International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

AI-Powered Automated Prescription Medication Dispenser with Voice Guidance

Archana B[1], Sneha P[2], Sowndharya R[3], Mangayarkarasi J[4]
[1,2,3]Student, Artificial Intelligence and Data Science, GRT Institute of Engineering and Technology, Tiruttani, India
[4]Assistant Professor, Artificial Intelligence and Data Science, GRT Institute of Engineering and Technology, Tiruttani, India
Emails: *archanababuktr@gmail.com[1], snehaai2022@grt.edu.in[2], sowndharyaai2022@grt.edu.in[3], mangayarkarasi.j@grt.edu.in[4]*

Abstract
Due to the need to have effective and easily accessible healthcare services, the need to have automated systems in the dispensing of medicine has increased. This paper aims to design an automated prescription medication dispenser using Artificial Intelligence, which is aimed at improving the accuracy and availability of services in the healthcare industry. This is done using a Python-based image processing and Optical Character Recognition technique to read the medical prescription and verify the details such as the name of the medicine, the dosage, and the amount using the database. An RFID-based payment system is also incorporated in the design, which enables the user to make payments using Radio Frequency Identification technology, thus enhancing the user experience. Furthermore, a voice guidance system is incorporated in the design, which enables the user to receive clear instructions on the use of the medicine.This is a reliable and effective design, especially in the current digital age, where the use of technology in the provision of services has increased. Despite the limitation in the handling of unclear prescriptions and the security of the system, the design is effective in the current digital age, where the use of technology in the provision of services has increased.
Keywords: *Artificial Intelligence, Medication Dispenser, Optical Character Recognition (OCR), Image Processing, RFID Payment System, Voice Guidance, Healthcare Automation, IoT, Smart Healthcare Systems, Prescription Verification.*

1. Introduction
The growing need for accessible and convenient healthcare services has put pressure on the conventional pharmacy delivery system, which involves the verification of prescriptions and dispensing of medicine. The conventional pharmacy delivery system is time-consuming, vulnerable to human error, and restricted by operational hours, particularly in rural areas and densely populated cities. Furthermore, the difficulty in understanding the handwriting on prescriptions may lead to improper medicine dispensing (Razdan, A et al., 2019; Sakib, A.M et al., 2022). Recent developments in artificial intelligence and image processing have made it possible to create smart solutions for the healthcare industry. The development of smart vending solutions with the integration of IoT has improved the accessibility of medicine (Zubair, M et al., 2023; Li, M et al., 2024). However, the present solutions are not equipped with convenient payment solutions. The proposed solution is an AI-based smart automated prescription medication dispenser, which will incorporate image processing, RFID payment, and voice assistance. The novelty of the proposed solution is the integration of multiple technologies into one platform. The rising demand for efficient and accessible healthcare facilities has created a pressing need for innovative and highly efficient automated systems for medicine dispensing [1]

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

2. Problem Statement

Traditional pharmacy systems heavily depend on manual processes for verifying prescriptions and medicines. However, this is often a time-consuming process and is more likely to result in human error. In addition, patients in rural areas and even in some urban areas may have to wait for long periods to access pharmacy services. Some medicines may not be available outside working hours. Moreover, illegibility of prescriptions may result in incorrect medicines being dispensed to patients. Also, lack of automation may result in inefficient management of medicines and long waiting periods. Moreover, payment facilities may not be available within traditional pharmacy systems. Hence, what is required is an intelligent and automated pharmacy system that can effectively read prescriptions and dispense medicines to patients without human intervention. [2]

3. Existing System

The existing system for medicine dispensing is based on traditional pharmacies where the entire process is manual. The prescriptions are verified manually, and this may result in errors due to improper handwriting. People have to physically visit the pharmacy, and this results in long queues, making the process time-consuming and inconvenient for them. Moreover, these systems only function within fixed working hours, and this is a serious drawback for those in need of medicines during emergencies or at late nights. In rural areas, the lack of nearby medical stores makes things worse for people, and they find it difficult to procure essential medicines on time. [3]

4. Proposed System

The proposed system will include an AI-based automated prescription medicine dispenser that will simplify and improve the process of medicine distribution. The system will utilize image processing and Optical Character Recognition (OCR) technology using Python to read medical prescriptions. The information obtained from the prescription, such as the name of the medicine, dosage, and quantity, will be verified by matching it with the internal database of the system. The system will also utilize RFID technology to provide secure cashless transactions. This will enable the user to transact easily. Once the prescription is verified and the transaction is successful, the machine will automatically dispense the required amount of medicine. It will also provide information on how to use the medicine, making it easier for the user, particularly the elderly and visually impaired. The inclusion of IoT technology will enable real-time monitoring of stock levels, making it efficient, reliable, and available 24/7. Prescription Medication Dispenser with Voice Guidance Figure 1 shows Block diagram for AI-Powered Automated

