Installation of OpenCV on Raspberry Pi 3

You will require to install some software for Image and Video Processing on the Raspberry Pi 3(RPi3). These need to be open source software to perform your tasks for eYRC-2017. As you have gained familiarity with 3 open source software in Task 0 and Task 1 viz. OpenCV, Python and Numpy, we will continue to use the same software just on a new OS i.e. the Raspbian OS on the RPi3. You may add other compatible open source Python based software at this point like Matplotlib, Scipy, imutils, PIL, etc. However, if you choose to add these new software and test your codes then please ensure you disclose the same to e-Yantra with your team ID.

In this document we will discuss the installation of the required software i.e. OpenCV on the RPi3. Before we begin to do so, please note there is a long list of steps and procedure of installing dependencies, for the OpenCV, first.

Note: Python 2.7 and Numpy exists on the Raspbian OS so you don't need to install them.

OpenCV 3.3.1 documentation can be found at the link.

Please verify your version of python is Python 2.7.13 and Numpy is 1.12.1 by typing the command – ***python*** on the terminal of RPi3, as shown in the Figure 1. below:

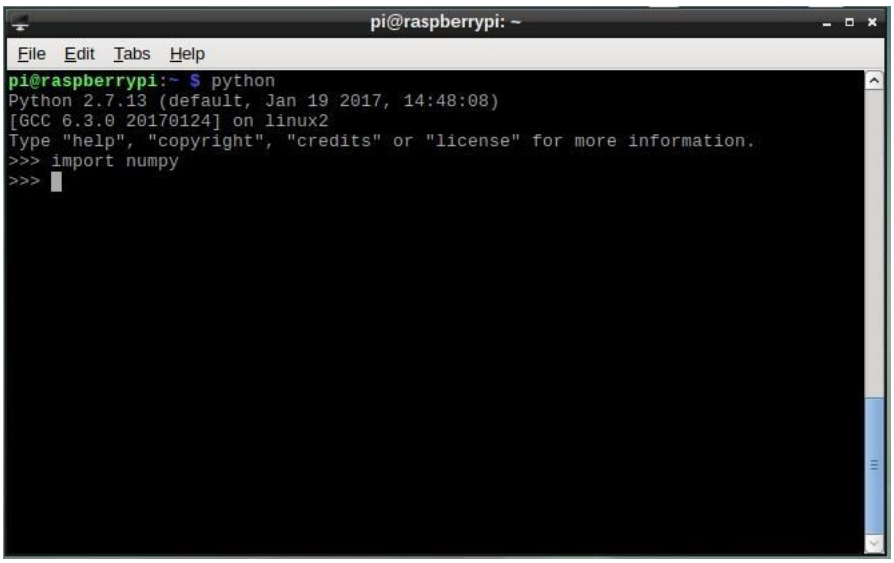


Figure 1. "python" command

Once in python shell, type the following commands in sequence to check the version of Numpy:

1. ***import numpy***
2. ***numpy.__version__***

as shown in the Figure 2. and Figure 3. below:

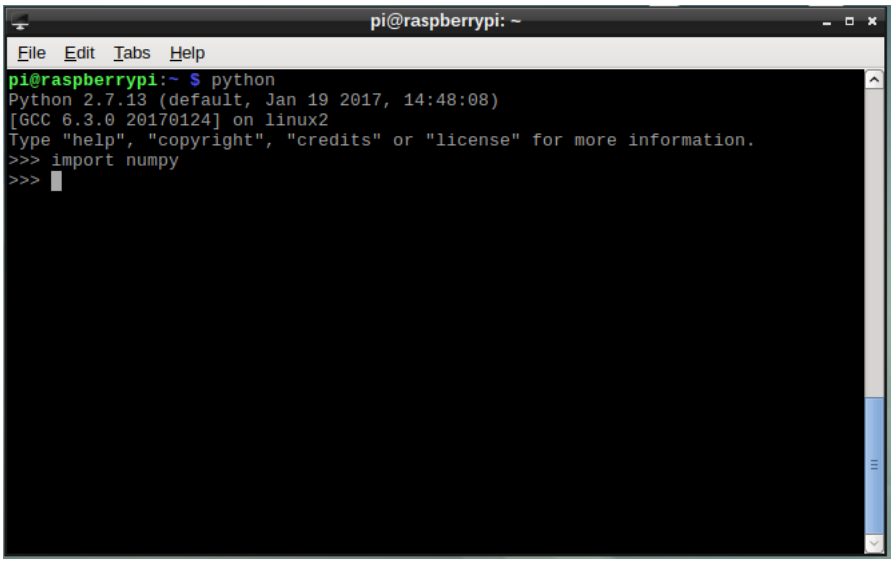


Figure 2. “import numpy” command

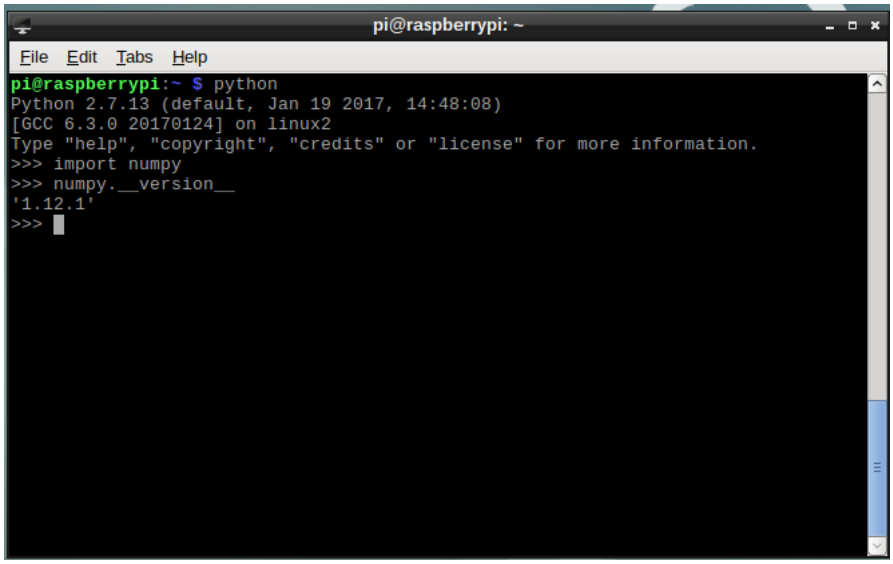


Figure 3. “numpy.__version__” command

To exit the python shell to do further steps of installing OpenCV, please type the command – ***exit()*** [word exit including the parentheses].

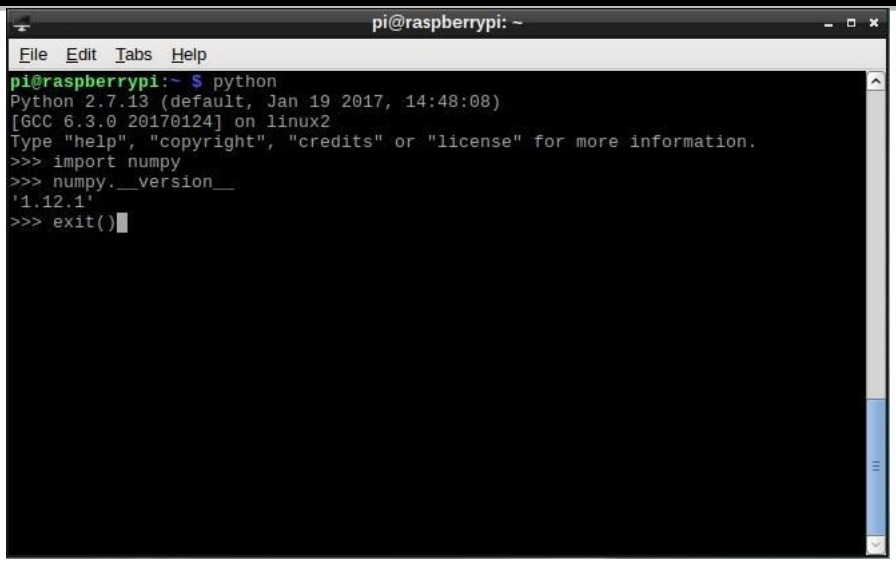


Figure 4. "exit()" command

Note: During all installations if you are asked a question of the format [Y/n], then you must enter Y.

To install OpenCV on RPi 3, we need to download its source as a zip from the github repo. Since we are using a new install of Raspbian, we are going to install the latest version of OpenCV on it which is version 3.3.1. We will download the source zip of OpenCV using "wget" command from the following url- https://github.com/opencv/opencv/archive/3.3.1.zip, as shown in the Figure 5. below:

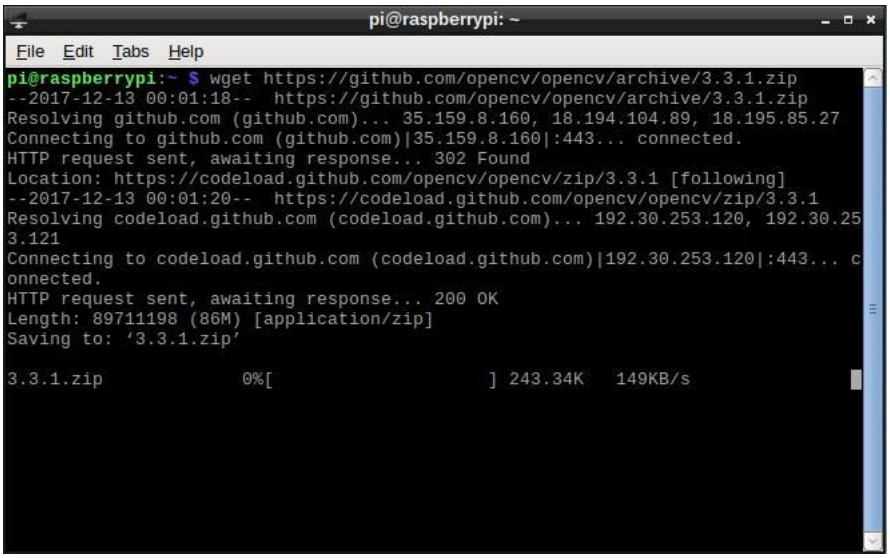


Figure 5. OpenCV source zip download via wget

The progress is shown by an arrow progressing from left to right with the % of download completed as shown in Figure 6. below:

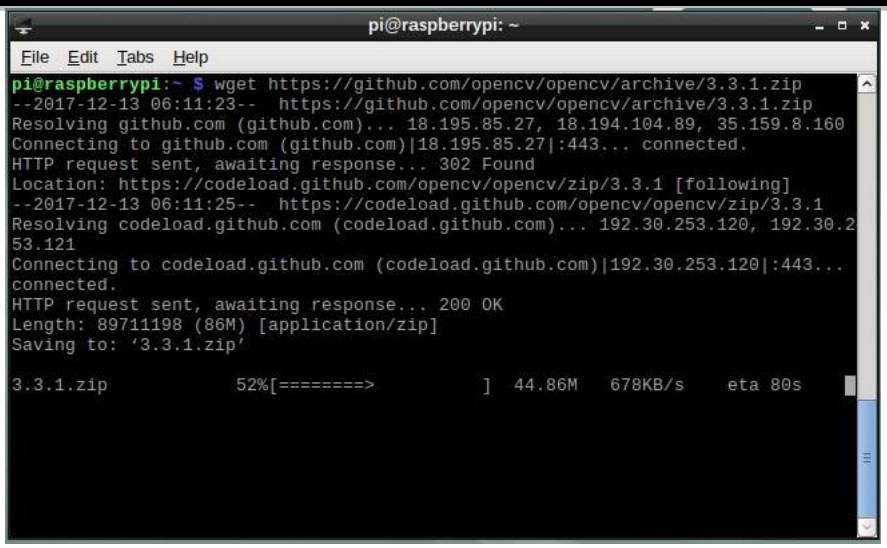


Figure 6. OpenCV download progress

You can verify that the OpenCV 3.3.1.zip had indeed downloaded by running a command- ***ls -lrth*** on the terminal, as shown in the Figure 7. below:

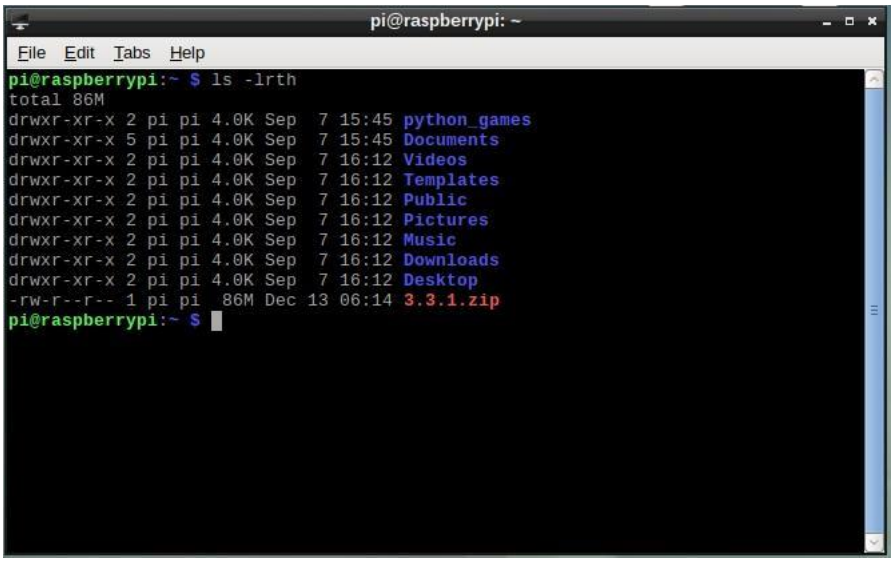


Figure 7. OpenCV zip downloaded

Next you must download extras for OpenCV called "OpenCV Contrib" using wget from the url- https://github/opencv/opencv_contrib/archive/3.3.1.zip. Since the .zip of OpenCV and OpenCV contrib are both named the same i.e. 3.3.1.zip, you must rename this zip download with the help of a -O flag, minus sign followed by alphabet 'O' followed by space and the name of what you want to store the zip by i.e. opencv_contrib.zip. This is shown in the Figure 8. below:

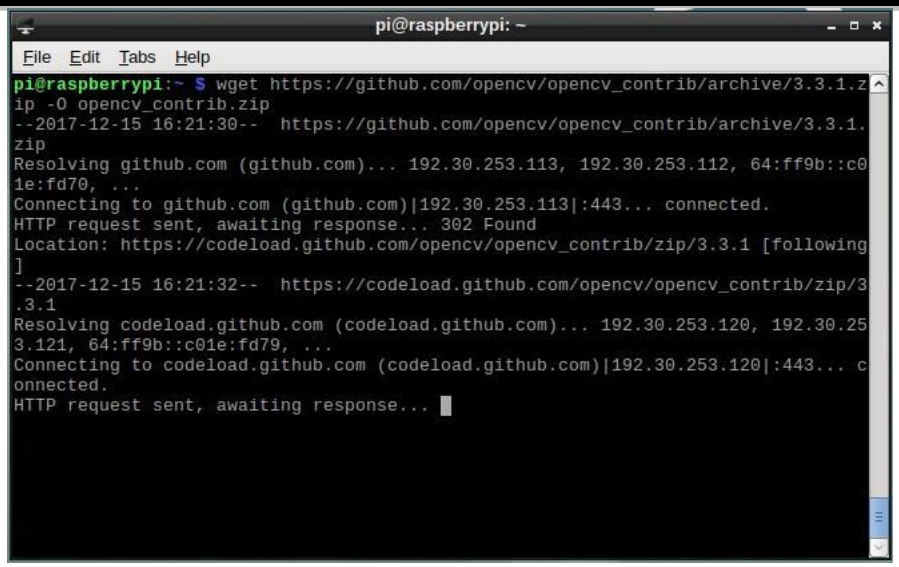


Figure 8. OpenCV Contrib download using wget with different name

You can verify that the OpenCV Contrib 3.3.1.zip had indeed downloaded by running a command- ***ls -lrth*** on the terminal with the new name you gave it, as shown in the Figure 9. below:

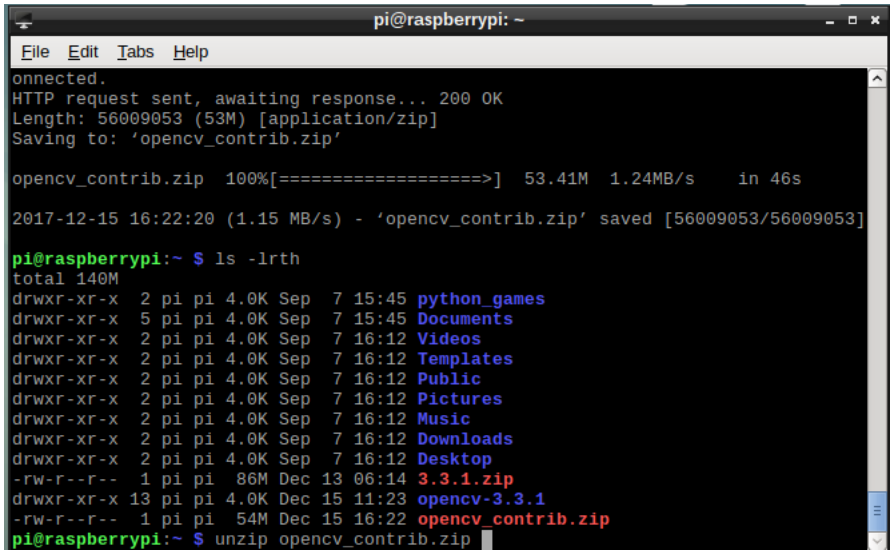


Figure 9. opencv_contrib unzip command

Now unzip both the OpenCV and OpenCV Contrib zip folders using the command- ***unzip 3.3.1.zip*** and the command- ***unzip opencv_contrib.zip***, as shown in Figure 9. above.

Before installing the dependencies, it is advised updating and upgrading all the Raspbian software using the following commands:

1. ***sudo apt-get update***
2. ***sudo apt-get upgrade***

as shown in the Figure 10. and 11. below:

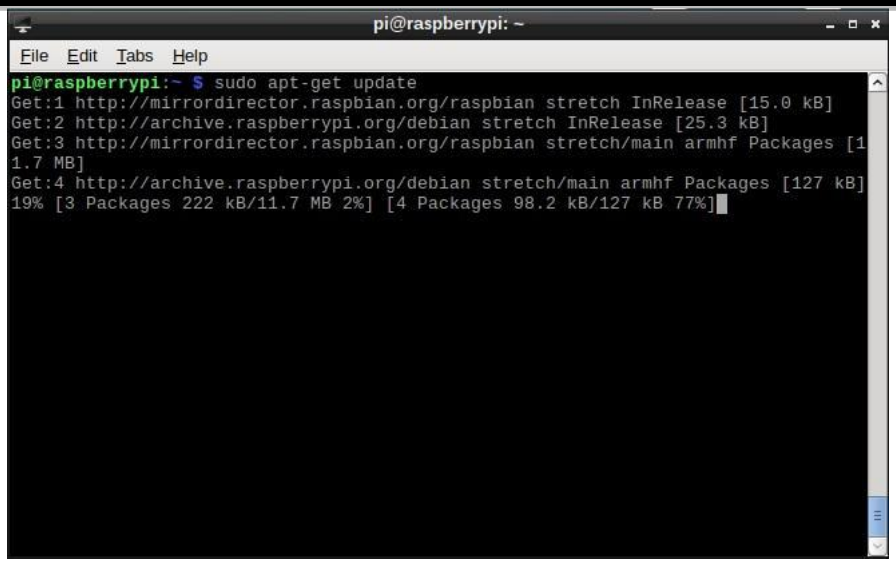


Figure 10. update command

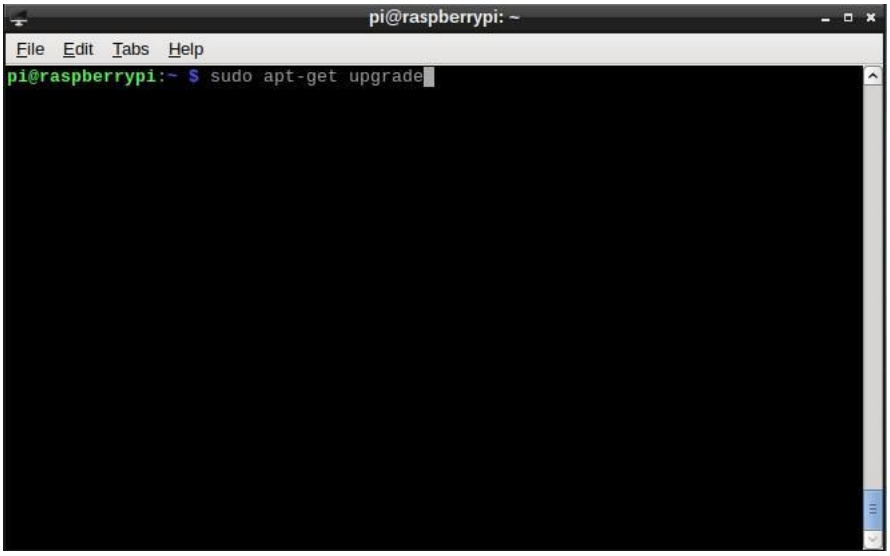


Figure 11. upgrade command

Now the next step is to install all dependencies for the Opencv3.3.1 version which can be done by ***sudo apt-get install*** of respective set of dependencies.

