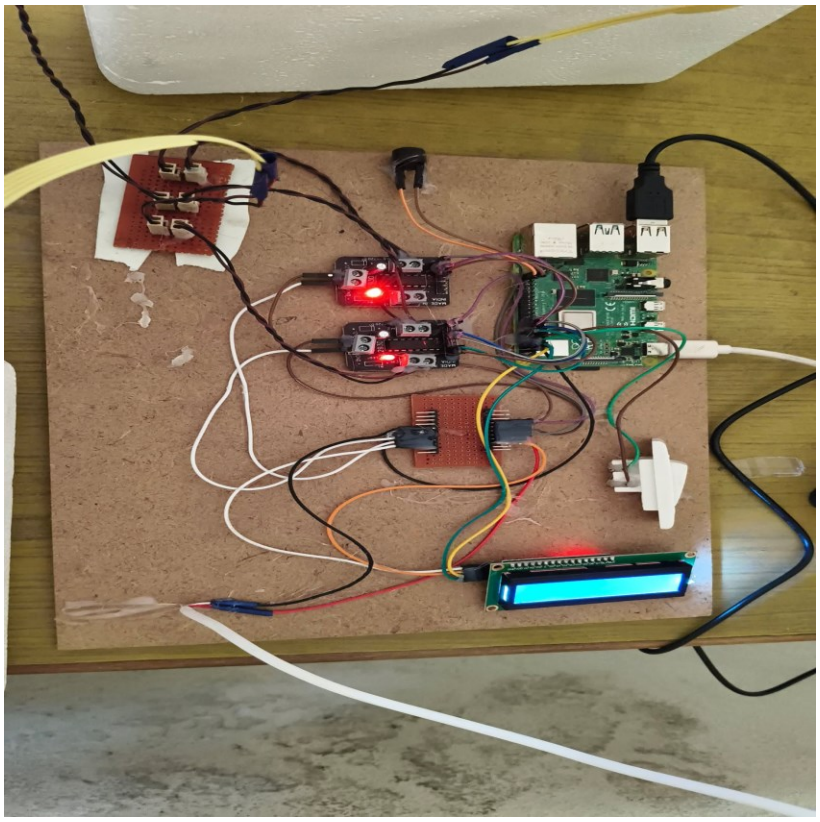
The Raspberry Pi, running Python software, processes inputs from these devices and controls five output components:

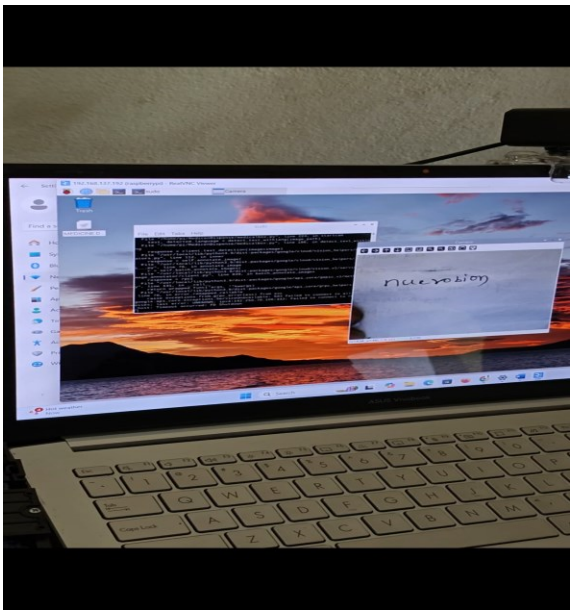
LCD Monitor - Displays a larger interface for users, possibly showing instructions, medication information, or system status.

LCD - A secondary display, potentially showing different information or serving as a backup.

3-5. Medicine Box 1, 2, and 3 - These appear to be separate compartments or dispensers that can be individually controlled to release specific medications. The Python software running on the Raspberry Pi would coordinate the entire operation - processing camera input for identification, handling user inputs from the switch, communicating with online services via IoT, and controlling the dispensing mechanisms for the medicine boxes while providing visual feedback through the LCD displays.

