

 免費電子書

學習

opencv

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Stack Overflow contributors.

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1: opencv

opencv。

opencv。 opencv。

OpenCV 3

3.2	20161223
3.1	20151218
3.0	WordPress
3.0 RC1	2015423
3.0 beta	2014117
3.0 alpha	2014821

OpenCV 2

2.4.13	2016519
2.4.12	
2.4.11	2015225
2.4.10	2014-10-01
2.4.9	2014414
2.3.1	2011-08-17
2.3.0	2011-07-04
2.2.0	2010-12-05
2.1.0	2010-04-06
2.0.0	2009-10-01
1.0.0	2006-10-19

Examples

OpenCV

OpenCV。 C / C ++PythonJava。

C ++

```
#include <opencv2/core.hpp>
#include <opencv2/highgui.hpp>

#include <iostream>

using namespace cv;

int main(int argc, char** argv) {
    // We'll start by loading an image from the drive
    Mat image = imread("image.jpg", CV_LOAD_IMAGE_COLOR);

    // We check that our image has been correctly loaded
    if(image.empty()) {
        std::cout << "Error: the image has been incorrectly loaded." << std::endl;
        return 0;
    }

    // Then we create a window to display our image
    namedWindow("My first OpenCV window");

    // Finally, we display our image and ask the program to wait for a key to be pressed
    imshow("My first OpenCV window", image);
    waitKey(0);

    return 0;
}
```

Python

```
#include <opencv2/core.hpp>
#include <opencv2/highgui.hpp>

#include <iostream>

using namespace cv;

int main(int argc, char** argv) {
    // We'll start by loading an image from the drive
    Mat image = imread("image.jpg", CV_LOAD_IMAGE_COLOR);

    // We check that our image has been correctly loaded
    if(image.empty()) {
        std::cout << "Error: the image has been incorrectly loaded." << std::endl;
        return 0;
    }

    // Then we create a window to display our image
    namedWindow("My first OpenCV window");
```

```

// Finally, we display our image and ask the program to wait for a key to be pressed
imshow("My first OpenCV window", image);
waitKey(0);

return 0;
}

```

Java

```

#include <opencv2/core.hpp>
#include <opencv2/highgui.hpp>

#include <iostream>

using namespace cv;

int main(int argc, char** argv) {
    // We'll start by loading an image from the drive
    Mat image = imread("image.jpg", CV_LOAD_IMAGE_COLOR);

    // We check that our image has been correctly loaded
    if(image.empty()) {
        std::cout << "Error: the image has been incorrectly loaded." << std::endl;
        return 0;
    }

    // Then we create a window to display our image
    namedWindow("My first OpenCV window");

    // Finally, we display our image and ask the program to wait for a key to be pressed
    imshow("My first OpenCV window", image);
    waitKey(0);

    return 0;
}

```

HighGuiopencv javanamedwindowssimshow。 swingswt。

OpenCV

DebianLinuxOpenCV 3。 。

SynapticGUIOpenCV。 。

```

sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev

```

```

sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev

```

OpenCV

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

◦ ◦

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

CMake◦

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

OpenCV

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

OpenCV◦ OpenCV

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

C ++

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

```
sudo apt-get update
sudo apt-get install build-essential
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

C ++◦

Python

```
sudo apt-get update
sudo apt-get install build-essential
```

```
sudo apt-get install cmake git libgtk2.0-dev pkg-config \
    libavcodec-dev libavformat-dev libswscale-dev
```

OpenCVPython。

OpenCV。

MacMac OS XOpenCV

JavaHello

JavaOpenCv

```
import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.imgcodecs.Imgcodecs;

public class Giris {
    public static void main(String[] args) {
        //Load native library
        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        //image container object
        Mat imageArray;
        //Read image from file system
        imageArray=Imgcodecs.imread("C:\\Users\\mesutpiskin\\sample.jpg");
        //Get image with & height
        System.out.println(imageArray.rows());
        System.out.println(imageArray.cols());
    }
}
```

OpenCVVideoCaptureJavaC / C ++Python。

Java

```
import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.videoio.VideoCapture;

public class Camera {
    public static void main(String[] args) {
        // Load Native Library
        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        // image container object
        Mat imageArray = new Mat();
        // Video device acces
        VideoCapture videoDevice = new VideoCapture();
        // 0:Start default video device 1,2 etc video device id
        videoDevice.open(0);
        // is conected
        if (videoDevice.isOpened()) {
            // Get frame from camera
            videoDevice.read(imageArray);
            // image array
        }
    }
}
```

```

        System.out.println(imageArray.toString());
        // Release video device
        videoDevice.release();
    } else {
        System.out.println("Error.");
    }
}
}

```

C ++

```

import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.videoio.VideoCapture;

public class Camera {
    public static void main(String[] args) {
        // Load Native Library
        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        // image container object
        Mat imageArray = new Mat();
        // Video device acces
        VideoCapture videoDevice = new VideoCapture();
        // 0:Start default video device 1,2 etc video device id
        videoDevice.open(0);
        // is conected
        if (videoDevice.isOpened()) {
            // Get frame from camera
            videoDevice.read(imageArray);
            // image array
            System.out.println(imageArray.toString());
            // Release video device
            videoDevice.release();
        } else {
            System.out.println("Error.");
        }
    }
}

```

```

import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.videoio.VideoCapture;

public class Camera {
    public static void main(String[] args) {
        // Load Native Library
        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        // image container object
        Mat imageArray = new Mat();
        // Video device acces
        VideoCapture videoDevice = new VideoCapture();
        // 0:Start default video device 1,2 etc video device id
        videoDevice.open(0);
        // is conected
        if (videoDevice.isOpened()) {

```

```

// Get frame from camera
videoDevice.read(imageArray);
// image array
System.out.println(imageArray.toString());
// Release video device
videoDevice.release();
} else {
    System.out.println("Error.");
}
}
}

```

WindowsOpenCV 3.1

WindowsOpenCV 3.1.0。 WindowsOpenCV。 。 。

OpenCV。 OpenCVWindows。 。


ProTipOpenCV。 C\D\ root

opencv_contrib。 。 。


OpenCV。 。

- [CMake](#) 。
- <https://github.com/Itseez/opencv.git>OpenCV。 “OpenCVdir”。

 **Itseez / opencv**

 Code

 Issues **880**

 Pull requests **32**

 Wiki

 Pu

Open Source Computer Vision Library <http://opencv.org>

 **18,556** commits

 **3** branches

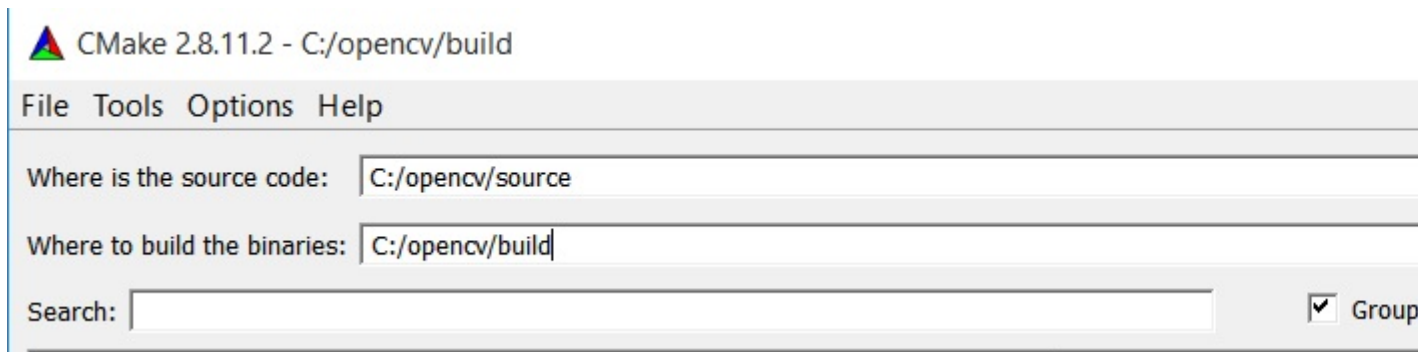
Branch: **master** ▼

New pull request

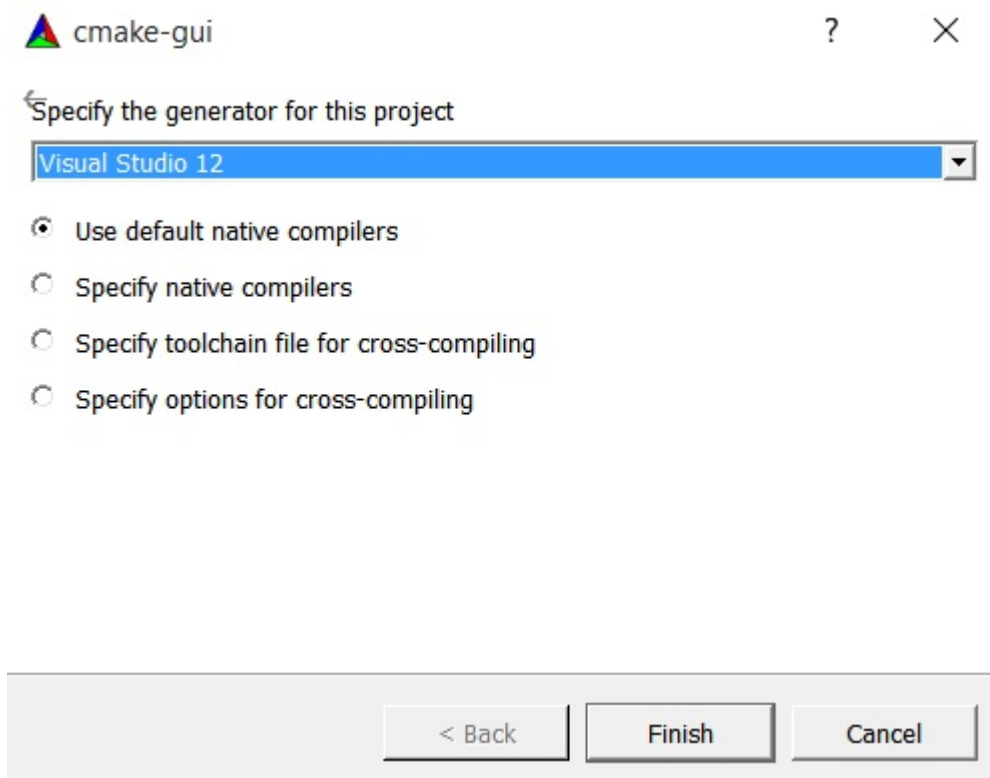
New file

Fi

- CMake GUIOpenCVdirSources。 opencv。



- Configure Visual Studio 12. Visual Studio 2013 Professional Visual Studio 12.



Visual Studio 2013 Professional. 30+ 90.

- Finish CMake. • Configure.
- opencv_contrib. opencv_contrib / modules CMake.

Where is the source code: C:/opencv/source

Where to build the binaries: C:/opencv/build

Search:

☒ Grouped

Name	Value
<input type="checkbox"/> CUDA	
<input type="checkbox"/> DOXYGEN	
<input type="checkbox"/> ENABLE	
<input type="checkbox"/> GIGAPI	
<input type="checkbox"/> INSTALL	
<input type="checkbox"/> JAVA	
<input type="checkbox"/> MATLAB	
<input type="checkbox"/> OPENCV	
<input type="checkbox"/> OPENCV_CONFIG_FILE_INCLUDE_DIR	C:/opencv/build11
<input type="checkbox"/> OPENCV_EXTRA_MODULES_PATH	C:/opencv/source/opencv
<input type="checkbox"/> OPENCV_WARNINGS_ARE_ERRORS	<input type="checkbox"/>
<input type="checkbox"/> PYTHON2	

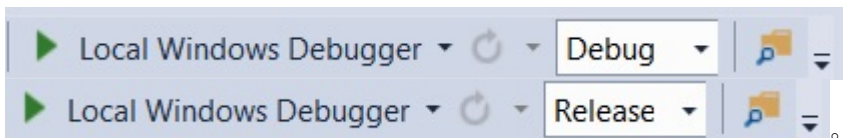
Press Configure to update and display new values in red, then press Generate to generate the build files.

Configure

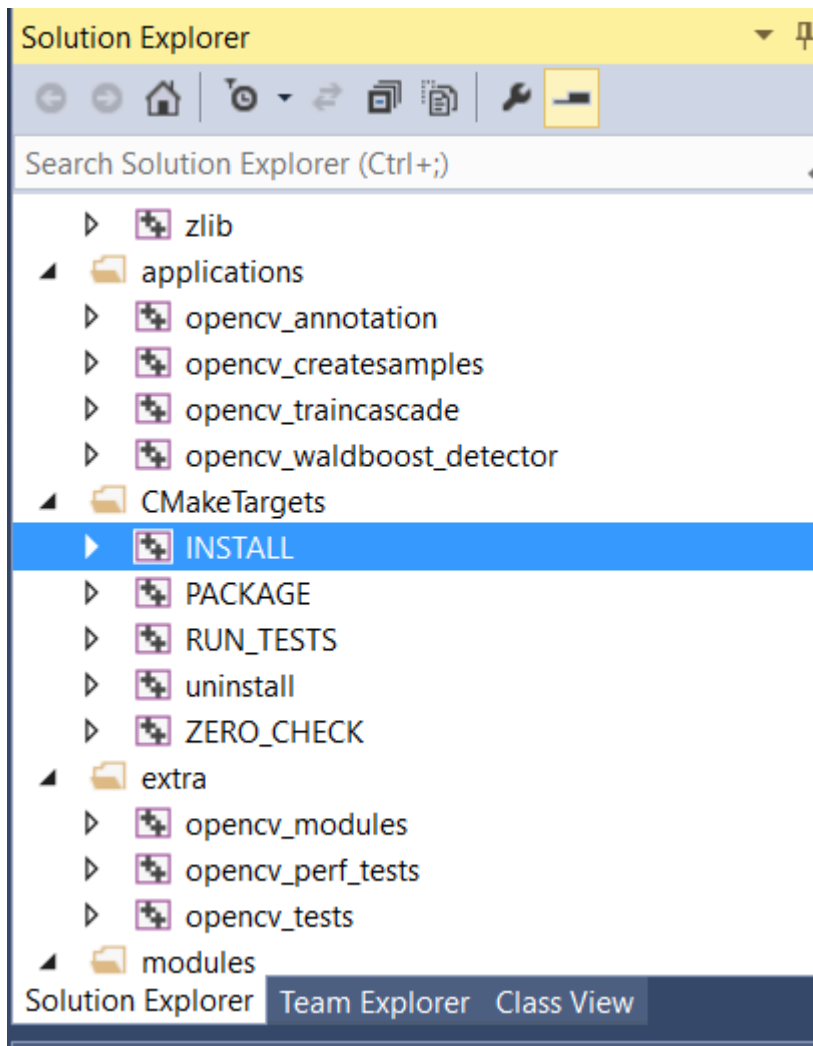
Generate

Current Generator: Visual Studio 12

- ConfigureGenerate.
- CMake. your_opencv \ build"OpenCV.sln". - Visual Studio. Debug



- Visual StudioINSTALL.







OpenCV。

OpenCV includeEnvironment VariablesPATH

- “”。

Control Panel Home

-  Device Manager
-  Remote settings
-  System protection
-  [Advanced system settings](#)



View basic information about your computer

Windows edition

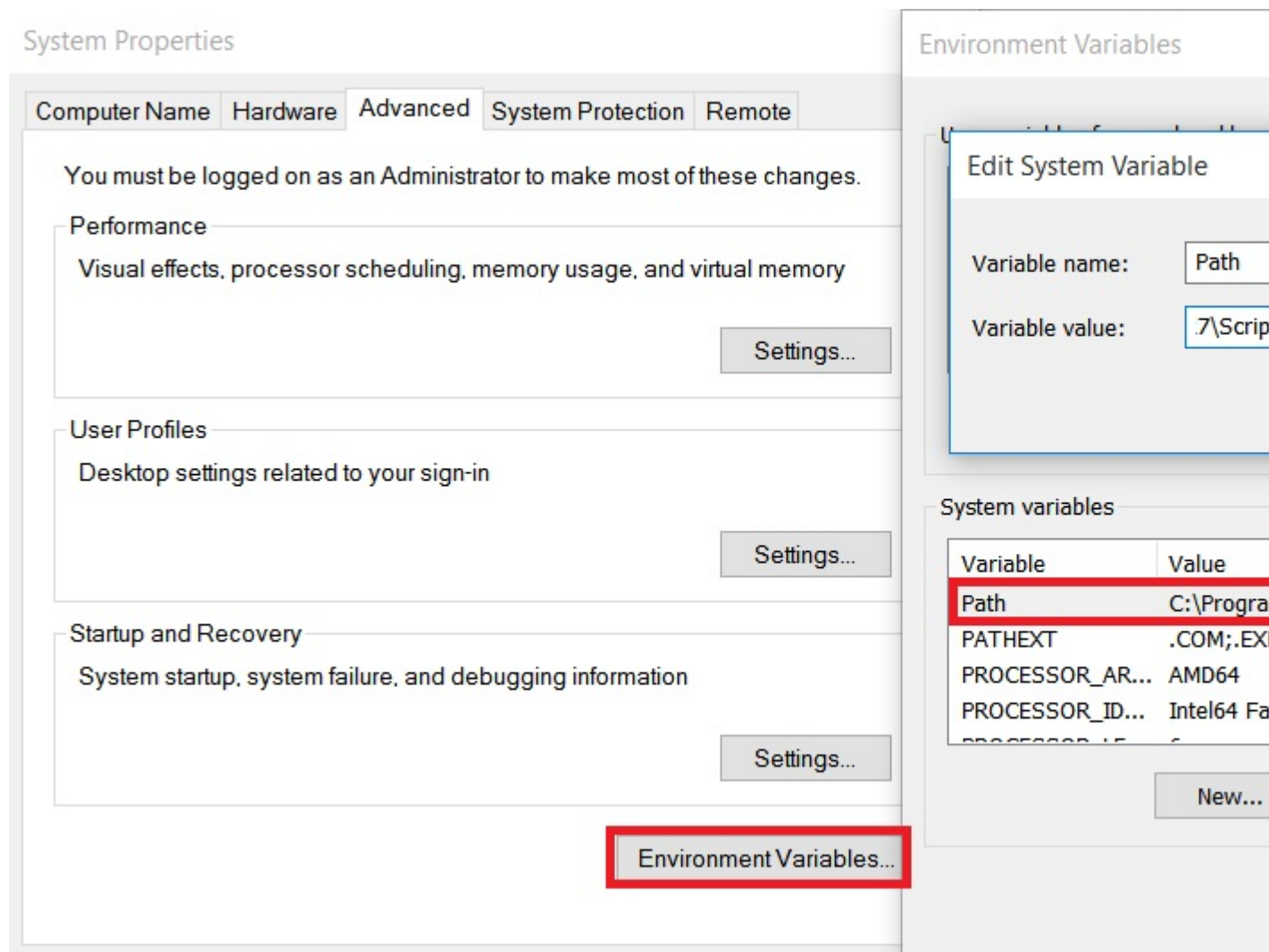
Windows 10 Home Single Language

© 2015 Microsoft Corporation. All rights reserved.

System

Processor:	Intel(R) Core(TM) i5-4210U CPU (1.7 GHz)
Installed memory (RAM):	6.00 GB (5.89 GB usable)
System type:	64-bit Operating System, x64-based processor
Pen and Touch:	No Pen or Touch Input is available for this device

- >>>>。



- OpenCVdir / build / install / x86 / vc ** / binbin。 Path。
- 。

OPENCV

OpenCV。 WindowsLinux androidios。 。 。

2500。 3D3D.OpenCV4.7700。 。

IBM Applied Minds VideoSurf Zeitera OpenCV。 OpenCV Willow Garage。 C ++ CPython Java
MATLAB Windows Linux Android Mac OS。 OpenCV MMXSSE。 CUDA OpenCL。 50010。 OpenCV
C ++ STL。

opencv <https://riptutorial.com/zh-TW/opencv/topic/800/opencv>

2: AndroidOpenCV

Examples

- [OpenCV Manager](#)OpenCV◦

