A PROJECT REPORT ON

ARDUINO BASED MEDICATION SYSTEM

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Abstract

This project focuses on the development of an automated medical dispenser utilizing Arduino to simplify medication management and ensure adherence to prescribed schedules. The system integrates an RTC (Real-Time Clock) module for precise timing, an LCD screen for user-friendly schedule setup and information display, LEDs for visual alerts, and a buzzer for audible reminders. At predefined times, the dispenser releases the correct dose of medication, accompanied by notifications via LEDs and the buzzer to alert the user.

The design prioritizes accessibility and ease of use, making it suitable for patients who require consistent medication, particularly the elderly or individuals with memory challenges. By automating the dispensing process, this project reduces dependency on manual methods, minimizes errors, and promotes better health outcomes. This cost-effective and reliable system demonstrates how microcontroller-based automation can be applied to enhance healthcare management.

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Introduction

Effective medication management is crucial for ensuring optimal health outcomes, particularly for individuals with chronic illnesses or complex treatment regimens. Missed doses or incorrect timing can lead to reduced treatment effectiveness and adverse health complications. This issue is especially prevalent among the elderly and individuals with cognitive impairments, who often struggle to adhere to prescribed schedules. Existing manual solutions, such as pill organizers, are limited as they rely on memory and lack automation, leading to errors and increased dependency on caregivers.

To address these challenges, this project introduces an automated medical dispenser built using Arduino. The system integrates an RTC (Real-Time Clock) module for precise timing, an LCD screen for intuitive setup and monitoring, LEDs for visual cues, and a buzzer for audible alerts. By automating the process of reminding and dispensing the correct medication at the right time and notifying users effectively, the dispenser aims to improve medication adherence while reducing caregiver burden. This innovative solution provides a reliable and user-friendly approach to managing medications, promoting independence and better health management.

Motivation

Ensuring that individuals take their medications on time is a critical aspect of healthcare, yet it remains a common challenge. Non-adherence to prescribed schedules is particularly prevalent among elderly patients and those with memory impairments, leading to adverse health outcomes and increased medical interventions. Despite the availability of tools such as alarms and pill organizers, these solutions often rely heavily on the user's ability to remember and act promptly, which can be unreliable in many cases.

The motivation behind this project is to address these limitations by providing a more effective reminder system. By using components like LEDs, buzzers, and an LCD screen, the solution focuses on creating clear and consistent notifications for users, ensuring they are reminded to take their medications at the correct times. This approach not only helps improve adherence but also reduces the stress on caregivers, offering a practical and reliable way to support medication management.

Literature Review:

The Standalone Pill Dispenser is a simple yet effective solution for managing medication schedules, designed with a focus on ease of use and affordability. It utilizes an Arduino microcontroller as the core component, enabling precise control over dispensing mechanisms and reminders. The device addresses the common challenges of medication adherence, offering a reliable and accessible option for individuals who might struggle with remembering or managing complex medication regimens.

A key feature of the system is its servo-controlled dispensing mechanism. Pills are stored in preloaded compartments, and at programmed times, a servo motor releases the medication for the user. This automated dispensing minimizes errors associated with manual pill sorting and ensures that the correct dosage is available at the right time. The design also incorporates visual and auditory notifications, such as LED indicators and alarms, to remind users when it is time to take their medication. These notifications are particularly beneficial for elderly individuals or those with sensory impairments, ensuring that reminders are effective in various scenarios.

One of the most appealing aspects of this device is its standalone operation. Unlike IoT-based medication dispensers, this system does not rely on internet connectivity, making it suitable for users in areas with unreliable network access or those who prioritize privacy. The dispensing schedules can be customized directly by modifying the Arduino code, allowing flexibility to accommodate different medication regimens or changing requirements over time. This feature enhances its utility for a wide range of users without requiring advanced technical expertise.

The Standalone Pill Dispenser is particularly well-suited for elderly individuals, patients with chronic conditions, or those in low-resource settings. Its cost-effective design, combined with straightforward functionality, makes it an excellent choice for individuals seeking a practical and dependable solution for medication management. While it lacks advanced features like caregiver alerts or remote monitoring, its minimalist approach ensures accessibility and reliability, making it an ideal entry-level prototype for basic medication adherence.

Objectives

1.Automate Medication Timing

Develop a system to dispense medication at predefined times, ensuring timely reminders for users.

2.Provide Effective Alerts

Incorporate LEDs and a buzzer to notify users visually and audibly when it is time to take their medication.

3.Enhance User Interaction

Use an LCD screen for easy configuration and real-time feedback, enabling users to set medication schedules effortlessly.

4.Promote Medication Adherence

Reduce the risk of missed or delayed doses by automating the reminder process.

5.Reduce Caregiver Involvement

Enable users, particularly the elderly or those with memory challenges, to manage their medications with minimal external support.

