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IMPLEMENTATION OF AUTOMATIC PILL DISPENSER WITH BIOMETRIC AUTHENTICATION USING RASPBERRY PI

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ABSTRACT

Health care industry is increasing rapidly. But the patients may face problems such as consuming the wrong medicine or over dosage. In order to reduce these problems a system can be developed. As technology is developing expeditiously and there are many new systems introduced for making our day-to- day activities. It is necessary to provide medication to the patients in time. Automatic pill dispenser is designed specifically for users who take medications without close professional supervision. The system contains raspberry pi interfaced with biometric module along with a camera for face recognition in order to detect the patient. Firstly the system scans the finger print using biometric module and later if finger print is not detected then it captures the image of the person. These are used to verify the person's presence. Selecting age group and medicines can be done by using keypad. If the person visits the system once in a day, it dispenses the medicine using motors. If the person visits more than 4 times a day, the system cannot dispense the medicine and it displays to consult the doctor.

Keywords: Health Care, Automatic pill dispenser, Raspberry pi, Biometric module, Face recognition.

I.INTRODUCTION

Many people in India die due to lack of diagnosis. Availability of medicine in time or in affordable cost is also a problem because poverty includes low income. For primary diagnosis, medicine is needed for the patient where medical stores may or may not available at some places especially during night times. Majorly this problem can be found in remote areas and places where population is less i.e., in highways, temples where population is high. Kids and senior citizens may suffer without availability of basic medicines. This is critical issue to have medicine availability within the patient's reach. Based on this situation, the existing system implemented a machine which can provide medicines at any time by giving input as money. But using the same dose for many times for the same problem make a person unhealthy.

The Healthcare Industry Vending System (IVS) refers to a specialized seller-managed Inventory (VMI) solution that connects healthcare supplier's network partners to one another. These network systems are used to reduce the availability of goods and optimized cost through health care companies. This research was successful factors and performance results in Health care IVS, current health resource and management [1]. Vending machines are more common in a variety of settings, including schools, universities, health facilities and various activities. According to the State of the Vending Industry Report in 2011, 28.5% of all vending machines in the US, 26.8% in manufacturing buildings, 9.1% in retail sites, 8.8% in hospitals and nursing homes, 7.0% bars and clubs in restaurants, primary, middle and high schools %, And 5.9% in universities and colleges [2].

There are number of medicine dispensing machines available in the market today. However, most of these are customized for household use, and cannot be used for outdoor applications. The machines designed for outdoor use require a doctor’s prescription to be fed into the system, either through a dispenser placed in the clinic, or through a healthcare worker. While this prevents misuse, it again poses the problem of not being feasible in remote areas due to the shortage of healthcare professionals and issues faced in establishing a clinic in developing countries. This medicine dispenser designed addresses those shortcomings by its ease of installation at any location, because it is aimed at mainly providing basic medicinal assistance till proper care.

II. EXISTING SYSTEMS

For this work existing systems are analyzed and conducted an extensive study on different medicine vending machines available now.

In 2012 a large metropolitan health service in Australia implemented state government guidelines for the provision of healthy food and drink in public hospitals. The health service operates three major hospital sites plus additional settings for a range of other services. In total, 37 vending machines were located across these three sites, with 33 machines located at the largest site which is located closest to the central business district [3].

