

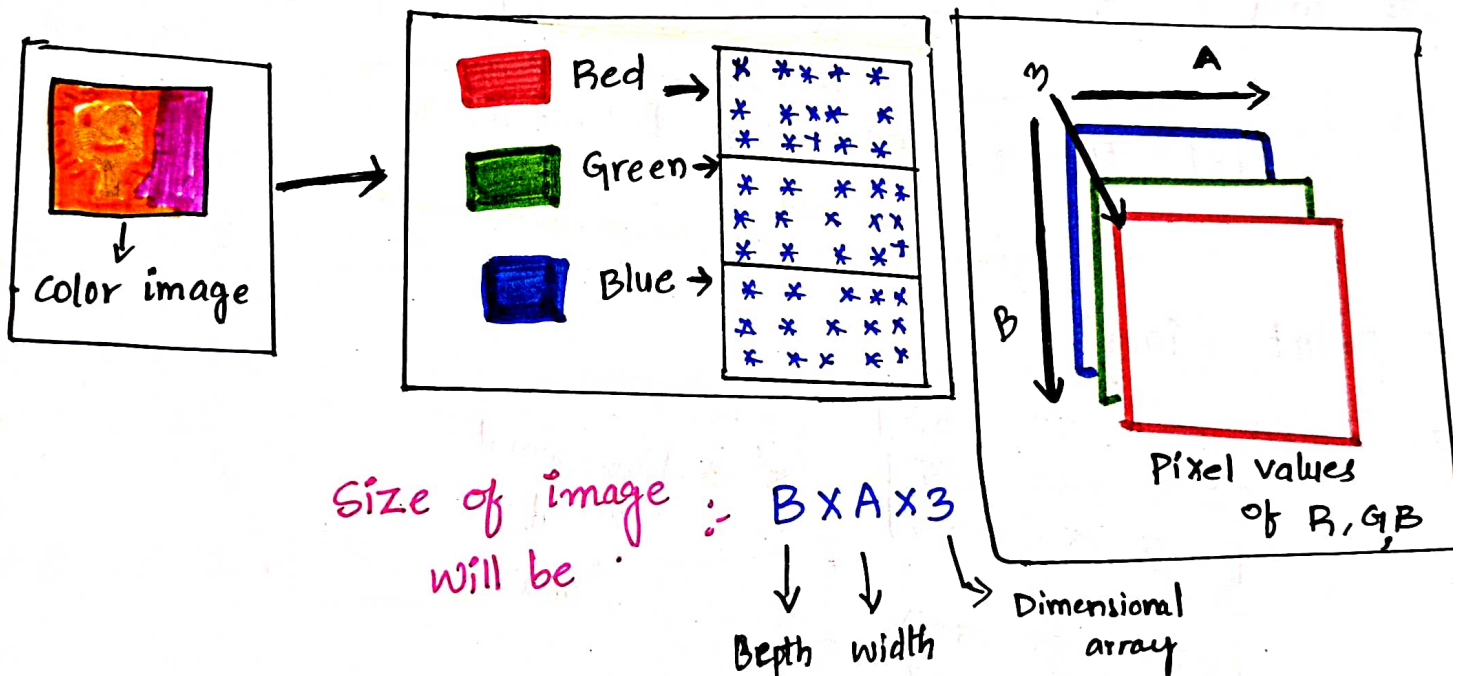
Computer Vision

Open CV

Q. What is Computer Vision?

Object detection, it identifying various object, it used for image recognition.

Q. How Computer reads an image?



Q. What is Open CV?

- * Open CV is a library of python
- * it is designed to Solve computer vision problems
- * it converts images into "Numpy arrays"
- * From that we process the data.

Exkurs: 1797: Vertrag von Campo Formio - 1798

Legend:  CVL

Import ramp as up

Load/Read time

Load/Read Image

load an image using "imread" specifying the path to image. (bgr)

img = cv2.imread ("image_examples/modi.jpg", 1)

↑
Color image

↑
Grayscale

Let's take a closer look at how images are stored.

point (img)

Out :

$$\begin{bmatrix} \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \\ \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \\ \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \\ \dots \dots \dots \\ \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \\ \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \\ \begin{bmatrix} 255 & 255 & 255 \end{bmatrix} \end{bmatrix}$$

→ 3 dimensional array
↓
values

Shape gives The dimensions of image array

img. shape

Inq: $(1358, 1500, 3)$ → Tuple
 [Out]: $(1358, 1500)$ → Tuple

1358 x 500 pixels
3 → color image.

