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RASPBERRY PI MEDICINE REMINDER E-MAIL ALERT USING IOT

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Abstract

This Raspberry pi Medicine reminder system has remind and consume feature which is used to deliver notifications to the user to take pills at the appointed time. The pills to be swallowed are popped out of the pillbox at that moment. Smart pill box might lessen the guardian's obligation of administering the proper medications at the recommended time. The improvement in medical technology is one of the key contributors to the aging population. Most of the elderly have chronic ailments and they need to take drugs for an extended period of time in order to stabilize their health. So drug safety for the elderly is really crucial. The most typically seen scenarios of drug misuse include excessive drug consumption and violating the prescription recommendations. We have designed a gadget named "Raspberry pi Medicine reminder" to aid the aged population to ingest the proper medicine at the appropriate time according to their needs. This system enhances the current method by notifying the user at the specific time again by setting the count each time and the particular pill is recall by the system automatically by message and e-mail.

INTRODUCTION:

Preventing medication errors using a Linux-based Speaking Medication Reminder is a good way to save people from making potentially fatal blunders. Reminders may be entered from the outset. The system accepts numerous reminders with date, time, and dose by keyboard input. Afterwards, it reminds people to take their prescription as prescribed. Raspberry pi is used by the system to keep the dates and times associated with each user's medicine.

EXISTING SYSTEM:

Currently, doctors or caregivers remind patients to take their medication at the prescribed time. As an alternative, the patient may choose to use a regular alarm clock. There may be times when physicians aren't available.

PROPOSED SYSTEM:

Reminder and meditation dosage will be stored in the database by a server, which will automate the alarm with a voice on what medicine to take and how much of it to take, under this system's suggested implementation. When a user forgets the tablet's name and time, an email will be sent to remind them.

Architecture Diagram of the System:

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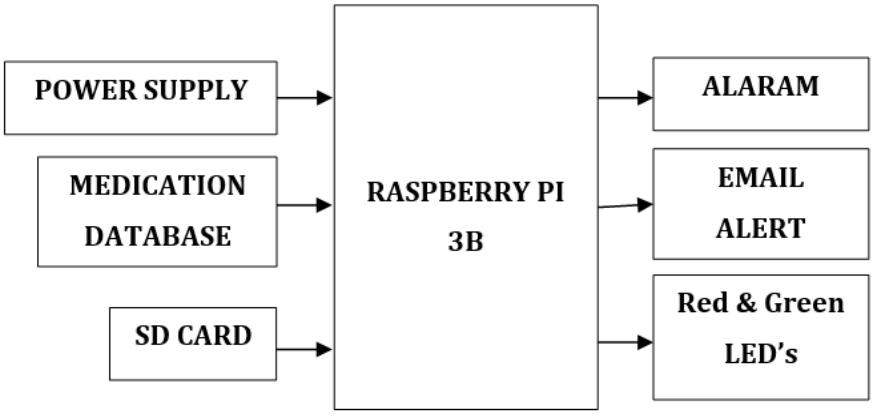


Fig. 2.1 Architecture diagram

ADVANTAGES:

- Handicap people can operate computers
- High accuracy

SOFTWARE TOOLS:

- Raspbian Bullseye OS
- MySQL database
- HTML and PHP
- Python Programming Language
- SMTP Server

LITERATURE SERVEY

Medicine dispensing machine using raspberry pi and Arduino Methodology [1]
The scientists suggest a machine that can deliver healthcare in places where a medical supply store isn't practicable or possible, according to the authors. It enables the user to pick a drug, pay the needed amount, and then the system validates the money received and distributes it. To validate and identify the amount, a credit card-sized controller known as the Raspberry Pi is used to analyse still photos. This microcontroller-based development board, Arduino, manages the payment and medication distribution modules. Using a USB connection, serial communication is used to connect the Raspberry Pi and Arduino controllers. To use the machine, just plug it into any standard 230V wall socket (alternating current). This machine has been built as a stand-alone device, needing little monitoring to run for extended periods of time, because to the physical and infrastructural difficulties in establishing a medical shop in distant locations.

INTRODUCTION TO EMBEDDED SYSTEM

If you've ever seen a computer that's part of a bigger system, you've probably heard of an embedded system. Often, it's part of a larger gadget, which may also include physical or mechanical components. Many regularly used gadgets are now controlled via integrated systems. Embedded system processors account for 92% of all microprocessors.

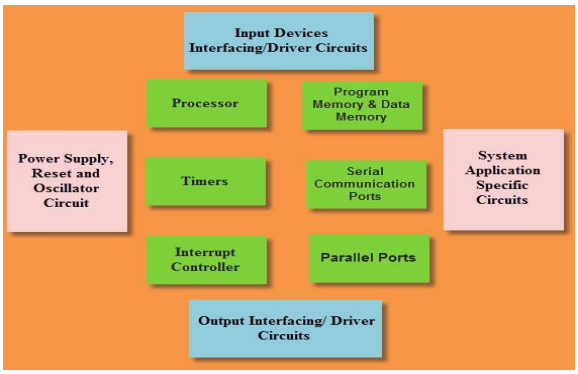


Fig 1. Embedded Systems Design

Cheap power consumption, compact size, variable performance, and low unit cost are just a few examples of computer qualities that are often implemented.