The RFID-based medical delivery systems are demanding that the daily routine supply from additional protection to patient medication supplies because the dose recording, patient billing and supplementation control. Health care professionals use RFID medical cabinets to automate general tasks, spending more time on patient care, improving security and safety in the range of patient care facilities. [4]. The Automatic Medicine Dispenser is working for pills and capsules of any size. It has been found that the dispenser can be programmed for 31 days for 21 different medicines. It has the facility to send alarms four times a day. It is possible programmable to dynamically change the number of times and the number of pills to be picked as per requirement [5]. The design for the machine was successful and we were able to get the expected output. The microcontroller was works on the basis of the code. The loads were operated in accordance with the code which was implemented by using Kiel software. When we swipe the smart card, machine or a device is activated, once we had an access to a device we can submit symptoms through touch screen and a coin like token will be given from an outlet. Then machine displays a message that to put these tokens in particular medicine box area. Now we will receive medicine [6]. The automatic medicine vending machine is technically feasible to the peoples. It is based in PIC micro-controller provide GSM service. It gives availability of medicines all the time, also in rural areas. it is very helpful. It gives ease of access also. It is sales person-less service which is based on smart card i.e. Near Field Communication (NFC) cards [7]. This section gives the perception of the exploratory outcomes. The solution administering procedure is done in well ordered through validation of the client, choice of drug, installment and accumulation of pharmaceutical. Initially the client needs to swipe his/her RFID card and enter the PIN number for confirmation. At that point the client needs to choose the required solution. In the event that the solution is available in the machine then the installment must be made for the asked for/accessible amount of the drug. At last the pharmaceutical is gathered [8] [9]. The medicine dispensing machine offers a flexible, simple and rugged solution for extending basic healthcare to all places, at a very moderate cost. The machine can be customized to suit any type of terrain or climate with minimal changes to the hardware and software. This machine will be extended to add an intelligent medicine unit, which sends a refill notification message to the nearest chemist when the number of medicine strips decrease below a certain level [10].

In existing system, only the machine is available to provide the medicines at any time by taking money like as medical stores. But it cannot identify the person's presence many times for the same medicine. Basically medicines are used for reducing the health problems but using of same medicine for many times leads some health problems. This is the major disadvantage in the existing system. And also poverty people may not have enough money to buy medicines. So, these problems can be avoided in the proposed system.

III. PROPOSED SYSTEM

In this fast moving world, people prefer the tools which are completely automatic. This is the biggest advantage of this project. This system is controlled entirely by raspberry pi 3. Automated dispensing machines increase availability for others and facilitate the time-keeping of medicines by increasing their flexibility on patient care units. This is especially important in emergency departments and intensive care units, where most hospitals still use a poor stocking system, often due to dosing changes and immediate access.

A.Problem Statement

Getting medicines from the medical stores is a time taking process and medical stores may or may not available all the time. So, this can be considered as the manual process. Automatic pill dispenser is the technique which can reduce the wastage of time. Generally in medical stores, it is possible to take the same medicine for many times. It can make the person unhealthy. But in the Automatic pill dispenser, person can access the machine thrice a day for getting medicines. If the user exceeds using the machine three times a day, the machine will not dispense the medicines and it displays to consult the doctor.

B.Block Diagram

For the implementation of Automatic pill dispenser, Raspberry pi-3 model B is used. Raspberry pi is a credit card sized computer and it is a series of small single board computers.

The below figure shows the block diagram of Automatic pill dispenser. When the user visits the machine for the first time, he or she should enroll their thumb impression by using biometric module and also give their face identity by using camera. So that they have their user id whenever they will access the machine.

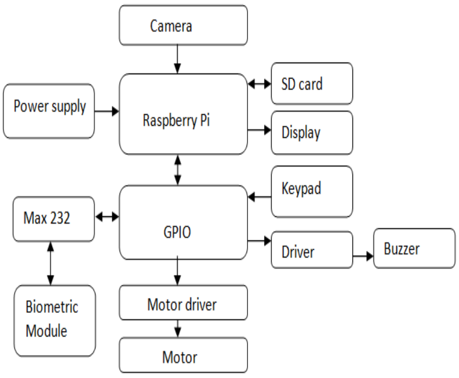


Fig 1: Block diagram of APM

All the modules which are using are connected to the GPIO pins of the raspberry pi. SD card is used for storing the details of the user and keypad is used for selecting purpose. Buzzer is used for alerting purpose when the user had already visited the machine more than thrice a day and if medicines are nil in the machine.

