

# OpenCV (Library)

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## Useful links:

<https://www.opencv-srf.com/2017/12/play-video-from-file-or-camera.html?showComment=1601387442826#c8956983925649439351>

<http://datahacker.rs/how-to-access-and-edit-pixel-values-in-opencv-with-python/>

<http://paulbourke.net/dataformats/bitmaps/>

<https://teachcomputerscience.com/image-representation/>

<https://www.learnopencv.com/how-to-find-frame-rate-or-frames-per-second-fps-in-opencv-python-cpp/#download>

<https://answers.opencv.org/question/75429/what-is-the-complimentary-operation-of-cvconvertscale-for-mat/>

<https://chercher.tech/opencv/drawing-images-opencv>

<https://learnopencv.com/image-resizing-with-opencv/>

## contours:

[https://docs.opencv.org/3.4/df/d0d/tutorial\\_find\\_contours.html](https://docs.opencv.org/3.4/df/d0d/tutorial_find_contours.html)

## iplimage :

<https://www.eyesweb.org/introduction-to-computer-vision-what-is-an-image/>

## Bgs:

[https://docs.opencv.org/master/d1/dc5/tutorial\\_background\\_subtraction.html](https://docs.opencv.org/master/d1/dc5/tutorial_background_subtraction.html)

## Motion detection:

<https://gist.github.com/six519/6d2beee53038ebe8abd98063abfdad86>

## tutorial

<https://www.opencv-srf.com/2017/11/opencv-cpp-api.html>

<http://opencv-code.blogspot.com/2016/12/how-to-draw-rectangle-opencv.html>

<https://www.programmingsought.com/article/39564829757/>

## Cvlabel:

<https://www.iis.sinica.edu.tw/papers/fchang/1362-F.pdf>

Gaussian

[https://www.bogotobogo.com/OpenCV/opencv\\_3\\_tutorial\\_imgproc\\_gaussian\\_median\\_bilateral\\_filter\\_image\\_smoothing.php](https://www.bogotobogo.com/OpenCV/opencv_3_tutorial_imgproc_gaussian_median_bilateral_filter_image_smoothing.php)

q). What is image?

ans).

\*. a digital image is a matrix of pixels.

q). What is pixel ?

ans).

\*.A pixel, it is literally “an element of an image”

<https://www.pyimagesearch.com/2021/01/20/opencv-getting-and-setting-pixels/>

<https://www.tutorialspoint.com/how-to-get-the-value-of-a-specific-pixel-in-opencv-using-cplusplus>

q).What is openCV?

ans).

\*.OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real-time computer vision.

Contrast - గమనించదగిన భేదాలతో కూడిన వస్తువు  
విరుద్ధంగా

q).How to install opencv in ubuntu 18.04?

ans).

These 2 steps works for me

1. *sudo apt-get install libopencv-dev*

2. Install required packages from

Required packages

[https://docs.opencv.org/4.0.1/d7/d9f/tutorial\\_linux\\_install.html](https://docs.opencv.org/4.0.1/d7/d9f/tutorial_linux_install.html)

q).how to check opencv installed version ?

ans).

\*.

Src: <https://learnopencv.com/how-to-find-opencv-version-python-cpp/>

prashad@ubuntu:~/test/opencv\_practice\$ ./a.out

OpenCV version : 3.2.0  
Major version : 3  
Minor version : 2  
Subminor version : 0  
###OpenCV 3

