STUDENT ATTENDANCE SYSTEM BASED ON THE FACE RECOGNITION OF WEBCSM'S IMAGE OF THE CLASSROOM

A PROECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE

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OF

INFORMATION TECHNOLOGY

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DECLARATION BY THE CANDIDATES

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Place : Jalpaiguri
Date: 23/06/2022

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CERTIFICATION

This is to certify that the work in preparing the project entitled "Student attendance system based on the face Recognition of webcam's image of the classroom", has been carried out by Swapnoneel Dutta Majumder, Sudip Mahata , Dipesh Kr Burnwal , Ronojit Chakraborty under my guidance during the session 2021-2022 and accepted in partial fulfilment of requirement for the degree of Bachelor of Technology in Information Technology.

Signature of the HOD with seal	Signature of the Supervisor with seal
(Prof. Aditya Kumar Samanta)	(Prof. Aditya Kumar Samanta)
Information Technology	Information Technology
Jalpaiguri Government Engineering College	Jalpaiguri Government Engineering College

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1.INTRODUCTION

In today's networked world, the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. From time to time we hear about the crimes of credit card fraud, computer breakin's by hackers, or security breaches in a company or government building.

In most of these crimes, the criminals were taking advantage of a fundamental flaw in the conventional access control systems: the systems do not grant access by "who we are", but by "what we have", such as ID cards, keys, passwords, PIN numbers, or mother's maiden name.

None of these means are really define us. Recently, technology became available to allow verification of "true" individual identity. This technology is based in a field called "biometrics".

Biometric access control are automated methods of verifying or recognizing the identity of a living person on the basis of some physiological characteristics, such as fingerprints or facial features, or some aspects of the person's behavior, like his/her handwriting style or keystroke patterns. Since biometric systems identify a person by biological characteristics, they are difficult to forge. Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. For this reason, since the early 70's (Kelly, 1970), face recognition has drawn the attention of researchers in fields from security, psychology, and image processing, to computer vision.

2. Review of Literature

Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. Over past 30 years, many researchers have proposed different face recognition techniques, motivated by the increased number of real world applications requiring the recognition of human faces. There are several problems that make automatic face recognitiona very difficult task. However, the face image of a person inputs to the database that is usually acquired under different conditions. The important of automatic face recognition is much be cope with numerous variations of images of the same face due to changes in the following parameters such as

1. Pose
2. Illumination
3. Expression
4. Motion
5. Facial hair
6. Glasses
7. Backgrnd

Face recognition technology is well advance that can applied for many commercial applications such as personal identification, security system, image- film processing, psychology, computer interaction, entertainment system, smart card, law enforcement, surveillance and so on. Face recognition can be done in both a still image and video sequencewhich has its origin in still-image face recognition. Different approaches of face recognitionfor still images can be categorized into three main groups such as

i) Holistic approach
ii) Feature-based approach
iii) Hybrid approach product

i) Holistic approach :- In holistic approach or global feature, the whole face region is taken into account as input data into face detection system. Examples of holistic methods are eigenfaces (most widely used method for face recognition), probabilistic eigenfaces, fisherfaces, support vector machines, nearest feature lines (NFL) and independent-component analysis approaches.They are all based on principal component-analysis.

ii) Feature-based approach :- In feature-based approaches or local feature that is the features on face such as nose, and then eyes are segmented and then used as input data for structural classifier. Pure geometry, dynamic link architecture, and hidden Markov model methods belong to this category. One of the most successful of these systems is the Elastic Bunch Graph Matching (EBGM) system [40],[41], which is based on DLA.
Wavelets, especially Gabor wavelets, play a building block role for facial representation in these graph matching methods. A typical local feature representation consists of wavelet coefficients for different scales and rotations based on fixed wavelet bases. These locally estimated wavelet coefficients are robust to illumination change, translation, distortion, rotation, and scaling. The grid is appropriately positioned over the image and is stored with each grid point's locally determined jet in figure 2(a), and serves to represent the pattern classes.
Recognition of a new image takes place by transforming the image into the grid of jets, and matching all stored model graphs to the image. Conformation of the DLA is done by establishing and dynamically modifying links between vertices in the modeldomain.

iii) Hybrid approach :- The idea of this method comes from how human vision system perceives both holistic and local feature. The key factors that influence the performance of hybrid approach include how to determine which features should be combined and how to combine, so as to preserve their advantages and avert their disadvantages at the same time.

These problems have close relationship with the multiple classifier system (MCS) and ensemble learning in the field of machine learning. Unfortunately, even in these fields, these problems remain unsolved. In spite of this, numerous efforts made in these fields indeed provide us some insights into solving these problems, and these lessons can be used as guidelines in designing a hybrid face recognition system. hybrid approach that use both holistic and local information for recognition may be an effective way to reduce the complexity of classifiers and improve their generalization capability.

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3. Objective of the Project:

To implement Student attendance system based on the face recognition of webcam's image in the classroom.