`img.shape[0]`

`OUT`: 1351 → height

`img.shape[1]`

`OUT`: 1500 → width.

Display the image

`cv2.imshow("PM", img)`



`cv2.waitKey(0)(2000)`

→ wait for 2000 milliseconds.
→ till you enter the any key it waits in new page/window

`cv2.destroyAllWindows()`

→ closes all windows

Save image

`cv2.imwrite("new PM.jpg", img)`

→ image is saved to present working directory

`OUT`: True

Resize image

`img = cv2.imread("image-examples/Modi.jpg")`

`resized_image = cv2.resize(img, (500, 500))`

`cv2.imshow("Modi image", resized_image)`

`cv2.waitKey()`

`cv2.destroyAllWindows()`

original size = 1351
resize = 500 x 500

Image shape

`img.shape[0] * 0.5`

`out: 679.0`

`img.shape[1] * 0.5`

`out: 750.0`

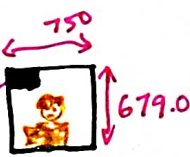
`# img = cv2.imread("image - examples/Modi.jpg")`

`# resized_image = cv2.resize(img, (679, 750))`
50/50

`# cv2.imshow("Modi image", resized_image)`
title

`# cv2.waitKey()`

`# cv2.destroyAllWindows()`

`out`  (50x50 size)

Face Detection using HAAR
Cascade classifiers

Q:- What is HAAR Cascade classifier?

HAAR cascade classifier will load "XML" files.

XML :- array of values.

Step: 1

[Face Detection]



image

create a cascade classifier. it will contain the Features of the Face.

↓
OpenCV will read the image and feature file.

Step: 2



Open CV



$\begin{bmatrix} 000 & 000 \\ 000 & 000 \\ 555 & 00 \\ 000 & 00 \\ 000 & 00 \\ 000 & 00 \end{bmatrix}$

Numpy Array

Search for the row & columns values of the face numpy ndarray (the face rectangle co-ordinates)

Step: 3



$\begin{matrix} 808 & 807 \\ 1744 & 1744 \end{matrix}$

Display the image with rectangular Face box

face_classifier = cv2.CascadeClassifier ("haarcascade_frontalface_default.xml")

↑
xml file (location)

image = cv2.imread ("image_examples/Modi.jpg")

image = cv2.resize (image, (500, 500)) → resize

Convert into grayscale (or) b/w image.

gray = cv2.cvtColor (image, cv2.COLOR_BGR2GRAY)

↓
Stored in "gray"

↓
convert color

Colour to Gray (or) Black and white

minNeighbors = 5

tuning cascade classifier - detect Multiscale.

faces = face_classifier.detectMultiScale (gray, 1.05, 5)

ScaleFactor = 1.05

method to search for the face rectangle Co-ordinates

Decreases the shape value by 5%, until the face is found. Smaller the value, greater the accuracy

Find The Nearest neighbors '5' in the image

(Zooming)

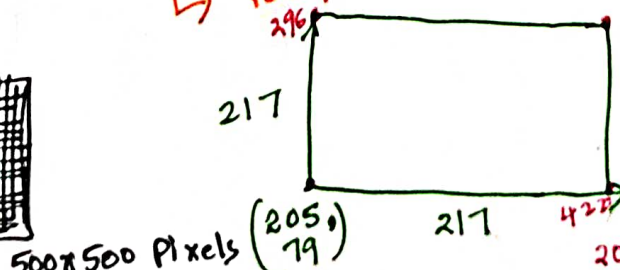
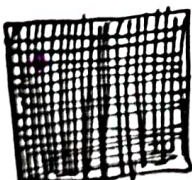


print (faces)

[[205, 79, 217, 217]]

X Y

Coordinates Found to the image.