Methodology

Components Required

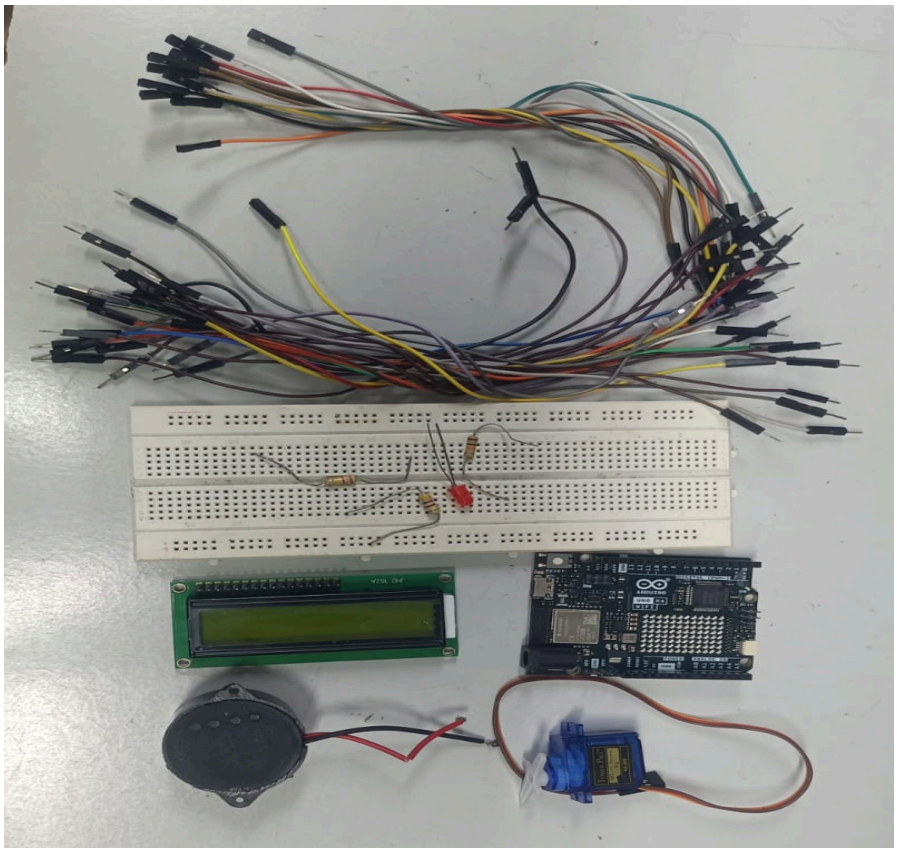

Fig1. Components used

1. Arduino Uno R4
2. Servo motor
3. Buzzor
4. LCD display
5. LED Cardboard
6. Breadboard
7. power source
8. Jumper wires
9. Resistors

Proposed Model

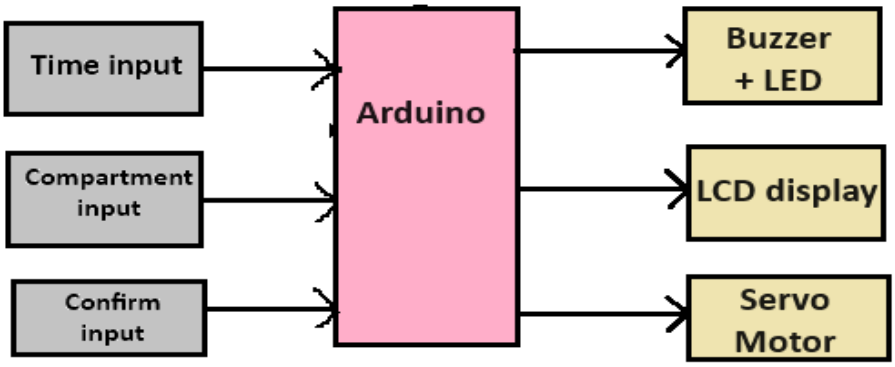

Fig2. Block diagram

1. A real time clock embedded in Arduino is used to keep track of the current time.
2. Arduino is responsible for coordinating all components and executing the control logic.
3. Buzzer and LED are used to provide auditory and visual alerts to notify the patient when it's time to take medication.
4. A Servo Motor controls the mechanism that indicates correct medicine. Only the compartment which has correct medicine will be open and all others will be kept closed.
5. An LCD Screen displays current time and message to take medicine when it is time to take.
6. Timing and compartment inputs of particular medicines are taken through GPIOs of arduino. One input pin "confirm" is used to take these inputs. When time and compartment are set and confirm input is on, the system takes time input of that particular compartment.
7. A real time clock embedded in Arduino is used to keep track of the current time.
8. Arduino is responsible for coordinating all components and executing the control logic.

Plan of action

1. Build logic for integration of all components.
2.Code the built logic.
3.Connect all the input and output components to the Arduino board.
4.Upload code to Arduino and test the model.
5.Debug if there are any issues

Results

Real time and date are displayed on the LCD screen. When it is time to take medicine, “Take Medicine” message is displayed. And when timing input is given (ie., when input pin “confirm” is high) the time being set and compartment number are displayed on the LCD display.

Servo motor is used to open a particular compartment at the right time. 3 compartments are used to store medicine and one slot is reserved as an open compartment. When it is time for a medicine, the compartment corresponding to that medicine comes to this open compartment position at that particular time. Angle of rotation depends on which compartment is going to be opened. As the servo motor rotates only 180 degrees 45 degrees are used for each compartment.