4. System Design

A throughout survey has revealed that various methods and combination of these methods can be applied in development of a new face recognition system. Among the many possible approaches, we have decided to use a combination of knowledge-based methods for face detection part and neural network approach for face recognition part. The main reason in this selection is their smooth applicability and reliability issues. Our face recognition system approach is given in Figure

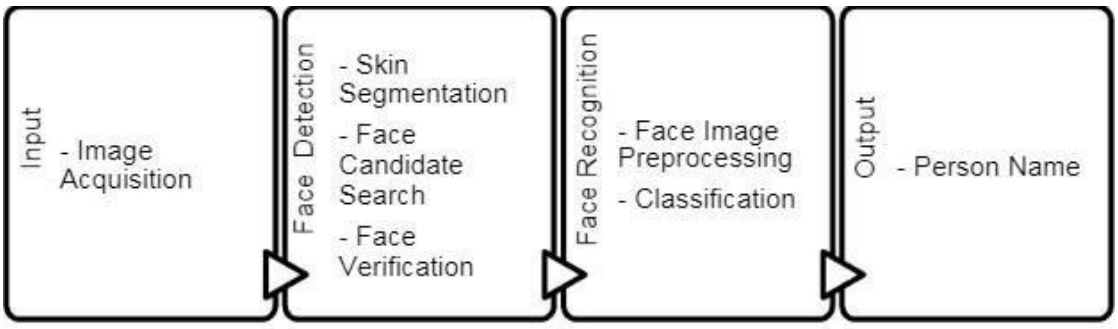


Figure 2 Face Recognition Approach

Input Part

Input part is prerequisite for face recognition system. Image acquisition operation is performed in this part. Live captured images are converted to digital data for performing image-processing computations. These captured images are sent to face detection algorithm.

Face Detection Part

Face detection performs locating and extracting face image operations for face recognition system. Face detection part algorithm is given in Figure given below. Our experiments reveal that skin segmentation, as a first step for face detection, reduces computational time for searching whole image. While segmentation is applied, only segmented region is searched weather the segment includes any face or not.

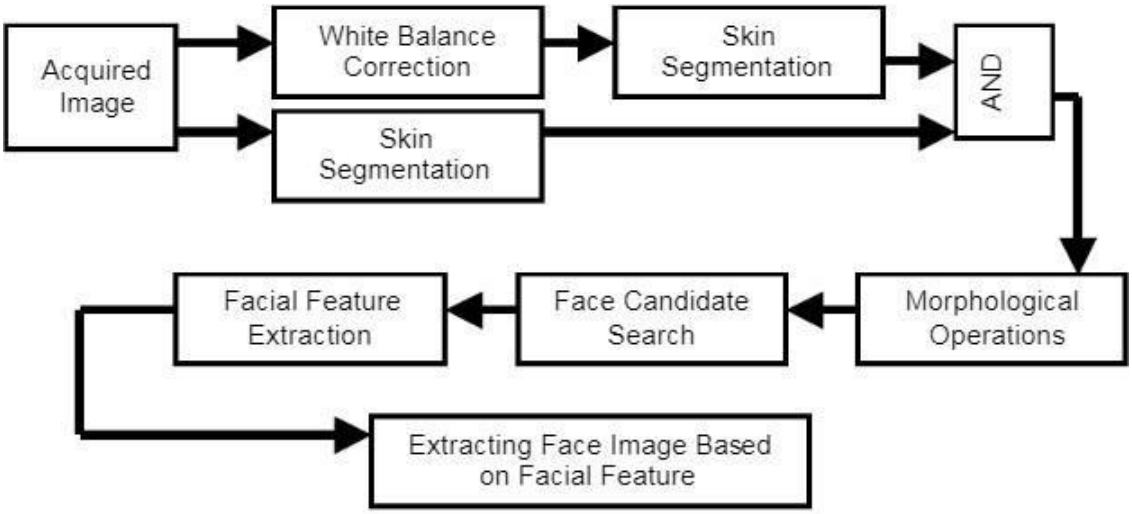
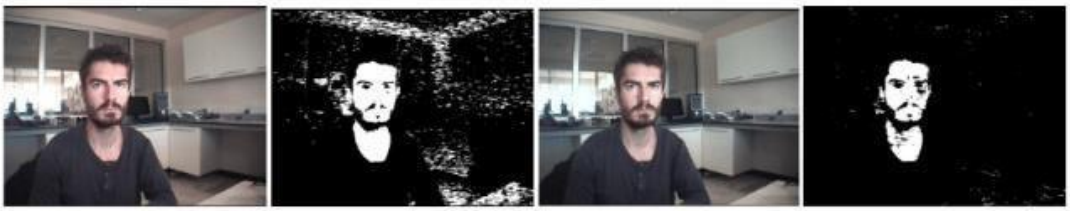


Figure 3 Algorithm of Face Detection Part

For this reason, skin segmentation is applied as a first step of detection part. RGB color spaceis used to describe skin like color [4]. White balance of images differs due to change in lighting conditions of the environment while acquiring image. This situation creates non-skinobjects that belong to skin objects.

Therefore, white balance of the acquired image should be corrected before segmenting it [18]. Results of segmentation on original image and white balance corrected image is givenin Figure 4 and 5.



a.) b.) c.) d.)

