Automated Pill Dispenser

Project Title: Automated Pill Dispenser with Missed Dose Management

Objective:

The objective of this project was to design and implement an automated pill dispenser using an Arduino Uno. The system is intended to dispense medication at preset times, alert the user via a buzzer and LED, and handle both missed and taken doses appropriately. An LCD display provides real-time feedback and system status.

Motivation:

Medication adherence is a major challenge for elderly individuals and people with dementia. These populations often struggle with remembering to take their medication on time or may accidentally take double doses, which can have serious health consequences. This project aims to address this problem by creating an automated solution that ensures pills are dispensed at the correct time, alerts the user when it's time to take their medication, and prevents double dosing by marking each dose as taken or missed. The goal is to support independent living and reduce health risks associated with medication mismanagement.

Components Used:

- Arduino Uno
- Servo Motor
- Buzzer
- LED
- Push Button
- LiquidCrystal_I2C Display (16x2)
- Jumper Wires
- Breadboard

Project Features:

1. **Scheduled Dose Dispensing:**

- The system dispenses pills at three preset times: 08:00 AM, 08:15 AM, and 08:22 PM.
- A servo motor rotates to simulate dispensing a pill.
2. **Alert Mechanism:**

- When it's time to take a pill, a buzzer sounds and an LED lights up.
- Alerts remain active for a 5-minute window or until the user confirms pill intake.

3. **User Confirmation:**

- A push button allows the user to confirm pill intake.
- Upon confirmation, alerts are deactivated and the dose is marked as taken.

4. **Missed Dose Handling:**

- If no confirmation is received within 5 minutes, the system marks the dose as missed and simulates pill retrieval.

5. **LCD Display Feedback:**

- Real-time display of current time.
- System status: "Waiting", "Ready", "ALERT: Take Pill!", or "Dose Missed!"

Code Summary:

The system simulates the passage of time (1 second = 1 minute for testing purposes) and checks if it's time to dispense a dose. If the user doesn't press the button within the allowed window, the dose is marked missed and the pill is retrieved. The system resets at midnight for the next day's doses.

Key functions include:

- ███████████████████: Simulates time progression.
- ███████████████████: Triggers pill dispensing.
- ██████████████████████: Checks if the user missed the dose.
- █████████████████████████: Handles user input.
- ███████████████████: Updates the LCD with time and status.

Tinkercad Simulation Setup:

Challenges Faced:

- Timing synchronization between alerts and dose window.
- Managing state transitions between dose dispensed, taken, and missed.
- Ensuring reliable button debounce and system responsiveness.

Future Improvements:

- Add a Real-Time Clock (RTC) module for accurate timekeeping.

- Incorporate a mobile app or SMS notification system.

- Add EEPROM storage for tracking historical dose data.

Conclusion:

This project successfully demonstrates a functional automated pill dispensing system with alert management, user interaction, and feedback display. It provides a solid foundation for more advanced healthcare-related embedded systems.