RASPBERRYRY PI MEDICINE REMINDER E-MAIL ALERT USING IOT

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Abstract

This Raspberry pi Medicine reminder system with remind and consumption function which is used to give alerts to the user to take pills at the scheduled time. The pills to be consumed are popped out of the pillbox at that time. Smart pill box can reduce the guardian's responsibility of giving the correct medicines at the prescribed time. The progress in medical technologies is one of the main contributions to the aging population. Most of the elders have chronic diseases and they need to take medications for a prolonged period of time in order to stabilize their conditions. So medication safety for the elderly is extremely vital. The most commonly encountered situations of drug abuse are excessive drug usage and disobeying the medication instructions. We have developed a device called "Raspberry pi Medicine reminder" to help the aging population to consume the right medication at the appropriate time according to their requirements. This system improves the existing system by alerting the user at the particular time again by setting the count each time and the particular pill is remind by the system automatically through message and e-mail.

INTRODUCTION:

Medication mix-ups are extremely dangerous; to avoid this Linux based Speaking Medication Reminder can help to prevent these life-threatening mistakes. It first allows users to enter reminder inputs. System takes input through keyboard to accept various reminders with date and time and dosage. It then reminds patients to take the right medication at the right time. System allows users to store their medication dates and time using raspberry pi.

EXISTING SYSTEM:

In the existing system, doctor or caretaker remind the patient to take the medicines in the time. Or patient will go with a normal alarm for the reminder. But doctors may not their round the clock.

PROPOSED SYSTEM:

In this proposed system, Both reminder and the meditation dose in being store in the database with the help of server which will automate the alarm with a speech with what medicine has to take and with how much quantity of it. This system will send Email alert to user for reminding the particular tablet name and time.
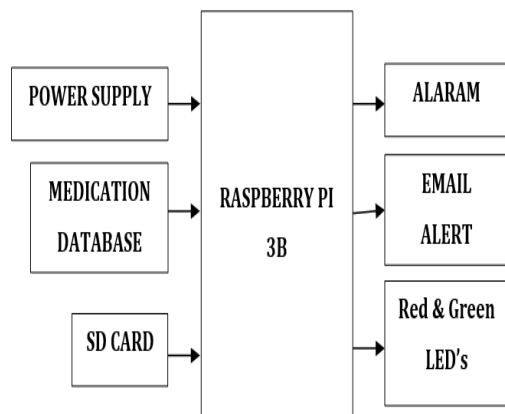
 Architecture Diagram of the System:

Fig. 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 authors propose a machine designed to provide such healthcare at areas where having a medical store may not be feasible or possible. It allows the user to select a medicine, pay the required amount after which it verifies the amount received and dispenses the medicine. The amount is authenticated and identified using an image processing unit controlled by a Raspberry Pi, a credit card sized controller capable of processing still images. The payment module and medicine dispensing module are controlled by the Arduino, a microcontroller-based development board. The communication between the Raspberry Pi

and Arduino controllers is serial, through a USB cable. The machine is powered by a regular power outlet of 230V (alternating current). Due to the physical and infrastructural limitations in establishing a medical store at remote areas, this machine has been designed to be a standalone unit, requiring minimum supervision to operate for long periods of time.
Automated medication dispensing [2]
Design and Implementation of Automatic Medicine dispensing machine

INTRODUCTION TO EMBEDDED SYSTEM
An embedded system is a computer system with a dedicated function within a larger, often with, real-time mechanical or electrical system constraints. It is incorporated as part of a complete device that often includes hardware and mechanical parts. Integrated systems today control many commonly used devices. 92% of all microprocessors are produced as embedded system components.
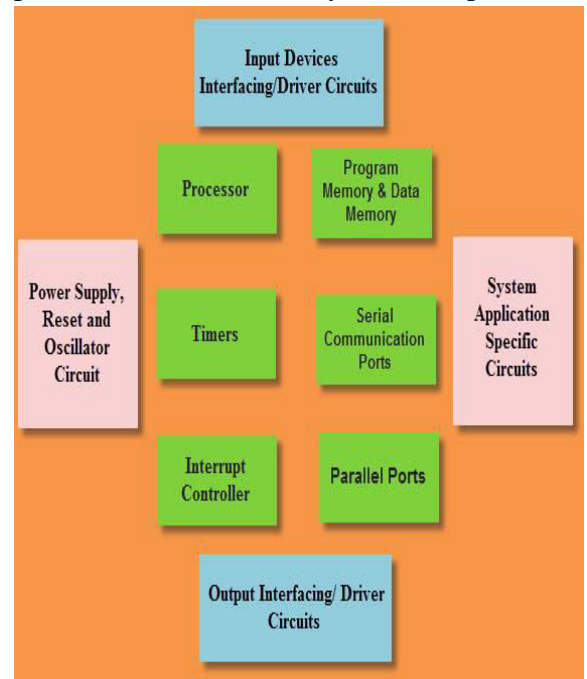
Fig 2. Embedded Systems Design