Figure 4 Example of taken/white balance corrected image and skin color segmentation (a.) Original Image (OI), b.)Segmentation on OI, c.)White Balance Correction on OI (WBI), d.) Segmentation on WBI)

After "and operation" is applied on segmented images, some morphological operations are applied on final skin image to search face candidate. Noisy like small regions elimination, closing operations are performed. Then, face candidates are choosen with two conditions.

which are ratio of bounding box of candidate and covering some gaps inside the candidate region. Ratio of bounding box should lie between 0.3 and 1.5

Figure 5 Results of Segmentation on Uncorrected (Left) and Corrected Image (Right)

Based on these conditions, face candidates are extracted from input image with modified bounding box from original bounding box. The height of bounding box modified as 1.28 times bigger than width of bounding box because chest and neck parts will be eliminated ifcandidate includes them This modification value have been determined experimentally.

These face candidates will be sent to facial feature extraction part to validate the candidates. Final verification of candidate and face image extraction, facial feature extraction process is applied. Facial feature is one of the most significant features of face. Facial features are eyebrows, eyes, mouth, nose, nose tip, cheek, etc. The property is used to extract the eyes and mouth which, two eyes and mouth generate isosceles triangle, and distance between eye to eye and mid point of eyes distance to mouth is equal [2]. Laplacian of Gaussian (LoG) filter and some other filtering operations are perfomed to extract facial feature of face candidate.

5. **Methodology for implementation (Formulation/Algorithm)**

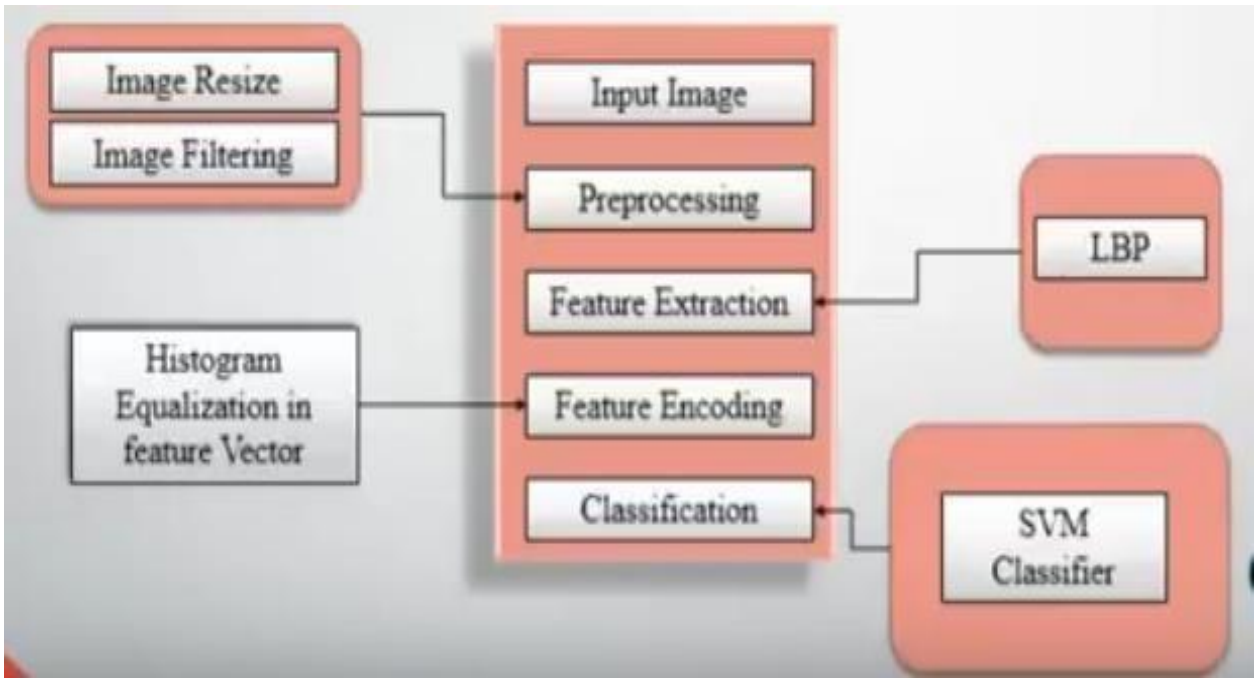


Figure 6

A similar separation of pattern recognition algorithms into four groups is proposed byJain and colleges. We can grop face recognition methods into three main groups. Thefollowing approaches are proposed:

Template matching:- Patterns are represented by samples, models, pixels, curves, textures. The recognition function is usually a correlation or distance measure.

Statistical approach:- Patterns are represented as features. The recognition function is adiscriminant function.

Neural networks. The representation may vary. There is a network function in some point.

Note that many algorithms, mostly current complex algorithms, may fall into more than one of these categories. The most relevant face recognition algorithms will be discussedlater under this classification.

