

# DoseMaster

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## **Project Abstract:**

The purpose of this project was to assist those who need help remembering to take their medication, and to keep those who would accidentally overdose from doing so. To complete this task it was decided to create a mechanism that was designed to dispense medicine to the user at a designated time, and remind them to take their medication at that time. Metal working, cutting plexiglass, code and circuitry were all used to create DoseMaster. DoseMaster has a mechanism to dispense pills at a certain time. There are multiple containers holding the different sized pills, each has a hole of a different size so that the pills may fall through one at a time. DoseMaster operates by revolving the container, allowing the pills to fall out as gravity pulls them along. When a sensor reads that a pill has been dropped, it ceases to revolve so that no more pills will fall. To prevent the user from overdosing DoseMaster has a protective shell made of plexiglass, around the entire mechanism and the pill storage, making it difficult for the user to break in at the incorrect time. DoseMaster also sends the user messages in case they forgot to take their medications, so that they will remember. Further development of DoseMaster could include improvements on the mechanism, safety of the medications, as well as improved protection with by having the shell made of steel, instead of plastic. This contraption will be useful in the modern world by reminding those who have difficulty remembering when to take their medications, and preventing them from taking them at the incorrect time.

## **Engineering Goal:**

The goal of this project is to create a mechanism that will dispense medication and alert the user at the proper time.

## Research Paper

What we are doing is making an engineering project that is designed to prevent over dosage and forgetfulness of taking medications. We will accomplish this by making a robot that is programmed to have timers and make sure only to dispense medications at a set time and prevent the user to break in and take more than necessary. basically this will be a box that prevents the user from taking more medications than they need, and also it will only dispense when the doctor prescribed to them, ,so that they don't miss a time. however people can still forget to take their medications, so in the future of this project, we may allow it to connect to the user's wifi and send a message to the user's phone or computer, to remind them about 30 minutes before their medication must be taken. This machine would be primarily a robot that dispenses medications, but once we finish that project, we will make it better by making it similar to a protective safe. This project is important because it prevents people from overdosing themselves and dying, while also prevents others from taking your medications for some reason. One problem we faced so far and have thought of a way to overcome is how is the user gets his medication, but loses it or needs another for legitimate reasons ,then there will be a keyhole, or a number pad that the user must input a key or password that overrides the main program of the "DoseMaster" this will allow the robot to dispense another medication at the time that the user wants the robot to.

## Reference list:

1. <http://www.webmd.com/mental-health/addiction/drug-overdose>  
- Provides more information on drug overdosage.
2. <http://www.fda.gov/MedicalDevices/>  
- More medical devices for inspiration on how to build.
3. <https://www.arduino.cc/>  
- Contains an extensive library of Arduino code, so that we can reference for help.
4. <http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/LawsActsandRules/ucm084159.htm>  
-Information on laws pertaining to drug dosage.
5. <http://www.drugs.com/>  
- Info pertaining to different drugs and dosages

## **Materials**

- Arduino Mega Based Microcontroller
- 9V DC Supply
- 12V DC Supply
- 2x 0.4" Thick Plexiglass Sheets
- 2x 0.25" Thin Plexiglass Sheets
- 1x Metal (Aluminum) Sheet
- 1x Aluminum Bar
- 1x Infrared Sensor (KEYESIR sensor)
- 1x 2.8" TFT LCD (Touch Interface Liquid Crystal Display)
- 1x Breadboard
- Nx Pill containers / capsules.
- 2x 18v DC Motors
- 1x Real Time Clock Module
- 40x Jumper Wires
- 6x Magnets
- 1x Piezo Buzzer
- 1x Wifi Module
- 1x Heat Gun
- 1x Hack Saw
- 1x High Friction Drill Wheel
- 30x Screws
- Electromagnet / Solenoid

## **Procedure:**

1. Planned and mapped each circuit before taking any action.
2. Built circuit for LCD and programmed Graphical User Interface(GUI) into the Arduino.
3. Installed the breadboard and built the circuit for Time Module, synchronized it to the local time and programmed alarm system into the Arduino.
4. Connected a DC motor to a relay(to control the start and stop at 12 volts).
5. Built circuit for the IR obstacle sensor, and programmed it to control the motor stopping when a pill is detected.
6. Linked the individual programs together and flashed it to the Arduino.
7. Organized each circuit into a single breadboard.
8. Constructed the dispensing unit mounts using magnets and attached them to the motors and mounted the motors on a bent aluminum bar.
9. Mounted the aluminum bar on to a tin base tray.
10. Designed the plexiglass casing and hopper.

11. Marked and cut the plexiglass using a cutting wheel and hack saw.
12. Designed, cut, and bent(heat gun) the thin plexiglass sheets to form a hopper trough for the dispensed pills to fall through.
13. Attached the breadboard(with the circuits) on the metal base within the casing.
14. Inserted the Infrared sensor into the trough to sense the falling pills.
15. Attached the Arduino to the back panel of the case.
16. Used a hinge to attach the top panel to the case leaving an easily accessible opening for the user to access the dispensing units.
17. Assembled the casing and the trough to complete the DoseMaster.

## **Conclusion:**

DoseMaster solves the issue of accidental and improper drug consumption utilizing the power of digital electronics and material construction. The real challenge behind DoseMaster was designing a way to accurately control the dispensing of the medicine from the storage containers. After the initial prototyping was done, the overall design of the machine was created, circuits were assembled to perform the various complex functions of the device. Software was developed and programmed to the Arduino microcontroller, to control the circuits. The individual programs created were combined into a single embedded program. Once the motors and casing work was completed, the breadboard containing the circuits was mounted on the base of the device and attached to the individual sensors and motors.

The design of DoseMaster, being made of plexiglass, is not only structurally secure, but user friendly as well. The keypad and touchscreen make user input simple and intuitive, and the chute output is effective in delivering the dosage without chances of a jam or a stuck pill. The circuitry and pill containment units are accessible through a hatch at the top of the machine, and can be removed and installed using a magnetic action, which makes maintenance quick and simple. Due to the transparent materials, the mechanism is viewable and easy to diagnose.

The resulting performance of DoseMaster was quite effective, for it was able to deliver the medication in single/multiple doses at the specified times without any major errors. If no pill was dispensed with ten seconds of the programmed time due to a containment unit jam, or if it ran out of pills, the machine alerted the user with a series of beeps.