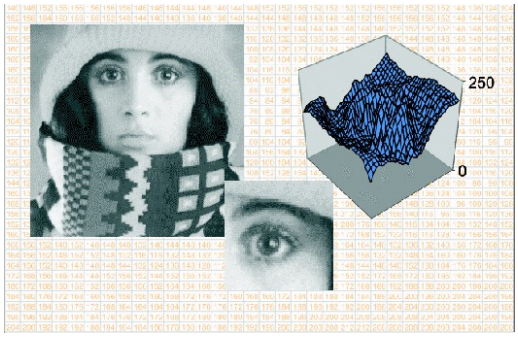
Image processing using OpenCV

Overview

- Introduction to Image processing
- Basic Image processing operations
- Shape detection
- Object detection
- Face detection

Image

- An image is a mathematical representation of a physical observation as a function over a spatial domain



Digital Image

- An image contains discrete number of pixels

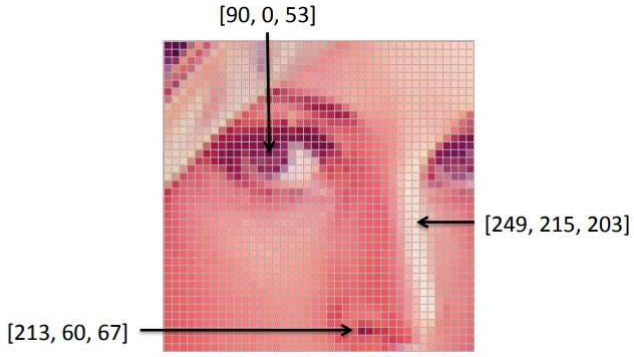
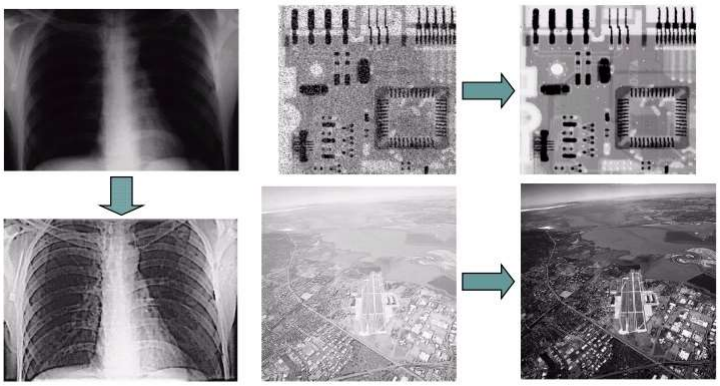
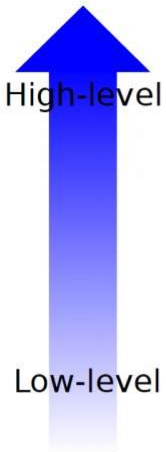


Image Processing

- Algorithms that alter an input image to create new image



Computer Vision



Computer Vision
Object detection, recognition, shape analysis, tracking
Use of Artificial Intelligence and Machine Learning

Image Analysis
Segmentation, image registration, matching

Image Processing
Image enhancement, noise removal, restoration, feature detection, compression

OpenCV

- open source computer vision and machine learning software library
- more than 2500 optimized algorithms
- C++, Python, Java and MATLAB interfaces

Installation

- Install python from https://www.python.org/downloads/
- Install opencv through Command prompt

pip install opencv-python

- Other packages

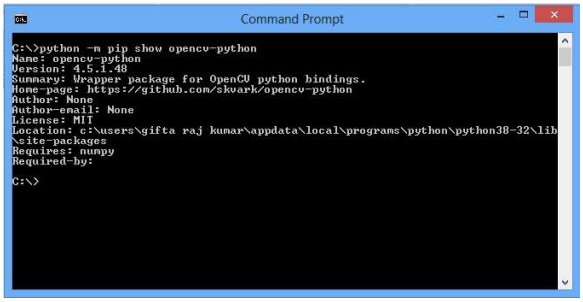
pip install numpy

pip install imutils

pip install -U scikit-learn

Check the Installation

- *python –m pip show opencv-python*
- *python –m pip show numpy*
- *python –m pip show imutils*
- *python -m pip show scikit-learn*

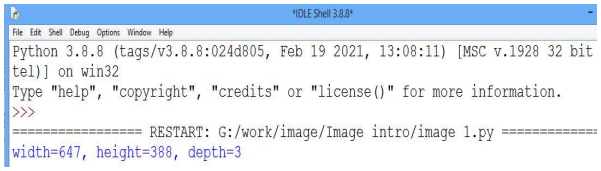


Loading and displaying an image

```
import cv2

image = cv2.imread("jeep.jpg")
(h, w, d) = image.shape
print("width={}, height={}, depth={}".format(w, h, d))

cv2.imshow("Image", image)
cv2.waitKey(0)
```



Accessing individual pixels

```
import cv2

image = cv2.imread("jeep.jpg")

(B, G, R) = image[100, 50]
print("R={}, G={}, B={}".format(R, G, B))
```

```
================== RESTART: G:/work/image
R=27, G=45, B=31
>>>
```

cropping

```
import cv2

image = cv2.imread("jeep.jpg")

roi = image[70:170,440:540]
cv2.imshow("ROI", roi)
cv2.waitKey(0)
```

Resizing

```
import cv2

image = cv2.imread("jeep.jpg")

resized = cv2.resize(image, (200, 200))
cv2.imshow("Fixed Resizing", resized)
cv2.waitKey(0)
```

Resizing

```
import cv2

image = cv2.imread("jeep.jpg")
(h, w, d) = image.shape

r = 300.0 / w
dim = (300, int(h * r))
resized = cv2.resize(image, dim)
cv2.imshow("Aspect Ratio Resize", resized)
cv2.waitKey(0)
```

Rotate images

```
import cv2

image = cv2.imread("jeep.jpg")
(h, w, d) = image.shape

center = (w // 2, h // 2)
M = cv2.getRotationMatrix2D(center, -45, 1.0)
rotated = cv2.warpAffine(image, M, (w, h))
cv2.imshow("OpenCV Rotation", rotated)
cv2.waitKey(0)
```

Smoothing an image

```
import cv2

image = cv2.imread("jeep.jpg")

blurred = cv2.GaussianBlur(image, (11, 11), 0)
cv2.imshow("Blurred", blurred)
cv2.waitKey(0)
```

Rectangle

```
import cv2

image = cv2.imread("jeep.jpg")

output = image.copy()
cv2.rectangle(output, (450, 80), (550, 180), (0, 0, 255), 2)
cv2.imshow("Rectangle", output)
cv2.waitKey(0)
```

Circle

```
import cv2

image = cv2.imread("jeep.jpg")

output = image.copy()
cv2.circle(output, (300, 150), 20, (255, 0, 0), -1)
cv2.imshow("Circle", output)
cv2.waitKey(0)
```

Line

```
import cv2

image = cv2.imread("jeep.jpg")

output = image.copy()
cv2.line(output, (60, 20), (400, 200), (0, 0, 255), 5)
cv2.imshow("Line", output)
cv2.waitKey(0)
```

Writing Text

```
import cv2

image = cv2.imread("jeep.jpg")

output = image.copy()
cv2.putText(output, "JEEP in the Jurassic Park!!!", (10, 25),
        cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 255, 0), 2)
cv2.imshow("Text", output)
cv2.waitKey(0)
```

- **Contact**

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