Or

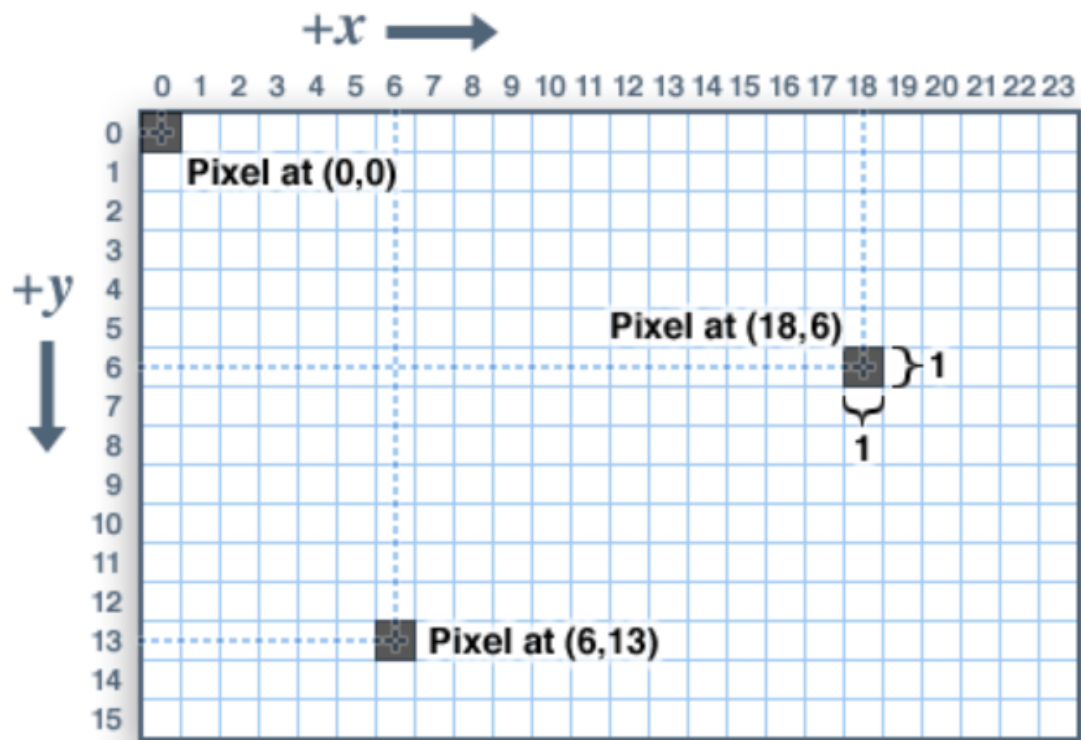
Check [/usr/share/OpenCV/OpenCVConfig.cmake](#)

```
# =====  
# Version variables:  
# =====  
SET(OpenCV_VERSION 3.2.0)  
SET(OpenCV_VERSION_MAJOR 3)  
SET(OpenCV_VERSION_MINOR 2)  
SET(OpenCV_VERSION_PATCH 0)  
SET(OpenCV_VERSION_TWEAK 0)  
SET(OpenCV_VERSION_STATUS "")
```

q). How to compile opencv sample program ?

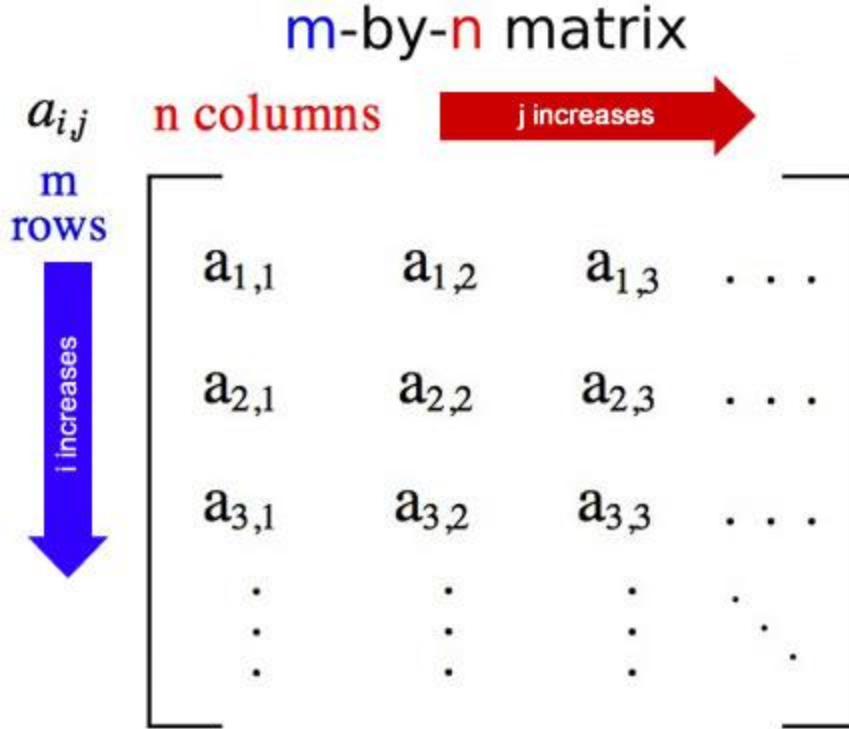
ans).

```
prashad@ubuntu:~/ $ g++ -g sample.cpp `pkg-config --cflags --libs opencv`
```



