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Opencv with python by example download

Welcome to a tutorial series, covering OpenCV, which is an image and video processing library with bindings in C++, C, Python, and Java. OpenCV is used for all sorts of image and video analysis, like facial recognition and detection, license plate reading, photo editing, advanced robotic vision, optical character recognition, and a whole lot more. We will be working through many Python examples here. Getting started with OpenCV's Python bindings is actually much easier than many people make it out to be initially. You will need two main libraries, with an optional third: python-OpenCV, Numpy, and Matplotlib. Windows Users: python-OpenCV - There are alternative methods, but this is the easiest. Download the appropriate wheel (.whl) file, and install using pip. See video for help. pip install numpy pip install matplotlib Not familiar with using pip? See the Pip installation tutorial for help. Linux / Mac Users: pip3 install numpy or apt-get install python3-numpy. You may need to apt-get install python3-pip. pip3 install matplotlib or apt-get install python3-matplotlib. apt-get install python3-OpenCV Matplotlib is an optional choice for displaying frames from video or images. We will show a couple of examples using it here. Numpy is used for all things "numbers and Python." We are mainly making use of Numpy's array functionality. Finally, we are using the python-specific bindings for OpenCV called python-OpenCV. There are some operations for OpenCV that you will not be able to do without a full installation of OpenCV (about 3GB in size), but you can actually do quite a bit with the fairly minimal installation of python-OpenCV. We will wind up using the full installation of OpenCV later in this series, so you can feel free to get it if you like, but these 3 modules will keep us busy for a while! Make sure your installations were successful by running Python, and doing: import cv2 import matplotlib import numpy If you get no errors, then you are ready to go. Ready? Let's dive off the deep-end! First, we should understand a few basic assumptions and paradigms when it comes to image and video analysis. With the way just about every video camera records today, recordings are actually frames, displayed one after another, 30-60+ times a second. At the core, however, they are static frames, just like images. Thus, image recognition and video analysis use identical methods for the most part. Some things, like directional tracking, is going to require a succession of images (frames), but something like facial detection, or object recognition can be done with almost the exact same code on images and video. Next, a lot of image and video analysis boils down to simplifying the source as much as possible. This almost always begins with a conversion to grayscale, but it can also be a color filter, gradient, or a combination of these. From here, we can do all sorts of analysis and transformations to the source. Generally, what winds up happening is there is a transformation done, then analysis, then any overlays that we wish to apply are applied back to the original source, which is why you can often see the "finished product" of maybe object or facial recognition being shown on a full-color image or video. Rarely is the data actually processed in raw form like this, however. Some examples of what we can do at a basic level. All of these are done with a basic web cam, nothing special: Background Subtracting: Color filtering: Edge detection: Feature matching for object recognition: General object recognition: In the case of edge detection, the black corresponds to pixel values of (0,0,0), and white lines are (255,255,255). Every picture and frame from a video breaks down to pixels like this, and we can deduce, like in the case of edge detection, where edges are based on where the white pixels are compared to black. Then, if we want to see the original image with the edges marked, we note all of the coordinate locations of white pixels, and then we mark these locations on the original source feed image or video. By the end of this tutorial, you will be able to do all of the above, and be able to train your machine to recognize any object you want. Like I said initially though, the first step is usually to convert to gray scale. Before that, we need to load the image. Thus, let's do it! Throughout this entire tutorial, I greatly encourage you to use your own data to play with. If you have a webcam, definitely use it, otherwise find an image that you think will be fun to work with. If you're having trouble, here's an image of a watch: import cv2 import numpy as np from matplotlib import pyplot as plt img = cv2.imread('watch.jpg',cv2.IMREAD_GRAYSCALE) cv2.imshow('image',img) cv2.waitKey(0) cv2.destroyAllWindows() First, we are importing a few things, those three modules I had you all install. Next, we define img to be cv2.read(image file, parms). The default is going