

3/4 Lab

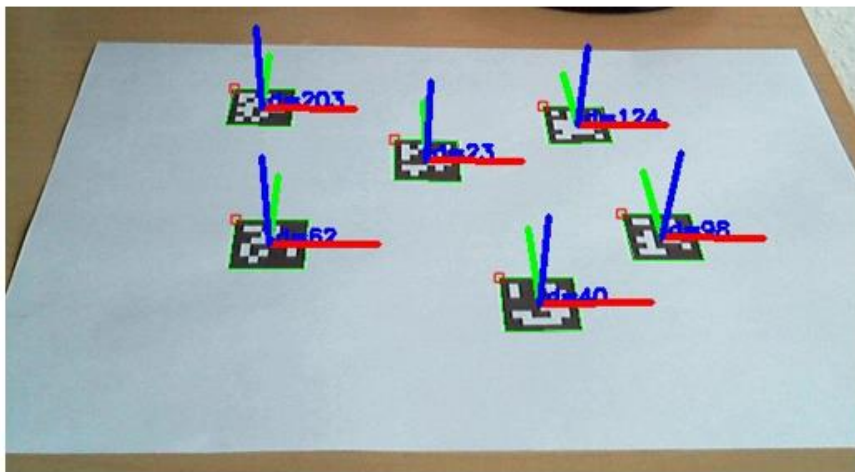
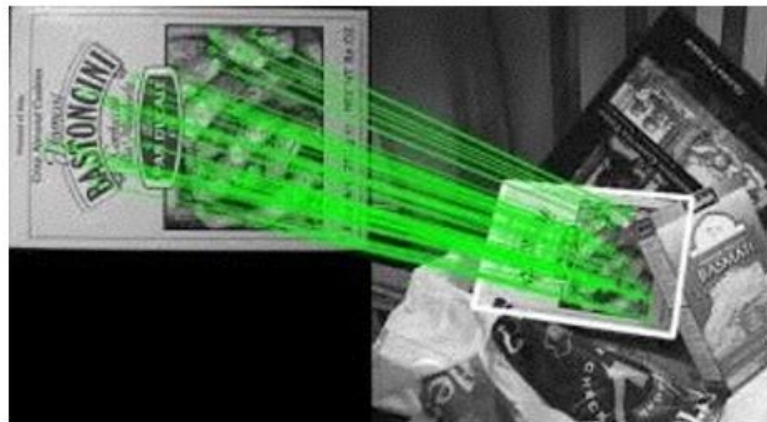
1. OpenCV introduction
2. Python 3 & opencv installation
3. Lab01



- core. The Core Functionality
- imgproc. Image Processing
- imgcodecs. Image file reading and writing
- videoio. Media I/O
- highgui. High-level GUI and Media I/O
- video. Video Analysis
- calib3d. Camera Calibration and 3D Reconstruction
- features2d. 2D Features Framework
- objdetect. Object Detection
- ml. Machine Learning
- flann. Clustering and Search in Multi-Dimensional Spaces
- photo. Computational Photography
- stitching. Images stitching
- cuda. CUDA-accelerated Computer Vision
- cudaarithm. CUDA-accelerated Operations on Matrices
- cudabgsegm. CUDA-accelerated Background Segmentation
- cudacodec. CUDA-accelerated Video Encoding/Decoding
- cudafeatures2d. CUDA-accelerated Feature Detection and Description
- cudafilters. CUDA-accelerated Image Filtering
- cudaimgproc. CUDA-accelerated Image Processing
- cudaoptflow. CUDA-accelerated Optical Flow
- cudastereo. CUDA-accelerated Stereo Correspondence
- cudawarping. CUDA-accelerated Image Warping
- shape. Shape Distance and Matching
- superres. Super Resolution
- videostab. Video Stabilization
- viz. 3D Visualizer
- bioinspired. Biologically inspired vision models and derivated tools
- cvv. GUI for Interactive Visual Debugging of Computer Vision Programs
- datasets. Framework for working with different datasets
- face. Face Recognition
- Binary descriptors for lines extracted from an image
- optflow. Optical Flow Algorithms
- reg. Image Registration
- rgbd. RGB-Depth Processing
- Saliency API
- surface_matching. Surface Matching

