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Ai Attendance Register Using Face Recognition with Haar Cascade Algorithm

Vishnu.R.S, Jaquin Jojy Abraham, Rajkumar B, Jayaprashant P , Mrs.Vineetha Varghese M.E, Dr.P.Arulprakash M.E.,Phd

UG Scholar,Dept of Computer Science and Engineering, Rathinam Technical Campus , Coimbatore,India

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ABSTRACT—AI attendance register,aim of the project is to make the attendance process in organization effortless.This system can be more efficient than bio metric attendance and other manual attendance system .We processed this system using python language with face recognition open cv libraries with Haar cascade algorithm.It can automatically detect the face with uploaded photo and mark the attendance with name and time in excel

Key words: Artificial intelligence, Face recognition, Haar cascade

I. INTRODUCTION

In this methodology of face recognition attendance system. the system is trained and tested whether it could detect the faces by uploading some pics of photos, after the successful detection of face, it compares the live faces through the webcam with the already uploaded photos. In this methodology Haar cascade algorithm is used for detecting faces, it is mentioned in further topics, now after the successful match of the live face through web cam and already uploaded pics. This function triggers the excel file and enter the name of the student and time when the attendance is taken. Programming language python is used for performing this methodology,since python contains libraries like open cv, it is easy to perform our methodology comparing to other language, automation process of opening and entering the details in excel is also performed by python This proposed methodology can be used in various organization for cut out the time waste of taking attendance, taking attendance using manual method leads to great time loss, for example consider 45 mins of an class , 15 mins of the class are wasted for just the attendance purpose, so this can be solved and also in our methodology we can recognize multiple faces at same time ,students or members need to present in the room the web cam in the class captures all the faces of the students and compares it with uploaded pics,this pics can be uploaded in the any file of our system , just we need to mention the path to the python code , after that we can perform calculations in the excel itself. Indepth concept of the proposed methodology is mentioned further

II. PROJECT BASICSAND REQUIREMENTS

A. BIOMETRICS

Biometrics are the calculation done in human characteristic features for identify or recognizing individuals from one another, since each and every individual has different face encoding, different thumb impressions, through this we can give access control, individual identification and so on. This methodology is used in computer science as face recognition

Iris recognition and thumb impression.Face recognition systems have been conducted now for almost 50 yearsFace recognition is one of the researches in areapattern recognition & computer vision due to its numerous practical applications in security system, personal identification and so on[1]

B. SOFTWARE REQUIREMENTS

Software requirements are the required system and application software to perform this methodology

- OS requirements: Linux\windows 7-11\Mac OS 10.6 -12
- Python IDE: PyCharm\visual studio code
- Python Libraries:OpenCV, Face-recognition, Numpy,Cmake, Dlib
- Data register: excel automated with python

C. HARDWARE REQUIREMENTS

- PC/laptop with at least 4GB RAM, 250GB HDD, i3 7th gen/AMD Ryzen3
- Inbuilt webcam/external webcam with at least 720p resolution

III. PROPOSED METHODOLOGY

A. HAAR CASCADE ALGORITHM.

In this methodology HAAR CASCADE machine learning algorithm is used for face recognition.Object/face Detection using Haar feature-based cascade classifiers is an effective method proposed by Paul Viola and Michael Jones in the 2001 paper, "Rapid Object Detection using a Boosted Cascade of Simple Features".[2].Face recognition includes the operations of automatically detecting followed by verifying a person from either picture or video[3]

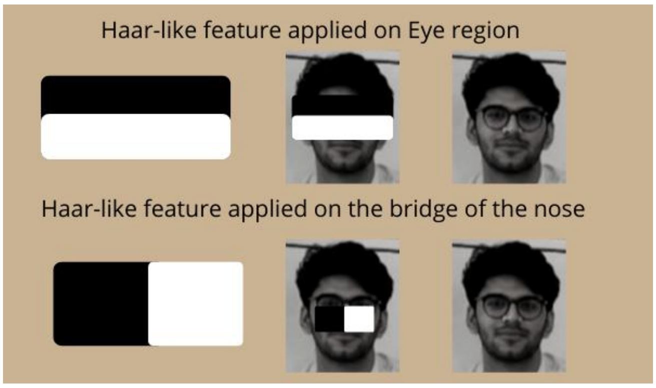

Haar-like feature applied on Eye region
Haar-like feature applied on the bridge of the nose

Fig 1:haar feature ,recognizing face (source:towardsdatascience.com)

In this pic Haar classifiers compares the dark and light area of the faces and determines whether it is a face or not and using this algorithm in Open cv framework we could recognize face and this algorithm can be used to detect objects too, with different haar feature variation

B. Face Encodings

After the successful image recognition using haar cascade algorithm , the live faces which is capturing by web cam will be compares with the students images already uploaded , this comparison can be done by python library called face recognition through which we can get the unique encodings for different faces ,Then we can compare the live face and uploaded images encoding, if it matches the face will be recognized by showing the name of the student in the web cam

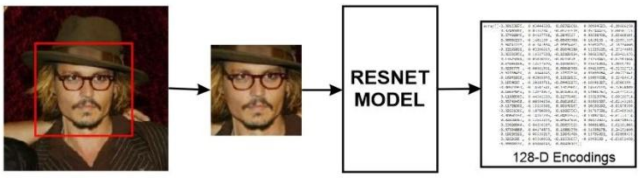


Fig3: face encoding

(source: towardsdtascience.com)