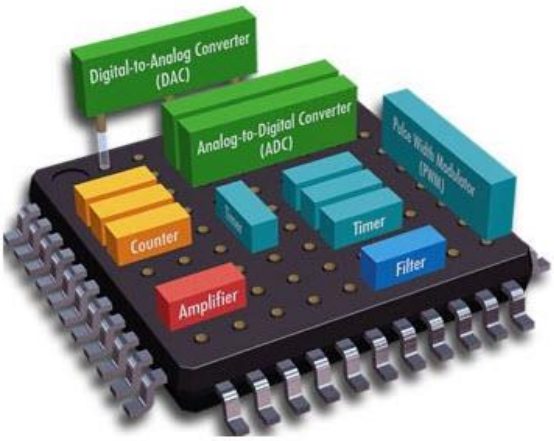
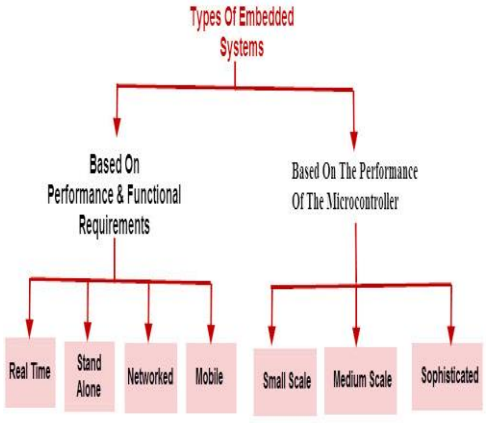


Fig 2: Embedded System Hardware

Embedded System Classification:



Classification of Embedded Systems

On the basis of the complexity of hardware and software and microcontrollers, embedded systems may be divided into many categories (8 or 16 or 32-bit). Based on the microcontroller's performance, embedded systems are divided into three categories:

- Small scale embedded systems
- Medium scale embedded systems
- Sophisticated embedded systems

On the basis of the system's performance and functionality, embedded systems are divided into four categories:

- Real time embedded systems
- Standalone embedded systems
- Networked embedded systems
- Mobile embedded systems

APPLICATIONS:

Consumer, industrial, automotive, medical, commercial, and military products all use embedded systems in some way. Embedded systems are no exception.

Embedded systems in telecommunications systems range from the network's telephone switches to the end user's mobile phone. In computer networking, data is routed via special routers and network bridges.

Fig 3: Real-life examples of Embedded System

MP3 players, mobile phones, videogame consoles, digital cameras, GPS receivers, and printers are examples of consumer electronics. Embedded systems are found in many common household appliances, such as microwaves, washing machines, and dishwashers, and they allow for more customization, efficiency, and functionality. Modern HVAC systems employ networked thermostats to regulate temperature more precisely and effectively as it varies with the time of day and season. Lighting, temperature, security, audio/visual, and surveillance may all be controlled via the usage of wired and wireless networking in the home, all of which rely on embedded devices for sensing and controlling.

A variety of ports may be used for debugging: JTAG, ICSP, BDM Port, BitP, and DB9.

PROPOSED METHODOLOGY:

We presume that the medication that patients need to take at certain times has been packed into the pillbox in order to alleviate the burden on family members.

Using the input system, we must establish the pill timing for each necessary drug. Various medicines may be taken at different times, which is something we can control. To get more pills, enter the box numbers into the computer system when more than one pill is needed at a time. In addition, the amount of tablets that will be inserted into the system is something that we control.

BLOCK DIAGRAM:

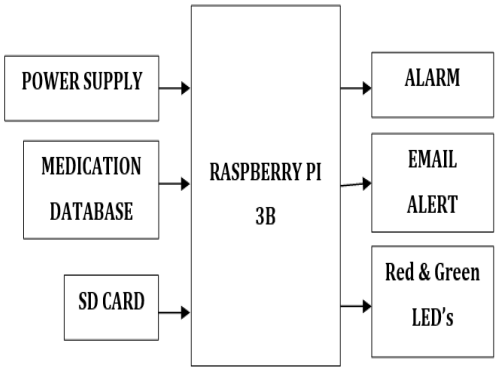


Fig 4.1. Block diagram

The output of a real-time clock is continuous time. A real-time clock is used to continuously monitor the time to determine when the pill should be taken. Taking a pill is indicated if the system time matches the time set for taking the tablet. The user must be reminded to take their medicines at a certain time.

The buzzer continues to ring until the user presses the button to stop it.

