

# Pill Dispenser – IOT Project Report

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## Objective and Motivation:

There are many people who need constant help, whether they be our old, family members, or the ones with special needs. The timing of taking a medicine has a greater impact on elders than on others.

It might be difficult for many elderly people to remember to take their medications. People over the age of 65, on average, use 12 or more prescription drugs each year. It is critical for their health and safety that they take the correct medication at the correct dose daily.

I have had grandparents who had to take a lot of medications because of concurrent medical conditions and they had to struggle a lot to take their medications. They usually had to struggle a lot to read medicine labels and remember how much of each medicine. So, solving this problem is important to me as it can help a lot of people like my grandparents with their quality of life.

The aim of this project is to create an IoT-based Smart Pill Dispenser to assist people, regardless of age, in taking their medications on time and with relative ease.

Our objective is to create a pill dispenser using Internet of Things that can perform the following features:

1. The pills dispenser should have to ability to hold and dispense different of pills.
2. The pill dispenser should be able to dispense these pills one a time and at the scheduled time.
3. If there are any other types of medications that are not supported by the pill dispenser then the user will have the ability to program the machine to remind the user through the speaker at the time scheduled.
4. The pill dispenser will come with an integrated phone application with a good and easy to read UI which allows the user to program the schedule for when the pills should be taken.
5. The phone application will have form fields for the name of the pill to be taken, time at which the pill is to be taken, number of pills that are to be taken and the number of pills to be taken.
6. The user can also modify the schedule from the phone application.
7. The phone application also has an option to call the physician in case of an emergency or to schedule an appointment with the physician.

8. To implement image processing so that we can use a camera connected to the raspberry pi to take a picture of the dispensed pills. From this picture we will count number of pills and whether the pills dispensed are correct.

## System Information:

To design this system, we need the following:

### Hardware Requirements:

1. Raspberry Pi
2. Servo Motors
3. Breadboard
4. Speaker
5. Jumper wires
6. Camera module

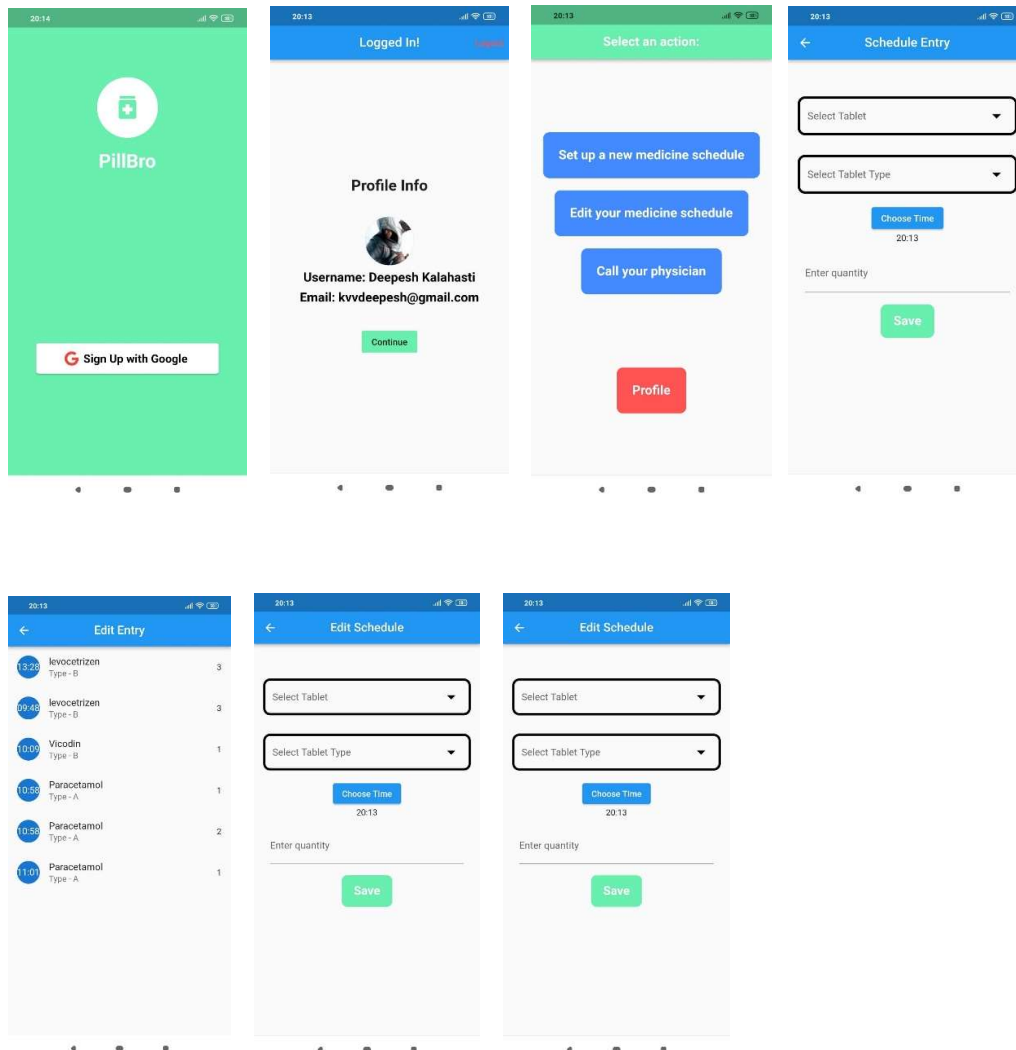
### Hardware Design:

To design pill dispenser, we have used Raspberry Pi 4 as it has Quad-Core 64-bit Broadcom 2711, Cortex A72 Processor which has other additional requirements attached to it such as Wi-Fi module, audio jack, good image processing power. We have designed pill dispenser in such a way that it dispenses pill as required by the user one at a time scheduled in the server. For the basic control mechanism, we have used servo, rotator and filler, where rotator has a hole on it so the pill will stop in it, when it is time, the servo will rotate the rotator and pill is dispensed. To ensure more safety and reliability we have added a speaker which announces when it's time to take the medication, and an integrated camera which takes the image of pills dispensed and the RPi processes if the required quantity and correct medicine is taken.

### Software Design:

We used Flutter as the framework for developing the mobile application. Flutter is a Google open-source application that allows developers to create smartphone, desktop, and web applications from a single code base. Flutter is a

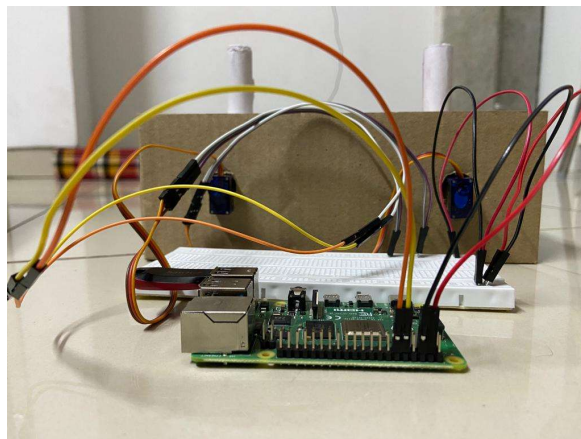
full SDK – software development kit – rather than a framework or repository, as is the case with other common solutions.



- We have developed a mobile application called PillBro which tracks the schedule and controls the Pill Dispenser. To use this app the user needs to sign up using a Google account and after signing up they will be taken to the profile page.
- From the profile page the next page that the user is taken to will be the home page where they will be given specific options regarding what they would like to do. They can set up a new schedule entry, modify an existing entry in the schedule and also call their physician. They can also go back to their profile page where they can logout.

- When they go to set up a schedule entry they get taken to a new screen where they can fill all the required fields. Once all the required fields are filled and the user clicks 'Save', the data will be sent to our database. This data will be collected by the Raspberry pi to control the pill dispenser.
- If the user would like to edit an entry they will be sent to a screen where all current scheduled medicines are displayed. They can click on one of the entries and then they will be sent to a screen similar to the one for setting up an entry above.
- If you click 'Call your physician' then you will directly go the phone contacts and can place a call.

### Results:



As per the objectives mentioned above, our pill dispenser works as intended. We are able to schedule our medications using the mobile application and are also able to dispense the pills one a time using the raspberry pi and the designed machine.

### Challenges:

1. We had implemented image processing however the results were not satisfactory as the results depended heavily on the lighting conditions and the image quality along with pills placement.
2. Dropping one pill at a time is not a 100 percent guarantee. There is a small chance of two pills being dropped at once.

## Future Work:

1. Implementing a more robust image processing program to accurately predict number of pills along with their colour.
2. We can make the application more user friendly and implement more features.
3. Designing a more robust physical machine for the pill dispenser.

## References:

- <https://docs.flutter.dev/>
- <https://pypi.org/project/opencv-python/>
- <https://www.raspberrypi.com/documentation/>
- <https://pypi.org/project/gTTS/>
- <https://pypi.org/project/RPi.GPIO/>
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