```
public class MainActivity extends Activity implements CvCameraViewListener2 {

    private BaseLoaderCallback mLoaderCallback = new BaseLoaderCallback(this) {
        @Override
        public void onManagerConnected(int status) {
            switch(status) {
                case LoaderCallbackInterface.SUCCESS:
                    Log.i(TAG, "OpenCV Manager Connected");
                    //from now onwards, you can use OpenCV API
                    Mat m = new Mat(5, 10, CvType.CV_8UC1, new Scalar(0));
                    break;
                case LoaderCallbackInterface.INIT_FAILED:
                    Log.i(TAG, "Init Failed");
                    break;
                case LoaderCallbackInterface.INSTALL_CANCELED:
                    Log.i(TAG, "Install Cancelled");
                    break;
                case LoaderCallbackInterface.INCOMPATIBLE_MANAGER_VERSION:
                    Log.i(TAG, "Incompatible Version");
                    break;
                case LoaderCallbackInterface.MARKET_ERROR:
                    Log.i(TAG, "Market Error");
                    break;
                default:
                    Log.i(TAG, "OpenCV Manager Install");
                    super.onManagerConnected(status);
                    break;
            }
        }
    };

    @Override
    public void onResume() {
        super.onResume();
        OpenCVLoader.initAsync(OpenCVLoader.OPENCV_VERSION_3_1_0, this, mLoaderCallback);
    }

    ...
}
```

OpenCV Manager◦ UIOnManagerConnected◦

OpenCVOpenCV◦ OpenCVOpenCV◦

BaseLoaderCallbackActivityActivity.finish()◦ BaseLoaderCallbackfinish()◦

OpenCV

OpenCV ManagerAndroidOpenCV。 OpenCV。

- 40MB。 ◦
- ◦
- OpenCV。 OpenCVGoogle Play◦
- ◦

◦

Android OpenCV Manager

18/10/16

[Play](#)OpenCV Manager2015921◦

OpenCV 3.1.0。 OpenCVSIGSEGV◦ Android SDK OpenCV-android-

sdk/apk/OpenCV_3.1.0_Manager_3.10_{platform}.apk ◦ [OpenCV](#)◦

[6247](#) ◦

OpenCV。 ◦ ◦

JNIOpenCVOpenCV-3.1.0-android-sdk/sdk/native/libsapp/src/main/jniLibs◦

JNIAndroid.mk"include \$(CLEAR_VARS)"include path_to_OpenCV-3.1.0-android-
sdk/sdk/native/jni/OpenCV.mk" "include \$(CLEAR_VARS)"include path_to_OpenCV-3.1.0-android-
sdk/sdk/native/jni/OpenCV.mk"

```
OPENCV_CAMERA_MODULES:=on  
OPENCV_INSTALL_MODULES:=on
```

```
OPENCV_CAMERA_MODULES:=on  
OPENCV_INSTALL_MODULES:=on
```

JNIOpenCVjniLibs◦

OpenCVOpenCV APIJava。 Activity

```
OPENCV_CAMERA_MODULES:=on  
OPENCV_INSTALL_MODULES:=on
```

OpenCVOpenCV

```
OPENCV_CAMERA_MODULES:=on  
OPENCV_INSTALL_MODULES:=on
```

[initDebug\(\)](#)◦ ◦ ◦

AndroidOpenCV <https://riptutorial.com/zh-TW/opencv/topic/7545/androidopencv>

3: C ++

- `void cv::Mat::convertToOutputArray(int rtype, double alpha = 1, double beta = 0, const`

	;
	;rtype
α	o o 11
	deltao

o o

o o

$g_{ij} = a_{ij} + \beta$

$f(x) \cdot g(x)$ o

$i \cdot j$ o

$\alpha > 0, \beta;$ o

Opencv [convertTo](#) o

http://docs.opencv.org/trunk/d3/d63/classcv_1_1Mat.html#adf88c60c5b4980e05bb556080916978b
<http://opencv-srf.blogspot.ca/2013/07/change-contrast-of-image-or-video.html> <http://opencv-srf.blogspot.ca/2013/07/change-brightness.html>

Examples

C ++

```
// main.cpp : Defines the entry point for the console application.
//
#include "opencv2/highgui/highgui.hpp"
#include <iostream>

using namespace cv;
using namespace std;

int main(int argc, const char** argv)

{
```

```

Mat img = imread("lena30.jpg", CV_LOAD_IMAGE_COLOR); //open and read the image

if (img.empty())
{
    cout << "Image cannot be loaded..!!" << endl;
    return -1;
}

Mat img_higher_contrast;
img.convertTo(img_higher_contrast, -1, 2, 0); //increase the contrast (double)

Mat img_lower_contrast;
img.convertTo(img_lower_contrast, -1, 0.5, 0); //decrease the contrast (halve)

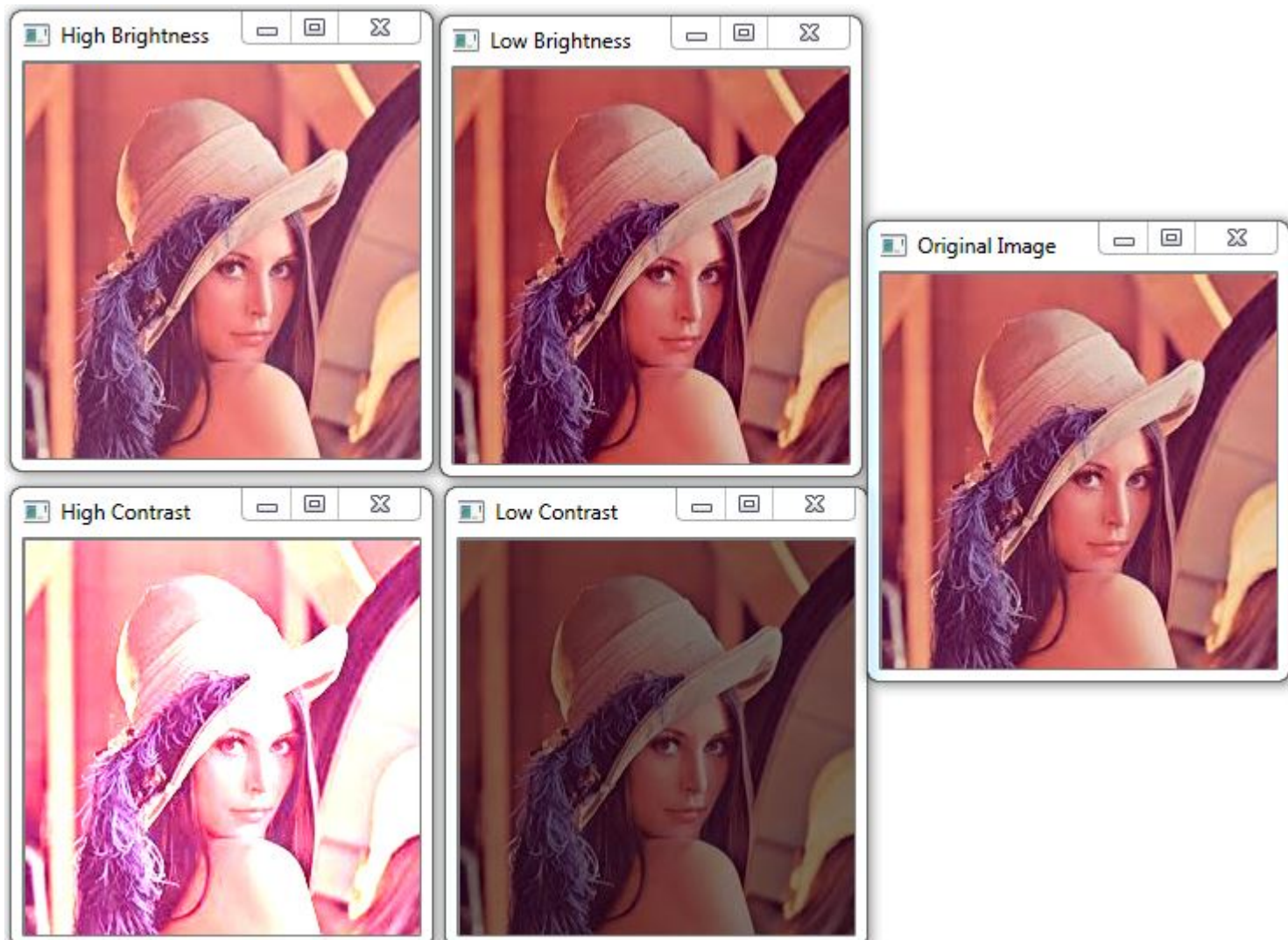
Mat img_higher_brightness;
img.convertTo(img_higher_brightness, -1, 1, 20); //increase the brightness by 20 for each
pixel

Mat img_lower_brightness;
img.convertTo(img_lower_brightness, -1, 1, -20); //decrease the brightness by 20 for each
pixel

//create windows
namedWindow("Original Image", CV_WINDOW_AUTOSIZE);
namedWindow("High Contrast", CV_WINDOW_AUTOSIZE);
namedWindow("Low Contrast", CV_WINDOW_AUTOSIZE);
namedWindow("High Brightness", CV_WINDOW_AUTOSIZE);
namedWindow("Low Brightness", CV_WINDOW_AUTOSIZE);
//show the image
imshow("Original Image", img);
imshow("High Contrast", img_higher_contrast);
imshow("Low Contrast", img_lower_contrast);
imshow("High Brightness", img_higher_brightness);
imshow("Low Brightness", img_lower_brightness);

waitKey(0); //wait for key press
destroyAllWindows(); //destroy all open windows
return 0;
}

```



C ++ <https://riptutorial.com/zh-TW/opencv/topic/6917/c-plusplus>

4: OpenCV

OpenCVLinuxMac OSWindows

Examples

UbuntuOpenCV

◦

1 - ubuntu

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

2 - Dependences

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

OpenCV3-Build

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

OpenCV4-Image I / O

```
sudo su

sudo apt-get -y update
```

```
sudo apt-get -y upgrade  
sudo apt-get -y dist-upgrade  
sudo apt-get -y autoremove
```

OpenCV5I / O

```
sudo su  
sudo apt-get -y update  
sudo apt-get -y upgrade  
sudo apt-get -y dist-upgrade  
sudo apt-get -y autoremove
```

6

```
sudo su  
sudo apt-get -y update  
sudo apt-get -y upgrade  
sudo apt-get -y dist-upgrade  
sudo apt-get -y autoremove
```

7-

```
sudo su  
sudo apt-get -y update  
sudo apt-get -y upgrade  
sudo apt-get -y dist-upgrade  
sudo apt-get -y autoremove
```

8-Java

