

```

1 import cv2
2 import numpy as np
3
4 # Creating face_cascade and eye_cascade objects
5 face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
6 eye_cascade=cv2.CascadeClassifier('haarcascade_eye.xml')
7
8 # Loading the image - 얼굴 이미지 데이터 읽기
9 img = cv2.imread('./face.png')
10 cv2.imshow('image show',img)
11 cv2.waitKey(0)
12
13 # Converting the image into grayscale 그레이로 바꿔줌
14 gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
15
16 faces = face_cascade.detectMultiScale(gray, 1.1, 4)
17
18 # Defining and drawing the rectangles around the face
19 for (x,y,w,h) in faces:
20     cv2.rectangle(img, (x,y), (x+w, y+h), (255, 0, 255), 2 )
21     # 색상 # 선의굵기
22
23 roi_gray = gray[y:(y+h), x:(x+w)]
24 roi_color = img[y:(y+h), x:(x+w)]
25
26 # eyes
27 eyes = eye_cascade.detectMultiScale(roi_gray, 1.1, 4)
28 print(eyes)
29 '''
30 2개의 좌표가 잡혀있음
31 [[41 82 45 45]
32  [112 48 52 52]]
33 '''
34 index = 0
35
36 # Creating for loop in order to divide one eye from another
37 for (ex, ey, ew, eh) in eyes :
38     if index == 0:
39         eye_1 = (ex, ey, ew, eh)
40     elif index == 1:
41         eye_2 = (ex, ey, ew, eh)
42
43     cv2.rectangle(roi_color, (ex, ey), (ex+ew, ey+eh), (0,0,255), 2)
44     index = index + 1
45
46 # 왼쪽 오른쪽 눈 파악
47 if eye_1[0] < eye_2[0] :
48     left_eye = eye_1
49     right_eye = eye_2
50 else:
51     right_eye = eye_1
52     left_eye = eye_2
53
54 # central points of the rectangles
55 left_eye_center = (int(left_eye[0] + (left_eye[2]/2)),
56                   int(left_eye[1] + (left_eye[3]/2)))
57
58 left_eye_center_x = left_eye_center[0]
59 left_eye_center_y = left_eye_center[1]
60
61 right_eye_center =(int(right_eye[0] + (right_eye[2]/2)),
62                   int(right_eye[1] + (right_eye[3]/2)))
63
64 right_eye_center_x = right_eye_center[0]
65 right_eye_center_y = right_eye_center[1]
66
67 cv2.circle(roi_color, left_eye_center, 5, (255,0,0), -1)
68 cv2.circle(roi_color, right_eye_center, 5, (255,0,0), -1)
69 cv2.line(roi_color, right_eye_center, left_eye_center, (0,200,200),1)
70
71 if left_eye_center_y > right_eye_center_y :
72     A = (right_eye_center_x, left_eye_center_y)
73     direction = -1 # 정수 -1은 이미지가 시계방향으로 회전함을 나타냅니다.
74 else :
75     A = (left_eye_center_x, right_eye_center_y)
76     direction = 1 # 정수 1은 이미지가 시계 반대방향으로 회전함을 나타냅니다.
77
78 cv2.circle(roi_color, A, 5, (255,0,0), -1)
79 cv2.line(roi_color, right_eye_center, A, (0,200,200),1)
80 cv2.line(roi_color, A, left_eye_center, (0,200,200),1)
81
82 # 각도 구하기
83 # np.arctan 함수 단위는 라디안 단위
84 # 라디안 단위 -> 각도 : (theta * 180) / np.pi
85 delta_x = right_eye_center_x - left_eye_center_x
86 delta_y = right_eye_center_y - left_eye_center_y
87 angle = np.arctan(delta_y / delta_x)
88 angle = (angle*180) /np.pi
89 print(angle)
90 # -21.80140948635181 도
91
92 h, w = img.shape[:2]
93 h, w, _ = img.shape
94
95 center = (w//2, h//2)
96 M = cv2.getRotationMatrix2D(center, angle, 1.0)
97
98 rotated = cv2.warpAffine(img, M, (w,h))
99
100 cv2.imshow('face_drawed', img)
101 cv2.waitKey(0)
102
103 cv2.imshow('face_rotated', rotated)
104 cv2.waitKey(0)
105
106 dist_1 = np.sqrt((delta_x * delta_x) + (delta_y * delta_y))
107 dist_2 = np.sqrt((delta_x * delta_x) + (delta_y * delta_y))
108
109 ratio = dist_1/dist_2
110

```