C. Flow Chart

The below figure shows the flow chart of the automatic pill dispenser

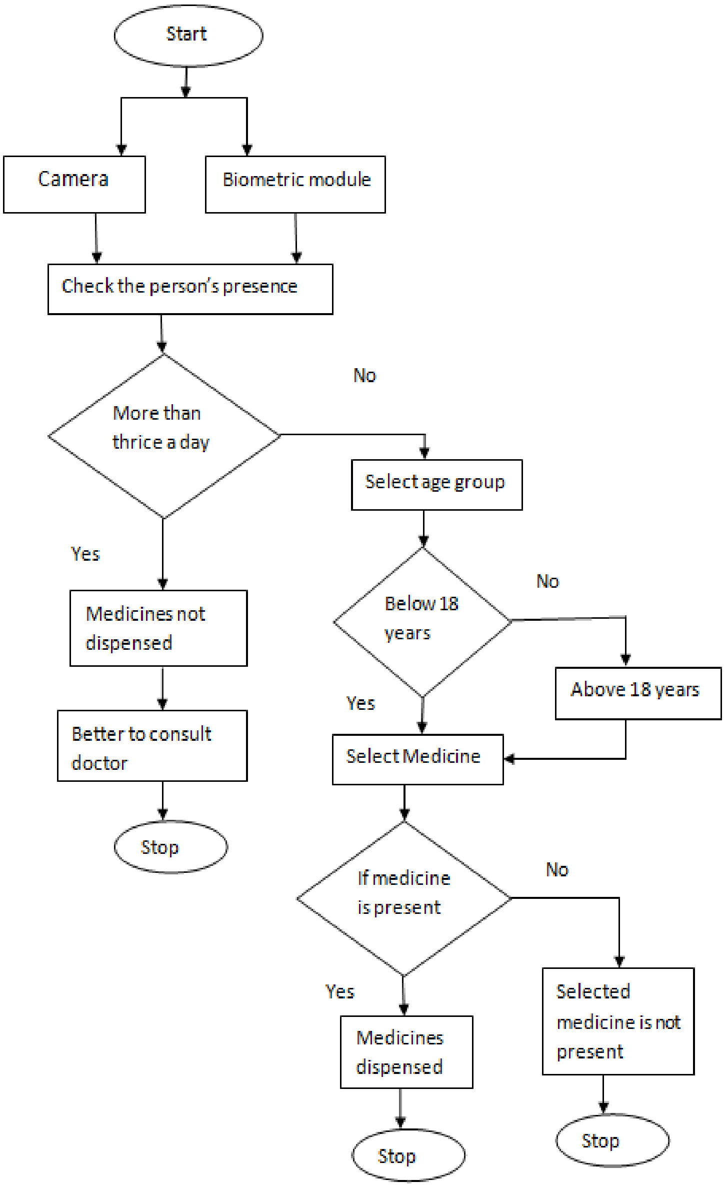


Fig 2: Flow chart

For accessing the machine, user has to give the thumb impression by using biometric module, some people do not have proper fingerprints and the machine doesn't recognize their finger prints. For that people second option will be available, they can go to the face recognition. After the identification, user has to select his or her age group i.e. adult or child. This message will be displayed by using display. Then the user has to select the medicine what he or she needs. Particular medicine with one day dose will be dispensed by using motors. This will be applicable only three times a day. If the user tries to get the medicine for the fourth time, he or she cannot get medicine and the machine displays better to consult a doctor.

D. Software

In raspberry pi default language is “python”. OS used in this is Jessie version. It is introduced on Jan 2017. Jessie is the name of the character in cow boy. Connect memory card to the computer to copy the software. Open win 32 disk manager. Copy Jessie image. Remove memory card and insert in raspberry pi. And update the library.

Python could be a widely used high-level programming language for general programming, created by Guido van Rossum and initial discharged in 1991. Associate degree taken language, Python encompasses a style philosophy that emphasizes code readability (notably exploitation whitespace indentation to delimit code blocks instead of premed brackets or keywords) and a syntax that permits programmers to specific ideas in fewer lines of code that may well be utilized in languages like C++ or Java. The language provides constructs supposed to alter writing clear programs on each a little and huge scale. Python interpreter’s square measure offered for several operating systems, permitting Python code to run on a large kind of systems.