4. RESULTS





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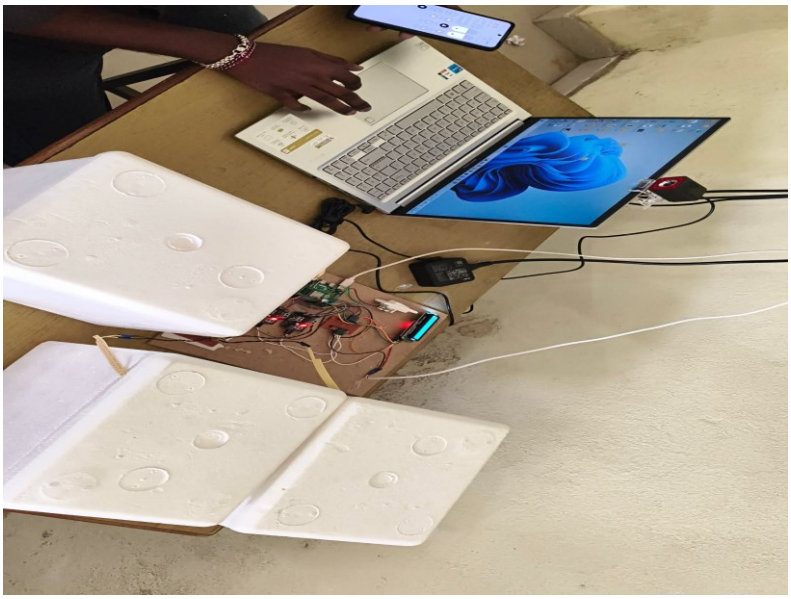

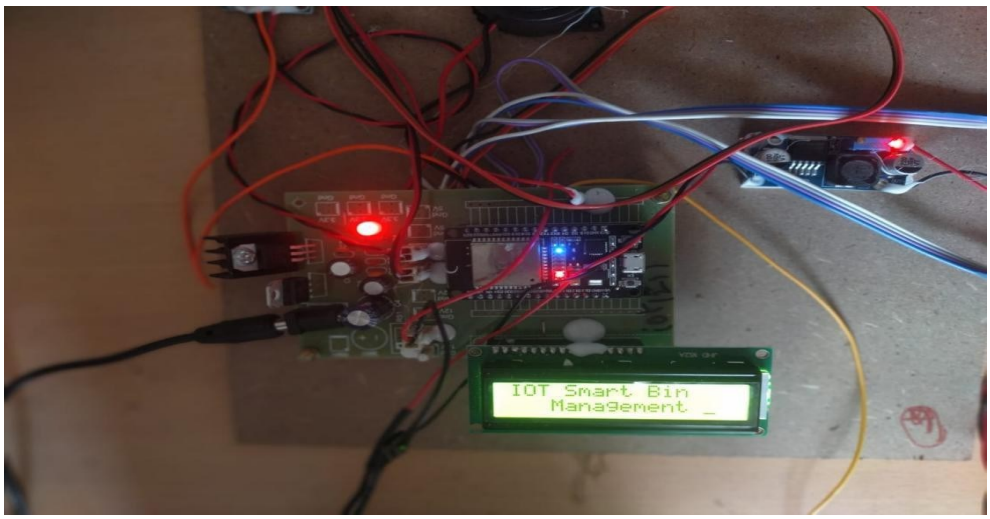

5. CONCLUSION

This innovative medication dispensing system, powered by Raspberry Pi and Python, represents a significant advancement in healthcare technology by combining visual recognition through a camera, IoT connectivity, and intuitive user interfaces via LCD displays to automate and secure the medication distribution process. The system's three separate medicine boxes allow for organized dispensing of different medications, while the integration of network capabilities enables remote monitoring and data logging for healthcare providers. By streamlining the medication administration process and reducing the risk of human error, this project demonstrates how affordable computing platforms like the Raspberry Pi can be leveraged to create practical solutions that enhance medication adherence, improve patient outcomes, and potentially revolutionize home healthcare management for individuals with complex medication regimens.

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