Pixel - 0 - Black  
Pixel - 255 - White

Width - breadth - columns  
Height - height - rows

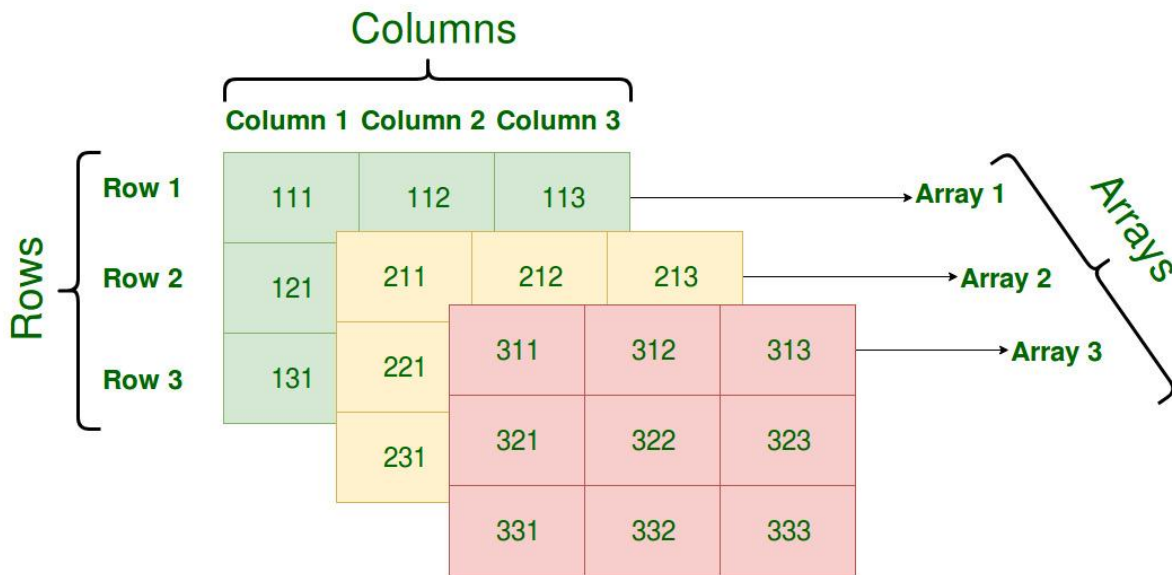


Matrix with - rows and columns

Q0. what is rows and columns here ?  
ans).

## Row - అడ్డు వరుస

1. **rows** - Number of rows in the 2D array ( i.e. - height of the image in pixels )
2. **cols** - Number of columns in the 2D array ( i.e. - width of the image in pixels )



Any digital image consists of pixels.

Every pixel should have some value.

The minimum value for a pixel is 0 and it represents black. When the value of the pixel is increased, the intensity of that pixel is also increased. The maximum value which can be assigned for a pixel depends on the number of bits allocated for each pixels. If the number of bits allocated per pixel is 8, then the maximum value of that pixel is 255 (11111111 in binary)

### Scale

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Scaling(Contraction/Dilation)

### DEPTH of an image:

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Now what is depth of an image? The image depth means the number of bits allocated for each pixel. If it is 8, each pixel can have a value between 0 and 255. If it is 4, each pixel can have a value between 0 to 15 (1111 in binary).