The first set of dependencies is of the libraries required to build the opencv from source using the command–

sudo apt-get install build-essential cmake pkg-config

as shown in the Figure 12. below:

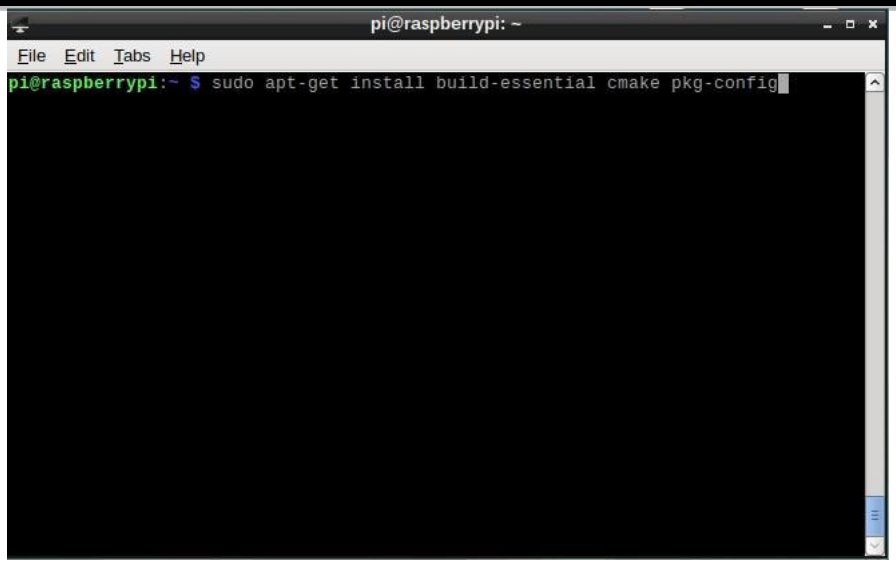


Figure 12. build libraries installation

The second set of dependencies is of the libraries required for the image format using the command–

sudo apt-get install libjpeg-dev libtiff5-dev libjasper-dev libpng12-dev

as shown in Figure 13. below:

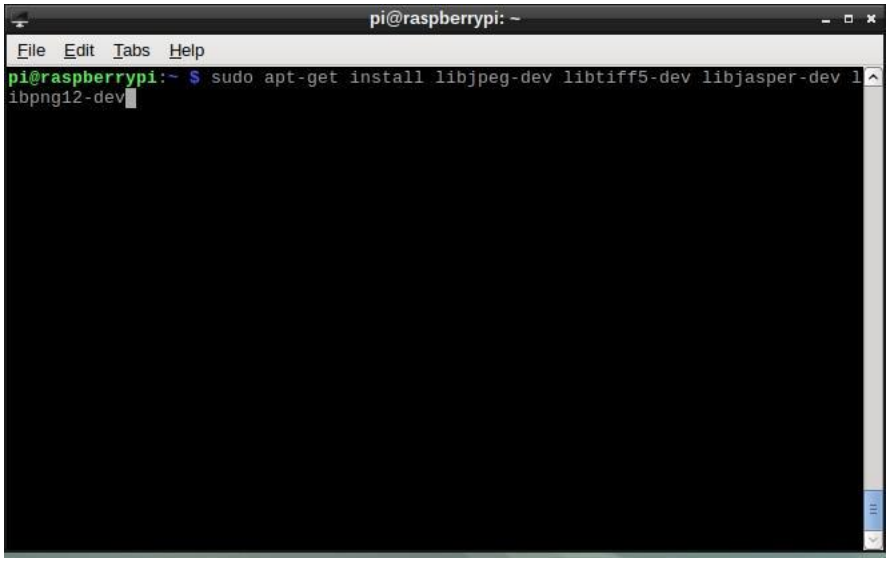


Figure 13. image format installation

The third set of dependencies is of the libraries required for the video codecs using the command-

sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev

As shown in Figure 14. below:

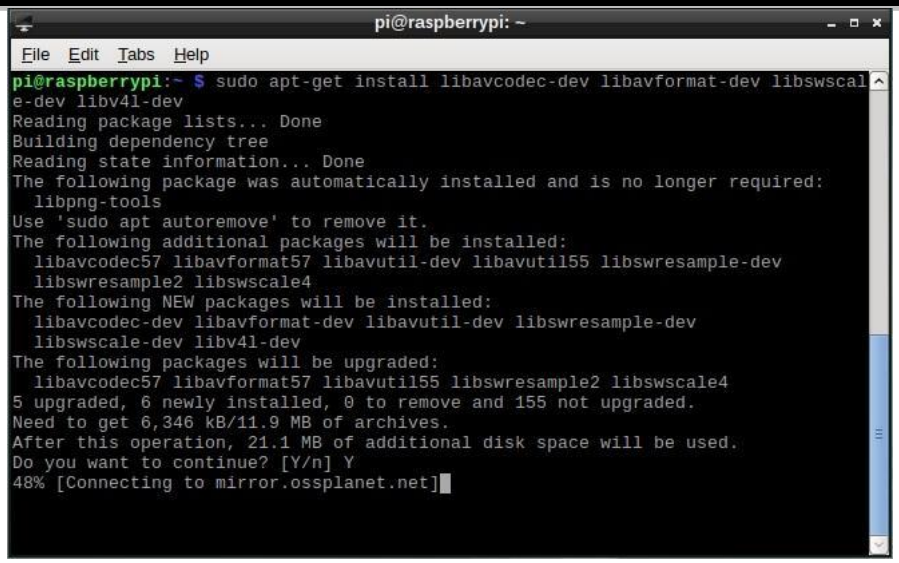


Figure 14. video codec installation

Second set of video codec dependencies are installed using the following command-

sudo apt-get install libxvidcore-dev libx264-dev

as shown in Figure 15. below:

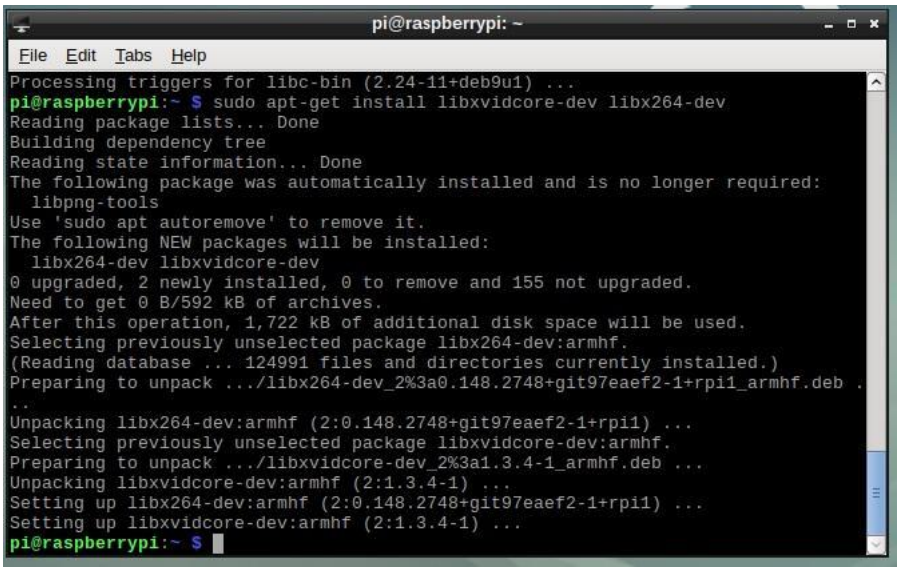


Figure 15. second set of video codec installation

Other dependencies are gtk3 which can be installed by the following command-

sudo apt-get install libgtk-3-dev

Next you have to install python development libraries and remaining dependencies with the command below-

sudo apt-get install python-dev python-numpy libtbb2 libtbb-dev libdc1394-22-dev

as shown in the Figure 17. below:

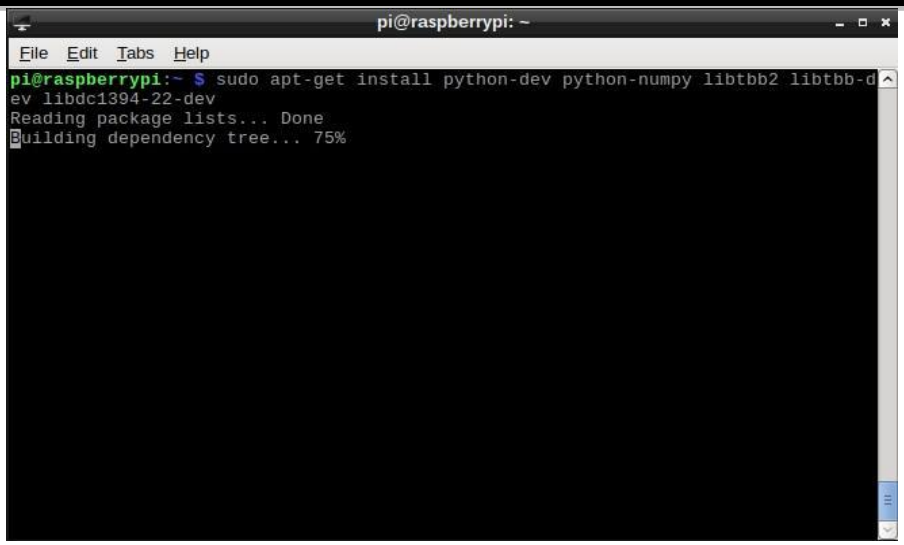


Figure 17. python development libraries installation

All the required dependencies have now been installed and you can go ahead and build OpenCV. Change your path to opencv-3.3.1 folder.

Note: Raspbian uses Linux style commands

So to change the directory type the command-

cd opencv-3.3.1

In this path make a new directory called “build” using the command-

sudo mkdir build

Now switch to the build folder by using command-

cd build

in this folder type the following cmake command to create the Makefile-

sudo cmake -DCMAKE_BUILD_TYPE=RELEASE -DCMAKE_INSTALL_PREFIX=/usr/local

-DINSTALL_PYTHON_EXAMPLES=ON -DBUILD_EXAMPLES=ON

-DOPENCV_EXTRA_MODULES_PATH=~/opencv_contrib-3.3.1/modules ..

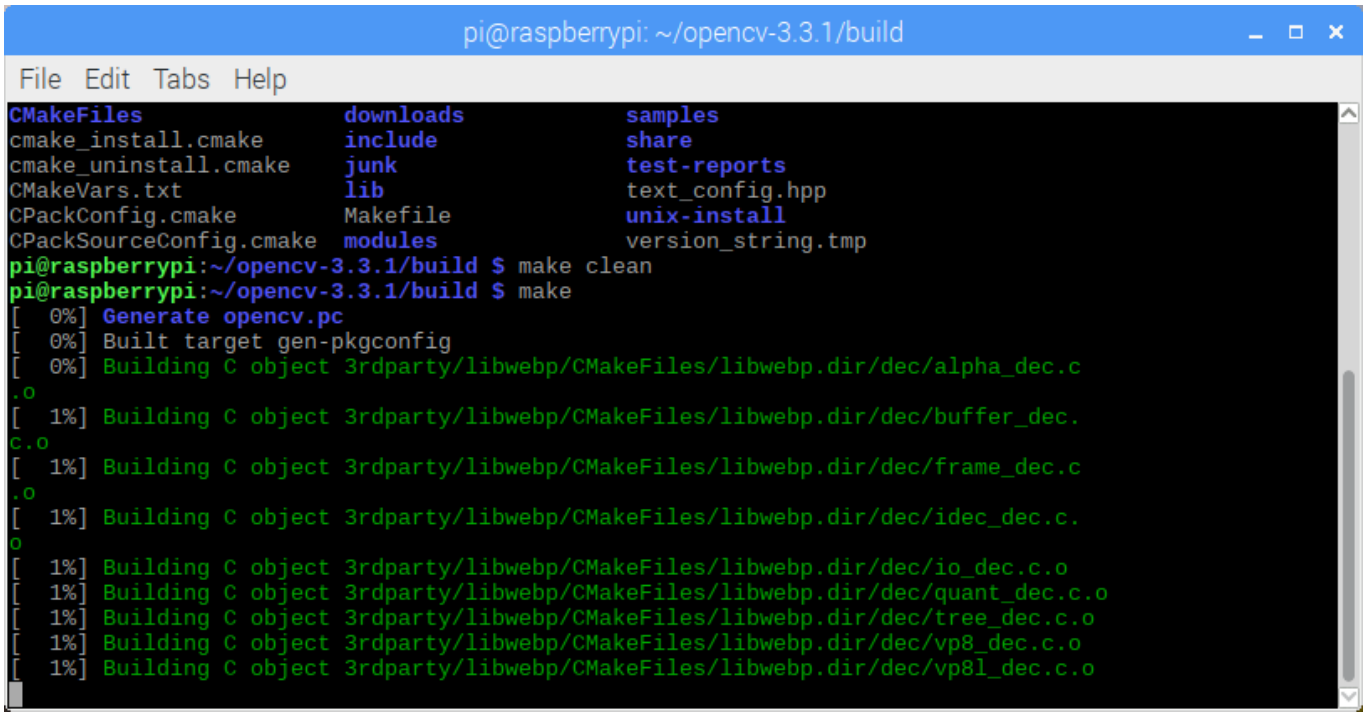
The above 3 lines are one command i.e. starting at sudo and ending at ..

