

A Smart Drug Dispensing Solution & Management System with Arduino

Vipra Bohara, Lokesh Sharma, Rakesh Kardam, Ram Singh, Gopal Tiwari, Neeraj Kumawat

Abstract— As technology advances, it becomes more and more clear that streamlined processes are demanded across a range of diligence. An automated medicine dispenser that's intended to fully transfigure drug administration is also oven result that's presented in this abstract. In contrast to conventional allocating ways, this system effectively automates the allocating process by exercising state- of- the- art technologies. Cases admit accurate drug delivery thanks to the automatic medicine dispenser, which reduces mortal error and improves perfection. This abstract emphasizes the value of technological invention in healthcare and stresses how automated results can enhance patient issues and expedite executive processes in the field.

Index Terms—Automation, Drug Dispenser, Health Care, RFID

I. INTRODUCTION

Automation has come synonymous with delicacy and effectiveness in the ultramodern day, and it permeates numerous angles of day-to-day life. The advancement of technology, videlicet in the healthcare sector, has encouraged the creation of creative results with the objective of perfecting patient care and streamlining functional procedures. The automatic drug dispenser is one similar revolutionary development. Automated drug dispensers want to reduce mortal intervention while maximizing effectiveness and delicacy, much like virtual helpmates in the consumer technology request. These systems may precisely apportion medicinal in agreement with specified tablets and time- tables by exercising sophisticated data processing and machine learning algorithms. This lowers the possibility of lawbreaking's and improves patient issues.

II. KEY AREAS

The health care assiduity is seeing a swell in exploration and development related to automated medicine dispensers, with the thing of converting drug operation procedures and enhancing patient issues. Indeed though the field is still in its early phases of exploration, its pledge to enhance drug adherence, lower pharmaceutical miscalculations, and expedite health care operations has attracted a lot of attention.

Vipra Bohara, ECE, JECRC, Jaipur, India,
Lokesh Sharma, ECE, JECRC, Jaipur, India
Rakesh Kardam, ECE, JECRC, Jaipur, India
Ram Singh, EE, JECRC, Jaipur, India
Gopal Tiwari, EE, JECRC, Jaipur, India
Neeraj Kumar Kumawat, EE, JECRC, Jaipur, India,

The maturity of the current exploration on automated medicine dispensers concentrates on the elementary ideas and original deployments of these systems. Scholars and medical interpreters are probing different design factors, technological structures, and stoner interfaces to develop.

A. Technological Foundations

Research has looked at the tackle and software demanded to construct auto copulated medicine dispensers, similar as robotic allocating systems, stoner interfaces, and pharmaceutical storage units. The thing of this exploration is to give accurate and reliable drug delivery by optimizing the design and performance.

B. Safety and Reliability

It's pivotal to guarantee the responsibility and safety of automated drug dispensers. Scholars are examining approaches to avoid pharmaceutical miscalculations, identify and address system failures, and cover medicines from unwanted access. This involves creating dependable security styles and fail-safe systems. It's pivotal to guarantee the responsibility and safety of automated drug dispensers. Scholars are examining approaches to avoid pharmaceutical miscalculations, identify and address system failures, and cover medicines from unwanted access. Creating dependable security protocols and fail-safe styles is part of this.

III. STRUCTURE

Medication management is revolutionized by auto mated drug dispensers, which automate the dispensing procedure and guarantee accuracy, timeliness, and safety. By removing the possibility of human mistake, such as giving the wrong dosage or forgetting to take a medication, these systems improve patient safety and lower the incidence of adverse drug events. They enhance drug adherence and therapeutic results by offering customized medication schedules and reminders. When paired with cutting-edge technology like RFID and bar-coding, they make effective drug tracking and inventory control possible.

Secure access controls are another feature that automated dispensers provide to stop drug theft and illegal access. They save time and money by streamlining healthcare practitioners' operations and eliminating the need for manual medication dispensing. It gives medical personnel the ability to monitor patients remotely, track adherence, and take preemptive measures as needed. These systems empower people, which promote patient-centered care.

IV. BACKGROUND

Automated medicine dispensers were developed in response to the urgent need to enhance health care settings' medication management. Medication errors have historically presented serious concerns to patient safety and therapeutic effects, including dosage errors and missed doses. The need for automated solutions has been highlighted by the human mistake and inefficiency that can occur during manual medicine delivery procedures.

The introduction of cutting-edge technology like IoT, AI, and robotics has opened the door for creative methods of delivering drugs. These technologies are used by automated drug dispensers to automate processes such as scheduling, dosage computations, and medicine distribution.

They provide accurate and dependable medicine dispensing, lowering the risk of mistakes and unfavorable drug effects.