feature detection

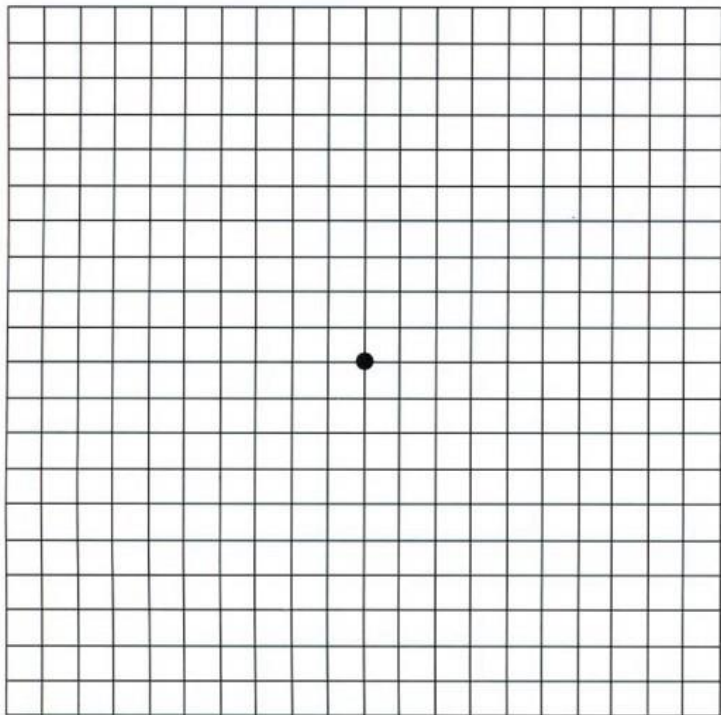
特征检测



pattern recognition

Mat

→ 圖片讀進來存成 matrix



rows: 長

cols: 寬

type: 像素型態

channels: 通道數

(灰階: 1 channel, 彩色: 3 channels)

normal:

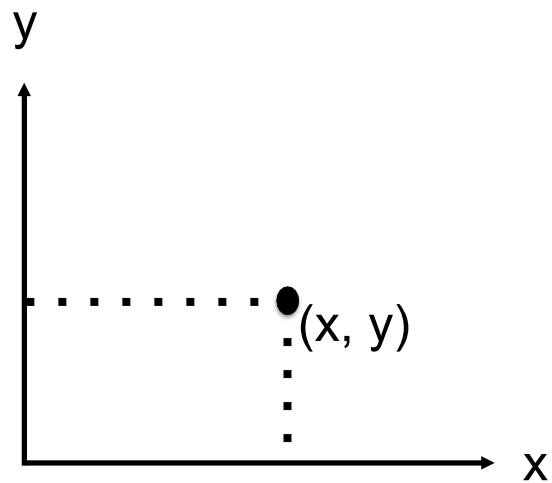


image:

```
0/0---column--->  
|  
|  
row  
|  
v
```

Python

長 寬 channel數 像素型態
↓ ↓ ↓ ↓

```
blank_image = np.zeros((height,width,3), np.uint8)
```

```
newImage = myImage.copy()
```

↓
複製 image 若沒用 copy
對 new 後果的改动, 原本也會改到

Mat value access

	Column 0	Column 1	Column ...	Column m
Row 0	0,0	0,1	...	0, m
Row 1	1,0	1,1	...	1, m
Row ...	...,0	...,1	...	..., m
Row n	n,0	n,1	n,...	n, m

3-channel : B, G, R

	Column 0			Column 1			Column ...			Column m		
Row 0	0,0	0,0	0,0	0,1	0,1	0,1	...	...	...	0, m	0, m	0, m
Row 1	1,0	1,0	1,0	1,1	1,1	1,1	...	...	...	1, m	1, m	1, m
Row ...	...,0	...,0	...,0	...,1	...,1	...,1	...	...	...	..., m	..., m	..., m
Row n	n,0	n,0	n,0	n,1	n,1	n,1	n,...	n,...	n,...	n, m	n, m	n, m