This step and following steps will take significant time of processing, so be patient.

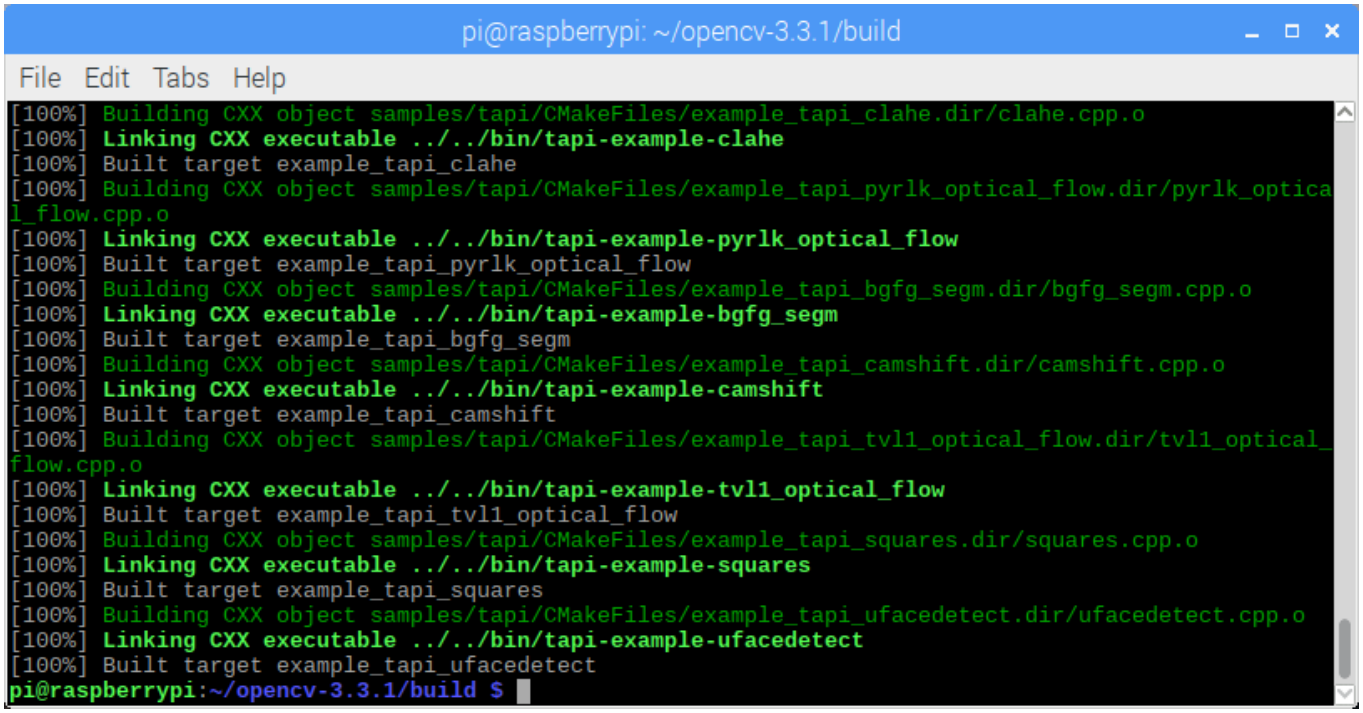
Next step is the execution of the following commands-