Eg: Grey scale image with a depth of 8

|    |     |     |     |     |
|----|-----|-----|-----|-----|
| 23 | 23  | 34  | 255 | 0   |
| 78 | 245 | 129 | 25  | 251 |
| 23 | 12  | 89  | 90  | 37  |
| 84 | 26  | 47  | 127 | 199 |



Here is some important properties of the above image.

- Image depth is 8 bits.
- Image consists of single channel.
- The height of the image is 4 pixel.
- The width of the image is 5 pixels.
- The resolution of this image is 5 x 4.

This is a gray-scale image (black and white image) because it only consists of a single channel. Therefore this image does not contain any color information. If the value of this pixel is higher, it will be shown more brighter. If the value is low, it will be shown more darker.

### **Color Image**

Following image is a simple model of a color image. Color image should consist of at least 3 planes; Red, Green and Blue. Any pixel is a combination

of the three values. Any color can be created by combining these 3 basic colors.

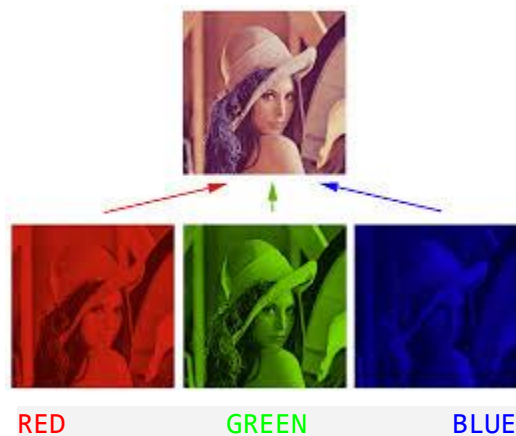
Examples -

- (255, 0, 0) represent pure red.
- (0, 255, 0) represent pure green.
- (0, 0, 255) represents pure blue.
- (255, 0, 255) represents pure violate.

| Red Plane |     |     |     |     | Green Plane |     |    |    |    | Blue Plane |     |     |    |    |
|-----------|-----|-----|-----|-----|-------------|-----|----|----|----|------------|-----|-----|----|----|
| 23        | 23  | 34  | 255 | 0   | 231         | 0   | 35 | 45 | 45 | 46         | 45  | 3   | 78 | 13 |
| 78        | 245 | 129 | 25  | 251 | 77          | 21  | 79 | 1  | 74 | 75         | 50  | 70  | 71 | 42 |
| 23        | 12  | 89  | 90  | 37  | 145         | 154 | 47 | 10 | 34 | 14         | 214 | 111 | 74 | 88 |
| 84        | 26  | 47  | 127 | 199 | 71          | 255 | 74 | 27 | 19 | 123        | 72  | 90  | 13 | 67 |

R, G, B planes of a color image

RGB



In the above image, top left pixel is (23, 231, 46). It will be shown as a greenish color because the green value (231) of that pixel is significantly larger than the red (23) and blue (46) value.

Here is some important properties of the above image.



- Image depth is **24 bits**. (because each pixel is represented with 8 x 3 bits (8 bits from each channel))
- The image consists of 3 channels.
- The height of the image is 4 pixel.
- The width of the image is 5 pixels.
- The resolution of this image is 5 x 4.

Note -

OpenCV library functions usually **read** images in **BGR format** which means blue plane first, green color plane next and the red plane at the end which is exactly the reverse order of the above image.

**q). Can i get frame rate of a video file ?  
ans).**

<https://www.learnopencv.com/how-to-find-frame-rate-or-frames-per-second-fps-in-opencv-python-cpp/>

```
VideoCapture video(0);
double fps = video.get(CV_CAP_PROP_FPS); // fps results 30
```

NOTE:

You may pass **0** for the argument index to use the **default camera** connected to your computer. You may use a positive integer as the index, if your computer is attached to more than 1 camera.