6. Sample inputs and outputs

Sample Inputs

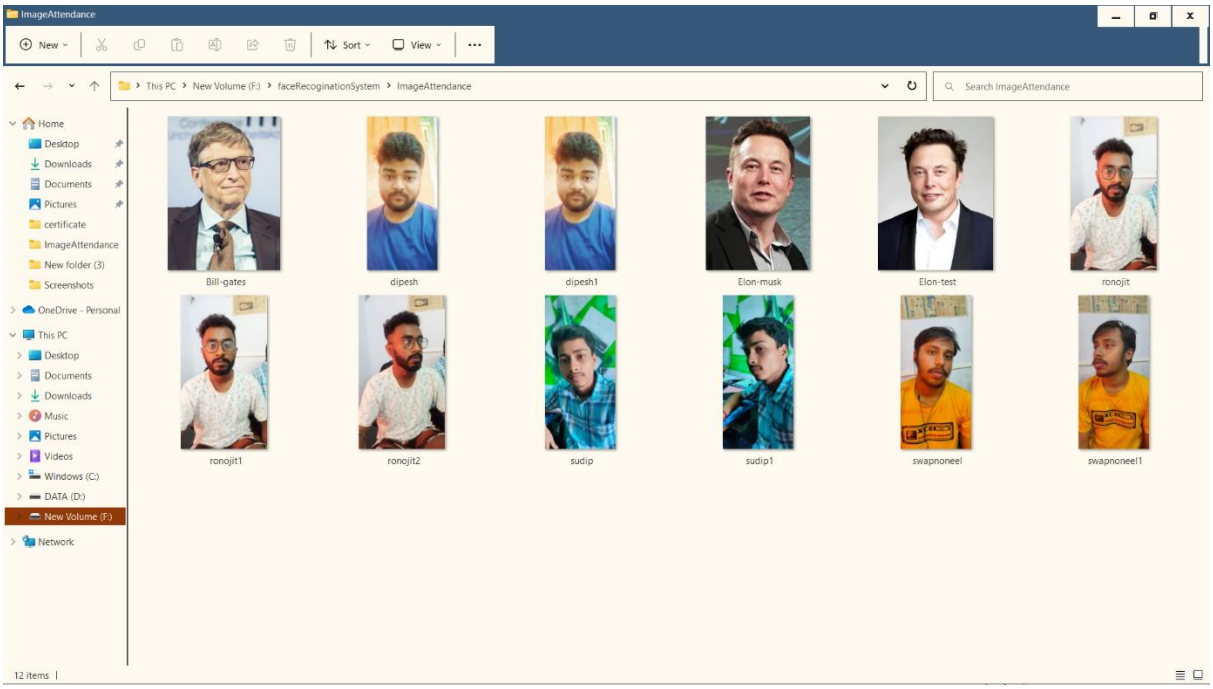


Figure 7

Sample Output

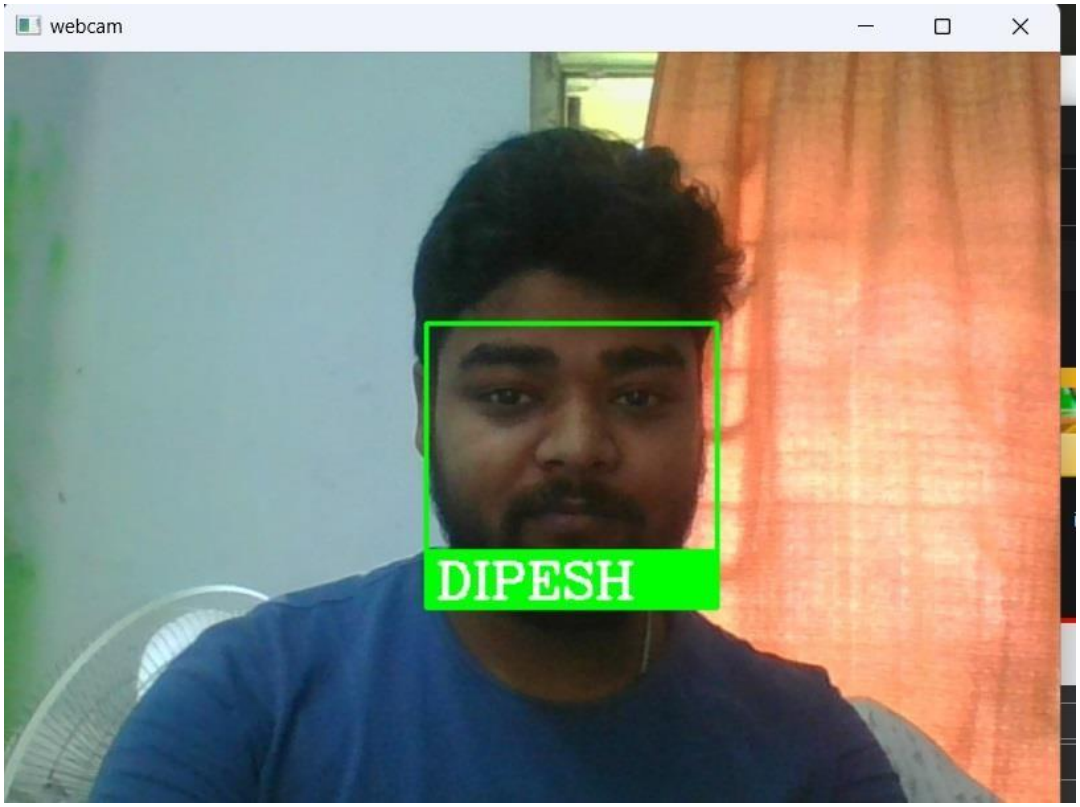


Figure 8

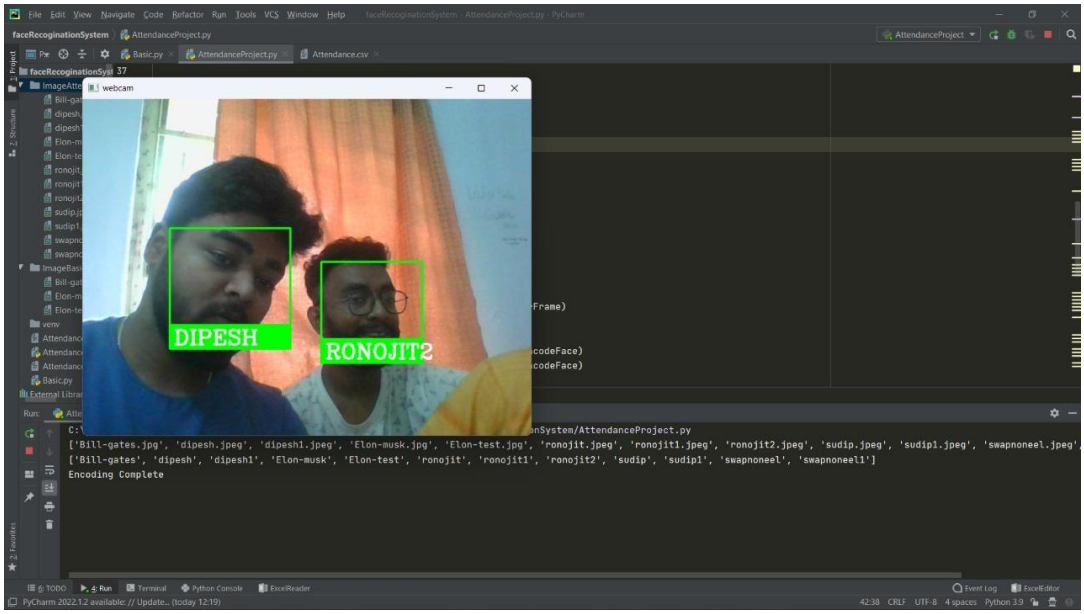


Figure 9

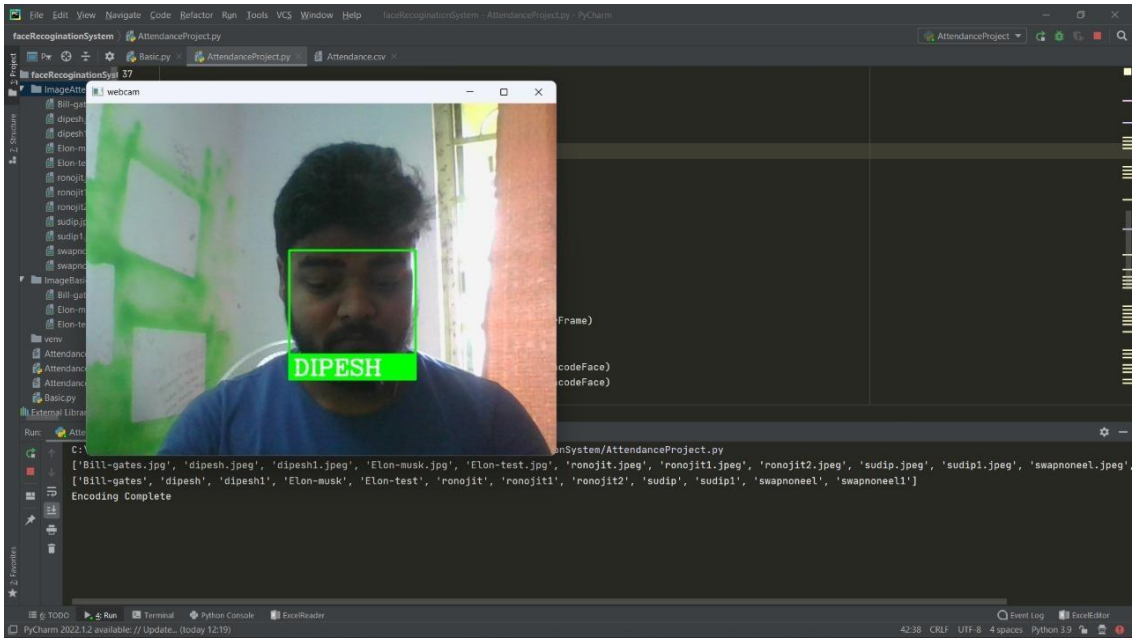

webcam
DIPESH
['Bill-gates.jpg', 'dipesh.jpeg', 'dipesh1.jpeg', 'Elon-musk.jpg', 'Elon-test.jpg', 'ronojit.jpeg', 'ronojit1.jpeg', 'ronojit2.jpeg', 'sudip.jpeg', 'sudip1.jpeg', 'swapnoneel.jpeg',
['Bill-gates', 'dipesh', 'dipesh1', 'Elon-musk', 'Elon-test', 'ronojit', 'ronojit1', 'ronojit2', 'sudip', 'sudip1', 'swapnoneel', 'swapnoneel1']
Encoding Complete