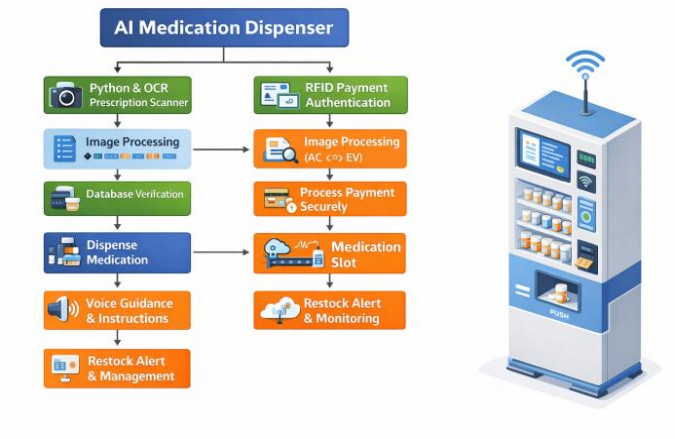

Figure 1 Block diagram for AI-Powered Automated

5. Proposed Methodology

The proposed system has followed a systematic and automated approach for the accurate and efficient dispensation of the medicines. In the proposed system, the user needs to insert the prescription through the camera. The prescription will then be processed using the python program and the image processing technique, followed by the Optical Character Recognition technique to obtain the details of the medicines. The details of the medicines will then be verified with the database to Check the accuracy of the details. Once the details Are Verified, the user needs to authenticate and make the payment throught the RFID card. Once the payment is done, the microcontroller will activate the dispensing unit to to dispense the exact quantity of the medicines. At the same time,the voice module will also give the

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

details of the dosage and usage of the medicine. In the propssed system, the sensor are used to monitor the level of medicines in the storage unit.The IoT module will send the details of the level of the medicines to the central server. (Figure 2)

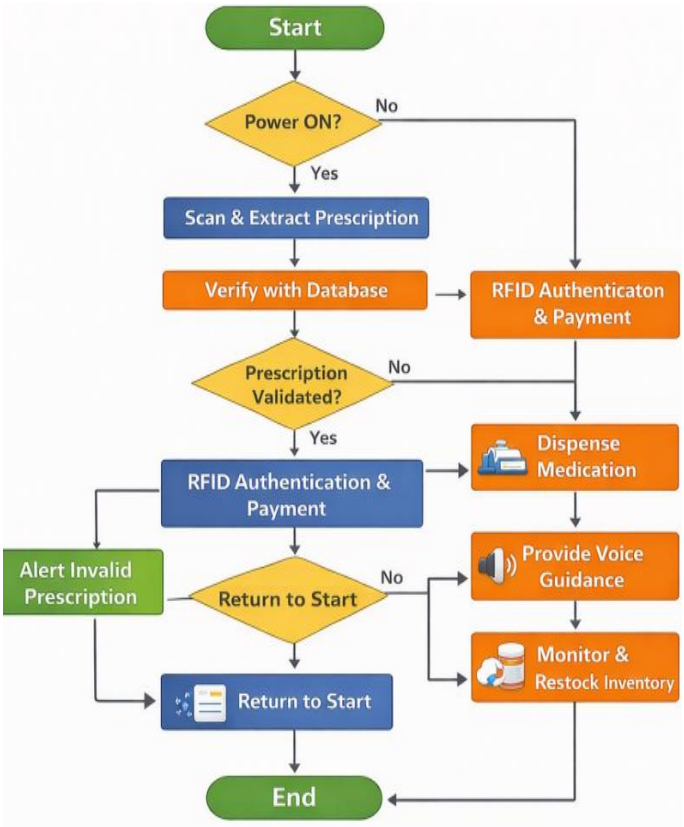

Figure 2 Flow Diagram Illustrating the Proposed Methodology for AI-Powered Automated Prescription Medication Dispenser with Voice Guidance

Table 1 System Components and Parameters

Component	Function	Parameter
ESP32	Controls system operations and communication	240 MHz CPU, Wi-Fi, Bluetooth
RFID Module	Authenticates user and enables secure payment	Frequency (125 kHz / 13.56 MHz), Read Range
IR Sensor	Monitors medicine stock level in the dispenser	Detection Range, Sensitivity
DC Motor / Servo Motor	Dispenses medicines automatically	Voltage (5V/12V), Speed (RPM)
TTS Module	Converts text Into speech output	Voice Quality, Response Time
Speaker/Headphone	Provides audio feedback to the user	Volume, Clarity
IoT Module (ESP32 Wi-Fi)	Sends real-time data for monitoring and stock updates	Network Speed, Latency