Examples of typically incorporated computer properties, compared to general-purpose counterparts, are low power consumption, small size, varying performance and low-cost unit cost. This is at the
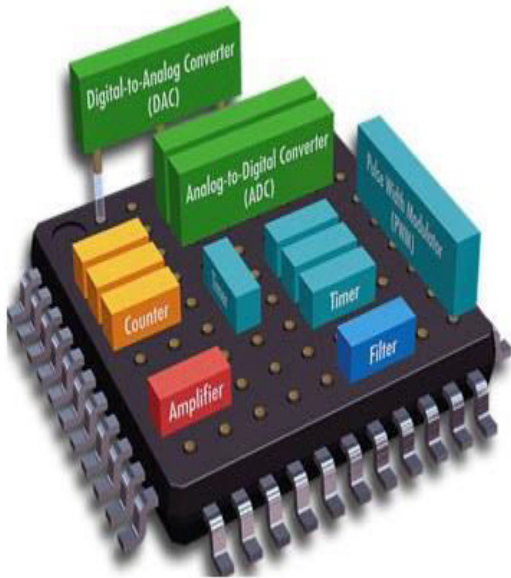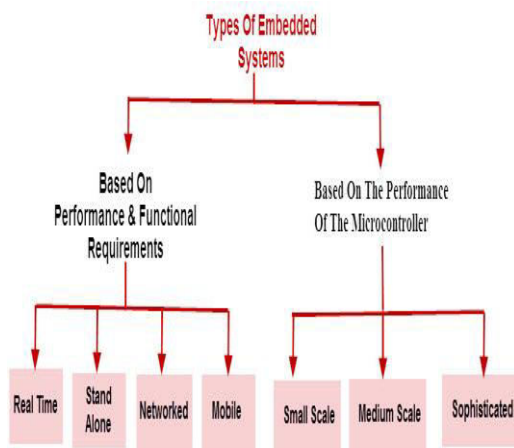

Fig 3: Embedded System Hardware

Embedded System Classification:

Classification of Embedded Systems

Embedded systems are primarily classified into different types based on complexity of hardware & software and microcontroller (8 or 16 or 32-bit). Thus, based on the performance of the microcontroller,

embedded systems are classified into three types such as:

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

Further, based on performance and functional requirements of the system embedded system classified into four types such as:

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

APPLICATIONS:

Embedded systems are commonly found in consumer, cooking, industrial, automotive, medical, commercial and military applications.

Telecommunications systems employ numerous embedded systems from telephone switches for the network to cell phones at the end user. Computer networking uses dedicated routers and network bridges to route data.

Fig 4: Real-life examples of Embedded System

Consumer electronics include MP3 players, mobile phones, videogame consoles, digital cameras, GPS receivers, and printers. Household appliances, such as microwave ovens, washing machines and dishwashers, include embedded systems to provide flexibility, efficiency and features. Advanced HVAC systems use networked thermostats to more accurately and efficiently control temperature that can change by time of day and season. Home automation uses wired- and wireless-networking that can be used to control lights, climate, security, audio/visual, surveillance, etc., all of which use embedded devices for sensing and controlling.

Embedded Wi-Fi modules provide a simple means of wirelessly enabling any device which communicates via a serial port.

Debugging: JTAG, ISP, ICSP, BDM Port, BITP, and DB9 ports.

PROPOSED METHODOLOGY:

In order to reduce the responsibility of family members of dividing the medications in the pillbox, we assume that the medicine the patients need to take at particular times has been packed into the pill box.

In this system we have to set the pill time for required medicine by using input system. We can set the different time for different pills. If more than one pill is required at a time, give the box nos. to the system to get required pills. We also set the number of pills we are inserting in the system.
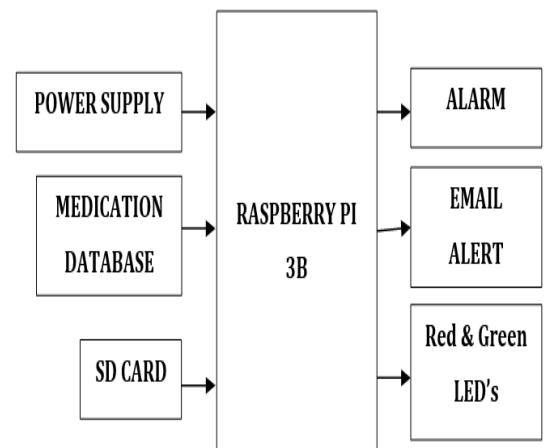
BLOCK DIAGRAM:

Fig 5. Block diagram

The real-time clock gives continuous time as an output. The system monitors the time continuously using a real-time clock to identify the pill time. If the system time matches with pill time, the system shows that that it is time to take a pill. It is necessary to alert the user to take pills at a particular time. When the system time match with pill time, the buzzer start continuously until the push button is

HARDWARE SPECIFICATIONS

RASPBERRY PI POWER SUPPLY:

To make the B+ more reliable and actually reduce the current draw, the power supply is completely redesigned.
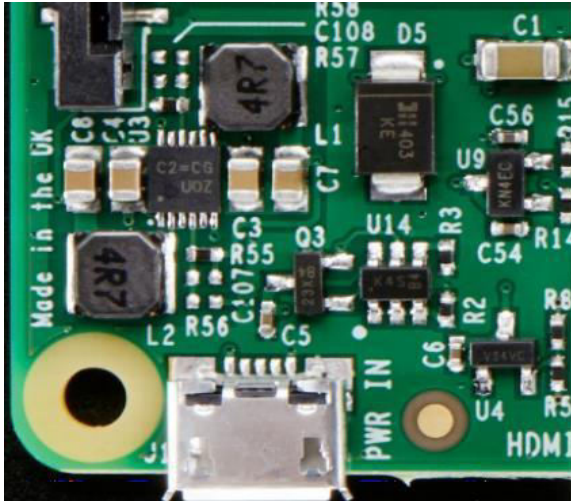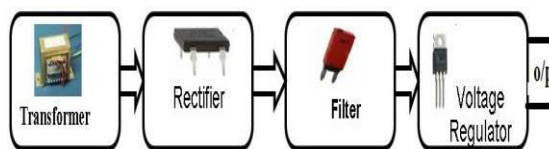
Fig. 6 Raspberry Pi RPS

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

A regulated DC power supply is also called as a linear power supply; it is an embedded circuit and consists of various blocks. The regulated power supply will accept an AC input and give a constant DC output. Figure below shows the block diagram of a typical regulated DC power supply.

The basic building blocks of a regulated DC power supply are as follows:

- ❖ A step down transformer
- ❖ A rectifier
- ❖ A DC filter
- ❖ A regulator
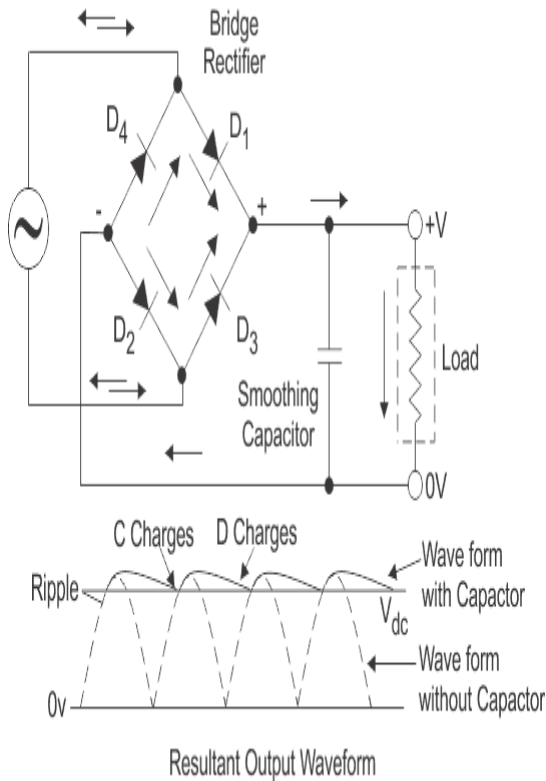- ❖ Operation of Regulated Power Supply:

Rectification:

Rectifier is an electronic circuit consisting of diodes which carries out the rectification process. Rectification is the process of converting an alternating voltage or current into corresponding direct (DC) quantity. The input to a rectifier is ac whereas its output is unidirectional pulsating DC. Usually a full wave rectifier or a bridge rectifier is used to rectify both the half cycles of the ac supply (full wave rectification). Figure below shows a full wave bridge rectifier.
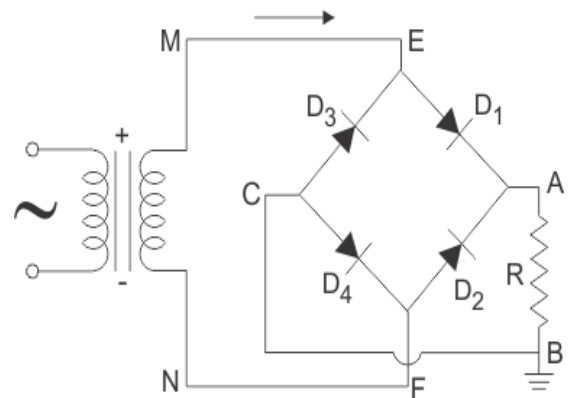
DC Filtration:

The rectified voltage from the rectifier is a pulsating DC voltage having very high ripple content. But this is not we want, we want a pure ripple free DC waveform. Hence a filter is used. Different types of filters are used such as capacitor filter, LC filter, Choke input filter, π type filter. Figure below shows a capacitor filter connected along the output of the rectifier and the resultant output waveform.