RASPBERRY PI POWER SUPPLY:

The power supply has been fully rebuilt to improve the B+'s reliability while also reducing its overall current demand.

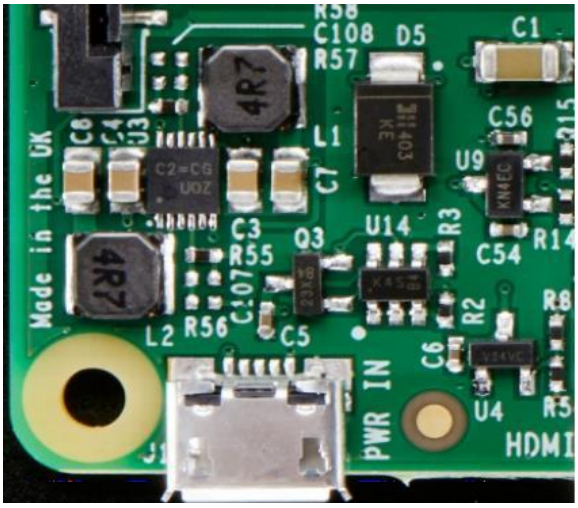
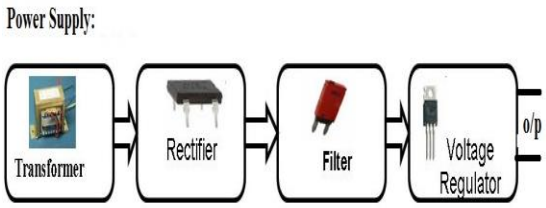


Fig. 4.1 Raspberry Pi RPS

Fig. 4.2 RPS Schematic Diagram

Fig. 4.3 Voltage Converter

A **regulated power supply** is an embedded circuit; it converts unregulated AC into a constant DC. With the help of a rectifier it converts



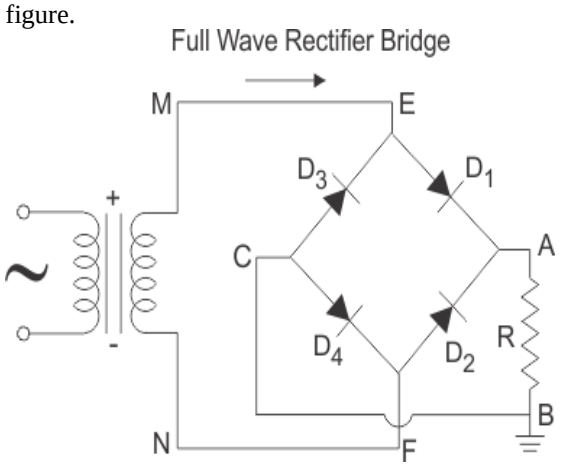
An integrated DC power supply, also known as a linear power supply, is made up of several blocks and is controlled. If you connect an AC power source to the regulated power supply, you'll get a steady DC output. A typical regulated DC power supply is shown in the figure below.
These components make up a regulated DC power supply:

1. A step down transformer
2. A rectifier
3. A DC filter
4. A regulator

Operation of Regulated Power Supply:

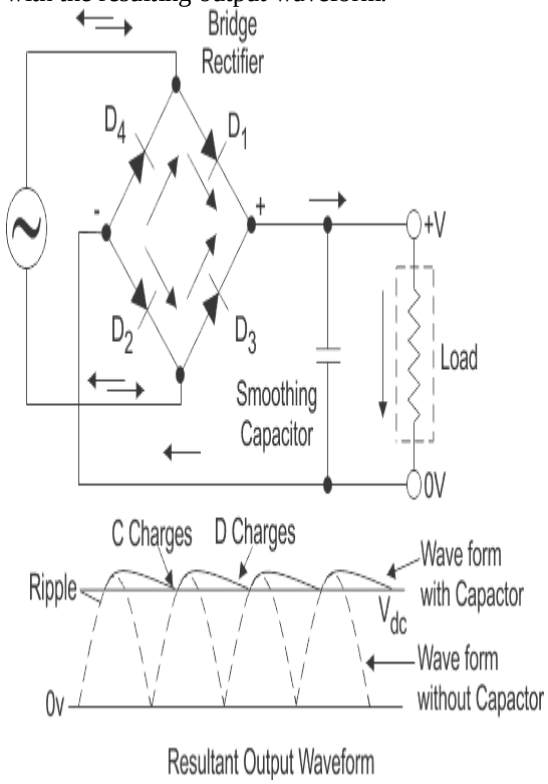
Rectification:
The rectification procedure is carried out using a diode-based electrical circuit. An alternating voltage or current is rectified into the corresponding direct (DC) amount by the process of rectifying. Rectifiers use alternating current (ac) as input and output, respectively. To rectify the alternating current supply's two half cycles, a full wave rectifier or a bridge rectifier is often used (full wave rectification).

The full-wave bridge rectifier is seen in the following figure.