操作像素

image[row, col, channel]

標頭引入

```
import numpy as np  
import cv2
```

讀寫圖片

讀取:

```
img = cv2.imread('image.jpg')
```

儲存:

```
cv2.imwrite('output.jpg', img)
```

✓ 要存的東西

顯示圖片

秀出影像:

```
# 顯示圖片  
cv2.imshow('My Image', img)
```

視窗名稱

要show的東西



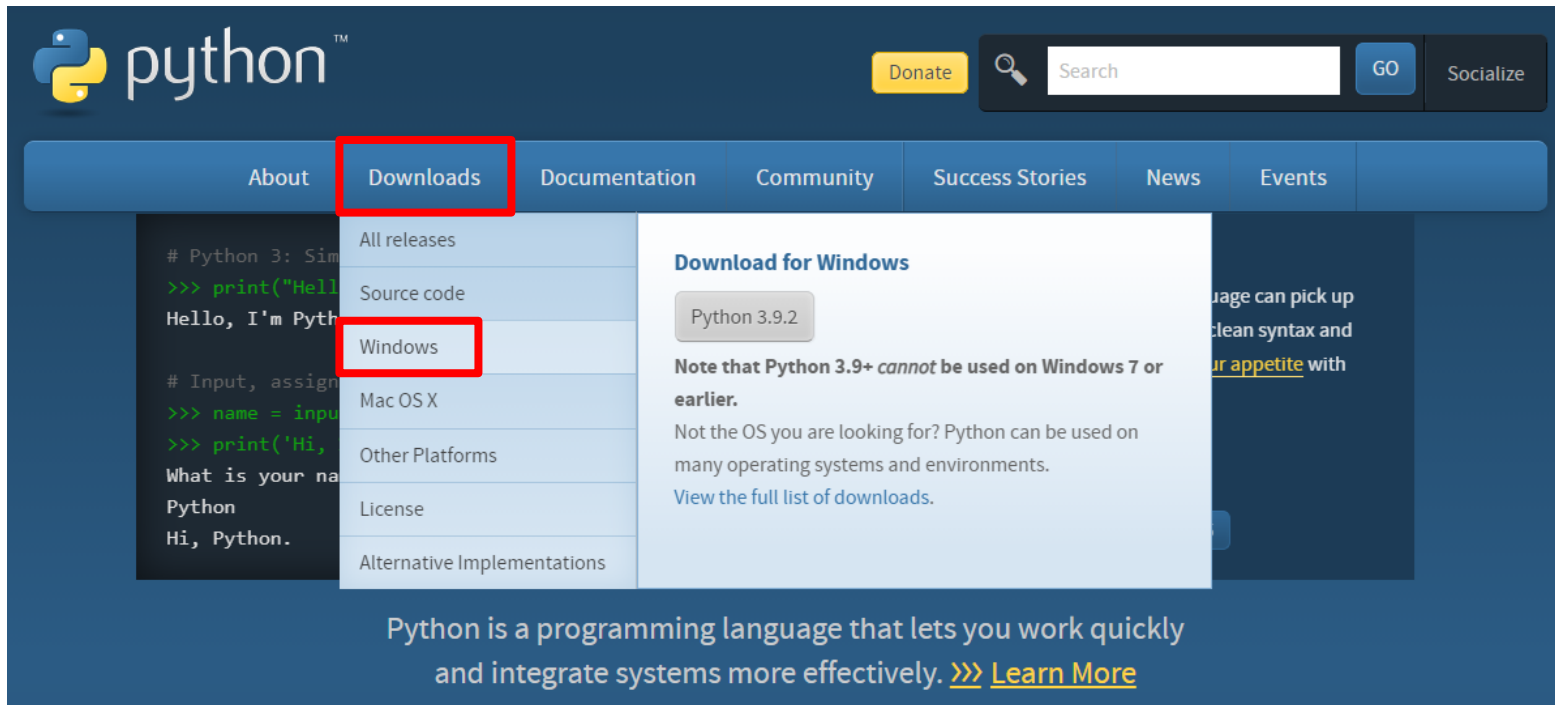
等待按鍵輸入:

```
# 按下任意鍵則關閉所有視窗  
cv2.waitKey(0) → 程序會停在這直到隨便按一個key  
cv2.destroyAllWindows()
```