```
sudo su  
sudo apt-get -y update  
sudo apt-get -y upgrade  
sudo apt-get -y dist-upgrade  
sudo apt-get -y autoremove
```

9-Python

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

10-GithubOPENCV

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

11-OPENCV Zip

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

12 - OPENCV Zip

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade

sudo apt-get -y autoremove
```

13-Build OPENCV

```
sudo su

sudo apt-get -y update

sudo apt-get -y upgrade

sudo apt-get -y dist-upgrade
```

```
sudo apt-get -y autoremove
```

sudo make install

```
sudo su  
  
sudo apt-get -y update  
  
sudo apt-get -y upgrade  
  
sudo apt-get -y dist-upgrade  
  
sudo apt-get -y autoremove
```

14-FinishedOpenCV

```
sudo su  
  
sudo apt-get -y update  
  
sudo apt-get -y upgrade  
  
sudo apt-get -y dist-upgrade  
  
sudo apt-get -y autoremove
```

OpenCV <https://riptutorial.com/zh-TW/opencv/topic/8934/opencv>

5: CMakeVisual StudioWindowsPython2 opencv 3.1.0-dev

opencv 3.1.0-devWindows UbuntuWindowsopencvpf

1. [Python 2.7.xPython 3.xx](#)
2. [CMake](#)

Python for Win3264CMake for Win32

32Python3232

3. [Visual Studio2013](#)
4. [Numpy](#) for Python2.7 Win32

PC

2

◦ ◦

githubopencvopencv_contrib ◦

1. [OpenCV](#)
2. [opencv_contrib](#)

opencv-3.1.0 ◦ zipsources

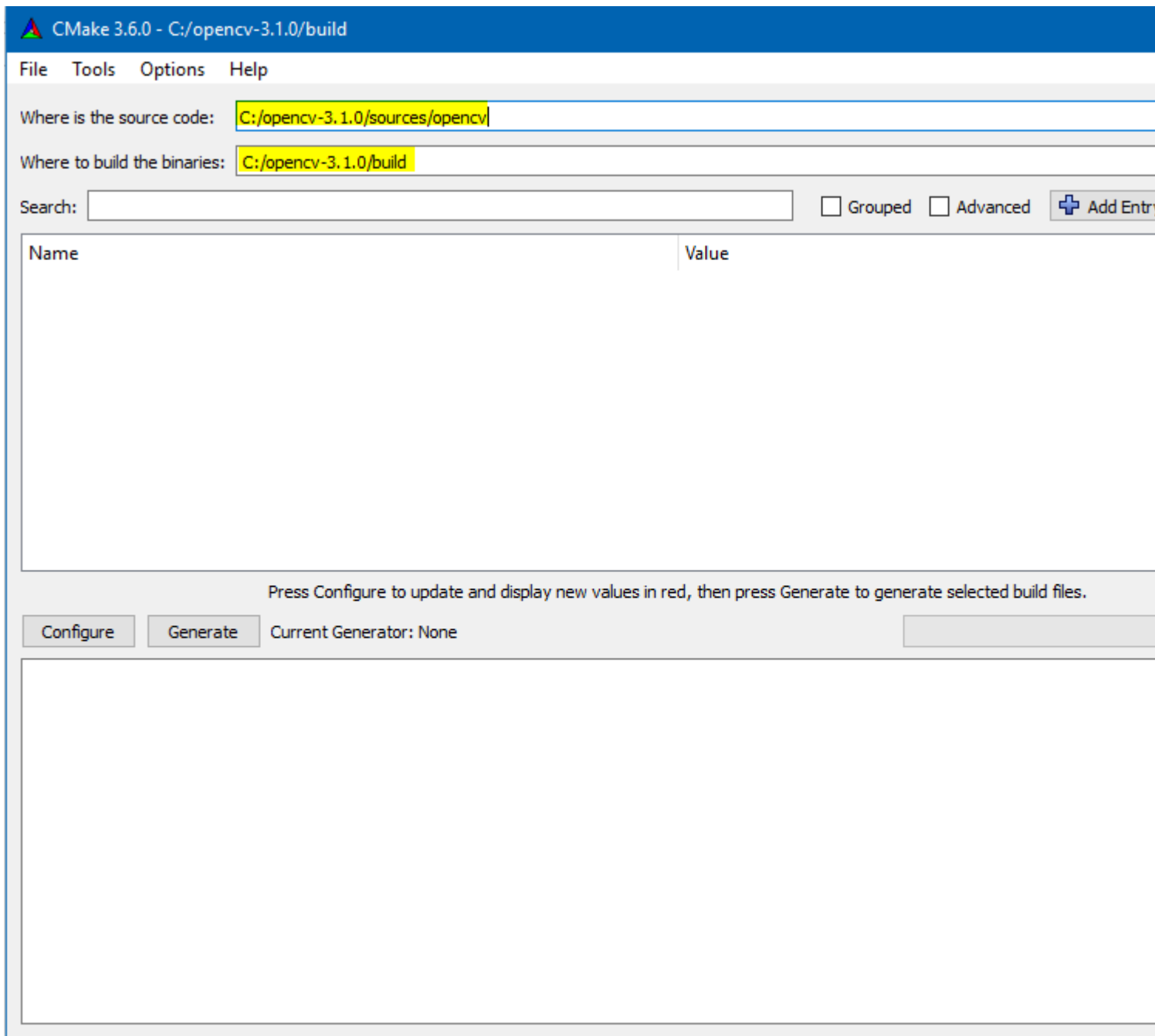
opencv-3.1.0C

1. C:\opencv-3.1.0
 2. C:\opencv-3.1.0\build
 3. C:\opencv-3.1.0\sources
-
1. C:\opencv-3.1.0\sources\opencv
 2. C:\opencv-3.1.0\sources\opencv_contrib

◦ ◦

3

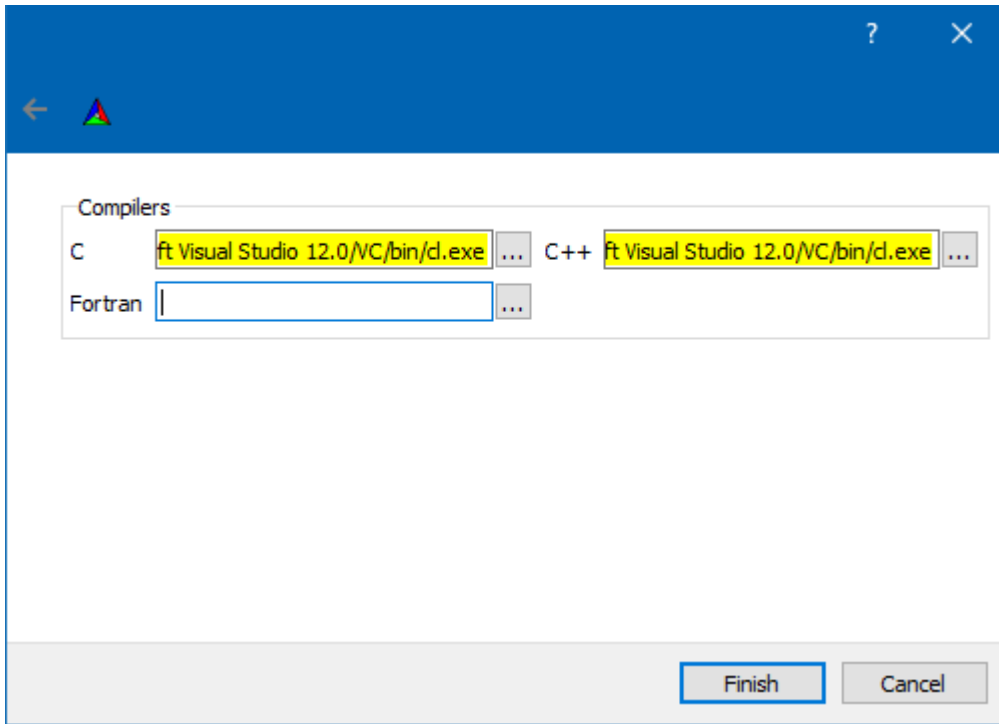
CMake ◦ opencv ◦ ◦



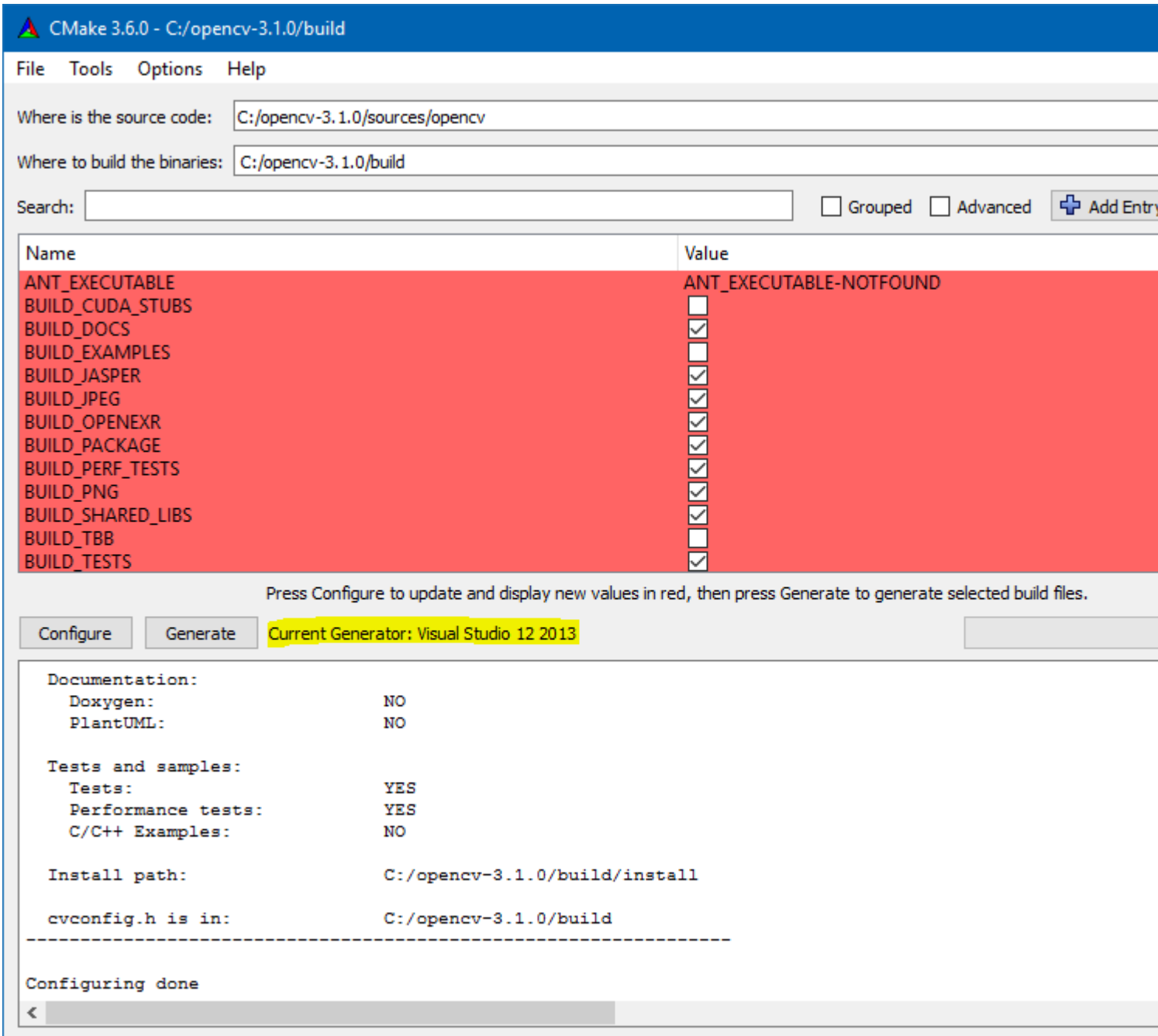
configure ;opencv。 Microsoft Visual Studio 2013cl.exe 。