DC Filtration:

There is a considerable amount of ripple in the rectified DC voltage that comes out of the rectifier. Our preferred DC waveform is one that is devoid of ripples, and this is not it. That's why we employ a filter. Filters of many sorts are used, including capacitor filters, LC filters, choke filters, and type filters. The rectifier's output is shown with a capacitor filter attached to it in the figure below, along with the resulting output waveform.



INTRODUCTION TO RASPBERRY PI:

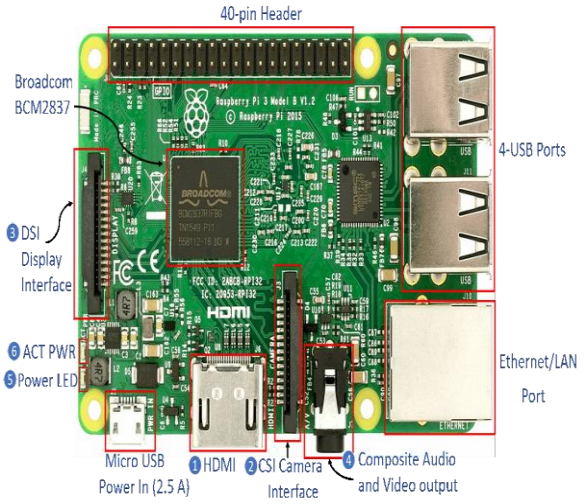
Slower than laptops and desktops, the Raspberry Pi can nonetheless deliver all the required functions and abilities while using very little power. Raspbian OS, based on Debian, is officially provided by the Raspberry Pi Foundation. It's also worth noting that they provide the NOOBS operating system for Raspberry Pi. Installing a Third-Party OS such as Ubuntu, Archlinux or RISC OS may be done.

It is possible to download Raspbian OS for free and use it on a computer. This operating system is specifically designed for usage on the Raspberry Pi and is very efficient. For browsing, Python programming, office applications, and video games, Raspbian has a graphical user interface (GUI). The following are the most often used and most notable features of the various Raspberry Pi models:

Raspberry Pi 3 Board:

Raspberry Pi 3 On-chip Hardware

The On-chip hardware of Raspberry Pi 3 (here) is as shown in below figure,



Raspberry Pi 3 Model B Hardware Some

HDMI (High-Definition Multimedia Interface): It uncompressed video or digital audio data Raspberry Pi may connect to a digital television using its HDMI connector.

1. The CSI (Camera Serial Interface) interface connects the Broadcom processor to the camera on the Raspberry Pi. This interface enables two devices to communicate with each other using electricity.
2. A 15-pin ribbon cable is used to connect the LCD to the Raspberry Pi through the Display Serial Interface (DSI). In order to transport video data from the GPU directly to the LCD display, DSI offers a quick, high-resolution display interface.
3. Using the composite video and audio output, you may send both video and audio signals to your home theatre system.
4. Colored RED, it serves as a power indicator for devices. When power is applied to the Raspberry Pi, this LED will come on. Whenever the supply voltage dips below 4.63 volts, the LED will begin to blink.
5. 5: ACT PWR: This green LED indicates that the SD card is now being used.

ARM ARCHITECTURE:

The ARM is a 32-bit RISC design created by ARM Organization. ARM processors have a

- Abort mode is entered after a data abort or prefetch abort. System mode is a privileged user mode for the OS.
- The undefined mode is entered when an undefined instruction exception occurs.
- Secure Monitor mode is a secure mode for the Trust Zone Secure Monitor code.

Registers:

The processor has a total of 40 registers

- 33 general-purpose 32-bit registers.
- Seven 32-bit status registers.

OPERATING SYSTEM

The majority of operating systems for the Raspberry Pi are Linux kernel-based. Since some prominent Linux distributions, including Ubuntu, no longer support version 6, the ARM11 relies on an older architecture. NOOBS is the name of the Raspberry Pi's installation manager. Included in NOOBS are the following operating systems:

• Arch Linux ARM
• OpenELEC
• Pidora (Fedora Remix)
• Raspbmc and the open source digital media centre, XBMC

ARM hard-float (armhf)-Debian 7 'Wheezy' architecture port based on ARM hard-float (armhf)-ARMv6 instruction set of the Raspberry Pi makes Raspbian work, but with slower performance, and is maintained independently of the Foundation. Raspbian was designed for an older ARMv6 processor, but Raspbian is compiled for an updated ARMv7 instruction set, making it work. Some deb software may be found here.

5.2 BOOT PROCESS:

The Raspberry Pi does not operate in the manner of a standard computer. Before the ARM CPU even begins to boot, the video core (the graphics processor) is activated.