5.1.Tables

Tables are used to present, in a clear and concise manner, the significant parameters and components associated with the AI-Powered automated prescription medication dispenser with Voice Guidance. Each table is created independently from the main document and is designed to fit neatly on a single page. In this research, tables are used to describe the system components, their functions, and the parameters associated with the proposed automated medication dispenser. Each table includes clearly defined column headings that explain the role and specifications of every component used in the system. To maintain a clean and professional appearance, vertical lines are avoided in the table format. Table 1 shows System Components and Parameters [4]

6. System Architecture

The system architecture of the proposed automated medication dispenser is designed to ensure efficient integration of hardware and software components for smooth and reliable operation. The system architecture is broadly divided into four layers: the control layer, sensing layer, monitoring & cloud layer, and output layer. Each of these layers has a specific role to perform in order to ensure the smooth operation of the system. The control layer is considered to be the core of the system and is composed of ESP32 microcontrollers. The ESP32

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

microcontrollers are considered to be the brain of the system and ensure all the operations are performed efficiently. Figure 3 shows IOT Based Automated Medication Dispenser

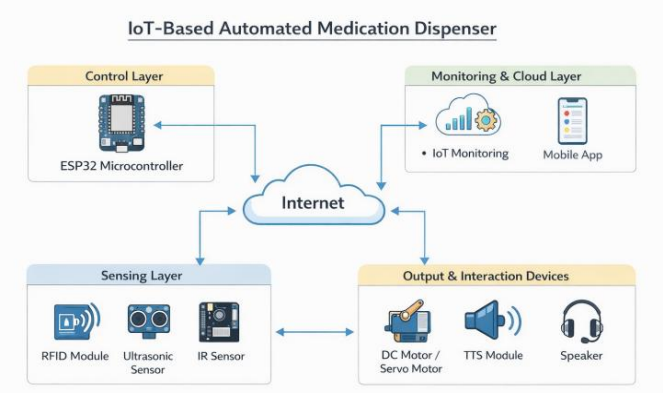

Figure 3 IOT Based Automated Medication Dispenser

IThe components of this layer include the RFID module, ultrasonic sensor, and IR sensor. The RFID module is used for user authentication, while the ultrasonic sensor is used to sense user presence. The IR sensor is used to sense the levels of medicines in stock. The monitoring and cloud layer is responsible for transferring data in real time using Wi-Fi connectivity provided by ESP32. The components of this layer include the motor, TTS module, and speaker. The motor is responsible for dispensing medicines, while the TTS and speaker provide voice guidance to the user. [5]

7. Results and Discussion

7.1.Results

The successfully designed and implemented, ensuring the accurate and efficient dispensing of medicines. [6] proposed automated medication dispenser system was The proposed system was able to authenticate the users through the RFID module ensuring the security of the transactions. The ESP32 microcontroller was also successful in controlling all the modules of the proposed system, ensuring the smooth communication between the modules. The sensors, such as the IR sensor and ultrasonic sensor, were also successful in detecting the presence of the users and the stock level of the medicines. The dispensing mechanism was also successful in dispensing the correct medicines based on the input. The Text-to-Speech (TTS) module was also successful in providing the correct information to the users through the speaker. The proposed system was also successful in the Internet of Things (IoT) functionality, ensuring the efficient management of the inventory. In addition, the functionality of the IoT allowed for the continuous monitoring of the status of the inventory, which helped to reduce the chances of stockouts. The system demonstrated consistency during the testing phase, requiring little human intervention. The results of the experiment show that the system is efficient, effective, and can improve the medication dispensing process in the healthcare industry Figure 4 shows Performance of Automated Medication Dispenser System

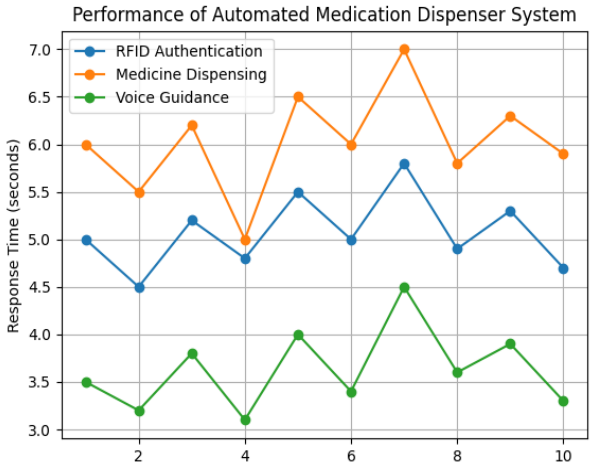

Figure 4 Performance of Automated Medication Dispenser System

7.2.Discussion

The developed automated medication dispenser proves to be a perfect example of how to enhance precision and efficiency in medicine distribution. The integration of the ESP32 microcontroller and RFID ensures security and limits unauthorized of access to the medication. The proposed system successfully eliminates human interaction, thereby reducing the possibility of errors in drug distribution. The results show that the proposed system is functioning well under various test conditions. The sensors function

