Automatic Pill Dispenser: A Reliable and Efficient Solution for Timely Medication Delivery

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A prevailing issue among the geriatric population is the difficulty of managing medication. With 36% of Americans over 65 using at least five prescription medications and 3% experiencing dementia or related cognitive illnesses, there is a large demographic that is at high risk for medication misuse. While personal caregivers can help, their high costs and recent shortages make them unsustainable for many. This project addresses medication adherence through a replicable, marketable pill dispensing machine. Designed in CAD and manufactured via 3D printing, the device integrates 12 micro-servo motors under a PCA9685 driver, an HM10 Bluetooth module, a PCF8523 RTC, a siren transistor system, and an IR break beam, all controlled via an Arduino Uno. It operates by establishing a schedule based on user input through a Bluetooth application, sorting pills into labeled slots, holding them until the designated time, and alerting users when their medication is ready. Two data sets were collected: pill seeding rates and dispensing success under different time complexity. A successful pill seed occurred when a pill fell into the correct slot without wedging, minimizing possible jamming throughout the machine. Across four pill sizes and 144 trials, the correct pill seed rate was 90.3%. Time complexity trials examined dispensing one to five pills simultaneously, with 100% success across 100 trials. These results confirm the engineering goal, demonstrating the machine's reliability and potential scalability. Future iterations could enhance fail-safes, expand pill compatibility, and integrate user-friendly features to improve accessibility and adoption.

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