to be IMREAD_COLOR, which is color without any alpha channel. If you're not familiar, alpha is the degree of opaqueness (the opposite of transparency). If you need to retain the alpha channel, you can also use IMREAD_UNCHANGED. Many times, you will be reading in the color version, and later converting it to gray. If you do not have a webcam, this will be the main method you will use throughout this tutorial, loading an image. Rather than using IMREAD_COLOR...etc, you can also use simple numbers. You should be familiar with both options, so you understand what the person is doing. For the second parameter, you can use -1, 0, or 1. Color is 1, grayscale is 0, and the unchanged is -1. Thus, for grayscale, one could do img = cv2.imread('watch.jpg', 0) Once loaded, we use cv2.imshow(title,image) to show the image. From here, we use the cv2.waitKey(0) to wait until any key is pressed. Once that's done, we use cv2.destroyAllWindows() to close everything. As mentioned before, you can also display images with Matplotlib, here's some code for how you might do that: import cv2 import numpy as np from matplotlib import pyplot as plt img = cv2.imread('watch.jpg',cv2.IMREAD_GRAYSCALE) plt.imshow(img, cmap = 'gray', interpolation = 'bicubic') plt.xticks([]), plt.yticks([]) # to hide tick values on X and Y axis plt.plot([200,300,400],[100,200,300],'c', linewidth=5) plt.show() Note that you can plot lines, just as you would or could with any other Matplotlib graph using the pixel locations as coordinates, here. Should you wish to draw on your images, however, Matplotlib is not required. OpenCV provides great methods for this. When you are done making modifications, you can save, like so: cv2.imwrite('watchgray.png',img) Getting images into OpenCV seems easy enough, how about loading video feeds? In the next tutorial, we're going to show how to load in a webcam or video feed. The next tutorial: Loading Video Source OpenCV Python Tutorial Build real-world computer vision applications and develop cool demos using OpenCV for PythonAbout This BookLearn how to apply complex visual effects to images using geometric transformations and image filtersExtract features from an image and use them to develop advanced applicationsBuild algorithms to help you understand the image content and perform visual searchesWho This Book Is ForThis book is intended for Python developers who are new to OpenCV and want to develop computer vision applications with OpenCV-Python. This book is also useful for generic software developers who want to deploy computer vision applications on the cloud. It would be helpful to have some familiarity with basic mathematical concepts such as vectors, matrices, and so on.What You Will LearnApply geometric transformations to images, perform image filtering, and convert an image into a cartoon-like imageDetect and track various body parts such as the face, nose, eyes, ears, and mouthStitch multiple images of a scene together to create a panoramic imageMake an object disappear from an imageIdentify different shapes, segment an image, and track an object in a live videoRecognize an object in an image and build a visual search engineReconstruct a 3D map from imagesBuild an augmented reality applicationIn DetailComputer vision is found everywhere in modern technology. OpenCV for Python enables us to run computer vision algorithms in real time. With the advent of powerful machines, we are getting more processing power to work with. Using this technology, we can seamlessly integrate our computer vision applications into the cloud. Web developers can develop complex applications without having to reinvent the wheel.This book will walk you through all the building blocks needed to build amazing computer vision applications with ease. We start off with applying geometric transformations to images. We then discuss affine and projective transformations and see how we can use them to apply cool geometric effects to photos. We will then cover techniques used for object recognition, 3D reconstruction, stereo imaging, and other computer vision applications.This book will also provide clear examples written in Python to build OpenCV applications. The book starts off with simple beginner's level tasks such as basic processing and handling images, image mapping, and detecting images. It also covers popular OpenCV libraries with the help of examples.The book is a practical tutorial that covers various examples at different levels, teaching you about the different functions of OpenCV and their actual implementation.Style and approachThis is a conversational-style book filled with hands-on examples that are really easy to understand. Each topic is explained very clearly and is followed by a programmatic implementation so that the concept is solidified. Each topic contributes to something bigger in the following chapters, which helps you understand how to piece things together to build something big and complex.

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