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Automatic Medicine Dispenser

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Abstract: *This project introduces a Smart Medical Dispenser System that uses contemporary embedded technology to automate and secure drug dispensing. A servo motor, RFID reader, and I2C LCD display are all integrated into the system, which is based on an ESP32 microprocessor. A distinct RFID card associated with their prescription is issued to each authorized user. The ESP32 verifies the RFID card against previously saved IDs after it has been read. The servo motor turns on and unlocks the dispenser to release the recommended tablet if the scanned RFID matches a valid entry. The patient ID and tablet name are shown simultaneously on the LCD screen, ensuring accountability and real-time validation. This system can be scaled for usage in pharmacies, hospitals, or at home by elderly and chronic care patients. It also guarantees safe medicine access and stops illegal dispensing. RFID technology improves user-specific access control, and servo mechanisms guarantee mechanical accuracy while delivering medications. The design is scalable, dependable, and reasonably priced, which makes it the perfect choice for intelligent healthcare automation.*

Key Word: *ESP32, Emergency Use, RFID Card and Tag, RFID Receiver, Servo Motors, LCD Display.*

I.INTRODUCTION

Healthcare process automation is becoming more and more crucial in today's fast-paced environment, particularly in areas like drug management. Many patients have trouble remembering their medication schedules or run the danger of taking the incorrect dose, especially those who are older or have chronic diseases. In order to overcome these obstacles, this project presents a Smart Medical Dispenser that uses cutting-edge integrated technology to guarantee the safe and precise administration of medications. An ESP32 microcontroller was used in the development of this system, acting as the main controller for managing servo motor operation and RFID-based user authentication. Authorized users are identified using RFID cards and an RFID reader. Access to the designated pill is made possible by the ESP32 activating a servo motor to open the pharmaceutical compartment upon scanning a valid card. In order to provide visual confirmation, the tablet name and user ID are simultaneously displayed on an I2C LCD display. The system is appropriate for home care, clinics, and hospitals because it provides a number of advantages, including individualized dispensing, regulated access to medication, and fewer manual errors. It is an affordable and scalable way to improve medication safety and adherence in medical settings because of the hardware and logic's simplicity.

II.MATERIAL AND METHODS

Literature Review

Research and development has been ongoing in the area of integrating automation in healthcare, particularly for the distribution of medications. Numerous research and prototypes have been put forth to use embedded systems, Internet of Things technologies, and identification techniques like RFID to guarantee the precise and timely delivery of medication to patients. Radio Frequency Identification, or RFID, technology is widely used for tracking and authentication. RFID can be used successfully in medical systems to identify users or patients in order to prevent unwanted access to medication, per research by Ghosh et al. (2019). This enhances security and guarantees that the correct medication is given to the proper patient exclusively. Prior research has shown how to automate the delivery of pills using microcontrollers like the Arduino or Raspberry Pi. In mechanical automation, servo motors are renowned for their accuracy and dependability. They have been used to operate pill storage sections in medical dispensers. Wang and colleagues' study. Because of its dual-core processing, low power consumption, and Wi-Fi and Bluetooth capabilities, the ESP32 microcontroller has grown in popularity. Research and application-based initiatives have exploited ESP32 in smart health monitoring systems, confirming its efficiency for real-time embedded healthcare solutions.

III.METHODOLOGY

To safely and automatically distribute medication, the Automatic Drug Dispenser system makes use of an ESP32 microcontroller, four servo motors, an RFID reader with RFID cards or tags, and an LCD display. When the RFID reader reads the unique UID from an authorized tag, the process starts. After comparing the UID to a previously stored list of approved users,

the ESP32 turns on the appropriate servo motors to open the drug-containing compartments. Real-time feedback, such as "Access Granted" or "Invalid User," is provided by the LCD display, and success or failure is shown by LED indicators. The technology increases security, guarantees that only authorized users may access pharmaceuticals, and boosts medication distribution efficiency. Features like remote monitoring or a database for user administration can be added to the design.

