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Design & Implementation of an Automated Medicine Reminder for Old People in Hospitals Using Arduino

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Abstract: *Elderly patients frequently face challenges with memory, often forgetting to take their medications on time. In a hospital setting, where multiple patients require round-the-clock attention, the risk of missed or delayed medication can lead to serious health consequences. This paper introduces a low-cost, Arduino-based automated medicine reminder system designed to assist hospital staff and elderly patients. The system triggers visual and auditory alerts at predefined times, significantly reducing human error in medicine administration. The device is stand-alone, eliminating the need for internet connectivity and making it highly reliable for institutional use.*

Keywords: Arduino, Medicine Reminder, Elderly Patients, Automation, Healthcare, Hospital Assistance

I. INTRODUCTION

With the global population steadily aging, the healthcare industry is facing new challenges in ensuring quality care for elderly patients. One of the most critical aspects of geriatric healthcare is the timely and consistent administration of prescribed medication. According to the World Health Organization (WHO), more than 50% of patients, especially elderly individuals, do not take their medications as prescribed. The issue is compounded in hospital environments where healthcare providers are responsible for managing the medication schedules of multiple patients. In such settings, even minor lapses in medicine administration can lead to adverse drug reactions, deteriorating patient health, prolonged hospital stays, or even life-threatening situations.[18]

Manual systems for medication reminders—whether in the form of written charts, alarms, or nurse-assisted delivery—often suffer from inefficiencies and human error. With increasing patient loads and staff shortages, especially in public healthcare facilities, the risk of overlooked or delayed medicine administration grows. This creates a demand for automated systems that can complement human effort and ensure that no patient misses their scheduled dose.

Technology offers a viable solution to this problem. The advent of low-cost microcontroller platforms such as Arduino has opened the door to developing custom solutions for healthcare automation. Arduino is an open-source platform widely used in education, prototyping, and IoT (Internet of Things) applications. It allows easy integration with a variety of sensors and output devices, enabling the design of versatile and reliable systems. In this context, Arduino serves as the brain behind an automated medicine reminder system tailored specifically for use in hospitals.

An automated medicine reminder system designed with Arduino not only reduces the reliance on human memory but also introduces consistency and precision into the process. By integrating a real-time clock (RTC) module, LCD display, buzzer, and push button, the system can track scheduled times, notify caregivers or patients, and confirm the

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administration of medicine. The primary advantage of such a system is its standalone capability—it does not require internet access or complex infrastructure, making it highly suitable for hospitals in both urban and rural settings[15].

Moreover, the system is scalable and modifiable. While the current model focuses on generating alerts, future iterations can include features like pill dispensing, data logging, remote notifications, and integration with hospital information systems (HIS). The implementation of this system is also cost-effective, making it accessible for low-budget healthcare facilities. This aligns with global health initiatives aimed at improving elderly care through affordable technology.

This paper details the design, development, and implementation of a standalone Arduino-based medicine reminder system. It discusses the selection of components, system architecture, functionality, and advantages over traditional methods. In doing so, it highlights how simple electronic automation can make a significant impact on healthcare delivery in hospital environments.[23]

II. OBJECTIVES

- Develop a standalone automated medicine reminder using Arduino.
- Improve medication adherence in elderly hospital patients.
- Design a cost-effective and reliable system.
- Enable hospital staff to monitor and verify medicine administration timings.
- Provide a scalable model that can be integrated with future healthcare systems.

III. LITERATURE REVIEW

Numerous approaches have been explored to address medication non-adherence:

Several research studies have focused on developing electronic and automated systems to enhance medication adherence, especially among the elderly. Narendra et al. (2024) proposed an ESP32-based dispenser that utilized infrared sensors and GSM modules to track pill intake and notify caregivers. While effective, their system depended on an active internet connection, which could be a limitation in settings with unreliable connectivity. Similarly, Rahimi et al. (2021) explored a PIR-based Arduino system integrated with Blynk IoT, showing a noticeable improvement in medication adherence through mobile-based alerts. However, this system was more suitable for domestic environments and required constant internet availability.