In rectangle box "Face is available"

205 79
217 217
422 296

When no faces detected, face_classifier returns an empty tuple.

if face is ():

Print ("No faces found")

We Iterate through our faces array and draw a rectangle

over each faces in faces

for (x, y, w, h) in faces:

cv2.rectangle (image, (x, y), (x+w, y+h), (0, 0, 255), 2)

cv2.imshow ("Face Detection", image)

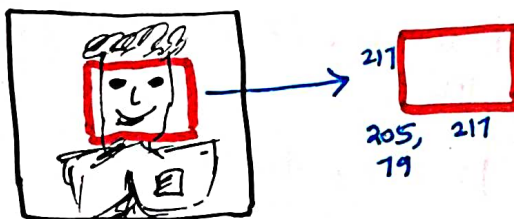
cv2.waitKey()

cv2.destroyAllWindows()



Thickness of line of Rectangular box

out,



Face & Eyes Detection

face_classifier = cv2.CascadeClassifier ("haarcascades/
For Face :- haarcascade_frontalface_default.xml")

eye_classifier = cv2.CascadeClassifier ("haarcascades/
For eye :- haarcascade_eye.xml")

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12/05/22
5:30 pm

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

resized_image = cv2.resize (img, (500, 500))

gray = cv2.cvtColor (resized_image, cv2.COLOR_BGR2GRAY)

faces = face_classifier.detectMultiScale (gray, 1.3, 5)

if faces is ():

Print ("No face found")

if condition is true,
then it work if condition.
if condition is false,
its not going to execute

for (x,y,w,h) in faces:

cv2.rectangle (resized_image, (x,y), (x+w,y+h), (255,0,0), 2)

instead Searching
total image search
only face image

roi_gray = gray [y:y+h, x:x+w]

roi_color = resized_image [y:y+h, x:x+w]

eyes = eye_classifier.detectMultiScale (roi_gray)

In Face image
detect only eyes

for (ex,ey,ew,eh) in eyes:

cv2.rectangle (roi_color, (ex,ey), (ex+ew,ey+eh), (0,255,0), 2)

cv2.imshow ("img", resized_image)

cv2.waitKey(0)

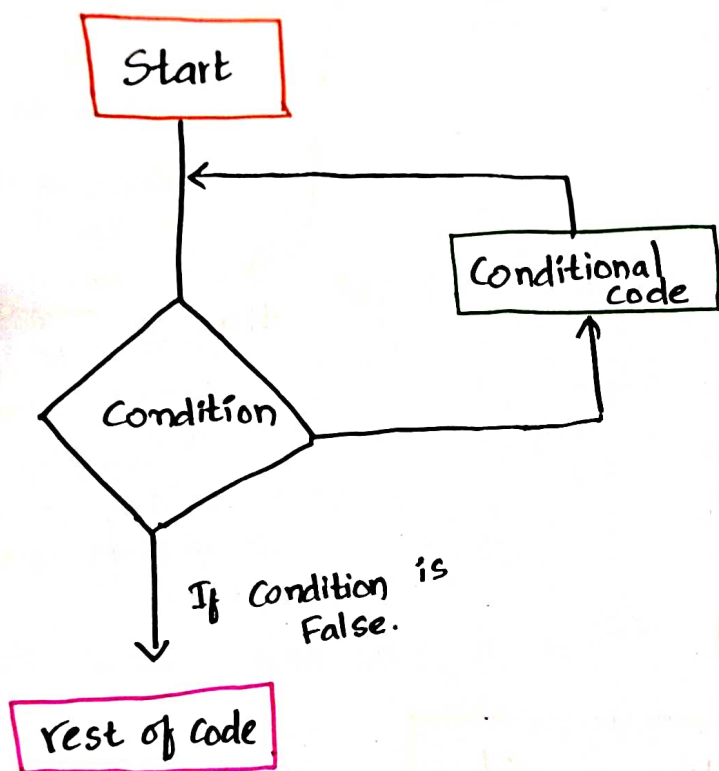
cv2.destroyAllWindows()



Capture a video

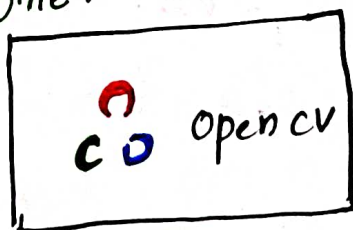
multiple images one-by-one in a loop is called "video".

