ACCESS TO LIVE IMAGES FROM DIGITAL MICROSCOPE USING OWNCLOUD ON RASPBERRY PI

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Abstract : This paper implements the idea of making raspberry pi a cloud server so that any legible user can have access to the live images captured by the digital microscope. Apache is installed on pi to allow it to serve webpages and python is used for storing the images. The captured images can be grouped in several folders and these folders can find application in various areas.

Keywords : OwnClowd, Python, Raspberry Pi.

I. INTRODUCTION

Think about the world where proficient scientists can have access to live images of specimen being at home. In this paper, we present an idea that can play a magnificent role in bringing this to reality. Internet of Things, which is the buzz around the world helps in connecting various devices but, it needs data that is provided by cloud.

Raspberry Pi is not only the smallest computer but is cheap and very powerful[1]. One can create its own Cloud server on Raspberry Pi with OwnCloud. Live images from the digital microscope will get stored in cloud which will be accessible to all those having credentials to get logged in. One can update the microscope using low cost and open-source materials. Citizen scientists from around the world will soon have a new powerful tool to aid in future discoveries[2].

It has inbuilt WIFI and Ethernet port[2]. It has four USB ports through which keyboard, mouse, and camera can be connected[3]. All the devices need to be connected through a common IP address. Power supply is given to the raspberry pi through micro USB, which should not exceed 5.2V as it will heat up the raspberry pi. LINUX operating system is installed on pi using Noobs or Raspbian[4]. For Windows users, it is recommended to format the SD card using the SD Formatter Tool.

II. SETTING UP AND CONFIGURATION OF OWN CLOUD

This section presents how setting and configuring of ownCloud can be done to interface cloud. Raspberry Pi should be optimally configured for use as an ownCloud host[5]. We change the username and password with the help of Raspberry Pi by entering the following command into the console:

sudo raspi-config

Computer and any installed packets should be up-to-date before starting the ownCloud installation process on the Raspberry Pi[5]. For this, we enter the following command:

sudo apt-get updatesudo apt-get upgrade

To start, we install the Apache HTTP server with the following command:

sudo apt-get install apache2

Further, we make ownCloud accessible online by activating port forwarding in router and redirecting router requests from port 433 to the Raspberry Pi. This works differently with every router. Further,we have to download PHP, SQLite, and other required packages with this command[5]:

sudo apt-get install php5 php5-gd sqlite php5-sqlite php5-curl

Apache web server will restart using following command:

sudo service apache2 restart

Then, we will download the .zip file from the 'Archive file' option and copy it onto the Raspberry Pi. Alternatively, we can install the program via the console.widget. We should unzip the files in the right folder:

sudo mv owncloud-9.0.4.zip /var/www/htmlcd /var/www/htmlsudo unzip -q owncloud-9.0.4.zip

Restart the Raspberry Pi:

sudo reboot

   At last, we have our own owncloud account. We can do this in Raspberry Pi's browser; simply by entering the mini-computer's IP address into the taskbar and adding the path ('/owncloud') at the end of the address (192.168.X.X/owncloud).
The Raspberry Pi file server is fully functional now. We need to register an admin account by setting up the username and password. There is IP restriction in ownCloud. WinSCP is established by activating Secure Socket Shell(SSH) on raspberry pi with the support of Putty. SSH assists in protected remote login[6]. CHmod 600 is provided which will only give read and write permission on file and provide better security.

III. EXPERIMENTAL SETUP

   It talks about the hardware configuration. Connect the raspberry pi 3 to the digital microscope, mouse and keyboard. We insert the SD card, which is the only memory unit in raspberry pi in its slot. Power adapter which has 1 kΩ resistor and LED attached with it provides a power supply of 5.11V . The power supply is given to the raspberry pi through micro USB[7]. All the mobile phones, raspberry pi, computers ,tablets in the world need to be connected to the same IP address so that they can access the digital microscope. We connect the pi with cloud through internet[7].