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,
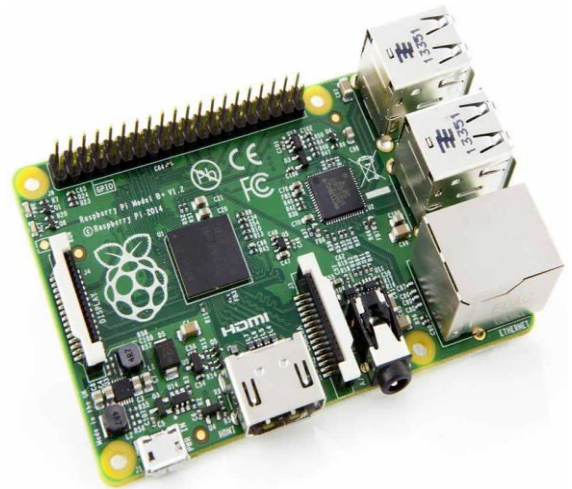

INTRODUCTION TO RASPBERRY PI:

Raspberry Pi is slower than laptop or desktop but is still a computer which can provide all the expected features or abilities, at low power consumption. Raspberry Pi Foundation officially provides Debian based Raspbian OS. Also, they provide NOOBS OS for Raspberry Pi. We can install several Third-Party versions of OS like Ubuntu, Archlinux, RISC OS, Windows 10 IOT Core, etc.
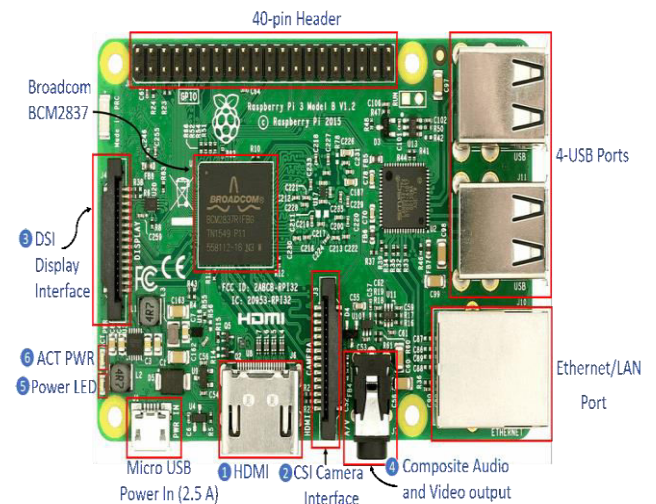
Raspbian OS is official Operating System available for free to use. This OS is efficiently optimized to use with Raspberry Pi. Raspbian have GUI which includes tools for Browsing, Python programming, office, games, etc. Out of the above versions of Raspberry Pi, more prominently use Raspberry Pi and their features are as follows:

Raspberry Pi 3 Model B Hardware Some Hardware Components shown above are mention below:

HDMI (High-Definition Multimedia Interface): It is used for transmitting uncompressed video or digital audio data to the Computer Monitor, Digital TV, etc. Generally, this HDMI port helps to connect Raspberry Pi to the Digital television.

CSI Camera Interface: CSI (Camera Serial Interface) interface provides a connection in between Broadcom Processor and Pi camera.

This interface provides electrical connections between two devices.

DSI Display Interface: DSI (Display Serial Interface) Display Interface is used for connecting LCD to the Raspberry Pi using 15-pin ribbon cable. DSI provides fast High-resolution display interface specifically used for sending video data directly from GPU to the LCD display.

Composite Video and Audio Output: The composite Video and Audio output port carries video along with audio signal to the Audio/Video systems.

Power LED: It is a RED colored LED which is used for Power indication. This LED will turn ON when Power is connected to the Raspberry Pi. It is connected to 5V directly and will start blinking whenever the supply voltage drops below 4.63V.

ACT PWR: ACT PWR is Green LED which shows the SD card activity.