Windows10
python 3 & opencv

1. 下載python

到[官網](#)點選Downloads



The screenshot shows the Python.org homepage. The 'Downloads' link in the top navigation bar is highlighted with a red box. A dropdown menu is open, showing options: 'All releases', 'Source code', 'Windows' (highlighted with a red box), 'Mac OS X', 'Other Platforms', 'License', and 'Alternative Implementations'. The 'Windows' section is expanded, displaying 'Python 3.9.2' and a note: 'Note that Python 3.9+ cannot be used on Windows 7 or earlier.' Below this, it says 'Not the OS you are looking for? Python can be used on many operating systems and environments. View the full list of downloads.'

python™

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Download for Windows

Python 3.9.2

Note that Python 3.9+ cannot be used on Windows 7 or earlier.

Not the OS you are looking for? Python can be used on many operating systems and environments. [View the full list of downloads.](#)

Python is a programming language that lets you work quickly and integrate systems more effectively. [>>> Learn More](#)

1. 下載python


選擇python 3

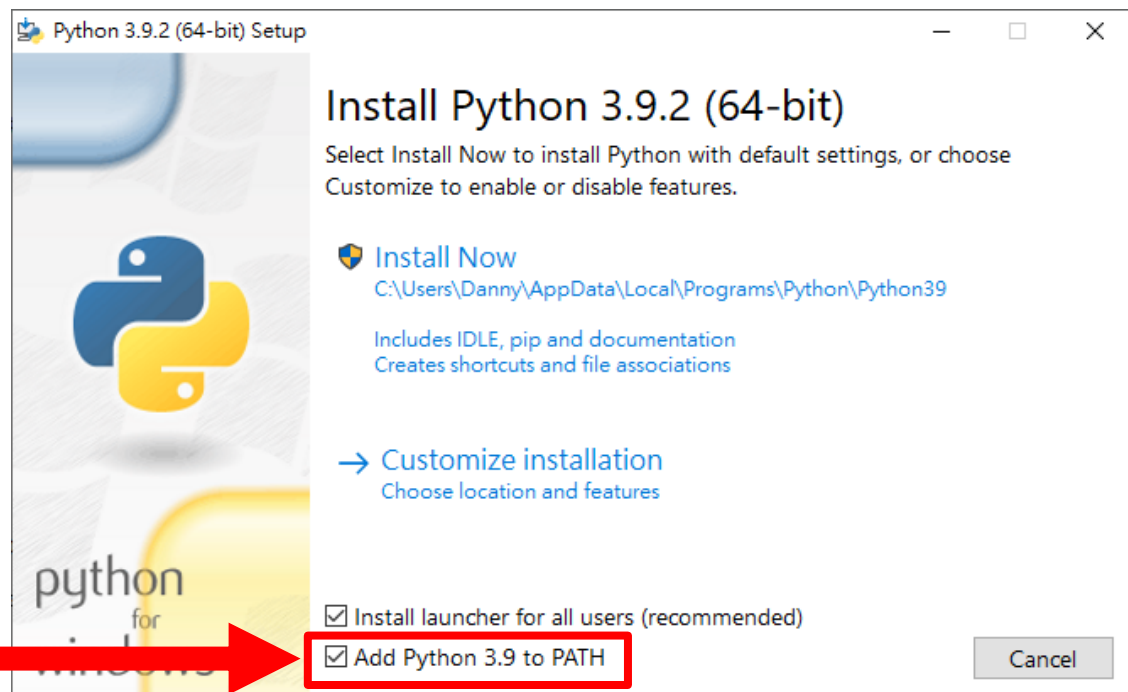
Python Releases for Windows

- 
- [Latest Python 3 Release - Python 3.9.2](#)
 - [Latest Python 2 Release - Python 2.7.18](#)