Figure 10

7. CONCLUSION:

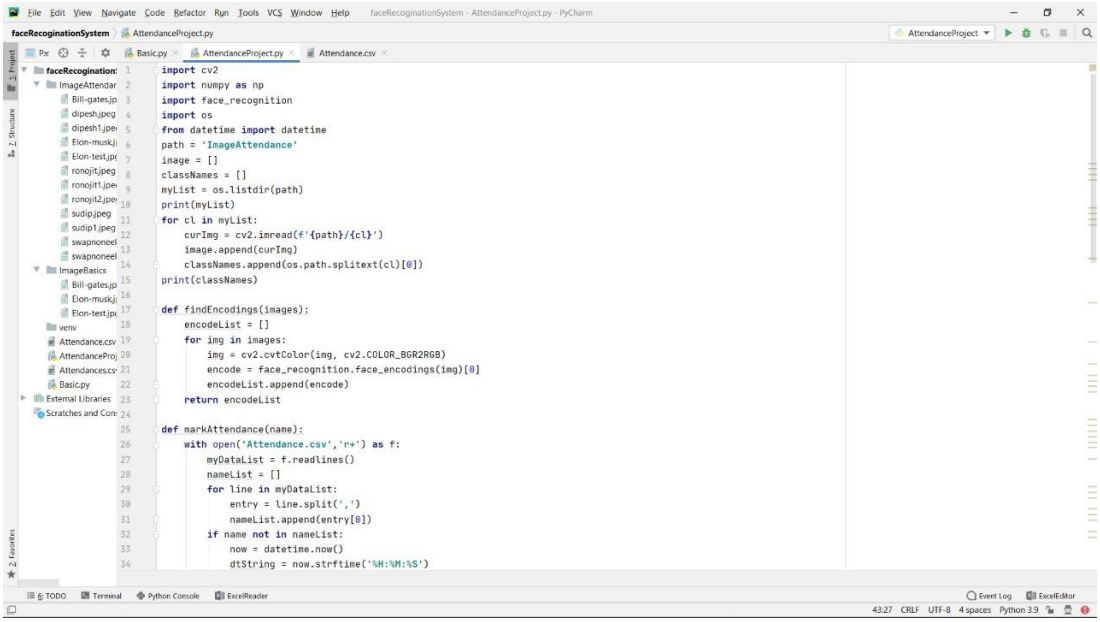
Face recognition systems are part of facial image processing applications and their significance as a research area are increasing recently. Implementations of system are crimeprevention, video surveillance, person verification, and similar security activities. The face recognition system implementation will be part of humanoid robot project at Atılım University.

The goal is reached by face detection and recognition methods. Knowledge-Based face detection methods are used to find, locate and extract faces in acquired images. Implemented methods are skin color and facial features. Neural network is used for face recognition.

RGB color space is used to specify skin color values, and segmentation decreases searching time of face images. Facial components on face candidates are appeared with implementation of LoG filter. LoG filter shows good performance on extracting facial compoments under different illumination conditions.

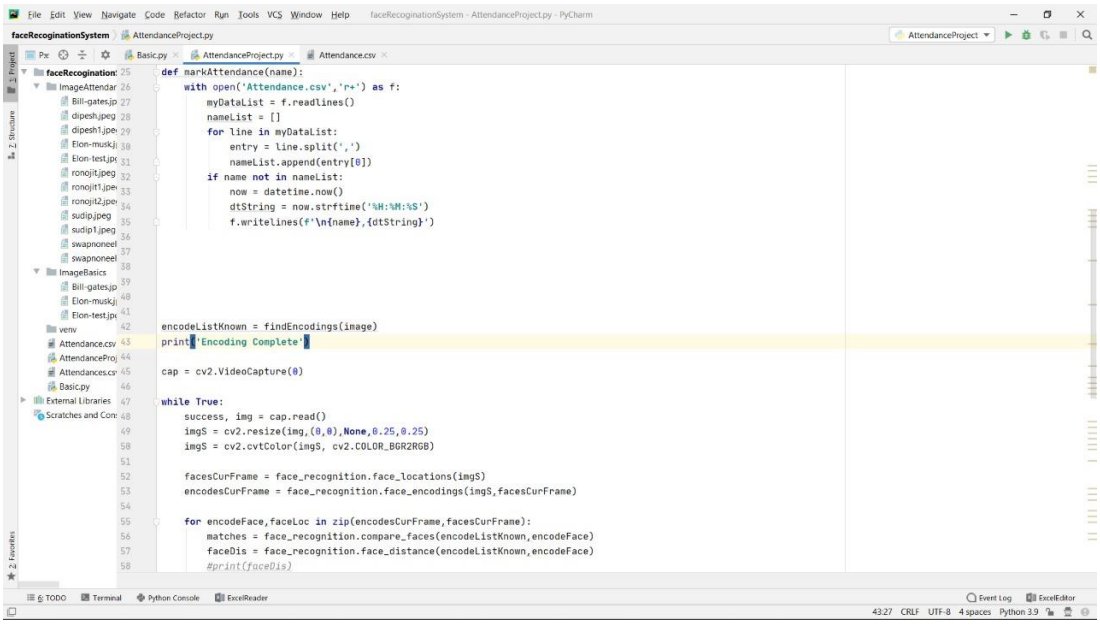
FFNN is performed to classifiy to solve pattern recongition problem since face recognition is a kind of pattern recognition. Classification result is accurate. Classification is also flexible and correct when extracted face image is small oriented, closed eye, and small smiled.