C:/Program Files (x86)/Microsoft Visual Studio 12.0/VC/bin/cl.exe 。

CC ++。 ""。 。



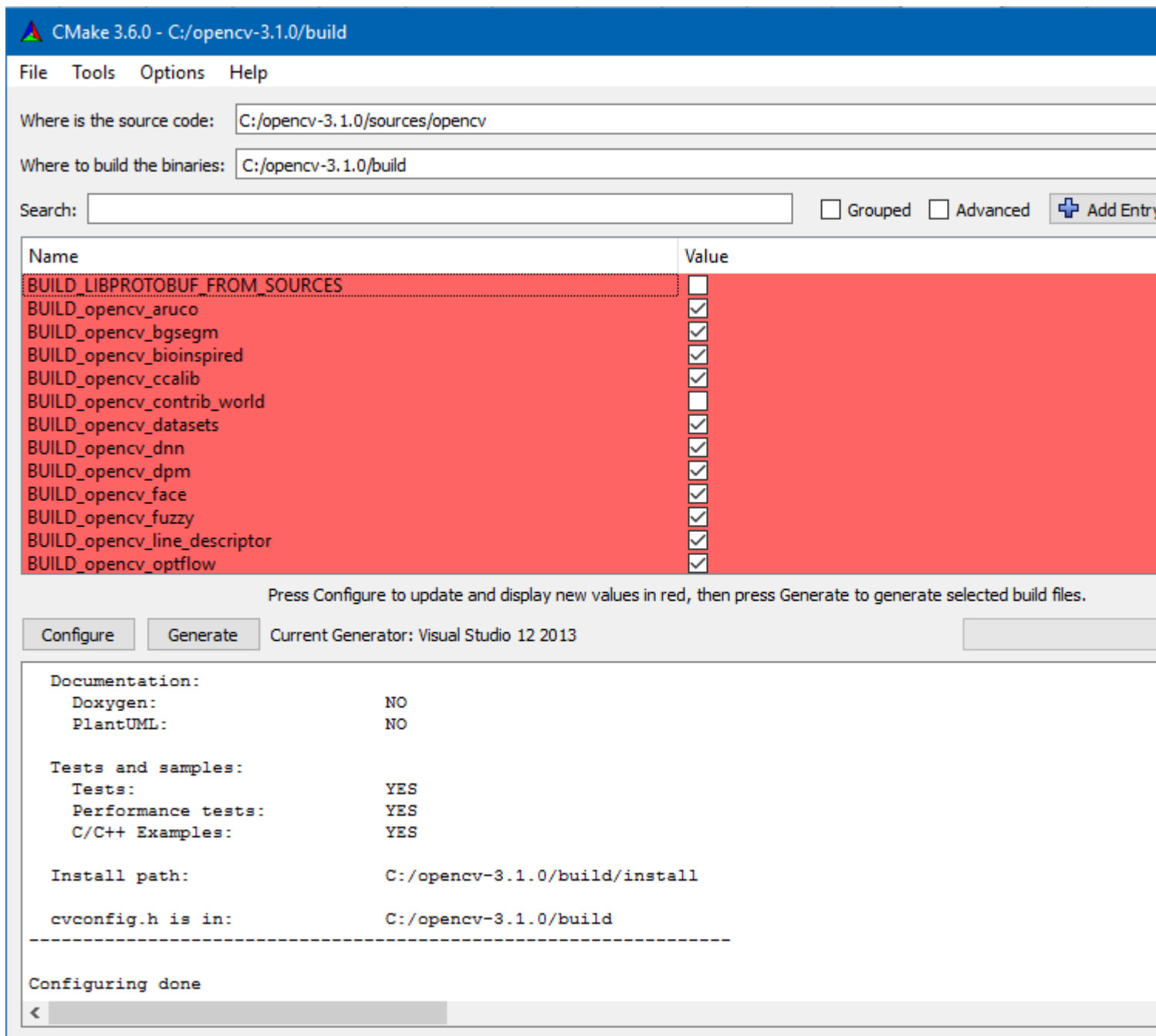
CMakeCMake。



◦ OPENCV_EXTRA_MODULES_PATHsourcesopencv_contribmodules◦

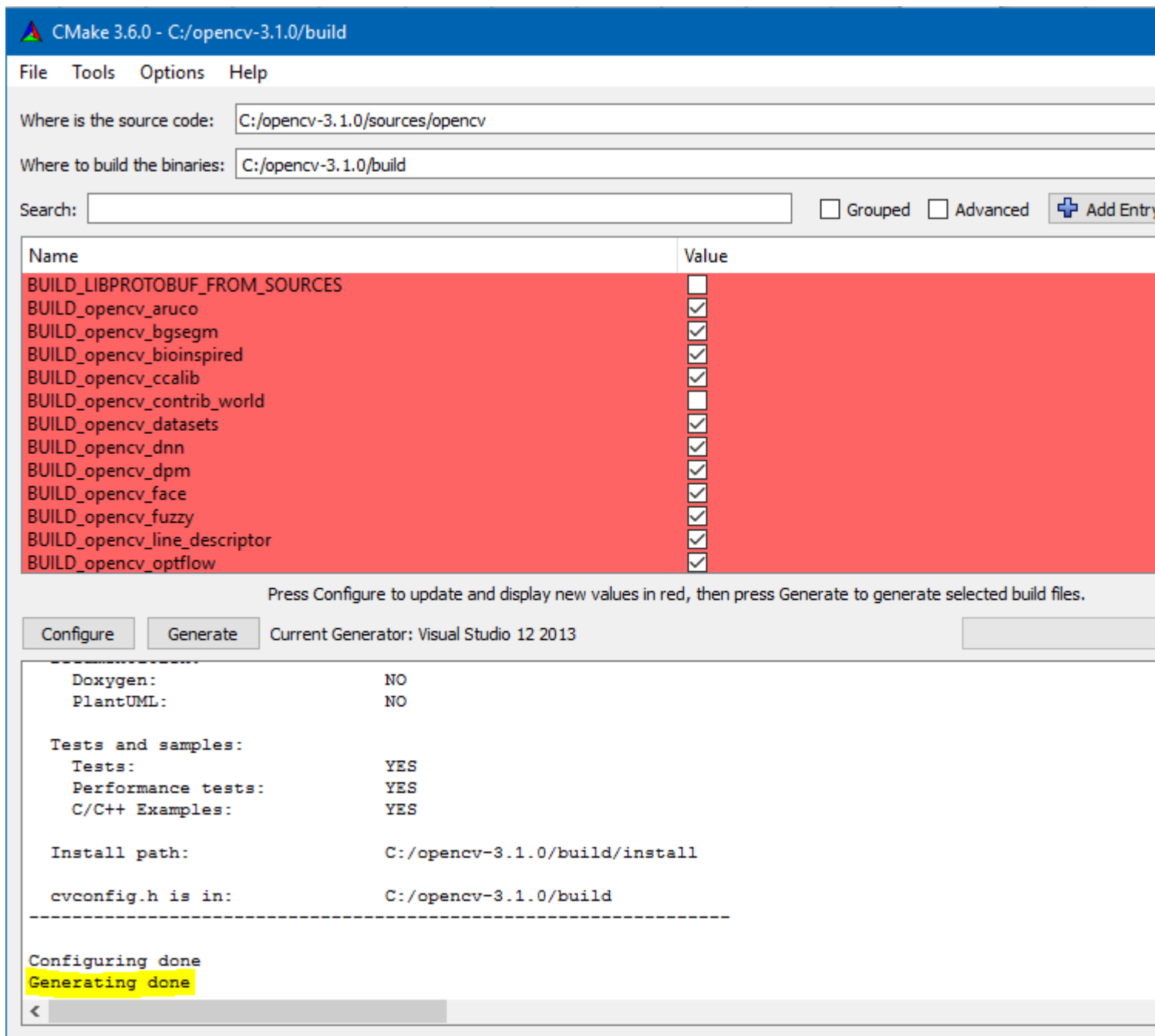
MATLAB_MEXEXT_SCRIPT_	
MATLAB_MEX_SCRIPT_	
MATLAB_ROOT_DIR_	
OPENCCL_FOUND	<input checked="" type="checkbox"/>
OPENCV_CONFIG_FILE_INCLUDE_DIR	C:/opencv-3.1.0/build
OPENCV_EXTRA_MODULES_PATH	C:/opencv-3.1.0/sources/opencv_contrib/modules
OPENCV_HAL_HEADERS	
OPENCV_HAL_LIBS	
OPENCV_WARNINGS_ARE_ERRORS	<input type="checkbox"/>
PVAPI_INCLUDE_PATH	PVAPI_INCLUDE_PATH-NOTFOUND
PYTHON2_EXECUTABLE	C:/Python27/python.exe
PYTHON2_INCLUDE_DIR	C:/Python27/include
PYTHON2_INCLUDE_DIR2	

configure◦ ◦



BUILD_opencv_contrib_worldBUILD_opencv_world . .






























CMake. “ ”.



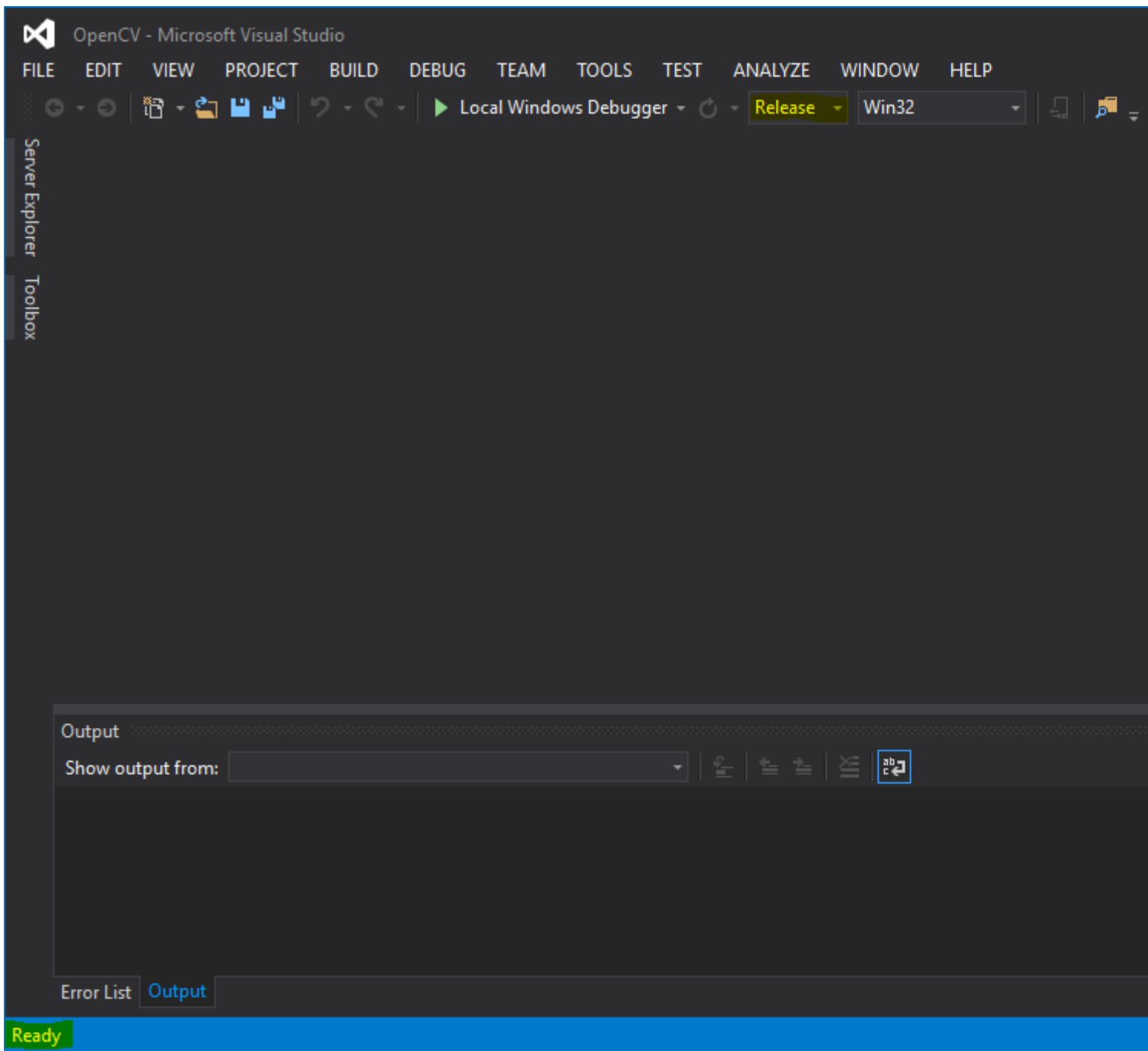
4

opencv-3.1.0. .

opencv.sln. CMake. Visual Microsoft 2013 .

Name	Date modified	Type	Size
 samples	7/30/2016 8:52 PM	File folder	
 test-reports	7/30/2016 8:38 PM	File folder	
 unix-install	7/30/2016 8:46 PM	File folder	
 win-install	7/30/2016 8:46 PM	File folder	
 ALL_BUILD.vcxproj	7/30/2016 8:52 PM	VC++ Project	88 KB
 ALL_BUILD.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB
 cmake_install.cmake	7/30/2016 8:52 PM	CMAKE File	7 KB
 cmake_uninstall.cmake	7/30/2016 8:38 PM	CMAKE File	2 KB
 CMakeCache.txt	7/30/2016 8:46 PM	Text Document	244 KB
 CMakeVars.txt	7/30/2016 8:46 PM	Text Document	407 KB
 CPackConfig.cmake	7/30/2016 8:46 PM	CMAKE File	10 KB
 CPackSourceConfig.cmake	7/30/2016 8:46 PM	CMAKE File	10 KB
 CTestTestfile.cmake	7/30/2016 8:52 PM	CMAKE File	1 KB
 custom_hal.hpp	7/30/2016 8:38 PM	C/C++ Header	1 KB
 cvconfig.h	7/30/2016 8:38 PM	C/C++ Header	5 KB
 INSTALL.vcxproj	7/30/2016 8:52 PM	VC++ Project	7 KB
 INSTALL.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB
 OpenCV.sln	7/30/2016 8:53 PM	Microsoft Visual S...	948 KB
 opencv_modules.vcxproj	7/30/2016 8:52 PM	VC++ Project	28 KB
 opencv_modules.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB
 opencv_perf_tests.vcxproj	7/30/2016 8:52 PM	VC++ Project	24 KB
 opencv_perf_tests.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB
 opencv_tests.vcxproj	7/30/2016 8:52 PM	VC++ Project	26 KB
 opencv_tests.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB
 OpenCVConfig.cmake	7/30/2016 8:46 PM	CMAKE File	19 KB
 OpenCVConfig-version.cmake	7/30/2016 8:38 PM	CMAKE File	1 KB
 OpenCVModules.cmake	7/30/2016 8:53 PM	CMAKE File	47 KB
 PACKAGE.vcxproj	7/30/2016 8:52 PM	VC++ Project	7 KB
 PACKAGE.vcxproj.filters	7/30/2016 8:52 PM	VC++ Project Filte...	1 KB

.sln Ready Solution ConfigurationReleaseDebug



5

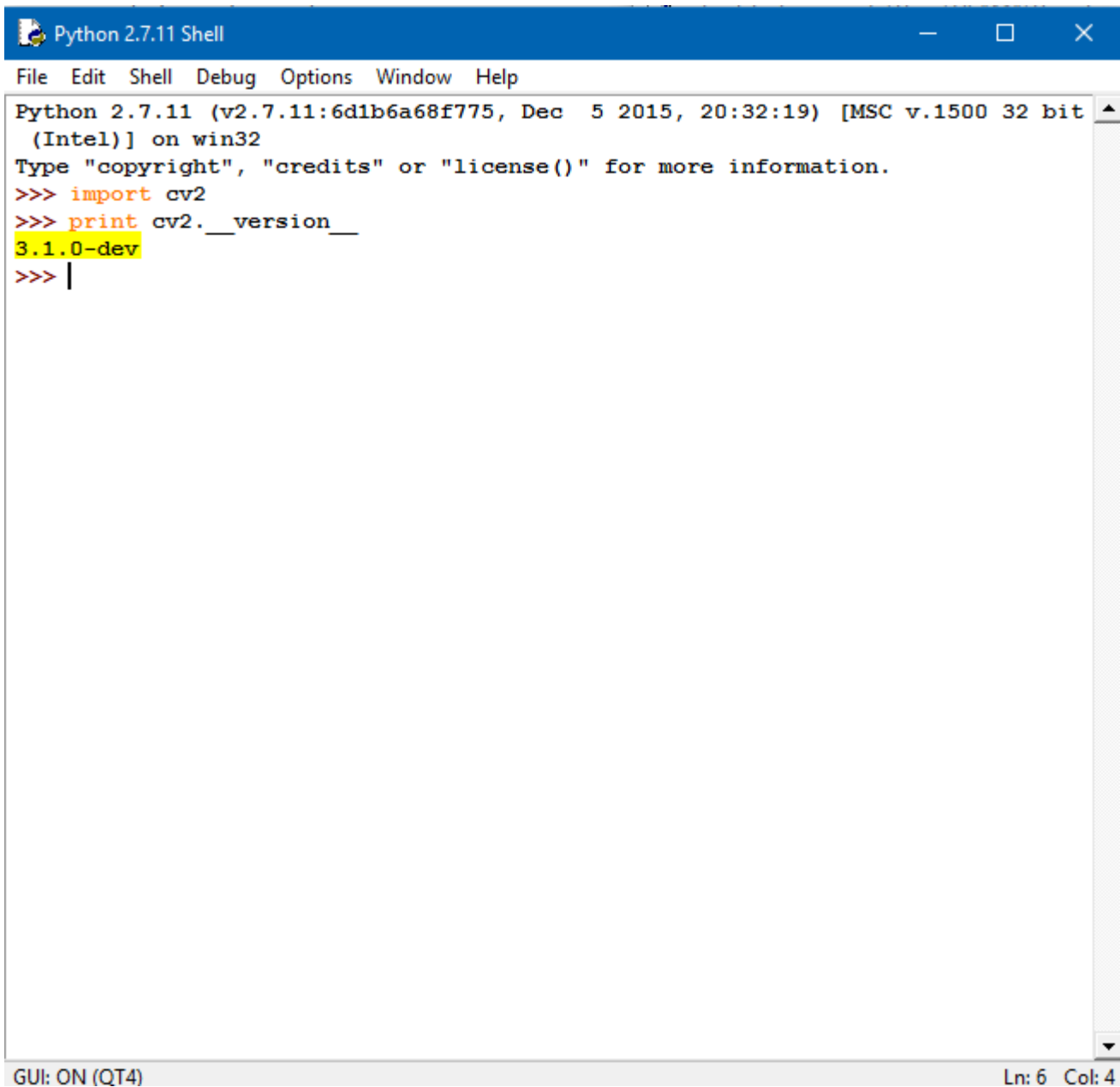
Python27°

cv2.pydsite-packagesPython27 ° cv2.pydC:\opencv-3.1.0\build\lib\Release ° C:\opencv-3.1.0\build\bin\Release.dllC:\Python27Python27°

PC°

IDLEPython shell

```
>>> import cv2
>>> print cv2.__version__
```



The screenshot shows a Windows-style application window titled "Python 2.7.11 Shell". The window has a menu bar with "File", "Edit", "Shell", "Debug", "Options", "Window", and "Help". The main text area displays the following content:

```
Python 2.7.11 (v2.7.11:6d1b6a68f775, Dec 5 2015, 20:32:19) [MSC v.1500 32 bit  
(Intel)] on win32  
Type "copyright", "credits" or "license()" for more information.  
>>> import cv2  
>>> print cv2.__version__  
3.1.0-dev  
>>> |
```

At the bottom of the window, a status bar shows "GUI: ON (QT4)" on the left and "Ln: 6 Col: 4" on the right.