Loops



We will using Loops to build a window, where images will appear really Fast, so that You can see it as a video.

We will be using OpenCV for reading frames & images one-by-one.



Input CV2

`Video = cv2.VideoCapture(0)` → webcam

`while True:` → Infinite loop (continuously read the images)

`check, frame = Video.read()`

`gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)`

`cv2.imshow("video", frame)`

`if cv2.waitKey(1) == ord("p"):`

`break`

`# Video.release()`

`# cv2.destroyAllWindows()`

Out



↓ Here it is convert it Gray. But, in Video (webcam) it showing color means Here, we wrote Frame, instead of "Gray" if written, it displays Gray

Face & Eye Detection in Video

Defining a function that will do the detections.

`# face_cascade = cv2.CascadeClassifier("haarcascade / haarcascade-frontal face - default.xml")`

`# eye_cascade = cv2.CascadeClassifier("haarcascade / haarcascade-eye.xml")`

some default function

```
def detect(gray, frame):
```

```
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)
```

```
    for (x, y, w, h) in faces:
```

```
        cv2.rectangle(frame, (x, y), (x+w, y+h), (255, 0, 0), 2)
```

```
        roi_gray = gray[y:y+h, x:x+w]
```

```
        roi_color = frame[y:y+h, x:x+w]
```

```
        eyes = eye_cascade.detectMultiScale(roi_gray, 1.1, 3)
```

```
        for (ex, ey, ew, eh) in eyes:
```

```
            cv2.rectangle(roi_color, (ex, ey), (ex+ew, ey+eh), (0, 255, 0), 2)
```

```
    return frame
```

Doing Some Face Recognition with webcam.

```
# video = cv2.VideoCapture(0)
```

While True:

```
    check, frame = video.read()
```

```
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
```

```
    canvas = detect(gray, frame)
```

```
    cv2.imshow("video", canvas)
```

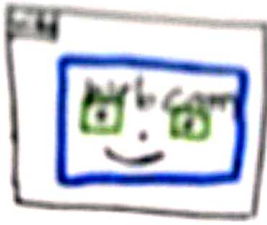
```
    if cv2.waitKey(1) == ord("p")
```

```
        break
```

```
# video.release()
```

```
# cv2.destroyAllWindows()
```


Out:



Pedistrian Detection

create our body classifier

```
# body_classifier = cv2.CascadeClassifier("Haarcascades \nhaarcascade-fullbody.xml")
```

initiate Video capture for video file.

```
# cap = cv2.VideoCapture("image-examples/walking.avi")
```

loop once video is successfully loaded

While cap.isOpened():

read first frame

check, frame = cap.read()

gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

pass frame to our body classifier

bodies = body_classifier.detectMultiScale(gray, 1.2, 3)

Extract bounding boxes for any bodies identified

for (x,y,w,h) in bodies :

cv2.rectangle (frame, (x,y), (x+w, y+h),
(0,255,255), 2)

CV2.imshow ("Pedestrians", frame)

if cv2.waitKey(1) == ord("p"):

break

cap.release()

cv2.destroyAllWindows()

traffic cars Detections

import time

create our body classifier

car_classifier = cv2.CascadeClassifier ("haarcascades |
haarcascade-car.xml")

initiate video capture for video file.

cap = cv2.VideoCapture ("image_examples/car.avi")

loop once video is successfully loaded

while cap.isOpened():

time.sleep(.05)

read first frame

check, frame = cap.read()

img = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
fig = plt.imshow(img)
fig.colorbar()
car_classifier = detectMultiScale(gray, 1.4, 2)
draw bounding boxes for any bodies identified

for (x, y, w, h) in cars:

cv2.rectangle(frame, (x, y), (x+w, y+h),
(0, 255, 255), 2)

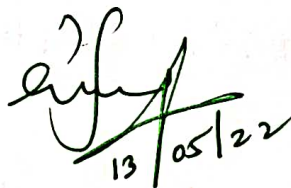
cv2.imshow("cars", frame)

if cv2.waitKey(1) == ord("p"):

break

cap.release()

cv2.destroyAllWindows()


13/05/22

3:30pm