SMART MEDICINE BOX

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Abstract

The Smart Medicine Box is an IoT-based system designed to help individuals take medicines on time. It uses an ESP8266 Wi-Fi module connected to the Blynk cloud app for real-time alerts. The system includes an ultrasonic sensor for hand motion detection, a servo motor for automatic box operation, and a buzzer for alerts. The project automates medication reminders, manages stock, and triggers refill alerts, improving medication adherence.

I. Introduction

Adherence to prescribed medication schedules is a critical component of healthcare. However, many patients, especially the elderly, fail to take their medication on time. The Smart Medicine Box is designed to mitigate this problem by utilizing IoT and cloud technologies. By sending real-time alerts and enabling automatic monitoring, the system improves medication compliance and provides refill alerts when necessary.

II. System Design and Architecture

The Smart Medicine Box is built using the following major components:

- **ESP8266 NodeMCU:** Acts as the central controller and Wi-Fi communicator.
- **Ultrasonic Sensor (HC-SR04):** Detects hand motion near the box.
- **Servo Motor:** Automates the opening and closing of the box.
- **Buzzer:** Provides audible alerts.
- **Blynk Cloud Platform:** Manages schedules and sends real-time notifications.

The system uses Network Time Protocol (NTP) servers for accurate time synchronization.

III. Hardware and Software Requirements

A. Hardware Components

Component	Description
ESP8266 NodeMCU	WiFi-Microcontroller
Ultrasonic Sensor	Distance measurement
Servo motor	Opening or closing box lid
Buzzer	Audio alert
Blynk App	Cloud control &event management

B. Software Components

- Arduino IDE for firmware development.
- NewPing library for ultrasonic sensor.
- Servo library for motor control.
- BlynkSimpleEsp8266 library for cloud communication.
- Time library for NTP synchronization

IV. Methodology

The Smart Medicine Box operates through the following steps:

1. **Scheduling:** Users schedule medication time via the Blynk app.
2. **Alert Mechanism:** At the scheduled time, the buzzer sounds, and the system checks for the user's hand near the box.
3. **Detection:** If hand motion is detected within a 30 cm range, the servo motor opens the box.
4. **Logging:** The system logs whether the medicine was taken or missed.
5. **Pill Count Monitoring:** Each successful intake decreases the internal pill count, with refill alerts triggered when the count is low.

Blynk app interfaces (virtual pins V1, V2, V3) are used for setting time, pill count, and managing notifications.

V. Experimental Results

Testing was conducted under real-world conditions:

- Buzzer alerts were triggered precisely at scheduled times.
- Ultrasonic sensor reliably detected hand motion within 30 cm.
- Servo motor operated smoothly to open and close the lid.
- Refill alerts were generated accurately once pill count fell below the threshold.

Blynk app interface show user-friendly scheduling and notification screens.

VI. Conclusion

The Smart Medicine Box successfully demonstrates how IoT and cloud technologies can be leveraged to enhance medication adherence. By automating reminders, detecting user responses, and issuing refill alerts, the system reduces the likelihood of missed medications. Future enhancements could include multiple compartment management, patient activity tracking, and AI-driven dose recommendations.

References

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