The significance of efficient medication management strategies has been further highlighted by the rising incidence of poly-pharmacy and chronic illnesses.

V. SYSTEM STRUCTURE

1. Provide accurate and controlled movement of the pharmaceutical containers by powering the mechanical parts of the dispensing system.
2. Controlling Circuits: Oversee the DC motors functioning to guarantee coordinated dispensing activities and effective power use.
3. OR Camera: This device scans drug packaging for QR codes, allowing the system to recognize and administer the appropriate medication based on unique identifiers.

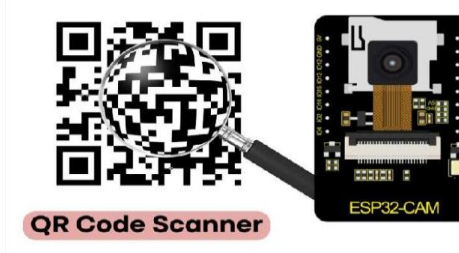


Fig. 1 Code Scanner

4. LCD 16x2 Display: Offers customers visual feedback by showing pertinent data such drug names, dosages, and dispensing status.
5. Button: Enables manual overrides and system navigation by allowing users to enter commands and communicate with the dispensing system.
6. Relay Driver: Manages the electrical circuit switching, allowing the dispensing system to turn on and off different parts including motors and sensors.
7. ESP32 Programming Chip: Serves as the system's central processing unit, carrying out pre-programmed

commands and directing the activities of every component.

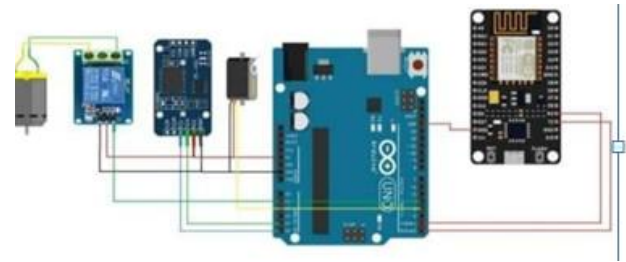


Fig. 2 Circuit Diagram

8. The Google Sheet to QR Converter App simplifies the process of updating and managing pharmaceutical information by converting data stored in Google Sheets into QR codes.
9. Tablet Box: Stores and arranges the pill bottles for administration.

VI. WORK FLOW

Each step in the flowchart represents a distinct stage in the medication dispensing process, ensuring accuracy, compliance, and patient safety throughout the operation of the Automated Drug Dispensing System.

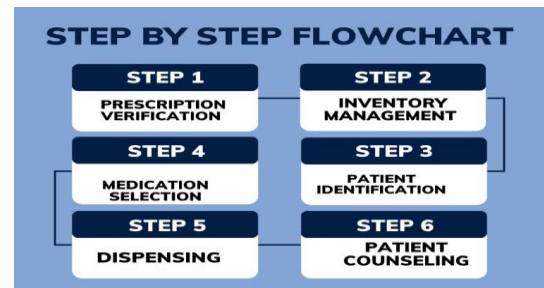


Fig. 3 Step by Step Flow Chart

Steps involved in the automated drug dispensing process:

- Prescription Verification: Verify the prescription and patient information.
- Inventory Management: Manage medication inventory and its availability.
- Patient Identification: Authenticate the patient's identity.
- Medication Selection: Select the appropriate medications based on the prescription.
- Dispensing: Dispense the medications into designated containers
- Patient Counseling: Provide relevant information and instructions to the patient.
- Documentation: Record the dispensing transaction for documentation purposes.
- End: End of the dispensing process.

VII. APPLICATIONS

1. **Healthcare:** Automated dispensing systems handle and dispense pharmaceuticals in clinics, hospitals, and pharmacies, increasing medication adherence, improving patient safety, and optimizing workflow for medical staff.
2. **Retail:** Automated retail stores, self-service kiosks, and vending machines are places where retailers use automated dispensing systems to give customers easy access to a range of goods, such as beverages, snacks, gadgets, and personal hygiene products.
3. **Manufacturing:** To precisely dispense chemicals, adhesives, and raw materials while maintaining consistency, cutting down on material waste, and increasing production efficiency, automated dispensing systems are integrated into industrial processes.
4. **Logistics and Distribution:** Automated dispensing systems in logistics and distribution facilities streamline inventory management, order fulfillment, and shipping processes by automating the selection, packing, and sorting of commodities.
5. **Food and Beverage:** Automated dispensing systems are utilized in the food and beverage sector to distributing rudiments, sauces, and condiments in restaurants, foodservice companies, and commercial kitchens. This practice enhances the consistency and efficiency of food production.

Overall, automated dispensing systems play a crucial role in optimizing processes, increasing efficiency, and ensuring accuracy across various industries, contributing to improved productivity, cost-effectiveness, and customer satisfaction.