E. Hardware View

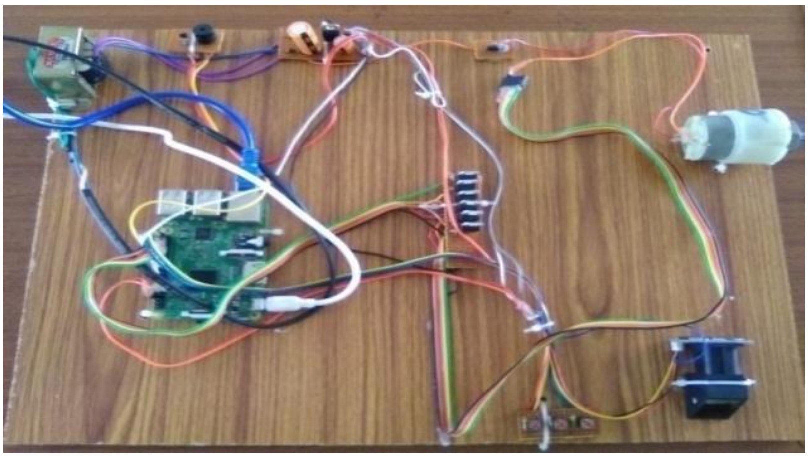
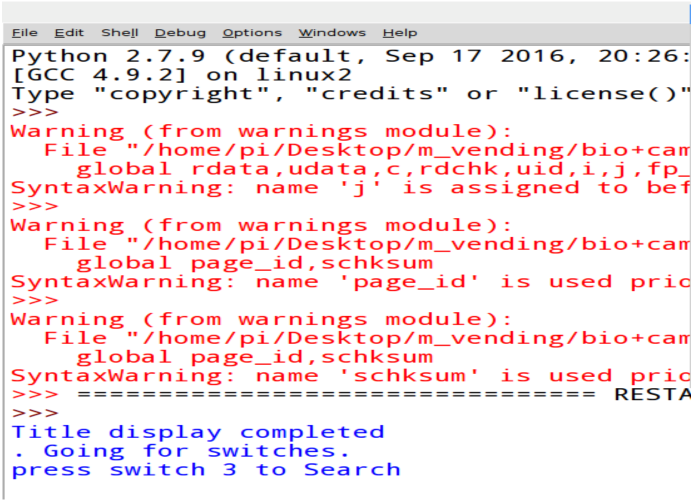


Fig 3: Hardware view

Fig 4: Medicine dispenser

IV. RESULTS



```
Python 2.7.9 (default, Sep 17 2016, 20:26:
[GCC 4.9.2] on linux2
Type "copyright", "credits" or "license()"
>>>
Warning (from warnings module):
  File "/home/pi/Desktop/m_vending/bio+cam
    global rdata,udata,c,rdchk,uid,i,j,fp_
SyntaxWarning: name 'j' is assigned to bef
>>>
Warning (from warnings module):
  File "/home/pi/Desktop/m_vending/bio+cam
    global page_id,schksum
SyntaxWarning: name 'page_id' is used pric
>>>
Warning (from warnings module):
  File "/home/pi/Desktop/m_vending/bio+cam
    global page_id,schksum
SyntaxWarning: name 'schksum' is used pric
>>> ================================ RESTA
>>>
Title display completed
. Going for switches.
press switch 3 to Search
```

Fig 5: Search window

After giving commands in terminal, the above shown python shell will get opened and user has to press switch 3 for searching his identification whether he or she enroll his or her details before or not.