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:

1. The processor has a total of 40 registers
2. 33 general-purpose 32-bit registers.
3. Seven 32-bit status registers.

SOFTWARE DESCRIPTION
OPERATING SYSTEM

The Raspberry Pi primarily uses Linux kernel-based operating systems. The ARM11 is based on version 6 of the ARM which is no longer supported by several popular versions of Linux, including Ubuntu. The install manager for Raspberry Pi is NOOBS. The OSs included with NOOBS are:

- Archlinux ARM
- OpenELEC
- Pidora (Fedora Remix)
- Raspbmc and the XBMC open source digital media center
- RISC OS – The operating system of the first ARM-based computer

Raspbian (recommended) – Maintained independently of the Foundation; based on ARM hard-float (armhf)-Debian 7 'Wheezy' architecture port, that was designed for a newer ARMv7 processor whose binaries would not work on the Rapberry Pi, but Raspbian is compiled for the ARMv6 instruction set of the Raspberry Pi making it work but with slower performance. It provides some available deb software

BOOT PROCESS:

The Raspberry Pi does not boot as a traditional computer. The Video Core i.e. the Graphics processor actually boots before the ARM CPU.

The boot process of the Raspberry Pi can be explained as follows:

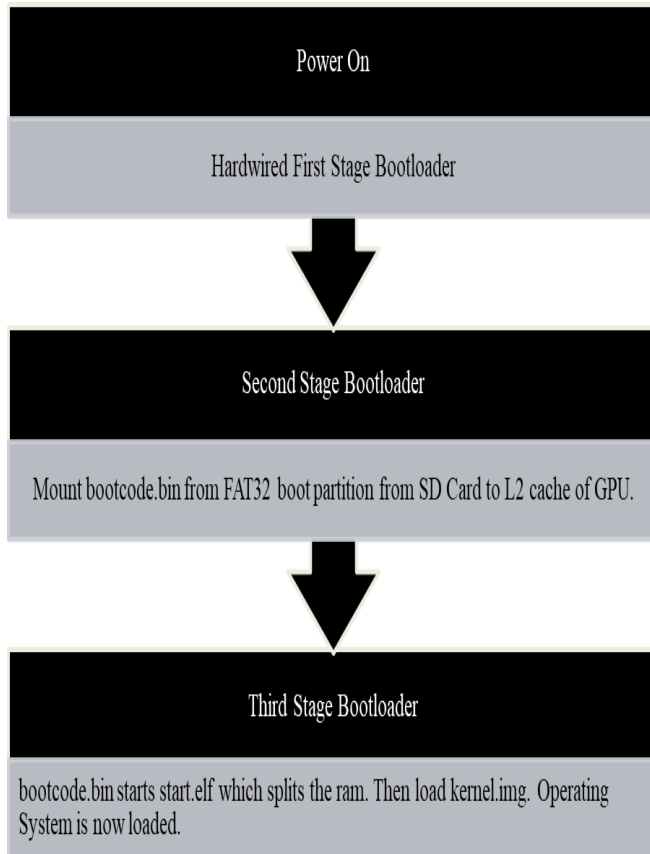When the power is turned on, the first bits of code to run is stored in a ROM chip in the

Figure 7:Boot process of Raspberry Pi

INTRODUCTION TO PYTHON:

Python is developed by **Guido van Rossum**. Guido van Rossum started implementing Python in 1989. Python is a very simple programming language so even if you are new to programming, you can learn python without facing any issues.

Interesting fact: Python is named after the comedy television show Monty Python's Flying Circus. It is not named after the Python snake.

Features of Python programming language:

Readable: Python is a very readable language.

Easy to Learn: Learning python is easy as this is a expressive and high level programming language, which means it is easy to understand the language and thus easy to learn.

Cross platform: Python is available and can run on various operating systems such as Mac, Windows, Linux, Unix etc. This makes it a cross platform and portable language.

Open Source: Python is a open source programming language.

Large standard library: Python comes with a large standard library that has some handy codes and functions which we can use while writing code in Python.

Free: Python is free to download and use. This means you can download it for free and use it in your application. See: Open Source Python License. Python is an example of a FLOSS (Free/Libre Open Source Software), which means you can freely distribute copies of this software, read its source code and modify it.

Supports exception handling: If you are new, you may wonder what is an exception? An exception is an event that can occur during program exception and can disrupt the normal flow of program. Python supports exception handling which means we can write less error prone code and can test various scenarios that can cause an exception later on.

Advanced features: Supports generators and list comprehensions. We will cover these features later.

Automatic memory management: Python supports automatic memory management which means the memory is cleared and freed automatically. You do not have to bother clearing the memory.

