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Automatic Dispensing Pill Caddy for the Elderly

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ELECTRICAL & COMPUTER ENGINEERING

CAPSTONE DESIGN EXPO 2017

Automatic Dispensing Pill Caddy for the Elderly

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Motivation

The report, Aging in the United States, finds that baby boomers who are retirement age are in worse health compared with previous generations. More of them are living with chronic conditions such as high cholesterol, hypertension, diabetes, arthritis, and heart disease; all which require medication. The report also anticipates the number of people with dementia could nearly triple in the coming decades, thus requiring more assistance with daily activities.

Our product intends to enhance the quality of life of the older adult population by providing a pill dispenser that creates convenience with alerts/ notifications, making the dosage easily accessible to those with cognitive and other impairments, and by helping these adults to live a healthier lifestyle all the while minimizing the stress involved and time needed to take their medication.

Market Analysis

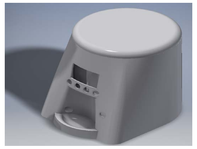
The demographics for our customer base include those who are ages 65+, the elderly who have difficulty with memory, the elderly with multiple diseases/chronic conditions, and independent elder men and women without close supervision. We will reach our most relevant market by selling our product individually and also by providing access to hospitals, insurance companies, and care providers.

Our product will add value to our end user's life, is easily accessible for the elderly patients and can easily be changed with evolving technology.

Direct competitors of this device include ultimate pill organizer, Philips medication dispensing service, e-pill pocket pill box with four vibrating daily alarms, compuMed, MED-E-LERT, Alert 1 pill dispenser, Medcenter 31, and the pill holder alarm box.

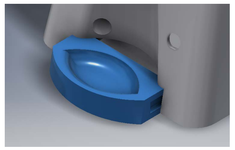
The Design

Device Design

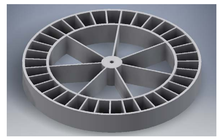


Exterior view of the entire device. The overall shape of the design is clearly displayed.

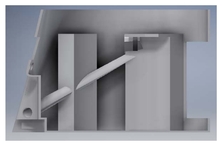
Front view of the device. The button layout, LCD screen, and opening where the pills will be dispensed can be seen.



Removable tray where pills are dispensed, allowing for easy access for users.



Pill containing ring inside the device, consisting of 35 individual containers for holding each dose.



Cross-sectional view showing the chute in which the pills will travel from the ring to the tray..

Hardware

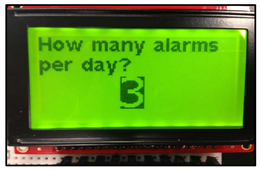
The device is centrally controlled via an Arduino MEGA microcontroller. The pill containing ring is rotated on a stepper motor, connected to a stepper motor driver controller, which is controlled from the Arduino. To allow pills to fall from the ring into the chute, a servo motor with a trap door is moved when pills need to be dispensed.

Software

Main Menu screen of the device. From here, the user can enter various sub menus, or go back to the time display.

Set Time menu where the user can set the current time to calibrate the device.

Time display that is shown when the user is not in the Main Menu. Note the larger bold font for the visually impaired.



Set Alarm menu asking the user how many alarms per day. They then go into a Set Alarm Time menu, similar to the second LCD image above.

Design Features

- Pill containing ring with 35 compartments
- Maximum supply: 1 Dose/Day for 5 weeks
- Up to four daily dosages with audio and visual alarms
- Bright 360° flashing LED visual alarm
- Removable pill tray for ease of access
- Large, easy to navigate LCD display for accessibility

System operation

Menu setup:

When the device is first powered, the user sees the Main Menu, which gives the user an option of entering a Set Time menu, a Set Alarms menu, or a Load Pills menu. The Set Time menu allows the user to set the time for the device. The Set Alarms menu asks the user how many alarms per day they need, and then prompts them set each individual alarm time. If the user hits the back button on the Main Menu, then the display changes to display the time, as seen in the third LCD picture. This display is larger, bolder, and overall more visible to allow the user to see from some distance away.

Medication loading and Daily Usage :

At the start of the medication cycle, the pills are loaded dose by dose into the pill containment ring. The ring holds a maximum of 35 doses. The dose position will be indicated by a laminated key that maps the location for each slot clearly indicating the first day. A stepper motor will be used to move the wheel to each indicated dose.

When its time to take a dose, an audible alarm and flashing LEDs will alert the user. The user will then press the "release pills" button on the front of the device. This will control a servo motor that moves a flap and drops the dose from the compartment into the pill tray. The pill tray is removable for simplicity in which can easily be scooped out and taken at discretion.

Future Considerations

- Smartphone app for caretakers including alarm reminders geared towards patients with cognitive impairments
- Bluetooth controlled alarms, LEDs, and pill dispensing
- Database of missed doses
- Aesthetically blend appearance to look like a simple alarm clock
- Increased functionality of customizable alarms

VCU School of Engineering