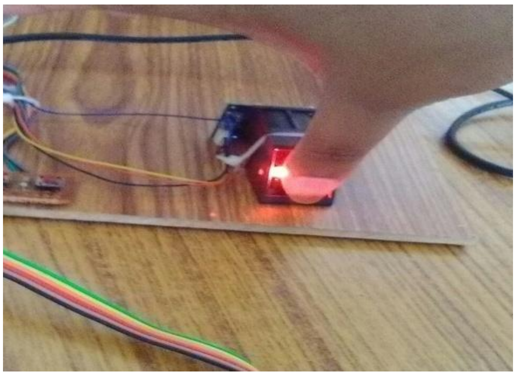
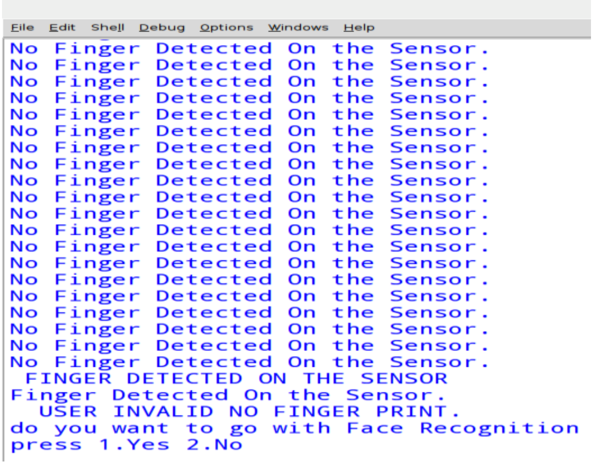


Fig 6: Placing finger on the biometric module

Firstly user has to scan his or her fingerprint using biometric module. Scanning the fingerprint is shown in the above figure.



```
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
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No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
 FINGER DETECTED ON THE SENSOR
Finger Detected On the Sensor.
   USER INVALID NO FINGER PRINT.
do you want to go with Face Recognition
press 1.Yes 2.No
```

Fig 7: Finger and face recognition window

If the fingerprint doesn’t detect on the sensor, then the machine asks to go for face recognition. The message can be shown in the above figure.

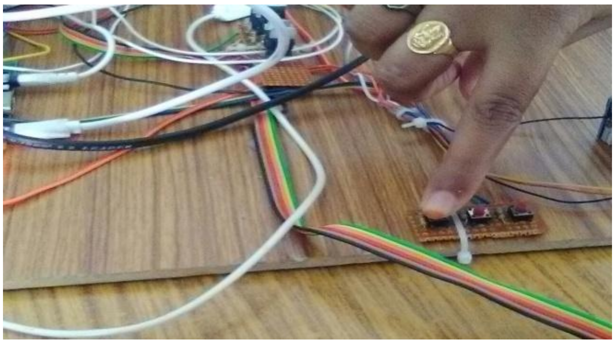
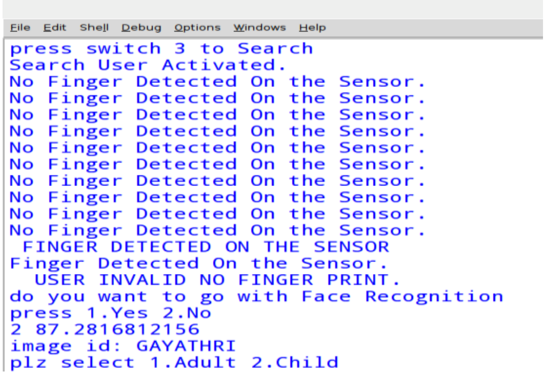


Fig 8: Selecting for face recognition

Going for face recognition by selecting switch one can be shown in the above figure.

Fig 9: Face recognition Active

Image can be captured using the camera. The above figure shows the face recognition of user.



```
press switch 3 to Search
Search User Activated.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
 FINGER DETECTED ON THE SENSOR
Finger Detected On the Sensor.
  USER INVALID NO FINGER PRINT.
do you want to go with Face Recognition
press 1.Yes 2.No
2 87.2816812156
image id: GAYATHRI
plz select 1.Adult 2.Child
```

Fig 10: Creation of image Id

After face recognition of user, image id will be displayed. The above figure shows the message that displays selecting age group.