IV.SYSTEM DESIGN

An ESP32 microcontroller serves as the key control unit in the Automatic Drug Dispenser's system design, regulating the interactions between different parts. In order to authenticate the user against a predetermined list of approved tags, the ESP32 processes the UID after the RFID reader reads RFID tags. The ESP32 opens and dispenses the medication by sending signals to four servo motors, each of which controls a compartment, after verification is successful. With statements like "Access Granted" or "Invalid User," the LCD display gives the user feedback, and LED indicators visually verify the status. The ESP32 manages the logic, user authentication, and display updates, while the servo motors receive power separately to guarantee correct operation. By restricting access to authorized users, the system maintains security. It can be expanded to include other functions like database integration or cloud monitoring.

V.RESULT

On the appropriate servo motors to open the appropriate drug compartment. The system provided real-time feedback by displaying statuses like "Access Granted" or "Invalid User" on the LCD screen when the RFID tag was read. Furthermore, the servo motors ran well and dispensed the medication on schedule. When someone tried to get access without authorizUsing RFID tags, the system was able to identify authorized users during the Automatic Drug Dispenser's testing. After authentication, the system turned ation, the LCD displayed "Access Denied," and the LED indicators flashed red to indicate a problem. High reliability was shown by the system, which safely gave authorized users the right medication while maintaining precise control and user verification. The live testing images that follow demonstrate how the system functions in a variety of test settings, confirming that it works as intended.

Figure 1 Scan RFID

Figure 2: Patient & Medicine details

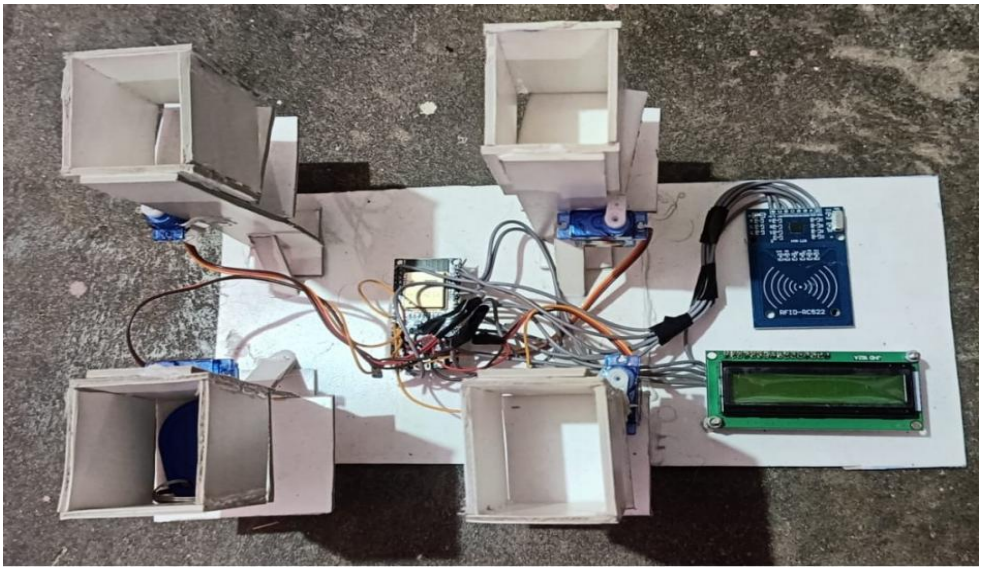

Figure 3: Complete Prototype

VI.CONCLUSION

In summary, the Automatic Medicine Dispenser project successfully illustrates a useful and effective medication management solution by utilizing the capabilities of an ESP32 microcontroller. The use of servo motors for accurate pill dispensing, in conjunction with an intuitive LCD display for user feedback and instructions, improves the system's accuracy and user-friendliness. The integration of an RFID reader, along with RFID cards and tags, provides a secure and personalized access mechanism, guaranteeing that only authorized individuals can retrieve their prescribed medication. This project successfully illustrates how embedded systems and Internet of Things principles can be applied to create smart healthcare solutions, ultimately improving medication adherence, lowering errors, and giving patients more autonomy in managing their health.Its place in contemporary home healthcare could be further cemented with future improvements that investigate connectivity for remote monitoring and prescription updates.

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