The Raspberry Pi's boot process can be summarised as follows:

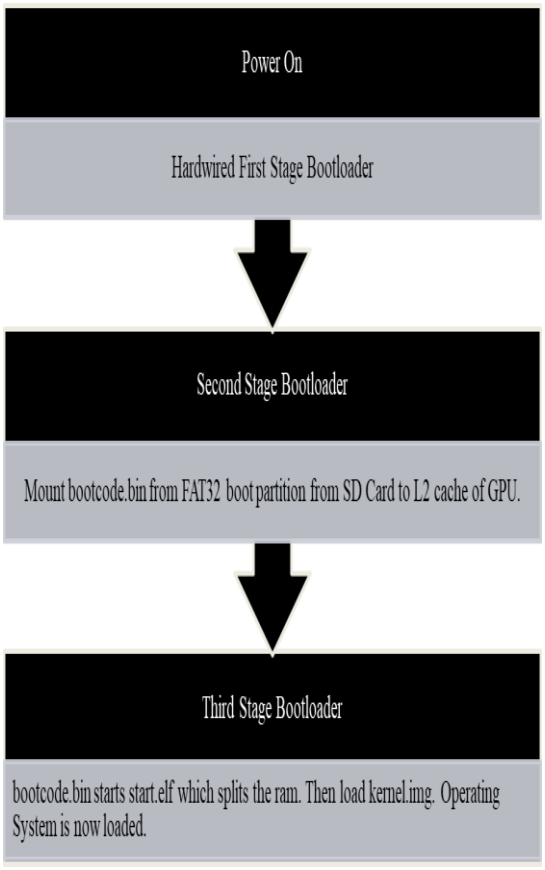


Figure 10: Boot process of Raspberry Pi

INTRODUCTION TO PYTHON:

Guido van Rossum is the creator of Python. In 1989, Guido van Rossum began working on the Python programming language. You can learn Python even if you've never programmed before because it's a simple programming language.

Not many people know this, but Python gets its name from the BBC comedy series Monty Python's Flying Circus. It has nothing to do with the Python snake, which it is not named after.

Features of Python programming language:

1. Readability: Python is an exceptionally easy language to learn and to write in.
2. Easy to Learn: Python is an expressive and high-level programming language, making it easy to grasp and hence easy to learn.
3. Cross-platform: Python can operate on a wide range of different operating systems like Macintosh/Windows/Linux/Unix and so on. As a result, it can be used on a wide variety of platforms.

4. In addition to being open source, Python is a programming language.

5. Python has a huge standard library that includes useful codes and methods that we may utilise when developing Python programming.

6. Python is available for free download and usage. This means that you are free to use it in your application after downloading it. See the Python License: Open Source. As a FLOSS (Free/Libre Open Source Program), Python allows you to freely share copies of this software, examine its source code and change it.

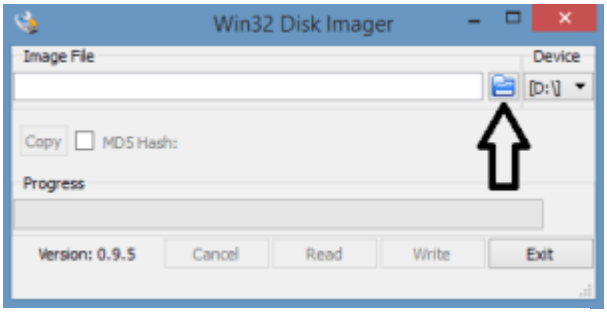
7. If you're new to this, you may be wondering what an exception is. When a programme exception occurs, an exception is an event that occurs and interrupts the execution of the programme. Because Python has built-in support for managing exceptions, we can create less error-prone code and test a wider range of situations that can result in an exception.

8. Support for generators and list comprehensions are among the more advanced capabilities. These aspects will be discussed in further detail in the future.

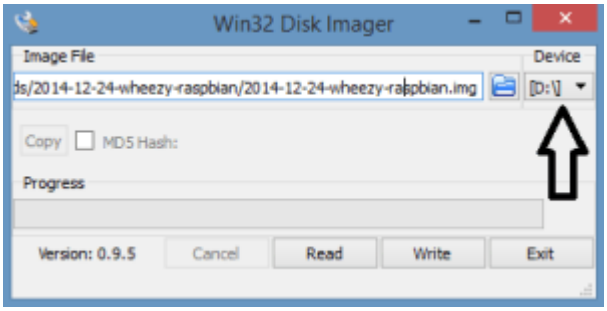
9. In Python, the memory is cleaned and released automatically because of the language's support for automated memory management. It's not necessary to do a memory clean.