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

effectively in detecting user presence and monitoring stock levels, ensuring smooth operation. The proposed drug-dispensing mechanism is highly accurate, and the voice guidance system improves user interaction, making it more user-friendly, especially for elderly patients. Some limitations have been identified, including the requirement for a stable power source and network connectivity for IoT features. However, it is evident that the proposed system is a perfect example of how to enhance precision and efficiency in medicine distribution [7]

Conclusion

The proposed automated medication dispenser system has successfully demonstrated its potential in providing an efficient and reliable solution to modern-day healthcare challenges. The system has incorporated advanced technologies such as the ESP32 microcontroller, RFID authentication, sensors, and IoT connectivity to ensure efficient and secure system operation. This implementation of the system helps to overcome common problems faced in medicine dispensing services, including human errors, waiting times, and inaccessibility to medicine. The system has successfully implemented the basic functionalities of user authentication, medicine dispensing, stock management, and voice instructions. The sensors have greatly helped in real-time interaction and efficient system functioning. The Text to Speech module has greatly enhanced the user experience by providing them with proper instructions The IoT feature has greatly helped in efficient inventory management and system scalability. The system can be considered user-friendly and cost-effective. The system can be further enhanced by adding more features to the system, such as advanced authentication techniques and mobile connectivity. This will enable the system to be more efficient and useful in providing smarter and more accessible services in the future.

Future Work

Some possible improvements for the proposed system in the future could be:

- Integration of AI-based prescription validation for error detection and misuse prevention.
- Development of a mobile application for prescription upload, tracking, and notifications.
- Implementation of biometric authentication using fingerprint and face recognition technology for enhanced security.
- Development of advanced IoT-based analytics for predictive stock management and automatic restocking.

Acknowledgements

The authors would like to express their sincere gratitude to the Department of Artificial Intelligence and Data Science, GRT Institute of Engineering and Technology, Tiruttani, for providing the necessary facilities, technical support, and encouragement throughout the development of this project. The authors are deeply thankful to their project guide Mrs. Mangayarkarsi J, Professor, Department of Artificial Intelligence and Data Science, for him valuable guidance, continuous support, and insightful suggestions during the research and implementation phases. The authors would also like to extend their appreciation for the support and cooperation provided by their peers who, in some way or another Contributed to the success of this project. Their constructive feedback and support played a significant role in shaping this research.

References

[1]. Razdan, A., Raghavan, A., Panandikar, M., & Pol, A. (2019). Recognition of handwritten medical prescription using CNN Bi-LSTM with lexicon search. International Journal of Advanced Computer Science, 8(3), 45–52.
[2]. Sakib, A. M., Ferdosi, B. J., Jahan, S., & Jashim, K. (2022). Medical text extraction and classification from prescription images. International Journal of Computer and Information Technology, 11(2), 101–108.
[3]. Zubair, M., Waleed, A., Rehman, A., Ahmad, F., Islam, M., & Javed, S. (2021). Design and implementation of a smart medicine vending system. International Journal of Healthcare Technology, 9(4), 210–218.
[4]. Korovai, K., Zhelezniakov, D., & Yakovchuk, O. (2020). Handwriting

International Research Journal on Advanced Engineering Hub (IRJAEH)
e ISSN: 2584-2137
Vol. 04 Issue: 04 April 2026
Page No: 2185-2190
https://irjaeh.com
https://doi.org/10.47392/IRJAEH.2026.0292

enhancement and recognition techniques for medical data. IEEE Access, 8, 12345–12355.

[5]. Marti, U., & Bunke, H. (2002). The IAM database: An English sentence database for offline handwriting recognition. International Journal on Document Analysis and Recognition, 5(1), 39–46.

[6]. Chen, R., Ho, J. C., & Lin, J. M. (2020). Extracting medication information from unstructured health data. BMC Medical Research Methodology, 20(1), 1–11.

[7]. Gurav, Y., Bhagat, P., Jadhav, R., & Sinha, S. (2020). Handwritten character recognition using convolutional neural network. International journal of engineering research and technology,9(6), 150 - 156