**Write the Raspbian Operating System to the SD/microSD Card**

Presently we are prepared to compose the Raspbian OS to our SD/microSD card. Open Win32DiskImager, and select the Raspbian picture record that was extricated before by tapping on the little document symbol to one side of the expansive content field:
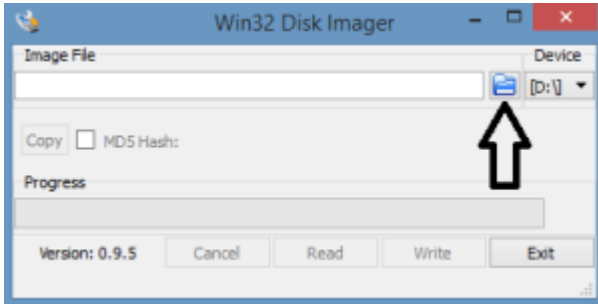

Next, select the drive letter that the SD/microSD card is inserted into from the drop-down list below "Device."
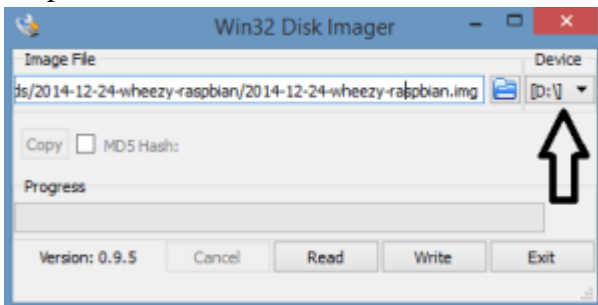
Now click "Write" on the bottom of the window. The writing process will take from 1 to 15 minutes depending on your computer and the size of your SD/microSD card:
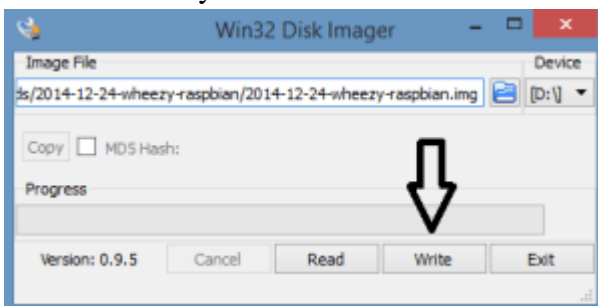
Wait for the process to complete, then eject the SD/microSD card from your computer and insert it into the Raspberry Pi.
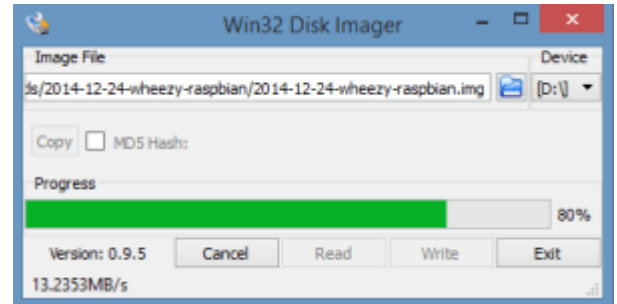

Now you are ready to power up the Raspberry Pi. Plug the power cord into the Raspberry Pi, and connect the Pi to your router via the Ethernet cable.

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

For my situation, it is 10.0.0.105. We will require the nearby IP deliver to set up an SSH association from our home PC to the Raspberry Pi.

Presently we can set up our SSH association with the Raspberry Pi with our SSH customer, PuTTY. Open up PuTTY, and enter the neighborhood IP address of the Raspberry Pi into the "Host Name (or IP address)" field. Try not to stress over the port, for the time being, keep it as seems to be:
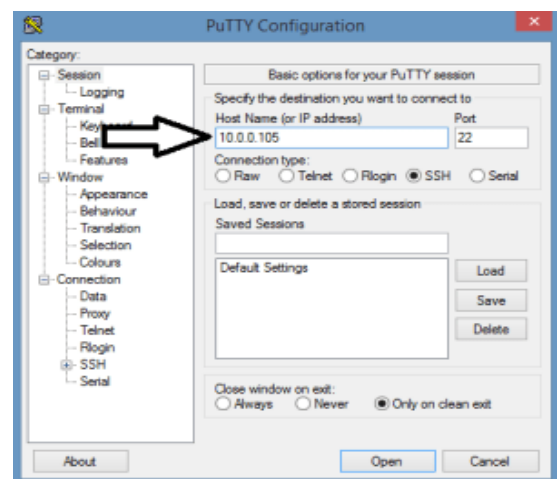