1. ***sudo make clean***

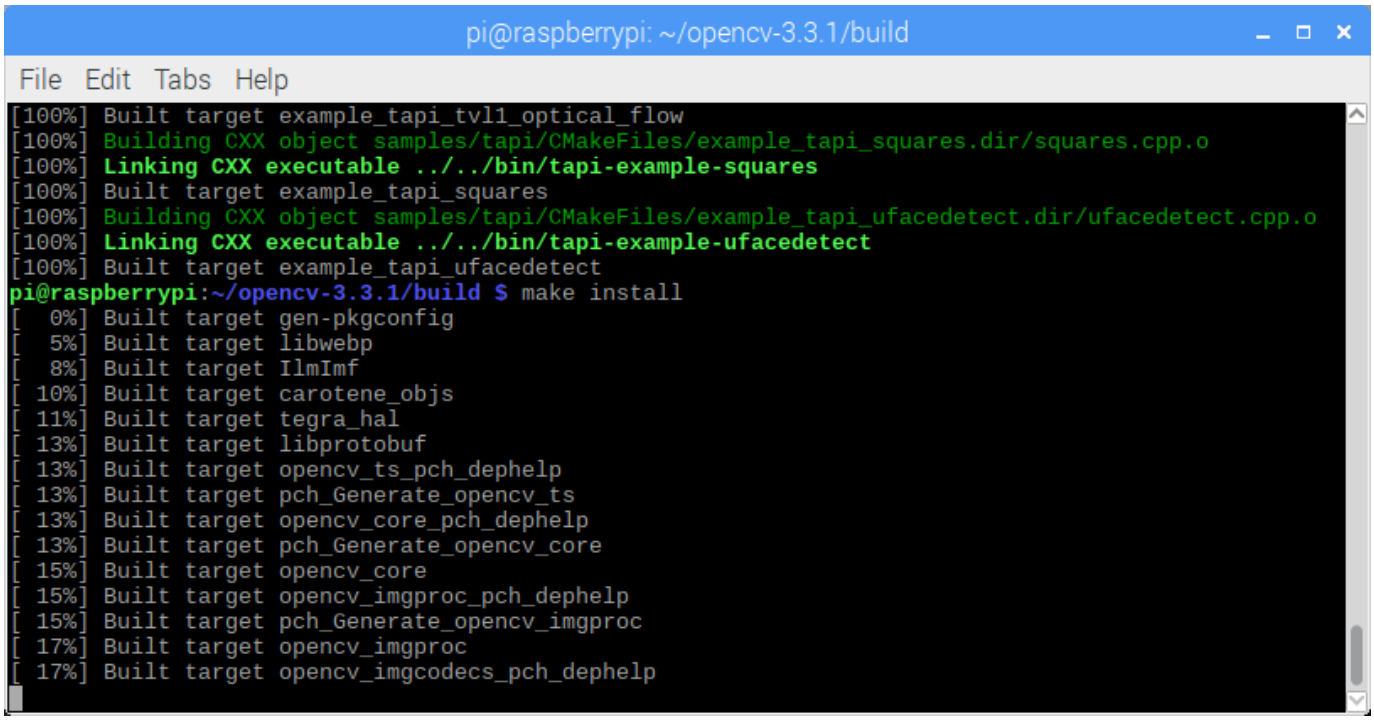
2. ***sudo make***



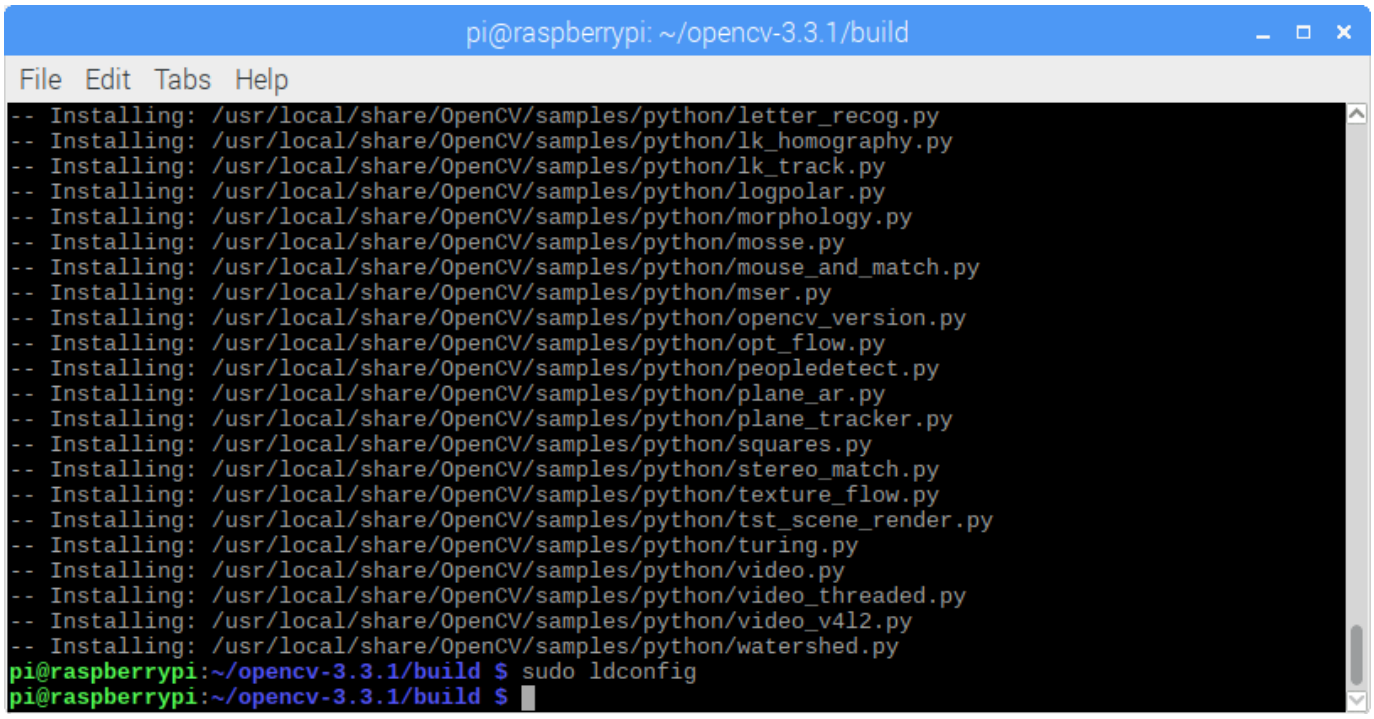
sudo make command will take a while to execute (approximately 2-3 hours)



3. *sudo make install*



4. *sudo ldconfig*



This successfully completes the installation of OpenCV on Raspbian OS.