



SMART MEDICINE DISPENSER

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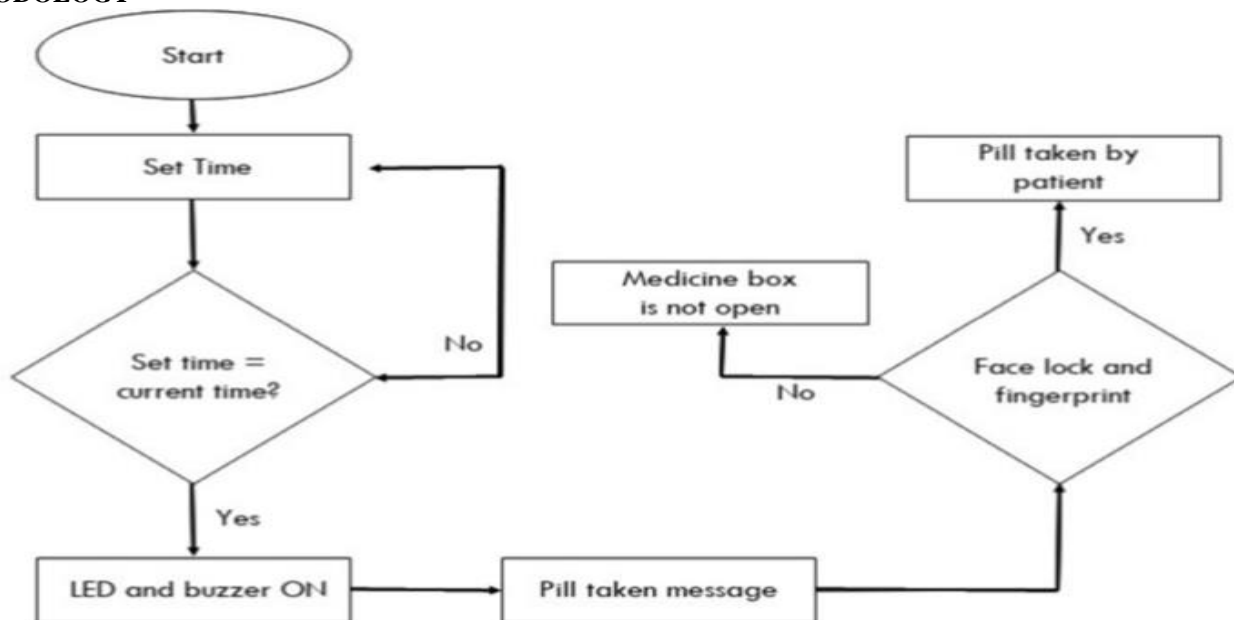
Abstract: Many medication errors occur because those responsible for managing patient or elder medications must sort through a huge number of pills each day. This manual process increases the risk of mistakes, such as missed doses or incorrect medication administration. Our project involves the conception, design, and creation of a pillbox prototype aimed at addressing these deficiencies in the medical field. This device is an innovative smart pill dispenser with the capability to sort pills automatically, minimizing human errors. It is intended for use in hospitals, retirement homes, and even home care settings, improving the efficiency and accuracy of medication management. Smart medical dispenser is designed for patients who frequently take medications or vitamin supplements, as well as for caregivers assisting older adults or individuals with chronic illnesses. The device is programmable, allowing users or caregivers to set the pill quantity, timing, and daily service schedule. It consists of twenty-one separate compartments, ensuring organized storage and easy access to multiple medications. The system includes an advanced alert mechanism that reminds users to take their medications through sound and light notifications. Additionally, to enhance security and prevent unauthorized access, the pillbox features fingerprint recognition technology, ensuring that only the intended patient or caregiver can access the medications. By integrating automation, security, and user-friendly functionality, our smart pillbox aims to reduce medication errors, improve adherence, and provide peace of mind for both patients and caregivers, ultimately contributing to better healthcare outcomes.