VIII. RESULTS

Automated dispensing systems offer a multitude of benefits, revolutionizing medication management and enhancing patient care in various health care settings:

1. **Enhanced Medication Safety:** Automated systems minimize the risk of medication errors through precise dispensing and verification processes, reducing adverse drug events and improving patient outcomes.
2. **Improved Efficiency:** By automating medication distribution tasks, these systems streamline work flow, optimize inventory management, and free up health care staff to focus on patient care activities, thereby increasing overall operational efficiency.
3. **Reduced Labor Costs:** Automating dispensing tasks decreases the need for manual intervention, leading to significant cost savings by minimizing labor requirements and increasing productivity within health care facilities.
4. **Enhanced Inventory Management:** Automated systems track medication inventory in real-time, providing

accurate data on stock levels, expiration dates, and usage patterns, enabling efficient inventory control and reducing waste.

5. **Patient Convenience:** Automated dispensing systems offer convenient access to medications.

IX. FUTURE SCOPE

The future scope of this research paper encompasses several avenues for further exploration and enhancement in the field of Medical Field through the integration of IOT and AI-ML:

1. **AI Integration for Personalized Care:** AI will be seamlessly integrated with automated dispensing systems to transform drug management by customizing treatment plans to meet the needs of each patient, improving the therapeutic efficacy, and reducing side effects.
2. **Cutting-Edge Machine Learning Algorithms:** Predictive analytics will be powered by cutting-edge machine learning (ML) algorithms, which will enable health care providers to monitor medication adherence patterns, identify possible drug interactions, and provide proactive interventions that will guarantee the best possible patient outcomes.
3. **Internet of Things (IoT):** Connectivity for Real-Time Monitoring: By enabling automated dispensing systems to communicate with wearable technology and electronic health records (EHRs), the Internet of Things (IoT) will allow for continuous remote monitoring of patient health status, medication adherence, and vital signs, promoting proactive health care interventions.
4. **RFID-enabled Smart Packaging:** Next-generation automated dispensing systems will feature RFID-enabled smart packaging solutions with sensors and tags for precise medication tracking, temperature monitoring, and counterfeit detection. These features will increase medication safety and regulatory compliance.
5. **Seamless Tele health Integration:** By enabling patients to take advantage of tele-monitoring programs, virtual medication consultations, and remote medication counseling, tele-health platforms will improve treatment and medication adherence from the comfort of their homes.

X. CONCLUSION

With so many benefits for both patients and health care practitioners, automated medicine dispensers are a promising development in health care technology. These technologies strengthen patient safety, reduce errors, and improve drug adherence by automating pharmaceutical distribution processes. They also improve health care personnel' workflow efficiency, freeing up more time for them to oversee patient care.

However, more improvement and optimization are required to solve present issues and guarantee a smooth integration into the current healthcare system in order to fully fulfill their potential. Automated drug dispensers have the potential to drastically improve patient care outcomes and change medication management practices in the years to come with continuing study and technological improvements.

REFERENCE

- [1] Nidhi Solanki, and DR.P.H.Zope International Research Journal of Engineering and Technology, Volume:05, Issue:July2018, e-ISSN:2395-0056.
- [2] Diaa Salama Abdul Minaam, and Mohamed Abd-EL fattah, Smart drugs: Improving
- [3] health care using Smart Pill Box for Medicine Reminder and Monitoring System, Future Computing and Informatics Journal, Volume 3, Issue 2, 2018, ISSN 2314-7288.
- [4] Mohammed Asad Fasahate, International Journal of Scientific & Engineering
- [5] Research, Volume 9, issue 2, February 2018, ISSN 2229-5518.
- [6] Ekbal Rosli and Yusnira Husaini 2018 IOP Conf. Ser..Mater.Sci.Eng 341012004,
- [7] Abdallah Kassem, A Comprehensive Approach for ASmart Medication Dispenser, International Journal of Computing and Digital Systems, March 2019, ISSN 2210-142X
- [8] Ana Rita Sousa, Proceedings of the 5th World Congresson Electrical Engineering and Computer Systems and Sciences(EECSS'19) Lisbon, Portugal August,2019.
- [9] N.Kattukkaran, A.George and T.P.M. Haridas,"Intelligent accident detection and alert system for Emergency medical assistance,"2017 International Conference On Computer Communication and Informatics (ICCCI),2017, pp. 1-6, doi: 10.1109/ICCCI.2017.8117791.
- [10] Aayaush Doshi, Jubin Kamdar, Bhavya Shah,"Accilert Accident Detection And Alert System,"2021Research Gate.(https://www.researchgate.net/publication/35595808_Accilert_Accident_Detection_AlertSystem)