BLOCK DIAGRAM
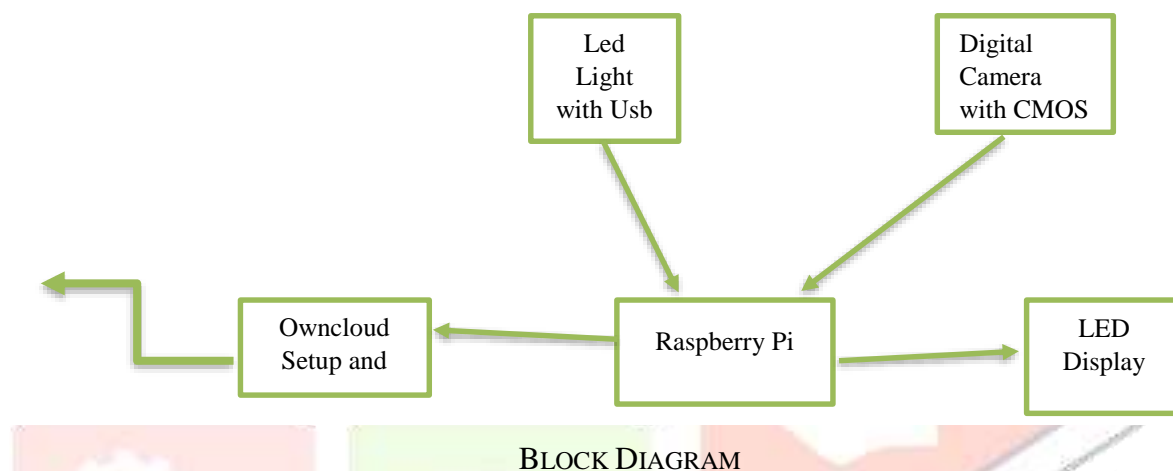
IV. USE OF PYTHON

   Python is an interactive, interpreted and object-oriented programming language. It has an easy to read syntax, and allows programmers to use fewer lines of code than would be possible in languages such as assembly, C, or Java[3]. It provides us with a large collection of libraries, which increases the pace of the development process. Python 2 and Python 3 are already installed on Raspbian OS, but for installing Python on Linux OS, we write one of these commands in the command prompt:

- *sudo apt-get install python3*
- *Installs or updates Python 3[3].*
- *sudo apt-get install python*
- *Installs or updates Python 2.*

   After that, we import pygame library as it helps in clicking and saving images and fswebcam package. The python program also helps in selecting the microscope and the monitor which will provide a big detailed view. Also, it enables clicking and processing of image which will be further stored on owncloud. The datetime function is used for matching the format and it notes the date, time and image number which helps in differentiating among several images. The image will be clicked on generating interrupt ctrl+C. All the images will be stored in the database. In command prompt, we will create a directory in ownCloud where we want our images to be stored. The folder specified in the directory needs to have the python program file for its execution. We can even create different folders for storing different types of images, which can be referred by date and time.

V. APPLICATIONS

   It has numerous applications as it is economical, includes internet of things and huge data. It has applications in various industries which require microscopic images as an input. It can be used in schools and colleges where every student can have access to the microscope be they present in the class or not. Also, the increasing strength of students and unsubstantial number of microscopes in the institution will no longer be the reducing factor. It can even be used in textile industries or biological industries. It can be used in research centers where scientists all over the world can refer and give opinions on the sample placed at one place in the laboratory. It can be used in medical sciences where inspecting skin or hair can be done easily and precisely with the consultation of any expert doctor as they can view the live images of patients, be they present anywhere in the world. It can be used in checking

originality of money, handwriting, medical investigations, fingerprints etc. Here are some of the pictures illustrating its wide range of functionalities. *Figure 1* shows the fingerprints of people where *Figure 2* and *Figure 3* throw a glimpse on the outer and inner view of a flower, respectively. *Figure 4* depicts the image of coins taken to check its originality. *Figure 5* shows the picture of a leaf and can be used for various biological inspection.

Figures

Figure 1: Fingerprint

Figure 2: Outer View of Flower

Figure 3: Inner View Of Flower

Figure 4: Coin

Figure 5: Leaf Vein

VI. CONCLUSION AND FUTURE SCOPE

This innovation makes raspberry pi act as a cloud server and provide live images to the users who have the credentials to access it. It provides a detailed view of objects and store them on cloud where people can have access to the live streaming images of the objects. Python has been used which is simple and easy to implement that other programming languages. Raspberry Pi is of low cost and uses software which are either free or open source.

With the advent of artificial intelligence, machine learning and big data analysis, it would no longer require the reference of experts. Rather, it would decide the specimen on its own based on previous experiences and statistics.

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