2. 安裝軟體

- 點選並安裝
- 加入環境變數

 python-3.9.2-amd64.exe



3. 安裝opencv

- pip install opencv-python
- Test :

```
1  import cv2
2
3  img = cv2.imread('kobe.jpg')
4
5  cv2.imshow('My Image', img)
6  cv2.waitKey(0)
7  cv2.destroyAllWindows()
8  |
```


Lab 01

1. 圖片翻轉和旋轉
2. Interpolation (bilinear, nearest neighbor)

1. 圖片翻轉(10%)

- 將圖片左右翻轉



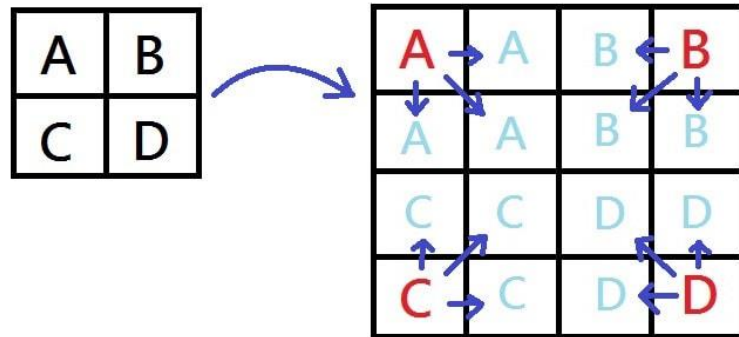
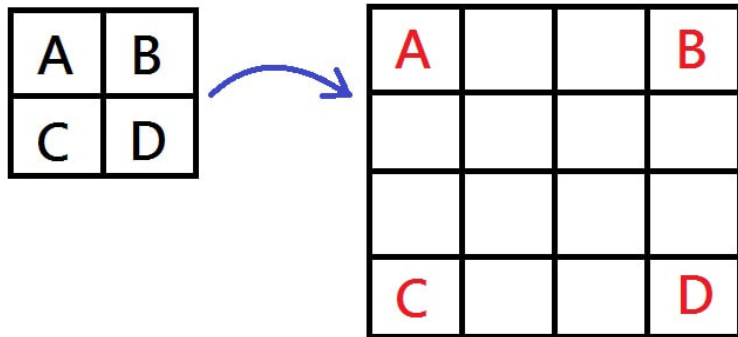
2. 圖片旋轉(10%)

- 將圖片逆時針旋轉90度



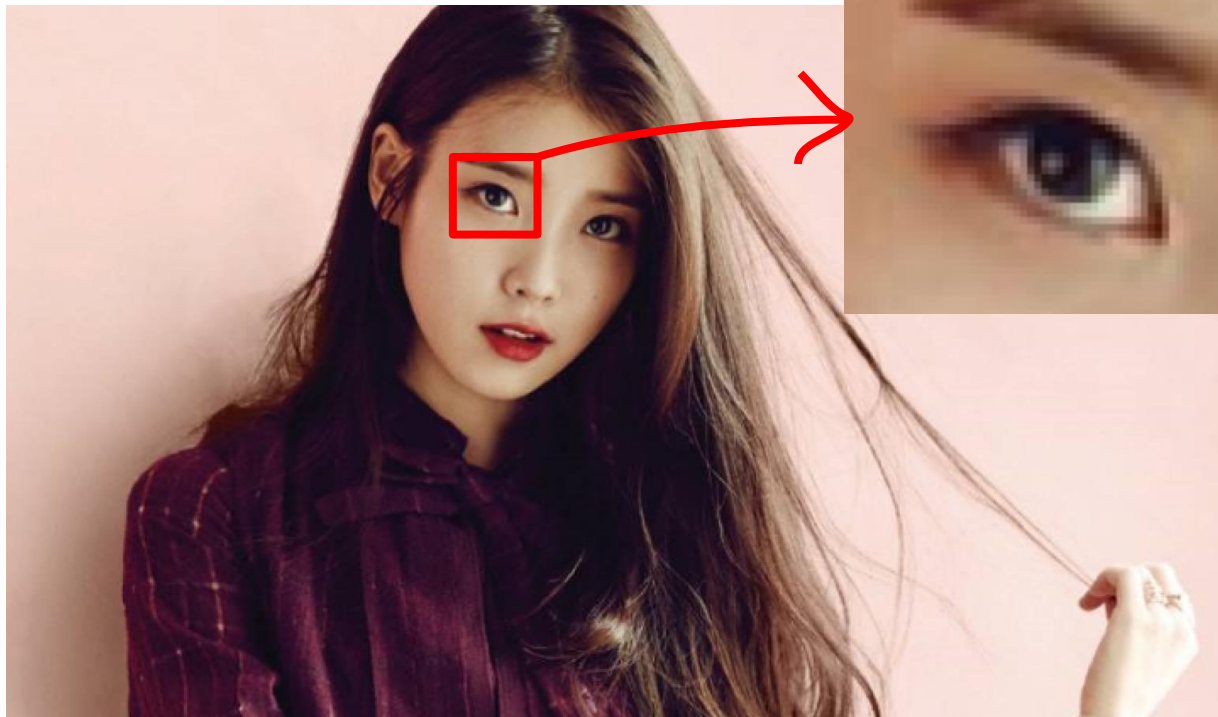
3. Interpolation - 最近相鄰內插法 (40%)