After you have entered the local IP address of your Raspberry Pi, click "Open" to initiate the connection. On the first connection attempt, an error message will appear, but

press yes anyway since you are connecting to your own Raspberry Pi so the security risk is minimal here:
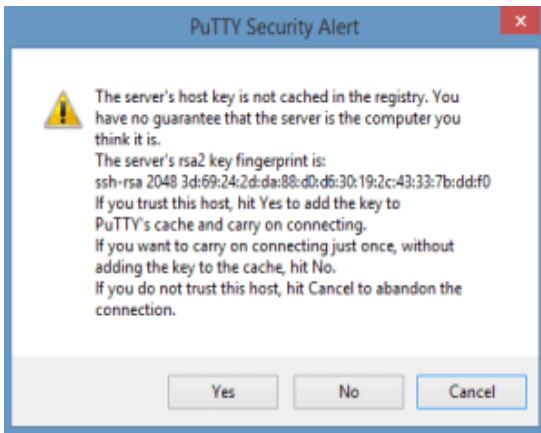
If the SSH connection is successful you will now be greeted with the login prompt of your Raspberry Pi:
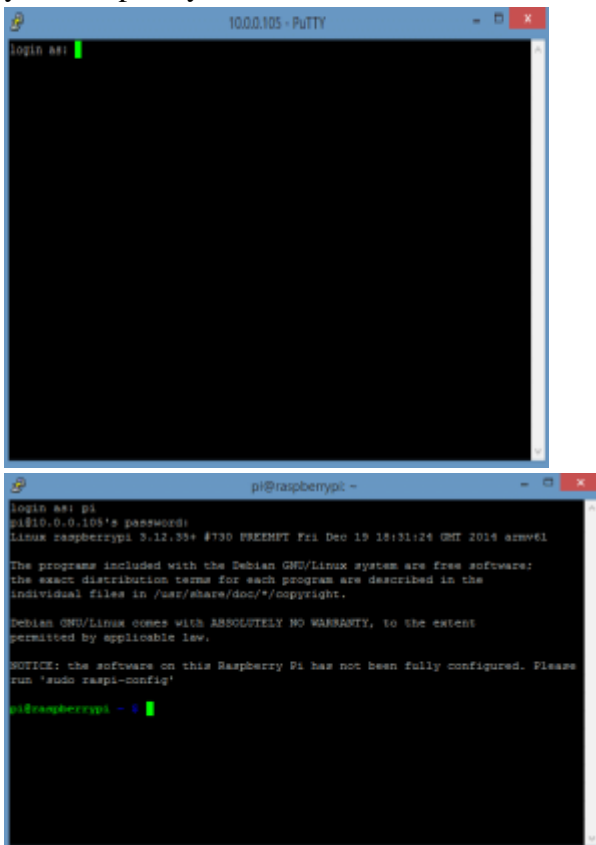
At this point, it's a good idea to configure your Raspberry Pi by entering raspi-config to enter the configuration settings menu:
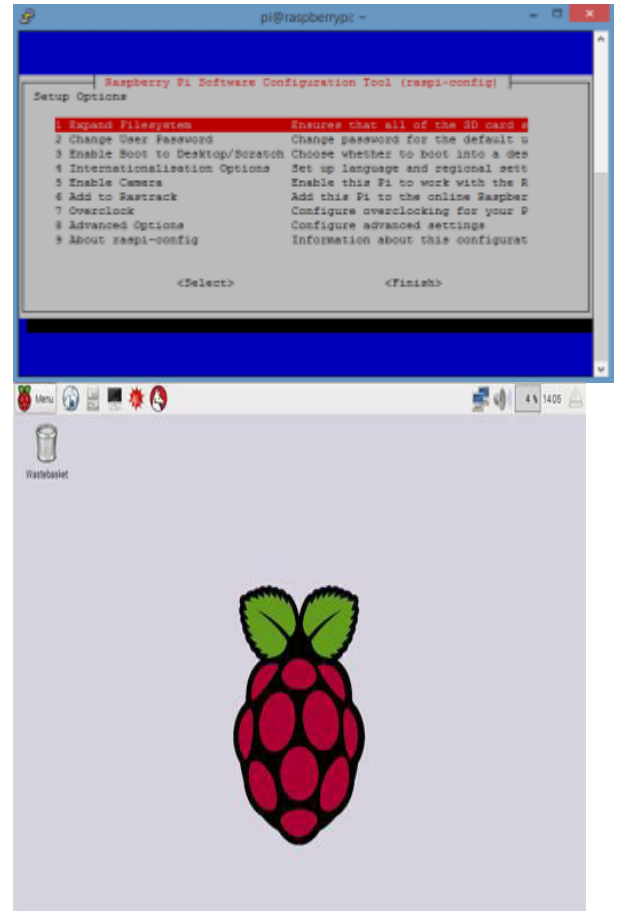
Fig. 7 Raspberry Pi Desktop view

- ❖ A Relational Data Base Management System (RDBMS) is a software that –
- ❖ Enables you to implement a database with tables, columns and indexes.
- ❖ Guarantees the Referential Integrity between rows of various tables.
- ❖ Updates the indexes automatically.
- ❖ Interprets an SQL query and combines information from various tables.

RDBMS Terminology

Before we proceed to explain the MySQL database system, let us revise a few definitions related to the database.

Database − A database is a collection of tables, with related data.