Keywords: Automated medication management Patient safety Pill sorting technology Fingerprint recognition security Alarm system

INTRODUCTION

The Smart Dispenser is an automatic medication dispenser that organizes, schedules, and delivers patient medication with the touch of a button. Most existing medication dispensers are designed to support only a single user and have a low degree of scalability. Thus, assigning one medication dispenser to each patient would increase operational costs. A correct medication schedule and system settings should be preconfigured in a medication dispenser. Moreover, considering that users of medication dispensers are typically in the older age group or are mostly patients with chronic diseases, it also allows medical staff and system administrators, instead of end users, to manage medication dispensers, leading to cost efficiency and safe operation of the device." "This fact is easily explained when we understand that many abilities, such as sight, memory, or logical capabilities, tend to decrease proportionally with age, making it difficult for individuals to remember which pill to take at the correct time, to remember to take them, or to distinguish one pill from another. This confusion may arise due to decreased sight as well as the similarity in the pills' forms and colors. Our medicine box is designed for users who regularly take medications or vitamin supplements, as well as for nurses who care for older patients. The medicine box is programmable, allowing nurses or users to specify the quantity of pills to take and the serving time for each day. It contains seven separate sub boxes, enabling the setting of information for seven different pills. Once the pill quantity and serving time have been set, the medicine box will remind users or patients to take their pills using sound and light. The specific number of pills to be taken will be displayed on a seven-segment LED display place on the corresponding box, in contrast to traditional pillboxes that require users or nurses to refill the box daily or weekly. With the tremendous growth in medical technology, there is now a cure for many dreadful diseases through the intake of several new medications. The number of medicines to be taken by each person has increased, making it challenging to remember to take them at the designated times. This smart medicine box assists in reminding us of the medications we should take at the appropriate times.

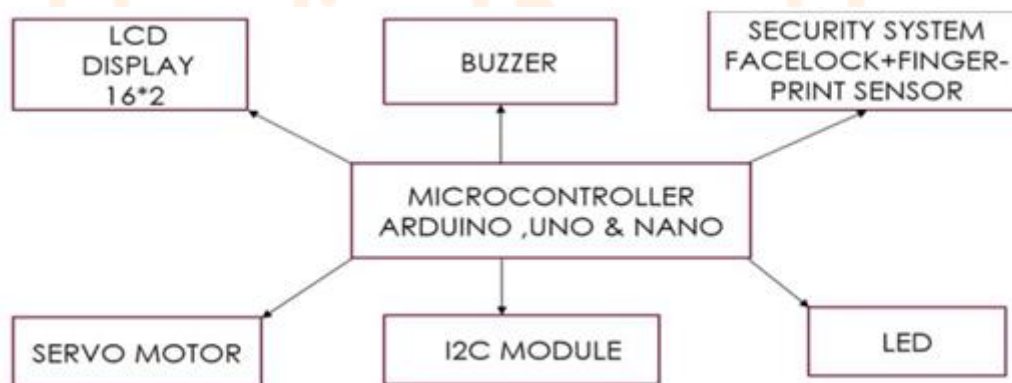
METHODOLOGY



[Figure 1: Flow Diagram]

In the proposed methodology, we created a smart medicine box to ensure that people take their medications according to schedule. The medicine box receives configuration data through an LCD, LED, buzzer, and buttons, all included in the smart medical dispenser. When the configuration is activated, the configuration data is sent and displayed on the screen. Stepwise motion of the compartment is achieved using a stepper motor. There is a built-in alarm system within the device, which consists of a buzzer and LED to indicate the time for medication. The principal idea is to solve the problem of designing a smart dispenser device that requires no human intervention. Details about the design of the smart medicine dispenser are provided. Initially, the requirements for designing this device are collected, and then design considerations are addressed. Finally, a design process is suggested to create the smart medicine dispenser. The programmable smart medicine dispenser allows the caretaker to reliably administer medications to a patient without needing to be present each time the medication is scheduled. The caretaker pre-programs the SMD, enabling it to set up to 21 medications through an ergonomically designed interface that utilizes an alphanumeric keypad and LCD display. The SMD can be pre-programmed to repeat the same cycle for one month. An alarm is provided to notify the owner to load the medicine if the number of pills or capsules falls below a threshold value, which can be set by the owner.