- 根據輸出影像的像素位置,找到輸入影像中最鄰近的點,即當作輸出影像的像素強度。
- 以下圖為例



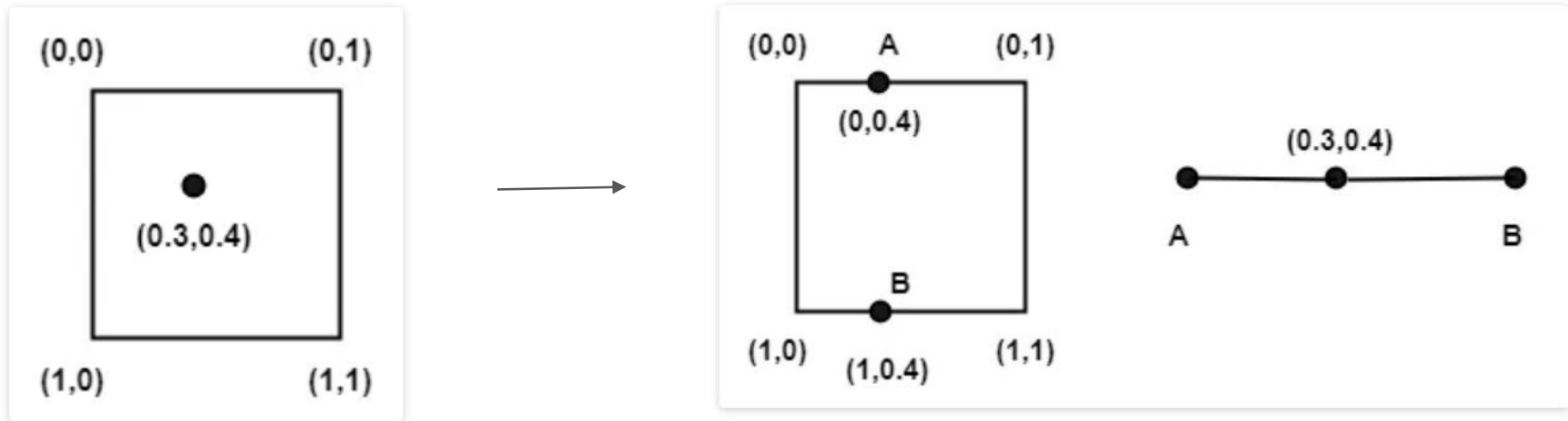
3. Interpolation - 最近相鄰內插法 (40%)

- 將照片放大3倍



4. Interpolation - 雙線性內插法 (40%)

- 根據輸出影像的像素位置，找到輸入影像中最鄰近的四個點，再利用雙線性內插法求出輸出影像的像素強度。



4. Interpolation - 雙線性內插法 (40%)

- 以參數方式輸入影像以及倍率
自行實作雙線性內插法 (40%)
- 下圖為輸入影像
右圖為
倍率=3之結果



助教時間

- 3/8 (一) 下午1:30~3:30