10. Figure 6.2: The Development Board for the Raspberry Pi.
Write the Raspbian Operating System to the SD/microSD Card

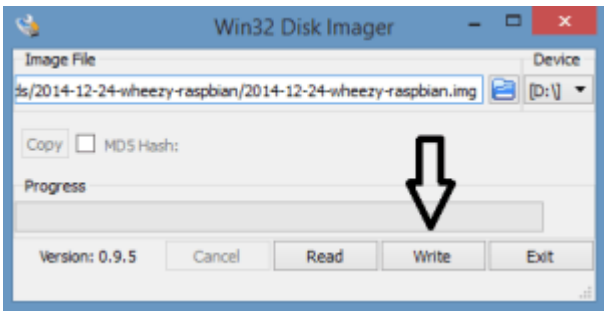
On our SD/microSD card, we can now write the Raspbian OS. Take advantage of Win32DiskImager, and select the Raspbian picture record by tapping on the little document symbol that sits on one side of the content field:



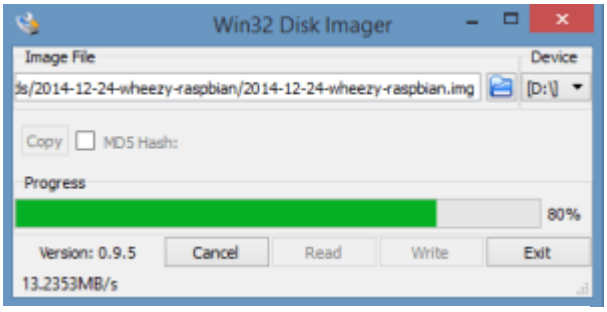
Next, choose the drive letter from the drop-down list underneath "Device" that the SD/microSD card is plugged into.



On the bottom of the window, click "Write." According to your computer and the size of your SD/microSD card, the procedure might take anywhere from 1 to 15 minutes.



You may now remove your SD/microSD card from your computer and place it into your Raspberry Pi.

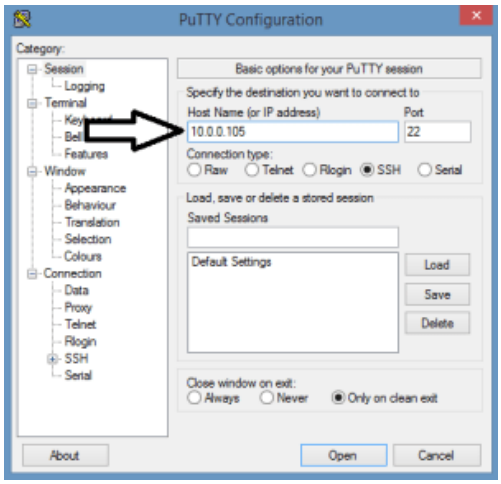


The Raspberry Pi is now ready to be powered on. A power wire and an Ethernet cable must be plugged into a Raspberry Pi to power it up and connect it to your network.

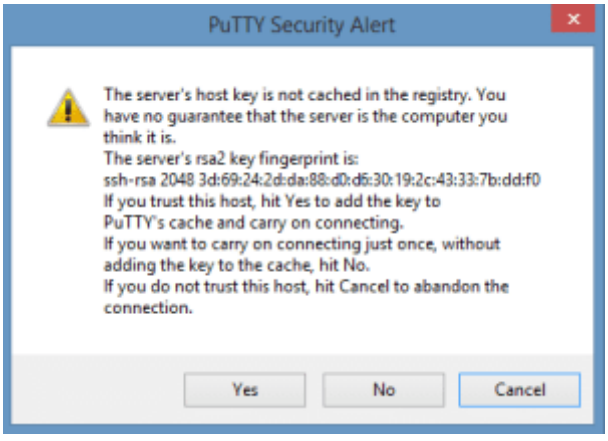
- **Establish an SSH Connection to your Raspberry Pi:**

It's 10.0.0.105 in my case. We'll need the IP address of a neighbouring network to connect our home computer to the Raspberry Pi through SSH.

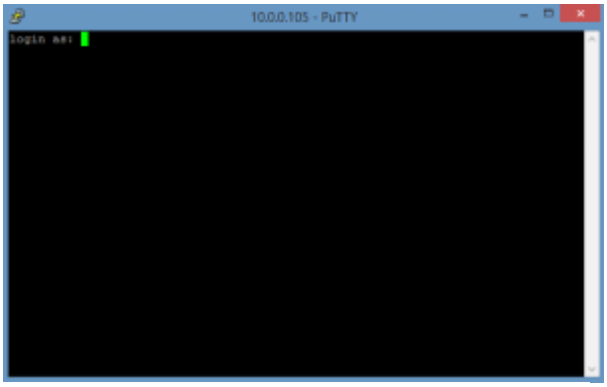
Using PuTTY as our SSH client, we can now connect to the Raspberry Pi through SSH. Open PuTTY and enter in the "Host Name (or IP address)" box the Raspberry Pi's local IP address. For the time being, don't worry about the port: it's OK as it is.