**q). How to open video.file / image from cli of ubuntu terminal ?  
ans).**

```
prashad@ubuntu:~/test$ xdg-open MyVideo.avi
prashad@ubuntu:~/test$ xdg-open output_image.jpg
```

**q).how to change an image colour to BGR ?  
ans).**

src:<https://www.opencv-srf.com/2018/02/histogram-equalization.html>

Src:

<https://stackoverflow.com/questions/10344246/how-can-i-convert-a-cvmat-to-a-gray-scale-in-opencv>

```
//change the color image to grayscale image
cvtColor(image, image, COLOR_BGR2GRAY);
```

The above function converts the image in BGR color space to grayscale color space.

Please note that the color space of the loaded image is BGR, not RGB. (i.e. - Channels are ordered as blue, green and red.)

q).how to increase the brightness of an image ?  
ans).

Change the **beta** value for brightness.

```
void Mat::convertTo( OutputArray m, int rtype, double alpha=1, double beta=0 ) const
```

```
image.convertTo(imageBrighnessHigh50, -1, 1, 50); //increase the brightness  
by 50
```

```
Mat imageBrighnessHigh100;  
image.convertTo(imageBrighnessHigh100, -1, 1, 100); //increase the  
brightness by 100
```

```
Mat imageBrighnessLow50;  
image.convertTo(imageBrighnessLow50, -1, 1, -50); //decrease the  
brightness by 50
```

```
Mat imageBrighnessLow100;  
image.convertTo(imageBrighnessLow100, -1, 1, -100); //decrease the  
brightness by 100
```

q).how to change the contrast of an image ?  
ans).

Change **alpha** value to change contrast

```
void Mat::convertTo( OutputArray m, int rtype, double alpha=1, double beta=0 ) const
```

```
Mat imageContrastHigh2;  
image.convertTo(imageContrastHigh2, -1, 2, 0); //increase the contrast by 2
```

```
Mat imageContrastHigh4;  
image.convertTo(imageContrastHigh4, -1, 4, 0); //increase the contrast by 4
```

```
Mat imageContrastLow0_5;  
image.convertTo(imageContrastLow0_5, -1, 0.5, 0); //decrease the contrast by 0.5
```

```
Mat imageContrastLow0_25;  
image.convertTo(imageContrastLow0_25, -1, 0.25, 0); //decrease the contrast by  
0.25
```

q). Convert ipl image to mat image?

ans).

src:<https://answers.opencv.org/question/23440/any-way-to-convert-iplimage-to-cvmat-in-opencv-300/>

```
IplImage * ipl = ...;
cv::Mat m = cv::cvarrToMat(ipl); // default additional arguments: don't
copy data.
```

q). Can we change colours ?

ans).

Yes.

Mat::cvtColor() vs cvConvertScale - iplimage

[Mat::convertTo\(\)](#)

```
Mat dst, hist;
image.convertTo(dst, CV_8U, a, b);
imshow("image", dst);
```

**alpha** optional scale  
factor.

cvConvertScale - iplimage

```
Mat image = imread("./input.jpg");
Show above images inside the created windows.
imshow(windowNameOriginalImage, image);
IplImage* frame = new IplImage(image);
cvConvertScale(frame, frame, 1, 0);
```

q).rectangle or cvRectangle ?

ans).

\*.

q). Why threshold ?

ans).

\*.

### Threshold - good example

Application example: Separate out regions of an image corresponding to objects which we want to analyze. This separation is based on the variation of intensity between the object pixels and the background pixels.



[https://docs.opencv.org/3.4/db/d8e/tutorial\\_threshold.html](https://docs.opencv.org/3.4/db/d8e/tutorial_threshold.html)

q). How to print height and width of an Ipl image ?

ans).

\*.

```
IplImage *frame = cvCreateImage(cvGetSize(img), img->depth, img->nChannels);
```

```
cout << "frame->depth: " << frame->depth <<endl;
```

```
cout << "frame->nChannels: " << frame->nChannels <<endl;
```

```
dim = cvGetSize(frame);
```

```
cout <<" frame - dimensions:: height:" << dim.height<<" width:"<<  
dim.width<< endl;
```

q). How to show ipl image?

ans).