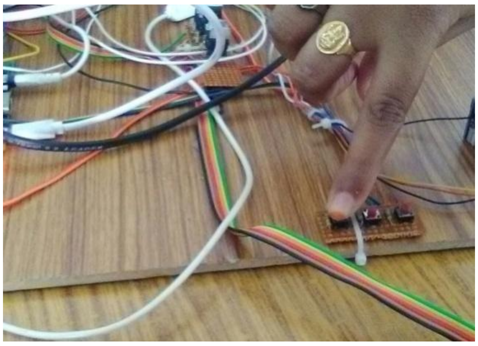
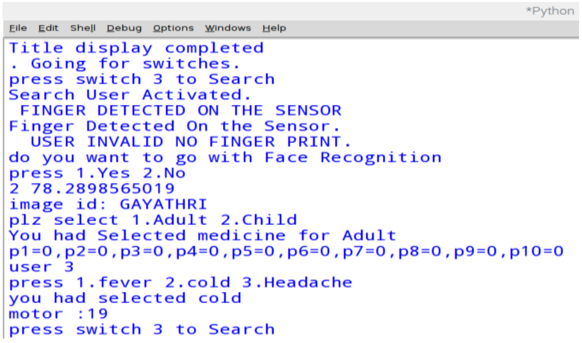


Fig 13: Selection of disease

The above figure shows the selection of medicine for cold. Here the user can select whatever medicine he or she needs and that particular medicine gets dispensed by using the motors.



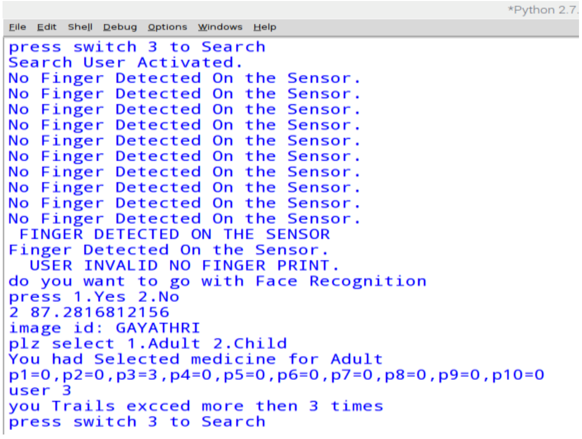
```
Title display completed
. Going for switches.
press switch 3 to Search
Search User Activated.
 FINGER DETECTED ON THE SENSOR
Finger Detected On the Sensor.
  USER INVALID NO FINGER PRINT.
do you want to go with Face Recognition
press 1.Yes 2.No
2 78.2898565019
image id: GAYATHRI
plz select 1.Adult 2.Child
You had Selected medicine for Adult
p1=0,p2=0,p3=0,p4=0,p5=0,p6=0,p7=0,p8=0,p9=0,p10=0
user 3
press 1.fever 2.cold 3.Headache
you had selected cold
motor :19
press switch 3 to Search
```

Fig 14: Displaying message that selection of medicine process is completed.

The above figure shows the message that cold medicine is selected and user can select whatever medicine he or she needs.

Fig 15: Dispensing medicine

The above figure shows the dispensing of cold medicine which the user selects. This process can be done only three times a day for any user, if it exceeds then it displays the following message.



```
press switch 3 to Search
Search User Activated.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
No Finger Detected On the Sensor.
 FINGER DETECTED ON THE SENSOR
Finger Detected On the Sensor.
  USER INVALID NO FINGER PRINT.
do you want to go with Face Recognition
press 1.Yes 2.No
2 87.2816812156
image id: GAYATHRI
plz select 1.Adult 2.Child
You had Selected medicine for Adult
p1=0,p2=0,p3=3,p4=0,p5=0,p6=0,p7=0,p8=0,p9=0,p10=0
user 3
you Trails excced more then 3 times
press switch 3 to Search
```

Fig 13: Message displayed that trails exceed more than three times.

III. CONCLUSION

The medicine dispensing machine offers a flexible, simple and rugged solution for extending basic healthcare to all places, at a very moderate cost. Hence we use this medicine vending machine to supply medicines to the persons who have diseases or problems. This machine recognizes the person, his information and supplies medicines related to him/her. This machine can also be extended by the face detection by using the camera and count the number of times a particular person is taking medicines. This machine can be added by many features for implementation.

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