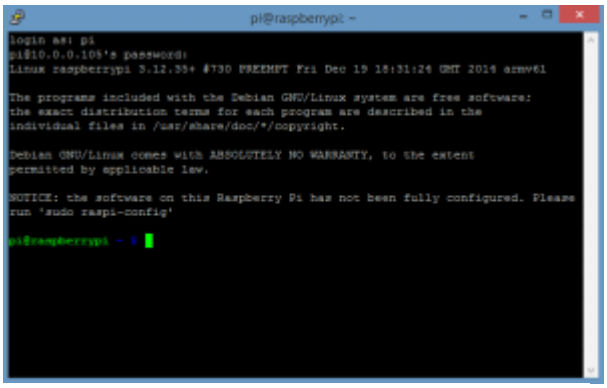


To begin the connection, click "Open" after entering your Raspberry Pi's local IP address. In the event of a problem, just hit yes despite the fact that you are connecting to your own Raspberry Pi and hence the security risk here is minimal:.

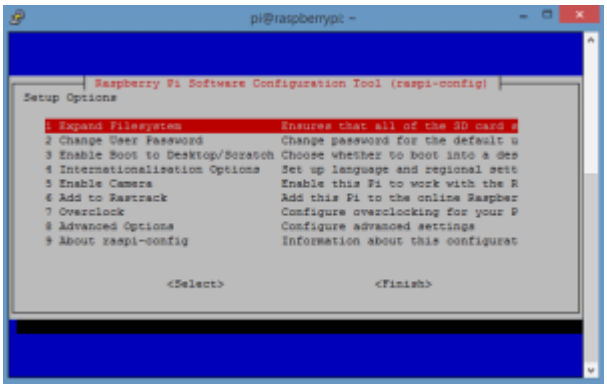


If the SSH connection is successful you will now be greeted with the login prompt of your Raspberry Pi:





You should now configure your Raspberry Pi by typing raspi-config on the command line to go to the configuration menu:



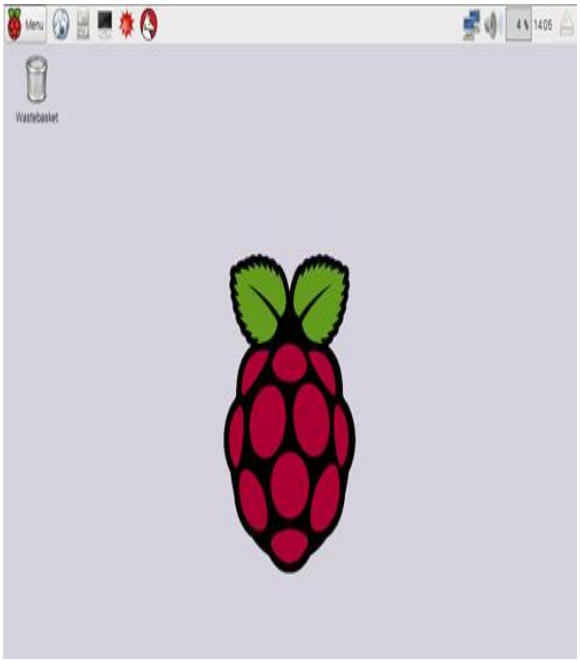


Fig. 5.3 Raspberry Pi Desktop view

A **Relational Data Base Management System (RDBMS)** is a software that −

- Table, column, and index creation is made possible.
- Ensures that rows in different tables have the same referencing integrity.
- Automatically updates the indexes.
- Consolidates data from many tables according to a SQL query.

RDBMS Terminology

- Before Before we go into the specifics of the MySQL database system, let's go through a few terms that should be clarified.
- As the name suggests, a database is an arrangement of tables, each with a unique set of data.
- Matrix A matrix is a table of data. A database table resembles a basic spreadsheet.
- For example, the column postcode includes only data of the same kind (column).
- As an example of a row, consider a subscription's data, which would be included as an entry in the database called a row.
- Redundant data storage speeds up the system by storing data twice for redundancy.

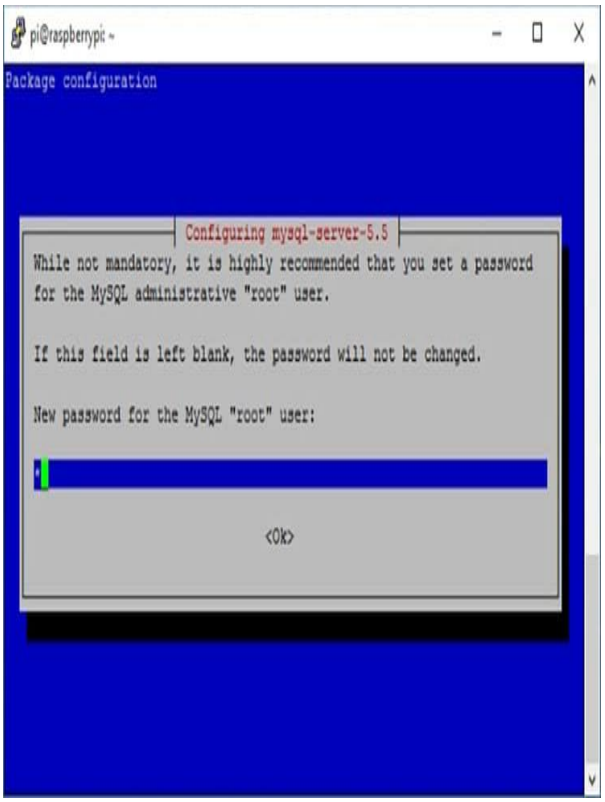
- A primary key is a one-of-a-kind identifier A table cannot have the same key value twice. Only one row may be located using a key.