LEDs are used as visual alerts. It blinks for sometime (here it is set to 4 flashes, can increase it as many as required) starting from the medication time that was set. Buzzer and LEDs work together. Buzzer also uses the same logic as LED. IT rings until LEDs flash.

Arduino was used to integrate all these components. Arduino was coded in Arduino IDE. GPIOs of arduino are used to take time and compartment number inputs.

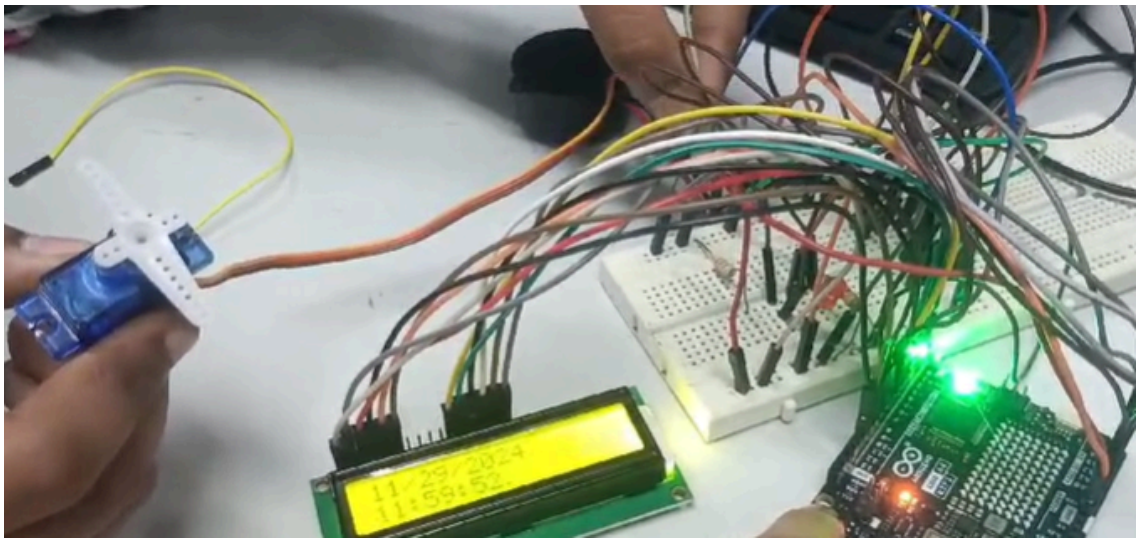

Fig3. Implementation. (LCD screen displaying current date and time)

Fig4. LCD screen displaying chosen time and compartment while giving inputs

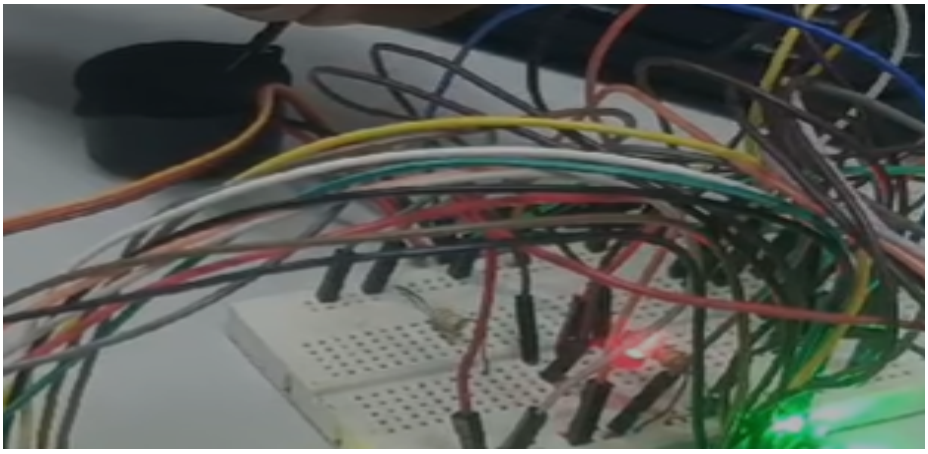

Fig5. LED blinking at the time set (Buzzer is also sounding)

Conclusion

The automated medical dispenser, developed using Arduino, successfully addresses the challenge of medication adherence by providing timely, reliable reminders for users. Through the integration of an RTC module, LCD screen, LEDs, and a buzzer, the system ensures users are consistently alerted to take their medication at the correct times. This project offers a practical and cost-effective solution for individuals, particularly the elderly or those with cognitive impairments, who may struggle with traditional methods of medication management. By reducing reliance on caregivers and minimizing human error, the dispenser enhances medication compliance and promotes better health outcomes. The system proves to be a valuable tool in supporting patients' independence while improving overall healthcare management.

Future scope

- The project can be extended to more number of compartments.
- Dosage amount can be accounted by incorporating suitable dispensing mechanism.
- If a patient misses to take medicine at first alert, snoozing can also be included by taking feedback input from user whether the medicine is taken or not.

References

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