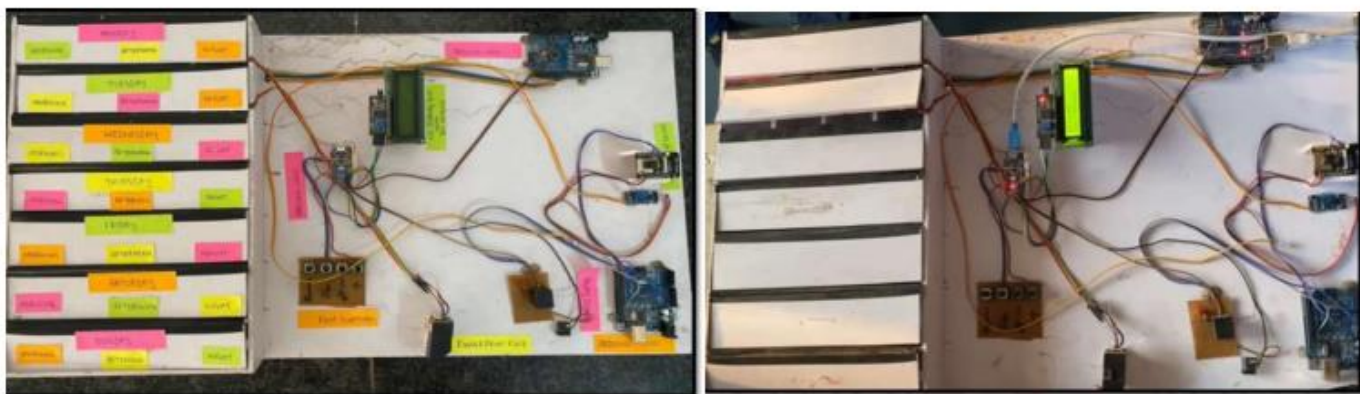
BLOCK DIAGRAM



[Figure 2: Block Diagram]

First of all, we can use the fingerprint sensor or face lock to open the pill box. Then we can set the time. In the pill box, the set time must equal the current time; if the set time does not match, the pill box will not open, and the signal will revert to the set time. Next, check the set time; if it matches, the smart medicine box will blink a light at the specific compartment, and a buzzer will sound with a high-pitched tone. Additionally, a 'pill taken' message will appear on the display. Afterwards, the patient can retrieve the medicine from the pill box using their fingerprint or face lock. If the fingerprint or face lock does not match, the pill box will not open, and an error message will be displayed. If the fingerprint or face lock matches, the 'pill taken' message will be shown on the display, and subsequently, the pill box will open, allowing the patient to take the medicine at the right time.

HARDWARE IMPLEMENTATION



[Figure 3: Hardware Implementation]

First, the buzzer will emit a high-pitched sound 5 minutes before the scheduled time for the patient to take the medicine. First, the ESP-32 CAM will perform face recognition. Once the face has been recognized, it will send a high signal to the controller, which will cause the LED to blink. If the camera fails to recognize the face, it will send a low output to the controller. After the camera successfully recognizes the face, the fingerprint sensor will come into play. At this stage, the sensor will recognize the patient's fingerprint and will send a high signal if the fingerprint is recognized; otherwise, it will send a low signal to the controller. When both the fingerprint and face recognition security checks are passed by the patient, the controller will activate the servo according to the time and day, along with the specific compartment LED. After the specific compartment is opened, if the patient does not take the medicine within 10 seconds, the servo will automatically close the compartment.

ADVANTAGES

1. Self-configuring and easy installation
2. Extra safety measures around children and pets
3. Medicine activity tracking report
4. LCD indicator
5. Overdose – prevention blocking mechanism
6. Portable mechanism

3.4 DIS ADVANTAGES

- 1 Wastage of medication
- 2 Storage of unnecessary drugs
- 3 Risk of organ failure
- 4 Dispensing errors
- 5 Prone to breakdown

CONCLUSION

This smart medicine dispenser covers almost all the aspects expected, whether it is notifying the caretaker or changing the location of the box; everything has been rendered through this paper. The prime motive of this research is to assist those suffering from amnesia or those who cannot keep track of their medications, which can eventually lead to dire conditions. Future work that can be incorporated to improve it further includes counting the medicines taken out of the dispenser and displaying this information on smart phones. This will help create a record for a greater number of patients under examination. Additionally, a website can be created to store ample data, and by analyzing that data, the patient's schedule must be adjusted according to the practitioner.

FUTURESCOPE

Future scope as targeted buyers not having any boundaries regarding awareness but using it as a plus point will lead us to a way brighter future with regular users: patients, senior citizens, younger individuals, and those who work outside. This device must further offer the best treatment for patients suffering from diseases; it would also be very helpful for normal patients and those who are paralyzed. We have a good opportunity with less competition around the state and country, as the need and lack of knowledge have hindered awareness among the general population. The concept of the smart medicine dispenser is to deliver medication at the appropriate time without any errors. In this case, we utilize a buzzer, LED, and display for visualization and to indicate to the patient when to take their medicine. The design of the smart medicine dispenser accommodates pills and capsules of any size. It has been found that the dispenser can be programmed for one week with different sub-compartments, with specific LEDs blinking in the designated compartments according to an appropriate schedule, along with a beeping sound five minutes prior to the medicine intake, so that the patient is aware of when to take their medication. The goal of this project, for further implementation, is to assist fully paralyzed patients through the use of a robotic arm. Additionally, we are implementing a telemetry system so that if anyone is not present with the patient, a message will be sent via the telemetry system.

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