Table − A table is a matrix with data. A table in a database looks like a simple spreadsheet.

Column − One column (data element) contains data of one and the same kind, for example the column postcode.

Row − A row (= tuple, entry or record) is a group of related data, for example the data of one subscription.

Redundancy − Storing data twice, redundantly to make the system faster.

Primary Key − A primary key is unique. A key value can not occur twice in one table. With a key, you can only find one row.
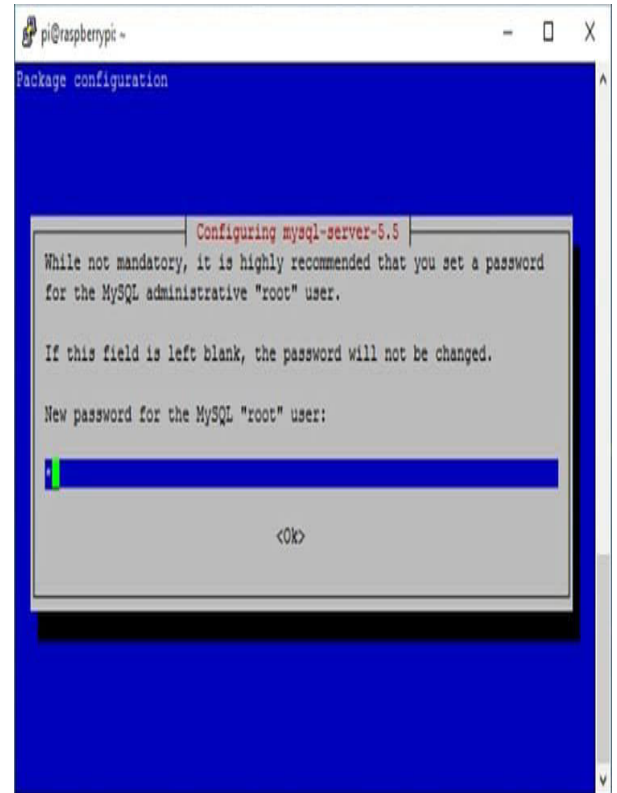
MySQL and phpMyAdmin Installation Process:

Installing Raspberry Pi MySQL:

1. Firstly let's install the MySQL server onto the Raspberry Pi.

Sudo apt-get install mysql-server

2. You will be prompted to enter a password for the root user. Make sure you write this down as we will need to use this to access the MYSQL server and connect PHPMyAdmin to it.

3. If you're not prompted to enter a password, you will need to enter the following command. Answer all the questions so it will be set up to match your security requirements.

Sudo mysql_secure_installation

4. Now if you want to access and start making changes to the database, enter the following command:

Sudo mysql -u root -p

5. It will now prompt you to enter the password we just created.

6. You can now enter MYSQL commands to create, alter, and delete databases.

7. You're able to leave the MYSQL command line by simply entering quit.

If you want to be able to interact with MYSQL in Python, you will need to install the Python bindings as well. You can do this by entering the following command.

Sudo apt-get install python-mysqldb

Now we're done installing the Raspberry Pi MYSQL you may want to install PHPMyAdmin, so you have a nice clean interface to work with.

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.
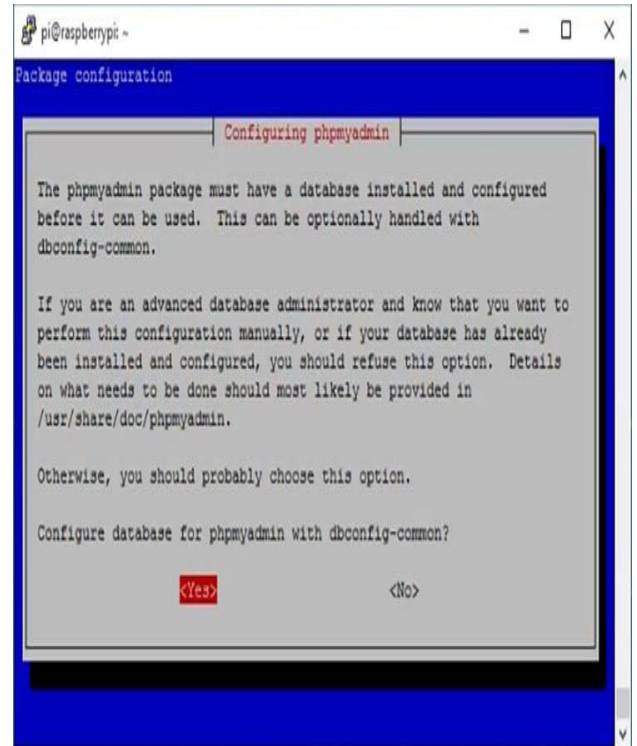
4

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

According to this system patient will have an easy way to remind their medication time with the

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