MySQL and phpMyAdmin Installation Process:

Installing Raspberry Pi MySQL:

1. et's get the Raspberry Pi set up with a MySQL server.

Install mysql-server 2 with sudo apt-get The root user will need a password, which you must supply. To connect PHPMyAdmin to the MYSQL server, we'll need your username and password, so write it down now!



The following command must be entered if you are not asked for a password. Fill out the form completely to ensure that it is configured to meet your security needs.

Run mysql secure installation with root privileges

Enter the following command to access the database and begin making changes: sudo mysql -u root -p

When prompted, enter the new password you just set in Step 5.

To build, edit, and remove databases, you may now use the MYSQL commands.

Entering quit will exit the MYSQL command line.

Python bindings for MYSQL are required if you wish to use Python to communicate with the database. Enter the following command to achieve this.

Sudo apt-get install python-mysqldb python

As soon as we've finished setting up the Raspberry Pi MYSQL, you may wish to set up PHPMyAdmin so that you may operate in a more user-friendly environment.

Creating an MySQL Database User:

1. By default, PHPMyAdmin will disallow you to log in using the root login. Instead, you will need to create a new user if you wish to create and access data tables within PHPMyAdmin. To do this first login as root with the password you selected.

`sudo mysql -u root -p`

2. Now run the following command, replacing username with the username of your choice. Also, replace password with a secure password of your choice.

```
GRANT ALL PRIVILEGES ON mydb.* TO 'username'@'localhost' IDENTIFIED BY 'password';
```

3. You can exit by entering `quit`. Once done you can proceed to install PHPMyAdmin.

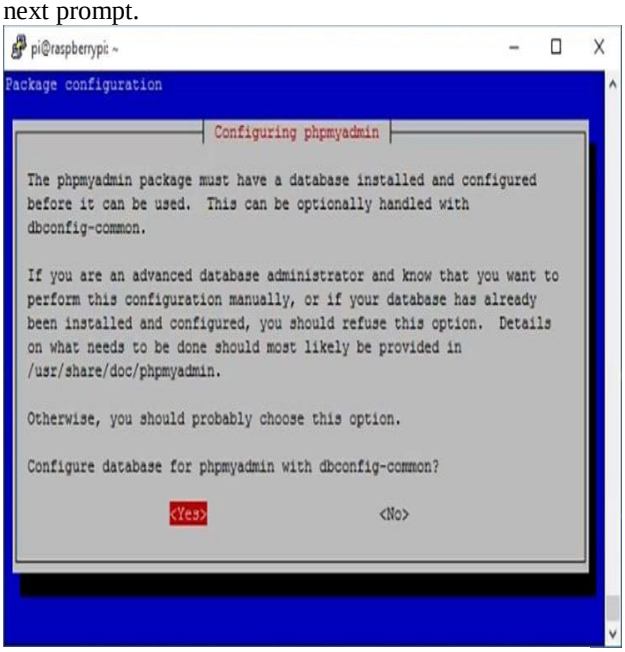
Installing Raspberry Pi PHPMyAdmin

`sudo apt-get install phpmyadmin`

2. It will now begin to install. You will be presented with a screen asking the type of web server you want it to run off. Select apache2 even if you are using NGINX since this doesn't hugely matter for us.

3. Next, we will need to configure PHPMyAdmin to connect to our SQL database server. (The one we set up previously in installing the Raspberry Pi MYSQL

step or the web server). To do this select **yes** at the next prompt.



- We can directly connect Raspberry Pi to the Digital Display using HDMI cable.

How to write C program on Raspbian OS

- So, let's write our First C code on Raspbian and execute it.
- First Create Empty file and label it with .c extension.
- Now write a small program to print "Hello World"

Program

```
#include<stdio.h>

int main(){
    printf("Hello World");
    return 0;
}
```

After writing the code, open terminal (ctrl+alt+t) to execute it. Then, type following commands for compiling and execution.

CONCLUSION

The patient will be able to easily remind themselves of their medicine times and dosages with the help of this system, which includes a smart pillbox with reminder and confirmation capabilities. The suggested pill box may alleviate some of the burden on family members to ensure that medications are taken correctly and on time. An alarm sound will be played for the user at a certain time, and a real-time clock will provide an output of continuous time. Alerts are sent to the user to remind them to take their medication at a certain time. With this project, users will be able to easily input the time and dosage of their prescription, as well as hear an alert and get an email reminder of when and how much they should be taking it.

REFERENCE

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