Kumar et al. (2022) presented a movable reminder system based on Arduino and DC motors. Though innovative, it was primarily aimed at home users and lacked adaptability for hospital use, where multiple patients and varied schedules complicate implementation. In contrast, Mydan et al. (2023) developed a minimalist, cost-effective Arduino system focused on simplicity and reliability. However, it did not include mechanisms for acknowledgment or feedback, limiting its practical application in institutional settings.

Advanced systems like Medi-Mate (2024) have taken the concept further by integrating servo motors and multiple compartments for accurate dosage control. While these systems are technically robust and offer significant functionality, they come with increased cost and complexity, making them less viable for budget-constrained hospital environments.

The literature highlights a trade-off between functionality, complexity, and cost. Many systems require internet connectivity or are optimized for home use rather than clinical environments. In contrast, our proposed system bridges this gap by offering a hospital-friendly, offline, and scalable solution that maintains essential features like alert generation and user acknowledgment. This approach ensures that patients receive timely medication while reducing the burden on healthcare workers, especially in resource-limited hospitals.

IV. COMPONENTS USED

- **Arduino Uno:** The heart of the system. An open-source microcontroller board based on the ATmega328P. It is responsible for all logical operations, reading the real-time clock, comparing times, and activating the alert components. It features 14 digital I/O pins (6 PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, USB connection, power jack, and a reset button.[21]

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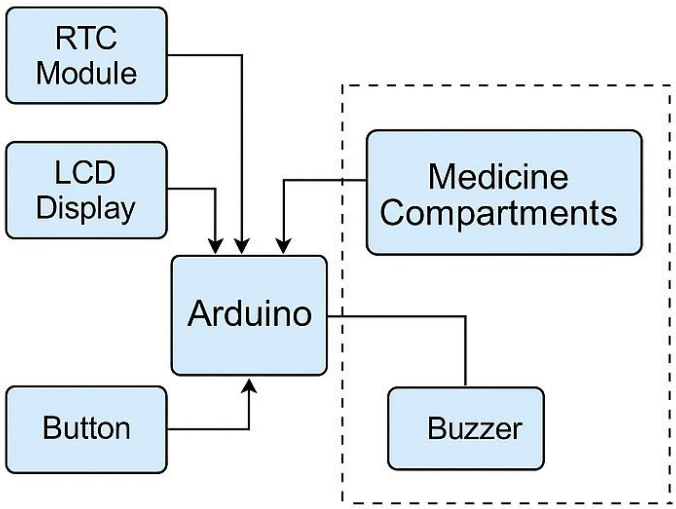
- **RTC Module (DS3231):** A highly accurate real-time clock with integrated temperature-compensated crystal oscillator. The DS3231 keeps track of seconds, minutes, hours, day, date, month, and year. It has battery backup, so it maintains accurate time even when power is interrupted.
- **16x2 LCD Display:** A display module that can show 16 characters per line over 2 lines. It's used to present real-time information such as the current time and the medicine alert messages. It is interfaced using either 4-bit or 8-bit mode to conserve I/O pins.
- **Buzzer:** A piezoelectric buzzer is used to create sound alerts at medicine times. It is controlled via a digital pin from the Arduino. The sound ensures that patients or caregivers are made aware of the medicine schedule even from a distance.
- **Push Button:** A normally open (NO) tactile switch that the user presses to acknowledge that they have taken the medicine. Once pressed, the Arduino stops the buzzer and resets the alert mechanism for the next cycle.
- **Power Supply (5V/9V):** A regulated power adapter or battery pack that provides stable voltage to the Arduino and connected components. In prototypes, USB or 9V batteries are often used; however, in deployed systems, adapters are preferred.
- **Breadboard and Jumper Wires:** Used during the prototyping phase. They enable rapid assembly and testing of the circuit without the need for soldering. Jumper wires connect all components to the Arduino and ensure smooth signal transmission.