Examples

```
import cv2  
import numpy as np  
  
img = cv2.imread('<your_image>')  
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)  
  
cv2.imshow('image', img)  
cv2.imshow('gray', gray)  
  
cv2.waitKey(0)  
cv2.destroyAllWindows()
```

CMakeVisual StudioWindowsPython2opencv 3.1.0-dev <https://riptutorial.com/zh-TW/opencv/topic/6100/cmakevisual-studiowindowspython2opencv-3-1-0-dev>

6: VideoCaptureOpenCV Python

Examples



```
import numpy as np
import cv2

#access a video from your disk
#to use the GIF in this example, convert to avi!
cap = cv2.VideoCapture('eg_videoRead.avi')

#we are going to read 10 frames
#we store the frames in a numpy structure
#then we'll generate a minimum projection of those frames

frameStack=[]
numFrames=10

for fr in range(numFrames):
    cap.set(cv2.CAP_PROP_POS_FRAMES,fr) #specifies which frame to read next
    frame=cap.read() #read the frame
    #gray = cv2.cvtColor(frame[1], cv2.COLOR_BGR2GRAY) #convert to gray scale
    frameStack.append(frame[1]) #add current frame to our frame Stack

minProjection=np.min(frameStack,axis=0) #find the minimum across frames
cv2.imshow("projection", minProjection) #show the result
```

VideoCaptureOpenCV Java

javainshow。 Mat2bufferedImage。 mat。

```
public static void main(String[] args) {
    Mat frame = new Mat();
    //0; default video device id
    VideoCapture camera = new VideoCapture(0);
    JFrame jframe = new JFrame("Title");
    jframe.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    JLabel vidpanel = new JLabel();
    jframe.setContentPane(vidpanel);
    jframe.setVisible(true);

    while (true) {
        if (camera.read(frame)) {
```

```
        ImageIcon image = new ImageIcon(Mat2bufferedImage(frame));
        vidpanel.setIcon(image);
        vidpanel.repaint();
    }
}
```

VideoCaptureOpenCV Python <https://riptutorial.com/zh-TW/opencv/topic/6803/videocapture-opencv-python>

7:

```
cv::Mat_<CV_8UC3> cv::Mat image.at<uchar>(r,c) image.at<uchar>(r,c)。
```

Examples

cv::Mat::at

OpenCV `cv::Mat`。

- `CV_8UC1` `uchar` `pixelGrayValue` = `image.at<uchar>(r,c)`。
- `CV_32FC1` `float` `pixelGrayValue` = `image.at<float>(r,c)`。
- `CV_8UC3` `cv::Vec3b` `pixelColor` = `image.at<cv::Vec3b>(r,c)`。
- `CV_32FC3` `cv::Vec3f` `pixelColor` = `image.at<cv::Vec3f>(r,c)`。

```
cv::imread("image.png", CV_8UC3)。
```

```
cv::Mat::at<T>(r,c) 返回 T 类型的值。
```

```
cv::Mat image。
```

- `CV_8UC1` `uchar` `pixelGrayValue` = `image.at<uchar>(r,c)`。
- `CV_8UC3` `cv::Vec3b` `pixelColor` = `image.at<cv::Vec3b>(r,c)`。
- `CV_32FC1` `float` `pixelGrayValue` = `image.at<float>(r,c)`。
- `CV_32FC3` `cv::Vec3f` `pixelColor` = `image.at<cv::Vec3f>(r,c)`。

OpenCV `Matlab`。

```
at<>cv::Point。
```

```
image.at<..>(cv::Point(x,y));
```

OpenCV。

cv::Mat::ptr

```
cv::Mat_ptr<T>(int r) 返回 T 类型的指针。
```

```
。
```

- `CV_8UC1` `uchar*` `ptr` = `image.ptr<uchar>(r)`;
- `CV_8UC3` `cv::Vec3b*` `ptr` = `image.ptr<cv::Vec3b>(r)`;
- `CV_32FC1` `float*` `ptr` = `image.ptr<float>(r)`;
- `CV_32FC3` `cv::Vec3f*` `ptr` = `image.ptr<cv::Vec3f>(r)`;

```
ptr[c] 返回 T 类型的值。
```



```

#include <opencv2/core.hpp>
#include <opencv2/imgproc.hpp>
#include <opencv2/highgui.hpp>

int main(int argc, char** argv) {
    cv::Mat image = cv::imread("image.jpg", CV_LOAD_IMAGE_COLOR);

    if(!image.data) {
        std::cout << "Error: the image wasn't correctly loaded." << std::endl;
        return -1;
    }

    // We iterate over all pixels of the image
    for(int r = 0; r < image.rows; r++) {
        // We obtain a pointer to the beginning of row r
        cv::Vec3b* ptr = image.ptr<cv::Vec3b>(r);

        for(int c = 0; c < image.cols; c++) {
            // We invert the blue and red values of the pixel
            ptr[c] = cv::Vec3b(ptr[c][2], ptr[c][1], ptr[c][0]);
        }
    }

    cv::imshow("Inverted Image", image);
    cv::waitKey();

    return 0;
}

```

C++

```

// PixelAccessTutorial.cpp : Defines the entry point for the console
// Environment: Visual studio 2015, Windows 10
// Assumptions: Opecv is installed configured in the visual studio project
// Opencv version: OpenCV 3.1

#include "stdafx.h"
#include<opencv2/core/core.hpp>
#include<opencv2/highgui/highgui.hpp>
#include<opencv2/imgproc/imgproc.hpp>
#include<string>
#include<iostream>

int main()
{
    cv::Mat imgOriginal;           // input image
    cv::Mat imgGrayscale;         // grayscale of input image

    std::cout << "Please enter an image filename : ";
    std::string img_addr;
    std::cin >> img_addr;

    std::cout << "Searching for " + img_addr << std::endl;

    imgOriginal = cv::imread(img_addr);           // open image

    if (imgOriginal.empty()) {                    // if unable to open
image

```

```

        std::cout << "error: image not read from file\n\n";           // show error message
on command line
        return(0);                                                    // and exit program
    }

    cv::cvtColor(imgOriginal, imgGrayscale, CV_BGR2GRAY);              // convert to grayscale

    const int channels = imgGrayscale.channels();
    printf("Number of channels = %d", channels);

    cv::Mat output ;
    imgGrayscale.copyTo(output); // Just to make sure the Mat objects are of the same size.

    //Set the threshold to your desired value
    uchar threshold = 127;

    if (channels == 1)
    {
        for (int x = 0; x<imgGrayscale.rows; x++) {
            for (int y = 0; y<imgGrayscale.cols; y++) {
                // Accesssing values of each pixel
                if (imgGrayscale.at<uchar>(x, y) >= threshold) {
                    // Setting the pixel values to 255 if it's above the threshold
                    output.at<uchar>(x, y) = 254;
                }
                else if (imgGrayscale.at<uchar>(x, y) < threshold) {
                    // Setting the pixel values to 255 if it's below the threshold
                    output.at<uchar>(x, y) = 0;
                }
                else {
                    // Just in case
                    printf("The value at (%d, %d) are not right. Value: %d\n", x, y,
imgGrayscale.at<uchar>(x, y));
                }
            }
        }
    }
    else if (channels == 3)
    {
        // This is only for gray scale images
        printf("\tThe image has 3 channels. The function does not support images with 3
channels.\n");
    }

    //Create windows to show image
    cv::namedWindow("Gray scale", CV_WINDOW_AUTOSIZE);
    cv::namedWindow("Binary", CV_WINDOW_AUTOSIZE);

    cv::imshow("Gray scale", imgGrayscale);
    cv::imshow("Binary", output);

    cv::waitKey(0);                                                    // hold windows open until user presses a key

    return 0;
}

```

Matiterator

;cv :: Mat :: at <T>。

;

```
#include <opencv2/core/core.hpp>
#include <opencv2/highgui/highgui.hpp>

int main(int argc, char **argv)
{

    // Create a container
    cv::Mat im;

    //Create a vector
    cv::Vec3b *vec;

    // Create an mat iterator
    cv::MatIterator_<cv::Vec3b> it;

    // Read the image in color format
    im = cv::imread("orig1.jpg", 1);

    // iterate through each pixel
    for(it = im.begin<cv::Vec3b>(); it != im.end<cv::Vec3b>(); ++it)
    {
        // Erase the green and red channels
        (*it)[1] = 0;
        (*it)[2] = 0;
    }

    // Create a new window
    cv::namedWindow("Resulting Image");

    // Show the image
    cv::imshow("Resulting Image", im);

    // Wait for a key
    cv::waitKey(0);

    return 0;
}
```

Cmake

```
#include <opencv2/core/core.hpp>
#include <opencv2/highgui/highgui.hpp>

int main(int argc, char **argv)
{

    // Create a container
    cv::Mat im;

    //Create a vector
    cv::Vec3b *vec;

    // Create an mat iterator
    cv::MatIterator_<cv::Vec3b> it;
```

```
// Read the image in color format
im = cv::imread("orig1.jpg", 1);

// iterate through each pixel
for(it = im.begin<cv::Vec3b>(); it != im.end<cv::Vec3b>(); ++it)
{
    // Erase the green and red channels
    (*it)[1] = 0;
    (*it)[2] = 0;
}

// Create a new window
cv::namedWindow("Resulting Image");

// Show the image
cv::imshow("Resulting Image", im);

// Wait for a key
cv::waitKey(0);

return 0;
}
```





◦

[http //docs.opencv.org/2.4/opencv_tutorials.pdf](http://docs.opencv.org/2.4/opencv_tutorials.pdf)145

Mat

OpenCV Mat◦ ◦

Basic Structures◦ CV_<bit-depth>{U|S|F}C(<number_of_channels>) CV_<bit-depth>{U|S|F}C(<number_of_channels>)◦ Vec◦

```
typedef Vec<type, channels> Vec< channels>< one char for the type>
```

typeuchar, short, int, float, doubleb, s, i, f, d◦

Vec2bunsigned char vector of 2 channelsunsigned char vector of 2 channels◦

Mat mat (R,C,T) R#rowsC#colsT◦ matij

2D

```
typedef Vec<type, channels> Vec< channels>< one char for the type>
```

3D

```
typedef Vec<type, channels> Vec< channels>< one char for the type>
```

<...>°

<https://riptutorial.com/zh-TW/opencv/topic/1957/>

8:

Examples

```
#include <highgui.h>

//...

cv::Mat img = cv::imread("img.jpg");
```

...

cv::VideoCapture o

```
#include "opencv2/highgui/highgui.hpp"
#include "opencv2/imgproc/imgproc.hpp"
#include "opencv2/core/core.hpp"
#include <iostream>

using namespace cv;
VideoCapture videoSource;
Mat frame;
#define VIDEO_PATH "video.avi"

int main()
{
    //Open video
    if (!videoSource.open(VIDEO_PATH))
    {
        std::cout<<"Video not found at "<<VIDEO_PATH<<std::endl;
        return 1;    // Exit if fail
    }
    videoSource.set(CV_CAP_PROP_CONVERT_RGB, 1);

    int cameraWidth = videoSource.get(CV_CAP_PROP_FRAME_WIDTH);
    int cameraHeight = videoSource.get(CV_CAP_PROP_FRAME_HEIGHT);
    float cameraAspectRatio = cameraWidth / cameraHeight;

    std::cout <<"Camera resolution: " << cameraWidth<<", "<<cameraHeight<<" aspect ratio:
"<<cameraAspectRatio<< std::endl;

    while(true)
    {
        videoSource >> frame;
        if(frame.empty())
            break;
        //Resize frame
        cv::resize(frame, frame, cv::Size(320, 320 / cameraAspectRatio));
        imshow("frame", frame);
        waitKey(20);
    }
    waitKey(0);
    return 0;
}
```

cv::VideoCapture° °

```
#include <iostream>

#include "opencv2/highgui/highgui.hpp"
#include "opencv2/imgproc/imgproc.hpp"
#include "opencv2/core/core.hpp"

using namespace cv;
VideoCapture videoSource;
Mat frame;

int main()
{
    if(!videoSource.open(0)) //if more cameras available use 1,2,...
        return 1;

    while(true)
    {
        videoSource >> frame;
        if(frame.empty())
            break;
        imshow("Webcam", frame); //or any kind of precessing
        if(waitKey(1)==27)
            break;//stop capturing is ESC pressed
    }

    return 0;
}
```

cv :: VideoWriter°

```
#include "opencv2/highgui/highgui.hpp"
#include <iostream>

using namespace cv;
using namespace std;

int main(int argc, char* argv[])
{
    VideoCapture cap(0); // open the video camera no. 0

    if (!cap.isOpened()) // if not success, exit program
    {
        cout << "ERROR: Cannot open the video file" << endl;
        return -1;
    }

    namedWindow("MyVideo",CV_WINDOW_AUTOSIZE); //create a window called "MyVideo"

    double dWidth = cap.get(CV_CAP_PROP_FRAME_WIDTH); //get the width of frames of the video
    double dHeight = cap.get(CV_CAP_PROP_FRAME_HEIGHT); //get the height of frames of the
    video

    cout << "Frame Size = " << dWidth << "x" << dHeight << endl;

    Size frameSize(static_cast<int>(dWidth), static_cast<int>(dHeight));

    VideoWriter oVideoWriter ("D:/MyVideo.avi", CV_FOURCC('P','I','M','l'), 20, frameSize,
```



```

true); //initialize the VideoWriter object

    if ( !oVideoWriter.isOpened() ) //if not initialize the VideoWriter successfully, exit the
program
    {
        cout << "ERROR: Failed to write the video" << endl;
        return -1;
    }

    while (1)
    {

        Mat frame;

        bool bSuccess = cap.read(frame); // read a new frame from video

        if (!bSuccess) //if not success, break loop
        {
            cout << "ERROR: Cannot read a frame from video file" << endl;
            break;
        }

        oVideoWriter.write(frame); //writer the frame into the file

        imshow("MyVideo", frame); //show the frame in "MyVideo" window

        if (waitKey(10) == 27) //wait for 'esc' key press for 30ms. If 'esc' key is pressed, break
loop
        {
            cout << "esc key is pressed by user" << endl;
            break;
        }
    }

    return 0;

}

```

Live Capture^o

```

#include <fstream>
#include <string>

#include <opencv2/highgui/highgui.hpp>
#include <opencv2/core/core.hpp>
#include <opencv2/imgproc/imgproc.hpp>

int main()
{
    std::stringstream file; // to write the file name

    cv::VideoCapture cap(0); // create a capture object

    int counter = 0; // Create counter

    while(true) // infinite loop
    {
        cv::Mat frame; // Create a object
    }
}