\*.

```
cvNamedWindow("grey_thersh", 1);
```

```
cvShowImage("grey_thesh", img);
```

q). How to show Mat image?

ans).

\*.

```
cvNamedWindow( "chB", CV_WINDOW_AUTOSIZE );
cvShowImage("chB", chB);
```

q). How to print height and width of an Mat image ?

ans).

\*.

```
cv::Mat mat;
int rows = mat.rows;
int cols = mat.cols;
```

q). How to get the height and width of an Mat frame from camera video ?

ans).

```
double dWidth = cap.get(CAP_PROP_FRAME_WIDTH); //get the width of frames of
the video
double dHeight = cap.get(CAP_PROP_FRAME_HEIGHT); //get the height of frames
of the video
```

q). Convert Mat to IplImage?

<https://stackoverflow.com/questions/4664187/convert-cv-mat-to-ipl-image>

```
Mat image1; IplImage* image2=cvCloneImage(&(IplImage)image1);
```

Guess this will do the job.

**Edit:** If you face compilation errors, try this way:

```
cv::Mat image1;
IplImage* image2;
image2 = cvCreateImage(cvSize(image1.cols,image1.rows),8,3);
IplImage ipltemp=image1;
cvCopy(&ipltemp,image2);
```

q). Convert IplImage to Mat ?

ans).

\*.

```
cv::Mat img_result = cv::cvarrToMat(frame);
img_result.copyTo(img_output);
```

q). Show image in IplImage formate ?

ans).

```
IplImage* image = cvLoadImage("Black&White.jpg");
cvNamedWindow( "Image", CV_WINDOW_AUTOSIZE ); cvShowImage("Image", image);
```

q).Mat read, write and show API's ?  
ans).

[https://docs.opencv.org/master/db/deb/tutorial\\_display\\_image.html](https://docs.opencv.org/master/db/deb/tutorial_display_image.html)

q).cvConvertScale  
ans).

\*.

Src: <http://www.cplusplus.com/forum/general/11614/>

q). Difference between cvSize and cvGetSize ?  
ans).

<https://titanwolf.org/Network/Articles/Article?AID=076f23a1-9fbe-422a-9966-9b67f0d14d3a#gsc.tab=0>

Contour(ఆకృతి, చిత్రం రేఖాకృతి):

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q). Sample webcam streaming ?  
ans).

```
prashad@ubuntu:~/working_dir/test$ g++ show_image.cpp `pkg-config --cflags --libs opencv`
```

```
Package opencv was not found in the pkg-config search path.
```

```
Perhaps you should add the directory containing `opencv.pc'
```

```
to the PKG_CONFIG_PATH environment variable
```

```
No package 'opencv' found
```

```
show_image.cpp:1:10: fatal error: opencv2/opencv.hpp: No such file or directory
```

```
#include <opencv2/opencv.hpp>
```

```
^~~~~~
```

```
compilation terminated.
```

```
prashad@ubuntu:~/working_dir/test$
```

```
prashad@ubuntu:/$ sudo apt-get install libopencv-dev
```

```
prashad@ubuntu:~/working_dir/test$ g++ show_image.cpp `pkg-config --cflags  
--libs opencv`  
prashad@ubuntu:~/working_dir/test$ echo $?  
0
```

webcam streaming works below snippet

<https://www.opencv-srf.com/2017/12/play-video-from-file-or-camera.html#:~:text=Capture%20and%20Play%20Video%20From%20Camera%2FWebcam&text=In%20this%20program%2C%20you%20just,is%20the%20sample%20OpenCV%20code.&text=%7D%20return%20%3B%20%7D-,Copy%20and%20paste%20above%20simple%20code,your%20IDE%20and%20run%20it.>

**q).how to uninstall libopencv-dev ?  
ans).**

```
sudo rm -rf ./usr/local/lib/pkgconfig/opencv.pc  
sudo apt-get remove libopencv-dev  
sudo apt-get remove --auto-remove libopencv-dev
```