

# \*INTRODUCTION\*

Face detection is considered one of the most important sciences of computer vision, and it is the basis for the science of face recognition, because the first step in building automatic face recognition is to detect the face itself, because if the face is detected correctly, then face recognition becomes relatively easy.

## \* CHALLENGES AND PROBLEMS \*

Face detection technology seeks to overcome many problems and challenges, for example the age and facial expression of a person. Many characteristics of the image have changed. For example, there are people with a beard. When you recognize them for the first time while they are with a beard, it is easy, but when the person shaves the beard and then returns to identify him again

There would be a problem because the image properties change this for men

As for women, when they come to identify the face without makeup, it is somewhat easy, but when applying makeup, there is a problem in recognizing the face because the characteristics of the image have changed.

## \*Technologies used in face detection\*

There are many ways to detect the face, but the research is concentrated in three main areas:

1: Research related to color, and these researches depend on techniques that make the color of the face distinct and known, such as the histogram and the back projection of the histogram.

2: Research related to neural networks and this technique depends on training and testing.

3: Research based on the characteristics of the face and rely on techniques that make the face known to him instead of color.

And we can divide the systems in this field into two types:

- A system that identifies the person in the photo.
- A system that first identifies the image, this is a face image, and then recognizes the person.

## \*Building a face detection model from A to Z\*

The model that we will work on is able to identify three characteristics of the face:

- Select the face and place it inside a rectangle.
- Define the eyes and mark them with x marks.
- Determine the smile on the face and place it inside a blue rectangle.

## Model building steps:

- 1: We use VScode, so you must download it first
- 2: The entire form was created using the Python language
- 3: Here we will use ready-made files trained by Python
- 4: We will use ready-made CV2 libraries
- 5: The last step is to write the code

# Code explanation:

```
face.py > ...
import cv2

face_detect = cv2.CascadeClassifier(r"D:\computer vision project\haarcascade_frontalface_default.xml")

eye_detect = cv2.CascadeClassifier(r"D:\computer vision project\haarcascade_eye.xml")

smile_detect = cv2.CascadeClassifier(r"D:\computer vision project\haarcascade_smile.xml")
```

- The first thing we need to do is import the CV2 library.
- We know three variables, one for the face, the second for the eyes, and the third for the smile.
- After this, we enter for each variable the path of its file, as it is on the computer.

```
8
9 stream = cv2.VideoCapture(0)
10
11 while True:
12     st, frame = stream.read()
13
14     gray_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
15
16
```

- This part of the code is responsible for opening the camera.

```

15 gray_frame = cv2.cvtColor(frame,cv2.COLOR_BGR2GRAY)
16
17 ##### Face Detect
18
19 faces = face_detect.detectMultiScale(gray_frame,1.3,5)
20
21 for (x,y,w,h) in faces:
22     cv2.rectangle(frame,(x,y),(x+w,y+h),(0,255,0),2)
23     face_only = frame[y:y+h,x:x+w]
24

```

- This part of the code is responsible for facial recognition and its dimensions.

```

24
25 ##### eye detect
26
27 eyes = eye_detect.detectMultiScale(face_only)
28 for (ex,ey,ew,eh) in eyes:
29     eye_x = int((ex+(ew/2))) - 10
30     eye_y = int((ey+(eh/2))) + 10
31     cv2.putText(face_only,"X",(eye_x,eye_y),cv2.FONT_HERSHEY_COMPLEX,1.5,(0,0,255),5)
32

