Smart Medical Pill Dispenser (SMPD)

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Problem

People often struggle with two major medication challenges. First, they forget to take their medications at the right time or take incorrect amounts. Second, they spend time sorting multiple medications into daily doses, which is both time-consuming and prone to errors. This is especially difficult for the elderly with multiple prescriptions they organize each week.

Solution

An intelligent device that both sorts and dispenses medications automatically. Instead of manually organizing pills into compartments, users simply load entire medication bottles one at a time into the device. The system then automatically sorts these pills into correct daily doses and dispenses them at scheduled times. You can use a website connected to your device's ID and place in the times, dosages, and days you need to dispense medications and the SMPD will buzz at those times and on clicking dispense give you the correct dosages at once.

Solution Components

Subsystem 1

The RTC module provides precise timekeeping to dispense the medications according to schedule. It maintains accurate time even during power outages through its backup battery system. The module communicates with the microcontroller via I2C protocol to provide current-time data.

Subsystem 2

The ESP8266 enables WiFi and remote management of the dispenser. It runs a web server that hosts the UI for medication management and provides real-time status

updates. The module allows users to receive notifications. It processes HTTP requests for schedule updates and transmits dispenser status data to the cloud.

Subsystem 3

The microcontroller drives the stepper motors that rotate the dispensing cylinder. It will make sure that the pills were dispensed at the right time (aka did you take your medication). The microcontroller activates buzzers or speakers for audible notifications and LEDs for visual alerts when it is time to take medication. Using ESP8266, the microcontroller connects to a web app to send reminders, allow remote monitoring, and enable users to adjust schedules.

Subsystem 4

The weight sensor system uses load cells and an HX711 amplifier to measure medication quantities. It monitors the weight of each medication compartment to track pill counts and verify successful dispensing. The sensor data is used to detect when medications are running low and trigger refill alerts.

Subsystem 5

The device housing and mechanical components are fabricated using food-safe PLA or PETG filament. The design includes separate sealed compartments for each medication type, a rotating dispensing mechanism, and channels for pill routing.

Subsystem 6

The top of the device will consist of a funnel-like structure which will enable the user to dispense the pill bottles one at a time. The funnels will drop the pills into a jar to sort them into different placeholders. Once one kind of pill has been emptied, there will be a disk in place to rotate onto the next jar for the next pill to be dispensed into. To have the pills dispense properly we will have the top of the funnel open and close when it is ready to take in a new pill, additionally, it will rotate the pillars so that it is directly below the funnel, so we never lose pills in any sense.

Criterion For Success

The following are all True/False evaluations

1. The smart medical pill dispenser correctly buzzes at the right day and time
2. The smart medical pill dispenser correctly dispenses the right medication with the correct dosage
3. The smart medical pill dispenser automatically sorts the inputted bottles into separate compartments
4. The smart medical pill dispenser appropriately alerts users when they need a refill by determining when certain medications are about to run out