```

```
cap.read(frame); // read the frame

file << "/home/user/path_to_your_folder/image" << counter << ".jpg"; // file name

cv::imwrite(file.str(), frame);

counter++; // increment the counter
}

return 0;
}
```

<https://riptutorial.com/zh-TW/opencv/topic/6658/>

9:

Examples

```
cv::Mat img
```

```
img = cv::Scalar(blueVal,greenVal,redVal);
```

```
cv::Mat::setTo()
```

```
img = cv::Scalar(blueVal,greenVal,redVal);
```

OpenCV C API `IplImage* img`

```
img = cv::Scalar(blueVal,greenVal,redVal);
```

OpenCVRGB / BGRHSV。。

CV_8UC3 3ucharCV_8U1ucharCV_32FC3CV_64F。

RGB`imread`。

```
Mat rgb = imread('path/to/rgb/image', CV_LOAD_IMAGE_COLOR);  
//to set RED pixel value of (i,j)th to X,  
rgb.at<Vec3b>(i,j)[0] = X;
```

```
Mat rgb = imread('path/to/rgb/image', CV_LOAD_IMAGE_COLOR);  
//to set RED pixel value of (i,j)th to X,  
rgb.at<Vec3b>(i,j)[0] = X;
```

OpenCVCV_8U0255.BW。

OpenCV - kmeans。。

```
#include <opencv2/opencv.hpp> #include <vector> using namespace std; using namespace cv; int  
main() { Mat3b img = imread("test.jpg"); z }
```

```
imshow("Original", img);  
  
// Cluster  
  
int K = 8;  
int n = img.rows * img.cols;  
Mat data = img.reshape(1, n);  
data.convertTo(data, CV_32F);  
  
Mat labels;  
Mat1f colors;  
kmeans(data, K, labels, cv::TermCriteria(), 1, cv::KMEANS_PP_CENTERS, colors);
```

```
for (int i = 0; i < n; ++i)
{
    data.at<float>(i, 0) = colors(labels.at<int>(i), 0);
    data.at<float>(i, 1) = colors(labels.at<int>(i), 1);
    data.at<float>(i, 2) = colors(labels.at<int>(i), 2);
}

Mat reduced = data.reshape(3, img.rows);
reduced.convertTo(reduced, CV_8U);

imshow("Reduced", reduced);
waitKey(0);

return 0;
```

```
#include opencv2/opencv.hpp> #include vector> using namespace std; using namespace cv; int
main() { Mat3b img = imread("test.jpg"); z }
```

<https://riptutorial.com/zh-TW/opencv/topic/6307/>

10:

1. **C++** void GaussianBlur(InputArray src, OutputArray dst, Size_32F ksize, double sigmaX, double sigmaY = 0, int borderType = BORDER_DEFAULT)

SRC	CV_8U CV_16U CV_16S CV_32FCV_64F °
DST	src
ksize	° ksize.widthksize.height ° sigma *
sigmaX	X °
sigmaY	Y ° sigmaYsigmaX sigmaXksize.widthksize.height° ksize sigmaXsigmaY °
borderType	°

Examples

C++

- °
- °
- °

OpenCVGaussianBlur() ° °

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

using namespace std;
using namespace cv;

int main(int argc, char** argv){

    Mat image , blurredImage;

    // Load the image file
    image = imread(argv[1], CV_LOAD_IMAGE_COLOR);

    // Report error if image could not be loaded
    if(!image.data){
        cout<<"Error loading image" << "\n";
        return -1;
    }

    // Apply the Gaussian Blur filter.
```

```

// The Size object determines the size of the filter (the "range" of the blur)
GaussianBlur( image, blurredImage, Size( 9, 9 ), 1.0);

// Show the blurred image in a named window
imshow("Blurred Image" , blurredImage);

// Wait indefinitely untill the user presses a key
waitKey(0);

return 0;
}

```

◦

Python



```

import cv2
image_path= 'd:/contour.png'
img = cv2.imread(image_path)

#display image before thresholding
cv2.imshow('I am an image display window',img)
cv2.waitKey(0)

#convert image to gray scale - needed for thresholding
img_gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

#apply threshold to gray image to obtain binary image

threshold=150 #value above which pixel values will be set to max_value
max_value=255 #value to which pixels above threshold will be set
threshold_stype=cv2.THRESH_BINARY #default threshold method

ret, img_binary = cv2.threshold(img_gray, threshold, max_value, threshold_stype)

#display image after thresholding
cv2.imshow('image after applying threshold',img_binary)
cv2.waitKey(0)

#save the binary image
cv2.imwrite('d:/binary.png',img_binary)
cv2.destroyAllWindows()

```



◦

;◦ edge◦ ;;◦

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

void main(int argc, char* argv[]) {
    if(argc==1) {
        std::cout << argv[0] << " <image>" << endl;
        return;
    }

    cv::Mat image, output;
    image = cv::imread(argv[1]);
    if(image.empty()) {
        std::cout << "Unable to load the image: " << argv[1] << endl;
        return;
    }

    cv::bilateralFilter(image, output, 3, 5, 3);
}
```

<https://riptutorial.com/zh-TW/opencv/topic/2032/>

11: C ++.....

OpenCV.....° ° °

Examples

```
#include <opencv2/core/core.hpp>
#include <opencv2/highgui/highgui.hpp>
#include <opencv2/imgproc.hpp> // drawing shapes
#include <iostream>

int main( int argc, char** argv )
{
    // First create a black image.
    cv::Mat image(500,500, CV_8UC3, cv::Scalar(0,0,0));

    // Check if the image is created successfully.
    if( !image.data ){
        std::cout << "Could not open or find the image" << std::endl ;
        exit(EXIT_FAILURE);
    }

    //#####( Draw Line )#####
    cv::Point p1(100,100), p2(200,100);
    cv::Scalar colorLine(0,255,0); // Green
    int thicknessLine = 2;

    cv::line(image, p1, p2, colorLine, thicknessLine);

    //#####( Draw Circle )#####
    // unfilled circle
    cv::Point centerCircle1(250,250);
    int radiusCircle = 30;
    cv::Scalar colorCircle1(0,0,255);
    int thicknessCircle1 = 2;

    cv::circle(image, centerCircle1, radiusCircle, colorCircle1, thicknessCircle1);

    // filled circle
    cv::Point centerCircle2(400,100);
    cv::Scalar colorCircle2(0,100,0);

    cv::circle(image, centerCircle2, radiusCircle, colorCircle2, CV_FILLED);

    //#####( Draw Rectangle )#####
    // unfilled
    cv::Point p3(400,400), p4(450,450);
    cv::Scalar colorRectangle1(0,0,255);
    int thicknessRectangle1 = 3;

    cv::rectangle(image, p3, p4, colorRectangle1, thicknessRectangle1);

    // filled
    cv::Point p5(100,400), p6(150,450);
    cv::Scalar colorRectangle2(255,0,255);
```



```

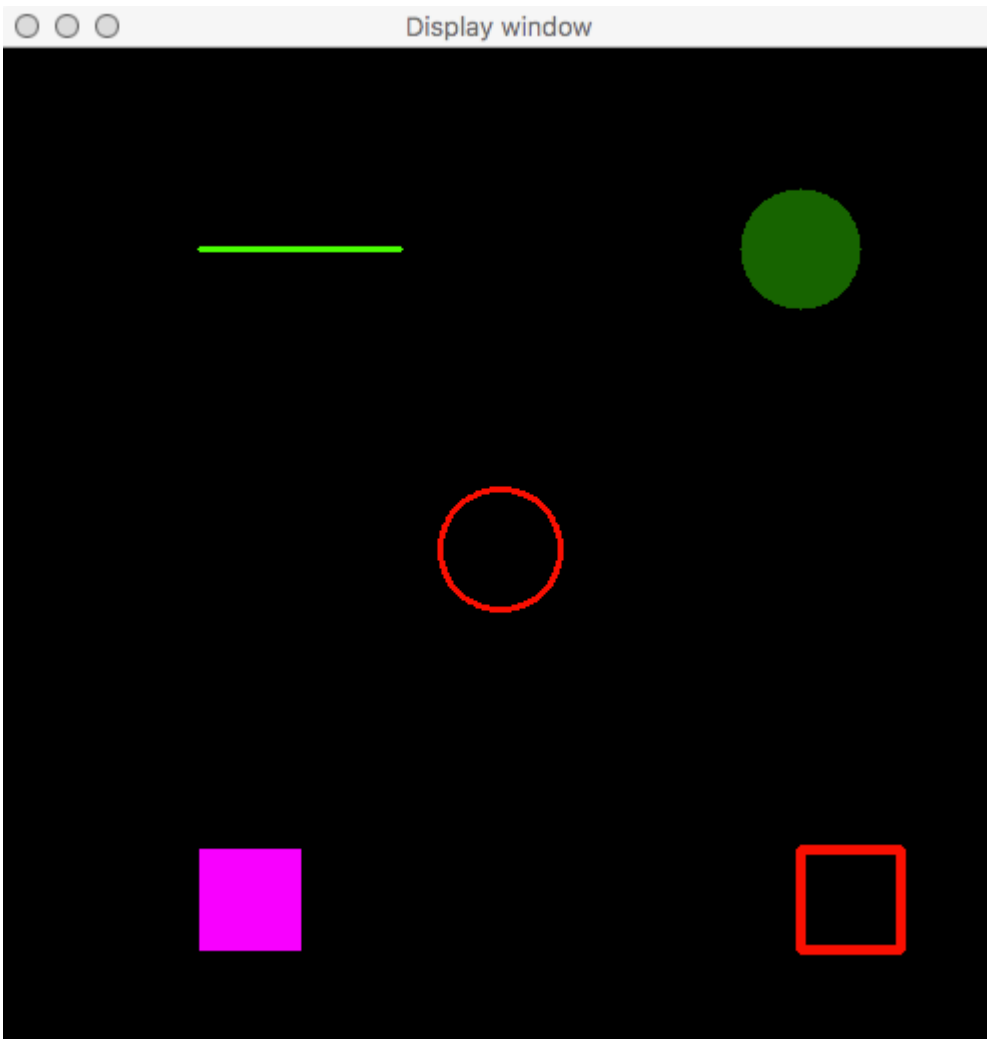
cv::rectangle(image, p5, p6, colorRectangle2, CV_FILLED);

//#####( Draw Shapes on Image )#####
cv::namedWindow( "Display window", cv::WINDOW_AUTOSIZE );
cv::imshow( "Display window", image );

cv::waitKey(0);

return 0;
}

```



g ++OpenCV 3.2 Mac

```

#include <opencv2/core/core.hpp>
#include <opencv2/highgui/highgui.hpp>
#include <opencv2/imgproc.hpp> // drawing shapes
#include <iostream>

int main( int argc, char** argv )
{
    // First create a black image.
    cv::Mat image(500,500, CV_8UC3, cv::Scalar(0,0,0));

```

```

// Check if the image is created successfully.
if( !image.data ){
    std::cout << "Could not open or find the image" << std::endl ;
    exit(EXIT_FAILURE);
}

//#####( Draw Line )#####
cv::Point p1(100,100), p2(200,100);
cv::Scalar colorLine(0,255,0); // Green
int thicknessLine = 2;

cv::line(image, p1, p2, colorLine, thicknessLine);

//#####( Draw Circle )#####
// unfilled circle
cv::Point centerCircle1(250,250);
int radiusCircle = 30;
cv::Scalar colorCircle1(0,0,255);
int thicknessCircle1 = 2;

cv::circle(image, centerCircle1, radiusCircle, colorCircle1, thicknessCircle1);

// filled circle
cv::Point centerCircle2(400,100);
cv::Scalar colorCircle2(0,100,0);

cv::circle(image, centerCircle2, radiusCircle, colorCircle2, CV_FILLED);

//#####( Draw Rectangle )#####
// unfilled
cv::Point p3(400,400), p4(450,450);
cv::Scalar colorRectangle1(0,0,255);
int thicknessRectangle1 = 3;

cv::rectangle(image, p3, p4, colorRectangle1,thicknessRectangle1);

// filled
cv::Point p5(100,400), p6(150,450);
cv::Scalar colorRectangle2(255,0,255);

cv::rectangle(image, p5, p6, colorRectangle2, CV_FILLED);

//#####( Draw Shapes on Image )#####
cv::namedWindow( "Display window", cv::WINDOW_AUTOSIZE );
cv::imshow( "Display window", image );

cv::waitKey(0);

return 0;
}

```

C ++..... <https://riptutorial.com/zh-TW/opencv/topic/9749/c-plusplus----->

12: Java

- `CascadeClassifier cascade = CascadeClassifier("cascade.xml"); //cascade.xml`
- `Mat image = Imgcodecs.imread("image.png"); //image.png Mat Matrix`
- `MatOfRect = MatOfRect; //MatOfRect`
- `detections.toArray; //Rect`
- `Imgproc.rectangle(image, new Point(rect.x, rect.y), new Point(rect.x + rect.width, rect.y + rect.height), new Scalar(0, 255, 0)); //Point xy Point xy Mat "image". "rect" Rect detections.toArray. OpenCV Point.`
- `Imgcodecs.imwrite("output.png", image); //Mat "image" "output.png"`
- `CascadeClassifier.detectMultiScale; //Mat "image" MatOfRect ""`
- `CascadeClassifier.detectMultiScale scaleFactor minNeighbors flags minSize maxSize; // . .`
- `Imgproc.ellipse(0, 0, 360, 255, 0, 255, 0); //center. OpenCV Point.`

	◦ = 1.1
minNeighbors	◦ = 4
	◦ 0 ◦ = 0
minSize	◦ OpenCVSize ◦ CPU ◦
MAXSIZE	◦ OpenCVSize ◦ CPU ◦
	OpenCVSize ◦ ◦
	◦
	◦ 0 8 4 CV_AA ◦ = 8

Examples

◦

OpenCV 3.1.

```
import org.opencv.core.Mat;
import org.opencv.core.MatOfRect;
import org.opencv.core.Point;
import org.opencv.core.Rect;
import org.opencv.core.Scalar;
import org.opencv.imgcodecs.Imgcodecs;
import org.opencv.imgproc.Imgproc;
import org.opencv.objdetect.CascadeClassifier;
```

```

public class Classifier {
    private CascadeClassifier diceCascade = new
        CascadeClassifier("res/newMethod/diceCascade.xml");
    private Mat image;
    private String loc = "path/to/image.png";
    private String output = "path/to/output.png";

    public void detImg() {

        Mat image = Imgcodecs.imread(loc); // Reads the image

        MatOfRect diceDetections = new MatOfRect(); // Output container
        diceCascade.detectMultiScale(image, diceDetections); // Performs the detection

        // Draw a bounding box around each detection.
        for (Rect rect : diceDetections.toArray()) {
            Imgproc.rectangle(image, new Point(rect.x, rect.y),
                new Point(rect.x + rect.width, rect.y + rect.height),
                new Scalar(0, 255, 0));
        }

        // Save the visualized detection.
        Imgcodecs.imwrite(output, image);

    }
}