8. Source Code:-



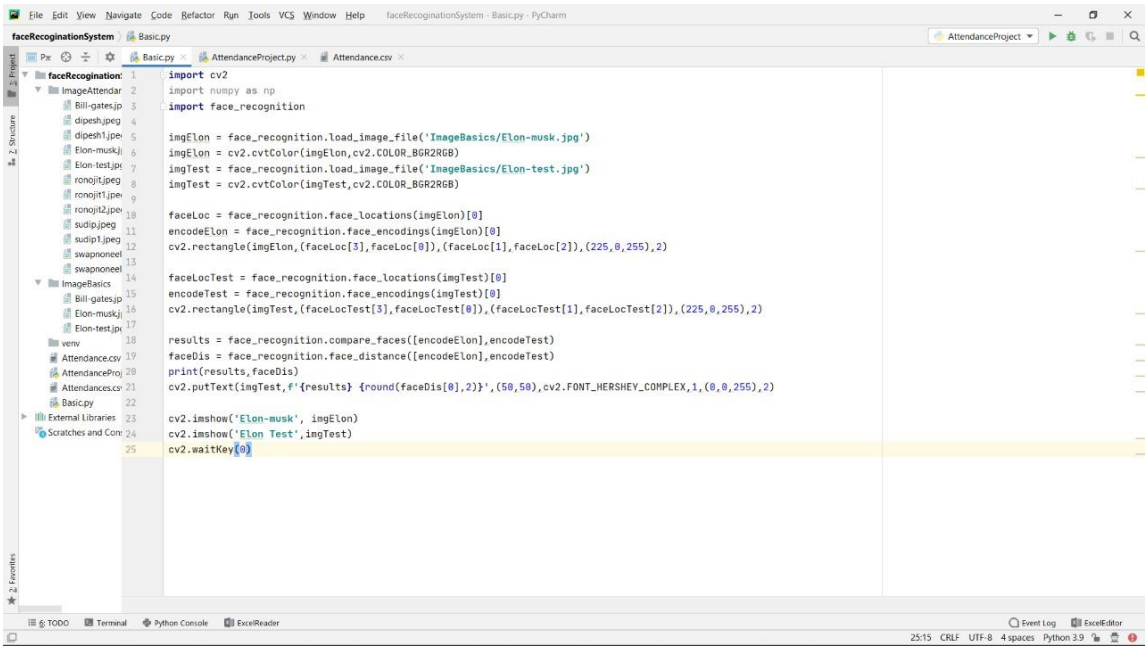
```
import cv2
import numpy as np
import face_recognition
import os
from datetime import datetime
path = 'ImageAttendance'
image = []
classNames = []
myList = os.listdir(path)
print(myList)
for cl in myList:
    curImg = cv2.imread(f'{path}/{cl}')
    image.append(curImg)
    classNames.append(os.path.splitext(cl)[0])
print(classNames)

def findEncodings(images):
    encodeList = []
    for img in images:
        img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
        encode = face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList

def markAttendance(name):
    with open('Attendance.csv','r+') as f:
        myDataList = f.readlines()
        nameList = []
        for line in myDataList:
            entry = line.split(',')
            nameList.append(entry[0])
        if name not in nameList:
            now = datetime.now()
            dtString = now.strftime('%H:%M:%S')
```

