Smart Medical Dispenser & Sorter

The 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 must spend considerable time sorting multiple medications into daily doses, which is both time-consuming and prone to errors. This is especially difficult for elderly patients or those with multiple prescriptions who must organize dozens of pills each week.

The Solution: An intelligent device that both sorts and dispenses medications automatically. Instead of manually organizing pills into compartments, users simply load entire bottles of medication one at a time into the device. The system then automatically sorts these pills into correct daily doses and dispenses them at scheduled times. Everything is controlled through a simple website where users or caregivers can set schedules and monitor medication adherence.

How It's Made: The heart of the system is a custom-designed circuit board built around an ATmega2560 microcontroller, which orchestrates all operations. The device consists of two main chambers: a sorting section and a dispensing carousel, housed in a secure plastic enclosure with separate compartments for electronics and medications.

The sorting mechanism operates like an automated assembly line in miniature. When a user loads a bottle of pills, they first tell the system which medication it is through the website. The pills enter a vibrating feed channel that ensures they move one at a time. Each pill passes through an infrared sensor gate that counts and verifies each pill individually. A rotating sorting arm, powered by a precise stepper motor, then places each pill into the correct compartment of the dispensing carousel below.

The dispensing carousel is driven by its own stepper motor and contains compartments for each scheduled dose. An optical sensor ensures perfect alignment when rotating to dispense medications. When it's time for a dose, the system alerts the user through both the device (with lights and sounds) and the website (with notifications).

The electronic brain coordinates everything through a Wi-Fi connection established by an ESP8266 module. This allows the system to receive scheduling information and send status updates to the web interface. A real-time clock chip ensures accurate timing even if the internet connection is temporarily lost. The entire system runs on a regulated power supply with battery backup to prevent any interruption in service.

For safety, multiple verification systems are in place. Infrared sensors count each pill to ensure accurate sorting. A lid switch detects any unauthorized access attempts. The software keeps track of all medications and quantities, warning users when supplies run low. If there's ever a power or mechanical issue, a manual override system allows access to medications in an emergency.

The web interface provides an intuitive way to set up and monitor the system. Users can input their medication schedules, specify which medication is being loaded, view their dispensing history, and receive alerts about low medication levels or missed doses. This information can also be shared with caregivers or healthcare providers if desired.

Smart Parking Assistant w/ Display

The Problem: Many drivers struggle with parking in tight spaces and gauging distances to obstacles, especially in older cars without built-in sensors. Traditional parking sensors are either expensive to install or provide only basic beeping feedback.

The Solution: A standalone, easy-to-install parking assistant that shows exact distances on a small display. It mounts on your dashboard and connects to ultrasonic sensors on your rear bumper. When you're in reverse, it shows you exactly how many feet/inches you are from obstacles.

How It's Made: The system consists of three main parts that can be built in 3 weeks:

Core Components:

- Arduino Nano (main controller)
- 3 ultrasonic sensors (HC-SR04)
- Small OLED display
- Buzzer for audio feedback
- 12V to 5V car power adapter
- Simple PCB for connections

The system taps into the car's reverse light for power and activation. When you put the car in reverse, the system automatically turns on, displaying distances from left, center, and right sensors. The display shows actual numbers (like "2.5 feet") rather than just beeping.