V. METHODOLOGY

The Arduino system is initialized and synchronizes with the RTC module. Medicine administration times are pre-programmed. As time progresses, the system continuously checks the current RTC time against the scheduled timings. When a match is detected: [19]
A buzzer sounds.
A message is displayed on the LCD, indicating the medicine name/time.
The buzzer stops only after the push button is pressed, indicating acknowledgment.
If the button is not pressed within a defined window, the system can optionally log a 'missed alert'.
This system loops indefinitely, supporting multiple daily reminders with ease.

VI. BLOCK DIAGRAM



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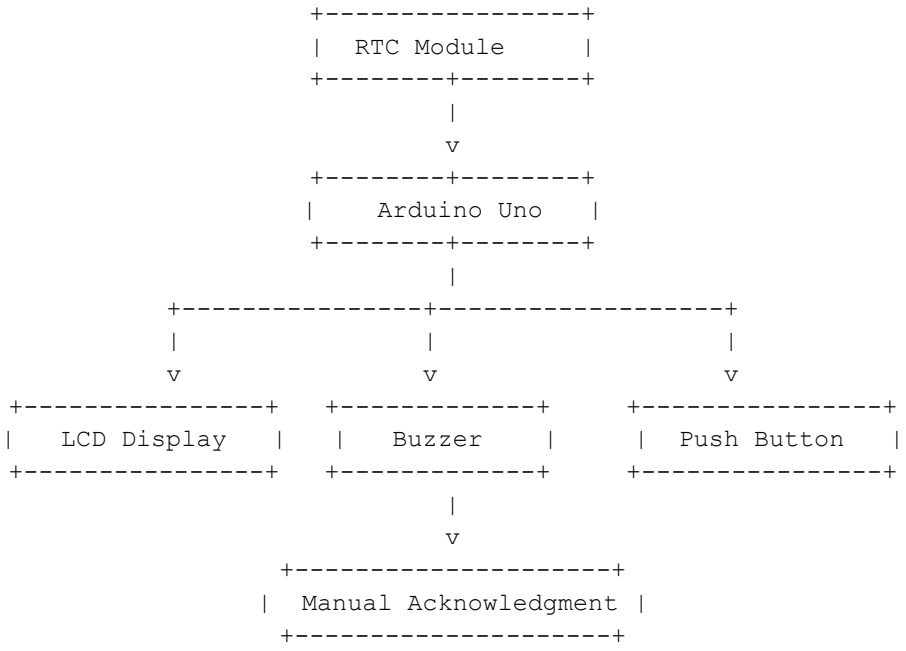
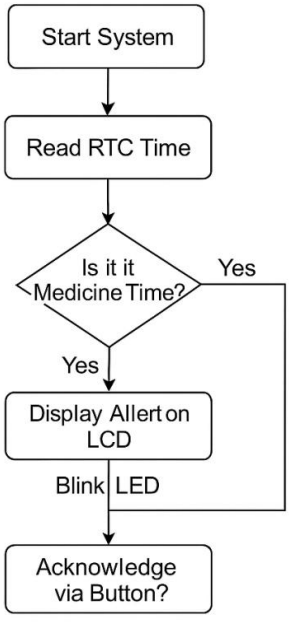
VII. COMPONENT DIAGRAM

- **Inputs:** RTC Module (Time Input), Push Button (User Acknowledgment)
- **Processing Unit:** Arduino Uno (Decision Making)
- **Outputs:** LCD Display (Information Output), Buzzer (Audio Alert)



VIII. FLOWCHART



Flowchart

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IX. ADVANTAGES

- Standalone and offline; works without internet or external systems.
- Customizable and cost-effective.
- Helps reduce caregiver burden.
- Ensures timely medication administration in hospital wards.

X. LIMITATIONS

- Requires manual reprogramming to change medicine schedule.
- Limited alert types; no SMS or voice notifications.
- No data logging or historical tracking unless extended.

XI. FUTURE SCOPE

- Integration with cloud platforms for remote monitoring.
- Use of GSM/Wi-Fi modules for caregiver alerts.
- Inclusion of sensors to detect pill intake.
- Expansion into automated pill dispensing units.
- Logging system for patient compliance tracking.

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