Figure 11



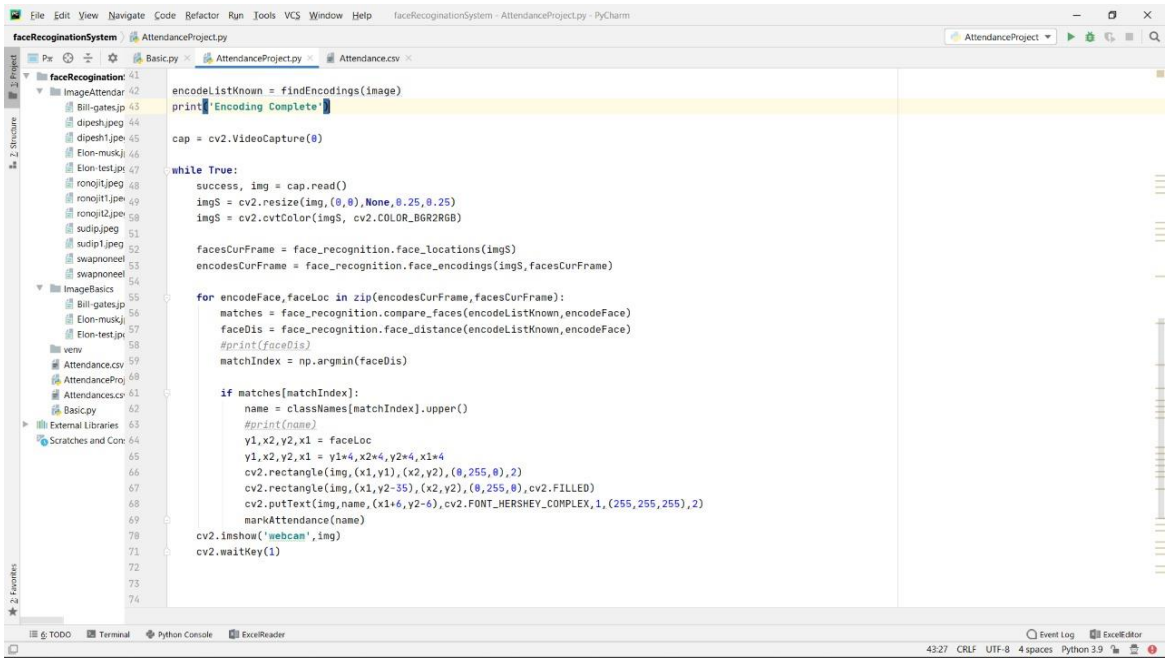
```
def markAttendance(name):
    with open('Attendance.csv','r+') as f:
        myDataList = f.readlines()
        nameList = []
        for line in myDataList:
            entry = line.split(',')
            nameList.append(entry[0])
        if name not in nameList:
            now = datetime.now()
            dtString = now.strftime('%H:%M:%S')
            f.writelines(f'\n{name},{dtString}')

encodeListKnown = findEncodings(image)
print('Encoding Complete')

cap = cv2.VideoCapture(0)

while True:
    success, img = cap.read()
    imgS = cv2.resize(img,(0,0),None,0.25,0.25)
    imgS = cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)

    facesCurFrame = face_recognition.face_locations(imgS)
    encodesCurFrame = face_recognition.face_encodings(imgS,facesCurFrame)

    for encodeFace,faceLoc in zip(encodesCurFrame,facesCurFrame):
        matches = face_recognition.compare_faces(encodeListKnown,encodeFace)
        faceDis = face_recognition.face_distance(encodeListKnown,encodeFace)
        #print(faceDis)
```

Figure 12



```
import cv2
import numpy as np
import face_recognition

imgElon = face_recognition.load_image_file('ImageBasics/Elon-musk.jpg')
imgElon = cv2.cvtColor(imgElon,cv2.COLOR_BGR2RGB)
imgTest = face_recognition.load_image_file('ImageBasics/Elon-test.jpg')
imgTest = cv2.cvtColor(imgTest,cv2.COLOR_BGR2RGB)

faceLoc = face_recognition.face_locations(imgElon)[0]
encodeElon = face_recognition.face_encodings(imgElon)[0]
cv2.rectangle(imgElon,(faceLoc[3],faceLoc[0]),(faceLoc[1],faceLoc[2]),(225,0,255),2)

faceLocTest = face_recognition.face_locations(imgTest)[0]
encodeTest = face_recognition.face_encodings(imgTest)[0]
cv2.rectangle(imgTest,(faceLocTest[3],faceLocTest[0]),(faceLocTest[1],faceLocTest[2]),(225,0,255),2)

results = face_recognition.compare_faces([encodeElon],encodeTest)
faceDis = face_recognition.face_distance([encodeElon],encodeTest)
print(results,faceDis)
cv2.putText(imgTest,f'{results} {round(faceDis[0],2)}',(50,50),cv2.FONT_HERSHEY_COMPLEX,1,(0,0,255),2)

cv2.imshow('Elon-musk', imgElon)
cv2.imshow('Elon Test',imgTest)
cv2.waitKey(0)
```

Figure 13



```
encodeListKnown = findEncodings(image)
print('Encoding Complete')

cap = cv2.VideoCapture(0)

while True:
    success, img = cap.read()
    imgS = cv2.resize(img,(0,0),None,0.25,0.25)
    imgS = cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)

    facesCurFrame = face_recognition.face_locations(imgS)
    encodesCurFrame = face_recognition.face_encodings(imgS,facesCurFrame)

    for encodeFace,faceLoc in zip(encodesCurFrame,facesCurFrame):
        matches = face_recognition.compare_faces(encodeListKnown,encodeFace)
        faceDis = face_recognition.face_distance(encodeListKnown,encodeFace)
        #print(faceDis)
        matchIndex = np.argmin(faceDis)

        if matches[matchIndex]:
            name = classNames[matchIndex].upper()
            #print(name)
            y1,x2,y2,x1 = faceLoc
            y1,x2,y2,x1 = y1*4,x2*4,y2*4,x1*4
            cv2.rectangle(img,(x1,y1),(x2,y2),(0,255,0),2)
            cv2.rectangle(img,(x1,y2-35),(x2,y2),(0,255,0),cv2.FILLED)
            cv2.putText(img,name,(x1+6,y2-6),cv2.FONT_HERSHEY_COMPLEX,1,(255,255,255),2)
            markAttendance(name)
    cv2.imshow('webcam',img)
    cv2.waitKey(1)
```

Figure 14

9. REFERENCES

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