```

diceDetections.toArray()Rect[]◦ Rect x y widthheight◦ xy widthheightwidthheightint◦◦
 Imgproc.rectangle

```

import org.opencv.core.Mat;
import org.opencv.core.MatOfRect;
import org.opencv.core.Point;
import org.opencv.core.Rect;
import org.opencv.core.Scalar;
import org.opencv.imgcodecs.Imgcodecs;
import org.opencv.imgproc.Imgproc;
import org.opencv.objdetect.CascadeClassifier;

public class Classifier {
    private CascadeClassifier diceCascade = new
        CascadeClassifier("res/newMethod/diceCascade.xml");
    private Mat image;
    private String loc = "path/to/image.png";
    private String output = "path/to/output.png";

    public void detImg() {

        Mat image = Imgcodecs.imread(loc); // Reads the image

        MatOfRect diceDetections = new MatOfRect(); // Output container
        diceCascade.detectMultiScale(image, diceDetections); // Performs the detection

        // Draw a bounding box around each detection.
        for (Rect rect : diceDetections.toArray()) {
            Imgproc.rectangle(image, new Point(rect.x, rect.y),
                new Point(rect.x + rect.width, rect.y + rect.height),
                new Scalar(0, 255, 0));
        }
    }
}

```

```

        // Save the visualized detection.
        Imgcodecs.imwrite(output, image);
    }
}

```

Point ◦ ◦ widthheightxyend ◦

Point **Java**Point ◦ **OpenCV**Point

VideoCapture ◦

```

import org.opencv.core.Mat;
import org.opencv.core.MatOfRect;
import org.opencv.core.Point;
import org.opencv.core.Rect;
import org.opencv.core.Scalar;
import org.opencv.imgcodecs.Imgcodecs;
import org.opencv.imgproc.Imgproc;
import org.opencv.objdetect.CascadeClassifier;
import org.opencv.videoio.VideoCapture;

public class Classifier {
    private CascadeClassifier diceCascade = new
        CascadeClassifier("res/newMethod/diceCascade.xml");
    private Mat image;
    private String loc = "path/to/image.png";
    private String output = "path/to/output.png";
    private VideoCapture vc = new VideoCapture();

    public void detImg() {
        vc.open(0); // Opens the video stream

        Mat image = new Mat(); // Creates an empty matrix
        vc.read(image); // Reads the image from the video stream and
            writes it to the image matrix.

        MatOfRect diceDetections = new MatOfRect(); // Output container
        diceCascade.detectMultiScale(image, diceDetections); // Performs the detection

        // Draw a bounding box around each detection.
        for (Rect rect : diceDetections.toArray()) {
            Imgproc.rectangle(image, new Point(rect.x, rect.y),
                new Point(rect.x + rect.width, rect.y + rect.height),
                new Scalar(0, 255, 0));
        }

        // Save the visualized detection.
        Imgcodecs.imwrite(output, image);

        vc.release(); // Closes the stream.
    }
}

```

MatBufferedImage

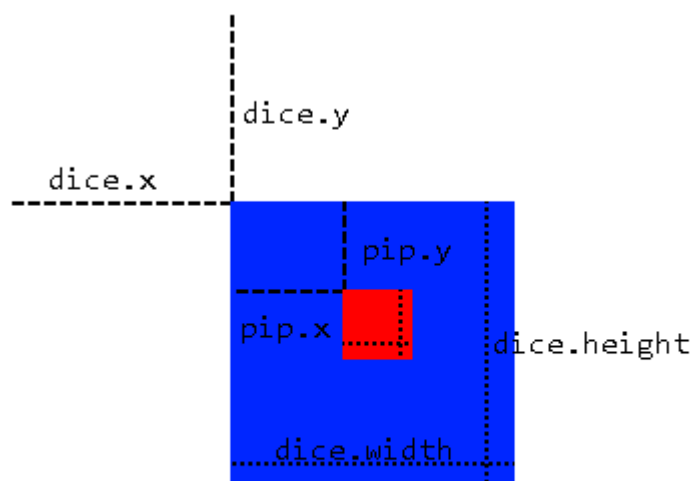
Mat `javax.swing` `BufferedImage` ◦ Graphics ◦

```
private BufferedImage toBufferedImage(Mat m) {
    if (!m.empty()) {
        int type = BufferedImage.TYPE_BYTE_GRAY;
        if (m.channels() > 1) {
            type = BufferedImage.TYPE_3BYTE_BGR;
        }
        int bufferSize = m.channels() * m.cols() * m.rows();
        byte[] b = new byte[bufferSize];
        m.get(0, 0, b); // get all the pixels
        BufferedImage image = new BufferedImage(m.cols(), m.rows(), type);
        final byte[] targetPixels = ((DataBufferByte)
        image.getRaster().getDataBuffer()).getData();
        System.arraycopy(b, 0, targetPixels, 0, b.length);
        return image;
    }

    return null;
}
```

Dice ◦ ◦

“” ◦ OpenCV ◦



◦ ◦

- ◦
- ◦

`MatOfRect` ◦ `MatOfRecttoArray()` `Rect[]` ◦ `RectMat` “” `Rect x, y, width, height` `Mat` ◦ `Rect` ◦

`Rect` `pips` ◦ 'dice.x' `dice.y` `Point` ◦

```

import org.opencv.core.Mat;
import org.opencv.core.MatOfRect;
import org.opencv.core.Point;
import org.opencv.core.Rect;
import org.opencv.core.Scalar;
import org.opencv.core.Size;
import org.opencv.imgcodecs.Imgcodecs;
import org.opencv.imgproc.Imgproc;
import org.opencv.objdetect.CascadeClassifier;
import org.opencv.videoio.VideoCapture;

public class Classifier {

    private CascadeClassifier diceCascade =
        new CascadeClassifier("res/newMethod/diceCascade.xml");
    private CascadeClassifier pipCascade =
        new CascadeClassifier("res/newMethod/pipCascade6.xml");
    private VideoCapture vc = new VideoCapture();
    private Mat image;

    public void openVC(int index) {
        vc.open(index);
    }

    public void closeVC() {
        vc.close();
    }

    public Mat getNextImage() {
        image = new Mat();
        vc.read(image); // Sets the matrix to the current livestream frame.

        MatOfRect diceDetections = new MatOfRect(); // Output container

        // See syntax for explanations on addition parameters
        diceCascade.detectMultiScale(image, diceDetections, 1.1, 4, 0, new Size(20, 20),
            new Size(38, 38));

        // Iterates for every Dice ROI
        for (int i = 0; i < diceDetections.toArray().length; i++) {
            Rect diceRect = diceDetections.toArray()[i];

            // Draws rectangles around our detected ROI
            Point startingPoint = new Point(diceRect.x, diceRect.y);
            Point endingPoint = new Point(diceRect.x + diceRect.width,
                diceRect.y + diceRect.height);
            Imgproc.rectangle(image, startingPoint, endingPoint, new Scalar(255, 255, 0));

            MatOfRect pipDetections = new MatOfRect();

            pipCascade.detectMultiScale(image.submat(diceRect), pipDetections, 1.01, 4, 0,
                new Size(2, 2), new Size(10, 10));

            // Gets the number of detected pips and draws a cricle around the ROI
            for (int y = 0; y < pipDetections.toArray().length; y++) {
                // Provides the relative position of the pips to the dice ROI
                Rect pipRect = pipDetections.toArray()[y];

                // See syntax explanation
                // Draws a circle around our pips
                Point center = new Point(diceRect.x + pipRect.x + pipRect.width / 2,

```

```

        diceRect.y + pipRect.y + pipRect.height / 2);
        Imgproc.ellipse(image, center, new Size(pipRect.width / 2, pipRect.height /
2),
        0, 0, 360, new Scalar(255, 0, 255), 1, 0, 0);
    }
}

return image;
}
}

```

getNextImage()MatBufferImage BufferedImage ◦

Java <https://riptutorial.com/zh-TW/opencv/topic/6377/java>

13:

OpenCV。 DataType Point Vec Size Rect Scalar PtrMat。

Examples

OpenCV unsigned char, bool, signed char, unsigned short, signed short, int, float, double。

OpenCV CV_<bit-depth>{U|S|F}C(<number_of_channels>) U: unsigned S:signed F:floating point。

CV_32FC2322。

```
#define CV_8U    0
#define CV_8S    1
#define CV_16U   2
#define CV_16S   3
#define CV_32S   4
#define CV_32F   5
#define CV_64F   6
#define CV_USRTYPE1 7
```

```
#define CV_8U    0
#define CV_8S    1
#define CV_16U   2
#define CV_16S   3
#define CV_32S   4
#define CV_32F   5
#define CV_64F   6
#define CV_USRTYPE1 7
```

。

Mat MatrixnRGBHSV。

Mat width height type channels data flags datastart dataend。

create copyTo convertTo isContinious。

Mat。 100200CV_32FC3

```
int R = 100, C = 200;
Mat m1; m1.create(R,C,CV_32FC3); //creates empty matrix
Mat m2(cv::Size(R, C), CV_32FC3); // creates a matrix with R rows, C columns with data type T
where R and C are integers,
Mat m3(R,C,CV_32FC3); // same as m2
```

```
int R = 100, C = 200;
Mat m1; m1.create(R,C,CV_32FC3); //creates empty matrix
Mat m2(cv::Size(R, C), CV_32FC3); // creates a matrix with R rows, C columns with data type T
where R and C are integers,
Mat m3(R,C,CV_32FC3); // same as m2
```

VEC

Vec **Vector**。 c++ vector **S**。

Vec

```
typedef Vec<type, channels> Vec< channels>< one char for the type>;
```

typeuchar, short, int, float, doubleb, s, i, f, d。

Vec**3b3**。 RGB。

```
typedef Vec<type, channels> Vec< channels>< one char for the type>;
```

Vec

```
typedef Vec<type, channels> Vec< channels>< one char for the type>;
```

<https://riptutorial.com/zh-TW/opencv/topic/9099/>

14:

Examples

◦ ◦ ◦

```
#include "opencv/cv.h"
#include "opencv/highgui.h"
#include "opencv/cxcore.h"

using namespace cv;

int main(int argc, char** argv)
{
    Mat img = imread("image.jpg", CV_LOAD_IMAGE_GRAYSCALE);
    Mat resultImg;
    cvtColor(img, resultImg, CV_GRAY2BGR);

    // threshold the image with gray value of 100
    Mat binImg;
    threshold(img, binImg, 100, 255, THRESH_BINARY);

    // find the contours
    vector<vector<Point>> contours;
    vector<Vec4i> hierarchy;
    findContours(binImg, contours, hierarchy, CV_RETR_CCOMP, CV_CHAIN_APPROX_SIMPLE);

    if(contours.size() <= 0)
    {
        printf("no contours found");
        return 0;
    }
    // filter the contours
    vector<vector<Point>> filteredBlobs;
    Mat centers = Mat::zeros(0,2,CV_64FC1);
    for(int i = 0; i < contours.size(); i++)
    {
        // calculate circularity
        double area = contourArea(contours[i]);
        double arclength = arcLength(contours[i], true);
        double circularity = 4 * CV_PI * area / (arclength * arclength);
        if(circularity > 0.8)
        {
            filteredBlobs.push_back(contours[i]);

            //calculate center
            Moments mu = moments(contours[i], false);
            Mat centerpoint = Mat(1,2,CV_64FC1);
            centerpoint.at<double>(i,0) = mu.m10 / mu.m00; // x-coordinate
            centerpoint.at<double>(i,1) = mu.m01 / mu.m00; // y-coordinate
            centers.push_back(centerpoint);
        }
    }

    if(filteredBlobs.size() <= 0)
    {
        printf("no circular blobs found");
    }
}
```

```
        return 0;
    }
    drawContours(resultImg, filteredBlobs, -1, Scalar(0,0,255), CV_FILLED, 8);

    imshow("Blobs",resultImg);
    waitKey(0);
    return 0;
}
```

<https://riptutorial.com/zh-TW/opencv/topic/6589/>

15:

Examples

Java

Java

```
import org.opencv.core.Core;
import org.opencv.core.Core.MinMaxLocResult;
import org.opencv.core.Mat;
import org.opencv.core.Point;
import org.opencv.core.Scalar;
import org.opencv.imgcodecs.Imgcodecs;
import org.opencv.imgproc.Imgproc;

public class TemplateMatching {

    public static void main(String[] args) {

        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        Mat source=null;
        Mat template=null;
        String filePath="C:\\Users\\mesutpiskin\\Desktop\\Object Detection\\Template
Matching\\Sample Image\\";
        //Load image file
        source=Imgcodecs.imread(filePath+"kapadokya.jpg");
        template=Imgcodecs.imread(filePath+"balon.jpg");

        Mat outputImage=new Mat();
        int machMethod=Imgproc.TM_CCOEFF;
        //Template matching method
        Imgproc.matchTemplate(source, template, outputImage, machMethod);

        MinMaxLocResult mmr = Core.minMaxLoc(outputImage);
        Point matchLoc=mmr.maxLoc;
        //Draw rectangle on result image
        Imgproc.rectangle(source, matchLoc, new Point(matchLoc.x + template.cols(),
            matchLoc.y + template.rows()), new Scalar(255, 255, 255));

        Imgcodecs.imwrite(filePath+"sonuc.jpg", source);
        System.out.println("Complated.");
    }

}
```



Resource Image



Template



Result Im

<https://riptutorial.com/zh-TW/opencv/topic/6735/>

16: Java

Examples

```
public class DrawRectangle {  
  
    public static void main(String[] args) {  
        //Load native library  
        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);  
        //image container object  
        Mat goruntuDizisi=new Mat();  
        //Read image in file system  
        goruntuDizisi=Imgcodecs.imread("C:\\image.jpg");  
        //Draw rectangle  
        //Parameters: mat object for drawing, point coordinates (x1,y1,x2,y2) and color BGR  
        Imgproc.rectangle(goruntuDizisi, new Point(10,100), new Point(100,200),new  
        Scalar(76,255,0));  
        Imgcodecs.imwrite("C:\\Yeni_kiz_kulesi.jpg", goruntuDizisi);  
        System.out.println("Writed");  
    }  
}
```

Java <https://riptutorial.com/zh-TW/opencv/topic/6153/java>

17:

Examples

```
import numpy as np
import cv2

#loading haarcascade classifiers for face and eye
#You can find these cascade classifiers here
#https://github.com/opencv/opencv/tree/master/data/haarcascades
#or where you download opencv inside data/haarcascades

face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
eye_cascade = cv2.CascadeClassifier('haarcascade_eye.xml')

#loading the image
img = cv2.imread('civil_war.jpg')

#converting the image to gray scale
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

#detecting face in the grayscale image
faces = face_cascade.detectMultiScale(gray, 1.3, 5)

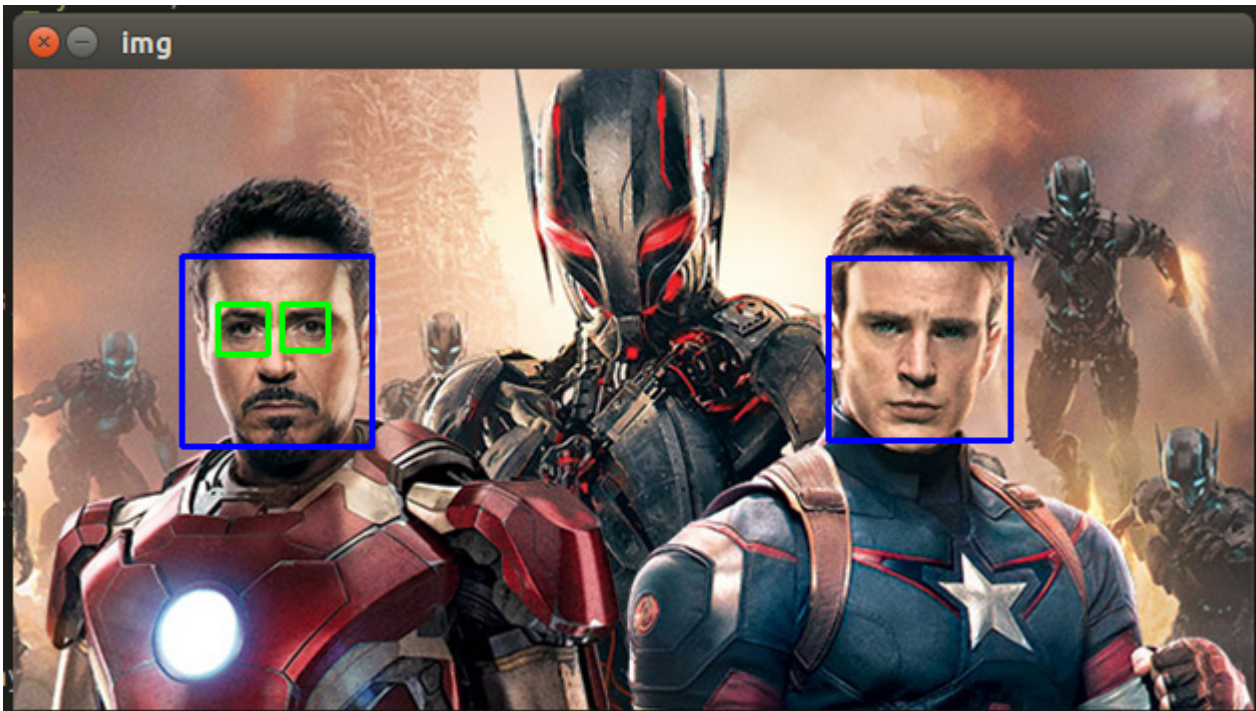
#iterate through each detected face
for (x,y,w,h) in faces:
    cv2.rectangle(img, (x,y), (x+w,y+h), (255,0,0),2) #draw rectangle to each detected face

    #take the roi of the face (region of interest)
    roi_gray = gray[y:y+h, x:x+w]
    roi_color = img[y:y+h, x:x+w]

    #detect the eyes
    eyes = eye_cascade.detectMultiScale(roi_gray)
    for (ex,ey,ew,eh) in eyes:

        #draw rectangle for each eye
        cv2.rectangle(roi_color, (ex,ey), (ex+ew,ey+eh), (0,255,0),2)

#show the image
cv2.imshow('img',img)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

Java

Java

```
import org.opencv.core.Mat;
import org.opencv.core.MatOfRect;
import org.opencv.core.Point;
import org.opencv.core.Rect;
import org.opencv.core.Scalar;
import org.opencv.highgui.Highgui;
import org.opencv.highgui.VideoCapture;
import org.opencv.objdetect.CascadeClassifier;

public class FaceDetector{

    public static void main(String[] args) {

        System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
        //Create object
        CascadeClassifier faceDetector = new
        CascadeClassifier(FaceDetector.class.getResource("haarcascade_frontalface_default.xml").getPath());

        //Read image
        Mat image = Highgui.imread("sourceimage.jpg");

        /*
        //Or read from webcam

        * Mat image=new Mat();
        *VideoCapture videoCapture=new VideoCapture(0);
        *videoCapture.read(image);
        */
        MatOfRect faceDetections = new MatOfRect();
        //Result list
        faceDetector.detectMultiScale(image, faceDetections);
```

```

        for (Rect rect : faceDetections.toArray()) {
            //Draw rectangle on result

            Core.rectangle(image, new Point(rect.x, rect.y), new Point(rect.x + rect.width,
rect.y + rect.height),
                new Scalar(0, 255, 0));
        }

        //write result
        Highgui.imwrite("result.png", image);
        System.out.println("Succesfull");
    }
}

```



haar

C ++

```

#include "opencv2/objdetect/objdetect.hpp"
#include "opencv2/highgui/highgui.hpp"
#include "opencv2/imgproc/imgproc.hpp"

#include <iostream>
#include <stdio.h>

using namespace std;
using namespace cv;

// Function Headers
void detectAndDisplay(Mat frame);

// Global variables
string face_cascade_name = "../data/haarcascade_frontalface_alt2.xml";
CascadeClassifier face_cascade;

// Function main
int main(void)
{
    // Load the cascade
    if (!face_cascade.load(face_cascade_name)) {
        printf("--(!)Error on cascade loading\n");
    }
}

```

```

        return (-1);
    }

    // Read the image file
    Mat frame = imread("d:/obama_01.jpg");

    // Apply the classifier to the frame
    if (!frame.empty())
        detectAndDisplay(frame);
    waitKey(0);
    return 0;
}

// Function detectAndDisplay
void detectAndDisplay(Mat frame)
{
    std::vector<Rect> faces;
    Mat frame_gray;

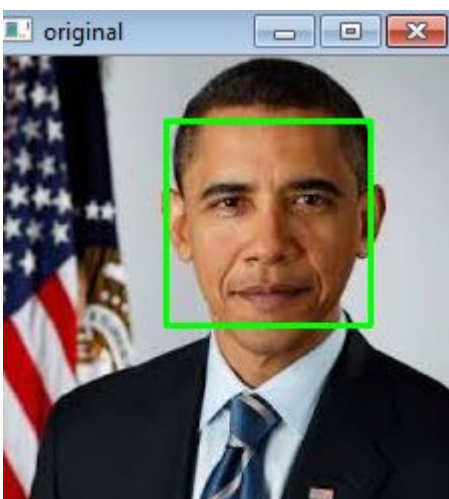
    cvtColor(frame, frame_gray, COLOR_BGR2GRAY);
    equalizeHist(frame_gray, frame_gray);

    // Detect faces
    face_cascade.detectMultiScale(frame_gray, faces, 1.1, 2, 0 | CASCADE_SCALE_IMAGE, Size(30,
30));

    for (int ic = 0; ic < faces.size(); ic++) // Iterate through all current elements
(detected faces)
    {
        Point pt1(faces[ic].x, faces[ic].y); // Display detected faces on main window - live
stream from camera
        Point pt2((faces[ic].x + faces[ic].height), (faces[ic].y + faces[ic].width));
        rectangle(frame, pt1, pt2, Scalar(0, 255, 0), 2, 8, 0);
    }

    imshow("original", frame);
}

```



<https://riptutorial.com/zh-TW/opencv/topic/6562/>

18:

- OpenCVVideoWriter
- FourCC

Examples

OpenCVJava

```
VideoWriter videoWriter;
videoWriter = new VideoWriter(outputFile, VideoWriter.fourcc('x', '2', '6', '4'),
                             fps, frameSize, isRGB);
//We have stated that we will use x264 as codec with FourCC
//For writing, we add the following method and it will write the image we give as parameter in
this call.
public void Write(Mat frame) {
    if(videoWriter.isOpened()==false){
        videoWriter.release();
        throw new IllegalArgumentException("Video Writer Exception: VideoWriter not
opened,"
                                     + "check parameters.");
    }
    //Write video
    videoWriter.write(frame);
}

//With Video Capture for example, we can read images from the camera and write the same video

VideoCapture videoCapture = new VideoCapture(0);
Size frameSize = new Size((int) videoCapture.get(Videoio.CAP_PROP_FRAME_WIDTH), (int)
videoCapture.get(Videoio.CAP_PROP_FRAME_HEIGHT));
VideoWriter videoWriter = new VideoWriter("test.avi", VideoWriter.fourcc('x', '2', '6', '4'),
        videoCapture.get(Videoio.CAP_PROP_FPS), frameSize, true);
while (videoCapture.read(mat)) {
    videoWriter.write(mat);
}
videoCapture.release();
videoWriter.release();
```

<https://riptutorial.com/zh-TW/opencv/topic/9196/>

19:

- edges = cv2. Canny threshold1threshold2 [edges [apertureSize [L2gradient]]]
- void Canny InputArrayOutputArraydouble threshold1double threshold2int apertureSize = 3
bool L2gradient = false

1	
2	
apertureSize	Sobel
L2gradient	

Examples

Canny

Canny. OpenCV.

```
import cv2
import sys

# Load the image file
image = cv2.imread('image.png')

# Check if image was loaded improperly and exit if so
if image is None:
    sys.exit('Failed to load image')

# Detect edges in the image. The parameters control the thresholds
edges = cv2.Canny(image, 100, 2500, apertureSize=5)

# Display the output in a window
cv2.imshow('output', edges)
cv2.waitKey()
```

Canny - C ++

c ++canny. Canny.

```
// CannyTutorial.cpp : Defines the entry point for the console application.
// Environment: Visual studio 2015, Windows 10
// Assumptions: Opecv is installed configured in the visual studio project
// Opencv version: OpenCV 3.1
```

```

#include "stdafx.h"
#include<opencv2/highgui/highgui.hpp>
#include<opencv2/imgproc/imgproc.hpp>
#include<string>
#include<iostream>

int main()
{
    //Modified from source:
https://github.com/MicrocontrollersAndMore/OpenCV\_3\_Windows\_10\_Installation\_Tutorial
    cv::Mat imgOriginal;           // input image
    cv::Mat imgGrayscale;          // grayscale of input image
    cv::Mat imgBlurred;            // intermediate blurred image
    cv::Mat imgCanny;              // Canny edge image

    std::cout << "Please enter an image filename : ";
    std::string img_addr;
    std::cin >> img_addr;

    std::cout << "Searching for " + img_addr << std::endl;

    imgOriginal = cv::imread(img_addr);           // open image

    if (imgOriginal.empty()) {                    // if unable to open image
        std::cout << "error: image not read from file\n\n";           // show error message on
command line
        return(0);                                // and exit program
    }

    cv::cvtColor(imgOriginal, imgGrayscale, CV_BGR2GRAY);           // convert to grayscale

    cv::GaussianBlur(imgGrayscale,                // input image
        imgBlurred,                               // output image
        cv::Size(5, 5),                          // smoothing window width and height in pixels
        1.5);                                     // sigma value, determines how much the image
will be blurred

    cv::Canny(imgBlurred,                        // input image
        imgCanny,                               // output image
        100,                                    // low threshold
        200);                                   // high threshold

    // Declare windows
    // Note: you can use CV_WINDOW_NORMAL which allows resizing the window
    // or CV_WINDOW_AUTOSIZE for a fixed size window matching the resolution of the image
    // CV_WINDOW_AUTOSIZE is the default
    cv::namedWindow("imgOriginal", CV_WINDOW_AUTOSIZE);
    cv::namedWindow("imgCanny", CV_WINDOW_AUTOSIZE);

    //Show windows
    cv::imshow("imgOriginal", imgOriginal);
    cv::imshow("imgCanny", imgCanny);

    cv::waitKey(0);                             // hold windows open until user presses a key
    return 0;
}

```

Canny

[opencvCanny](#)

Canny Edge - Python

```
import cv2

def canny_webcam():
    "Live capture frames from webcam and show the canny edge image of the captured frames."

    cap = cv2.VideoCapture(0)

    while True:
        ret, frame = cap.read() # ret gets a boolean value. True if reading is successful (I
think). frame is an
        # uint8 numpy.ndarray

        frame = cv2.GaussianBlur(frame, (7, 7), 1.41)
        frame = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

        edge = cv2.Canny(frame, 25, 75)

        cv2.imshow('Canny Edge', edge)

        if cv2.waitKey(20) == ord('q'): # Introduce 20 milisecond delay. press q to exit.
            break

canny_webcam()
```

Canny Edge ThresholdTrackbars

```
"""
CannyTrackbar function allows for a better understanding of
the mechanisms behind Canny Edge detection algorithm and rapid
prototyping. The example includes basic use case.

2 of the trackbars allow for tuning of the Canny function and
the other 2 help with understanding how basic filtering affects it.
"""
import cv2

def empty_function(*args):
    pass

def CannyTrackbar(img):
    win_name = "CannyTrackbars"

    cv2.namedWindow(win_name)
    cv2.resizeWindow(win_name, 500,100)

    cv2.createTrackbar("canny_th1", win_name, 0, 255, empty_function)
    cv2.createTrackbar("canny_th2", win_name, 0, 255, empty_function)
    cv2.createTrackbar("blur_size", win_name, 0, 255, empty_function)
    cv2.createTrackbar("blur_amp", win_name, 0, 255, empty_function)
```

```

while True:
    cth1_pos = cv2.getTrackbarPos("canny_th1", win_name)
    cth2_pos = cv2.getTrackbarPos("canny_th2", win_name)
    bsize_pos = cv2.getTrackbarPos("blur_size", win_name)
    bamp_pos = cv2.getTrackbarPos("blur_amp", win_name)

    img_blurred = cv2.GaussianBlur(img.copy(), (trackbar_pos3 * 2 + 1, trackbar_pos3 * 2 +
1), bamp_pos)
    canny = cv2.Canny(img_blurred, cth1_pos, cth2_pos)
    cv2.imshow(win_name, canny)

    key = cv2.waitKey(1) & 0xFF
    if key == ord("c"):
        break

    cv2.destroyAllWindows()
    return canny

img = cv2.imread("image.jpg")
canny = CannyTrackbar(img)
cv2.imwrite("result.jpg", canny)

```

<https://riptutorial.com/zh-TW/opencv/topic/6099/>

20: OpenCV

Examples

```
import cv2

image_path= #put your image path here

#use imread() function to read image data to variable img.
img = cv2.imread(image_path)

#display image data in a new window with title 'I am an image display window'
cv2.imshow('I am an image display window',img)

#wait until user hits any key on keyboard
cv2.waitKey(0)

#close any windows opened by opencv
cv2.destroyAllWindows()
```

cv2.imshow

```
import cv2

image_path= #put your image path here

#use imread() function to read image data to variable img.
img = cv2.imread(image_path)

#display image data in a new window with title 'I am an image display window'
cv2.imshow('I am an image display window',img)

#wait until user hits any key on keyboard
cv2.waitKey(0)

#close any windows opened by opencv
cv2.destroyAllWindows()
```

openCV

IPMJPEG

```
import cv2
import numpy as np
import urllib

stream=urllib.urlopen('http://96.10.1.168/mjpg/video.mjpg')
bytes=''
while True:
    bytes+=stream.read(1024)
    a = bytes.find('\xff\xd8') # JPEG start
    b = bytes.find('\xff\xd9') # JPEG end
    if a!=-1 and b!=-1:
        jpg = bytes[a:b+2] # actual image
```

```

bytes= bytes[b+2:] # other informations

# decode to colored image ( another option is cv2.IMREAD_GRAYSCALE )
img = cv2.imdecode(np.fromstring(jpg, dtype=np.uint8),cv2.IMREAD_COLOR)
cv2.imshow('Window name',img) # display image while receiving data
if cv2.waitKey(1) ==27: # if user hit esc
    exit(0) # exit program

```

JPEG0xff 0xd80xff 0xd9 ° ° [SO](#)

OpenCV Java

java

```

import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.imgcodecs.Imgcodecs;

//Load native library
System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
//Mat object used to host the image
Mat imageArray;
//Read image file from file system
imageArray=Imgcodecs.imread("path/to/image");

```

imshowOpenCV-java ° °

```

import org.opencv.core.Core;
import org.opencv.core.Mat;
import org.opencv.imgcodecs.Imgcodecs;

//Load native library
System.loadLibrary(Core.NATIVE_LIBRARY_NAME);
//Mat object used to host the image
Mat imageArray;
//Read image file from file system
imageArray=Imgcodecs.imread("path/to/image");

```

JframeJlabelJlabel °

OpenCV <https://riptutorial.com/zh-TW/opencv/topic/3306/opencv>

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