```

- This part of the code is responsible for identifying the eyes and their dimensions.

```

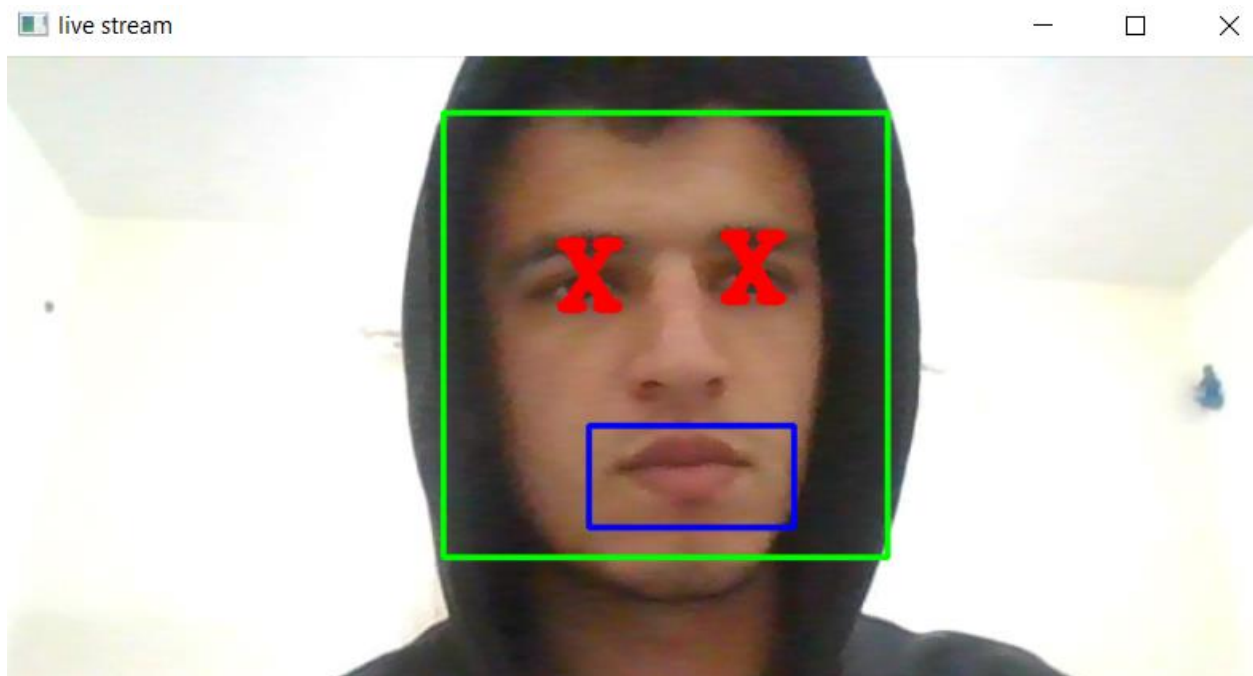
32
33 ##### Smile Detect
34 smiles = smile_detect.detectMultiScale(face_only,1.3,10)
35 for (sx,sy,sw,sh) in smiles:
36     cv2.rectangle(face_only,(sx,sy),(sx+sw,sy+sh),(255,0,0),2)
37
38
39

```

- This part of the code is responsible for recognizing the smile and the dimensions of the mouth.

```
40 ##### Show
41 cv2.imshow("live stream", frame)
42
43 if cv2.waitKey(50) & 0xff == ord("x"):
44     break
45
46 stream.release()
47
48 cv2.destroyAllWindows()
49
50
```

- This is the part responsible for running the code written above with opening the camera to identify me the face



- And this is the final result. The face was identified and identified and placed inside a green rectangle.

The eyes were also identified and distinguished. The smile was identified and placed inside a blue rectangle.

## \*Sources\*

\*Link article about the detection of the face by colors:

<https://www.researchgate.net/ /266080110 Automatic face detection using color based segmentation>

\*Link article on face detection by neurons:

<https://www.researchgate.net/profile/Manisha-Kasar/publication/301727666 Face Recognition Using Neural Network A Review/links/5ef18af5a6fdcc73be96ccc2/Face-Recognition-Using-Neural-Network-A-Review>

\* Link article about face detection by facial features:

[https://vision.ece.ucsb.edu/sites/default/files/publications/92CVPR\\_0](https://vision.ece.ucsb.edu/sites/default/files/publications/92CVPR_0)

\* Link download vscode:

<https://code.visualstudio.com/>

\* link download python:

<https://www.python.org/downloads/>

\* Link to the files used:

<https://drive.google.com/drive/folders/1BjQHI-lBsV-9dbBgfQLchXorg3ebajHf>

\* Video explaining the code:

[https://www.youtube.com/watch?v=hylMkhR89YM&list=PLH0em1f\\_fBoS\\_uPG7cn8Mwip6DF0YtnbB&index=10](https://www.youtube.com/watch?v=hylMkhR89YM&list=PLH0em1f_fBoS_uPG7cn8Mwip6DF0YtnbB&index=10)



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*Thanks for reading*

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