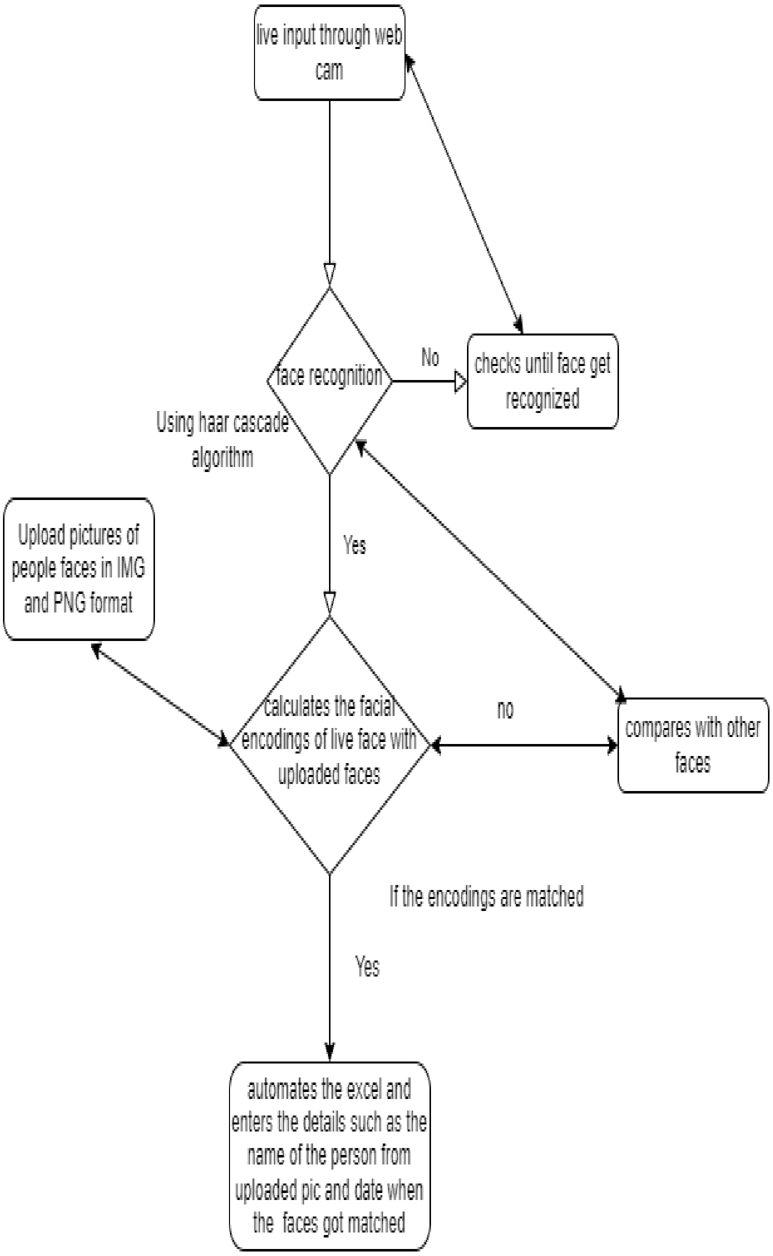
Different procedures will take place in the face recognition system when the image quality improves. The activities are completed using Python queries. "encode faces.py" in Python. The information will come from the dataset to be received in the "encodings.py" file[4]

Sample code for encodings match

```
im=cv2.resize(img,(0,0),None, zero.25,0.25)
im=cv2.cvtColor(im, cv2.COLOR_BGR2RGB)
faceloc=face_recognition. Face_locations(im)
faceenco=face_recognition.face_encodings(im,faceloc)
for f ,fa in zip(faceenco,faceloc):
suits=face_recognition.compare_faces(encodelistknown,f)
matcloc=face_recognition.face_distance(encodelistknown,f)
matchindex=np.argmin(matcloc)
```

This code explains how the encoding matches are done, first the color should be converted into B/W since the image recognition lib can’t recognize color pics then the encoding is calculated and compared while live camera is capturing faces.

C. Flowchart:


live input through web cam
face recognition
No
checks until face get recognized
Using haar cascade algorithm
Yes
Upload pictures of people faces in IMG and PNG format
calculates the facial encodings of live face with uploaded faces
no
compares with other faces
If the encodings are matched
Yes
automates the excel and enters the details such as the name of the person from uploaded pic and date when the faces got matched

The above flowchart explains the methodology of this system it explains the whole flow of the system from the input and output, the input will be the live faces captured through web camera and the output will be the data entered in the excel sheet

D.Algorithm

Step1: Tested the face detection module by uploading the image of facesto confirm that system could recognize face

Step2:Using face recognition lib through haar cascade algorithm the live faces are detected through web camera

Step3:After the successful detection of face,face recognition lib calculates the unique face encoding

Step 4:The face encodings of live face is compared with the uploaded photos

step 5: After the successful matches of encoding, excel automate module collects the data such as live date and name of the person from the uploaded pics and enters it in the excel workbook

E.Modules

This software is worked out in two modules, csv file and the file containing uploaded images. In main.py module the system is tested with random pic whether it is detecting faces in the pics or not

```
 import dlib
import cv2
import numpy
a=face_recognition.load_image_file("googleceo.jpg")
a=cv2.cvtColor(k,cv2.COLOR_BGR2RGB)
b=face_recognition.load_image_file("Elon_Musk.jpg")
b=cv2.cvtColor(k1,cv2.COLOR_BGR2RGB)
coordinates=face_recognition.face_locations(a)
encoding=face_recognition.face_encodings(a)[0]
coordinates1=face_recognition.face_locations(b)
encoding1=face_recognition.face_encodings(b)[0]
(x,y,w,h)=coordinates[0]


rect=cv2.rectangle(a,(h,x),(y,w),(0,255,0),2)
(x,y,w,h)=coordinates1[0]
rect1=cv2.rectangle(b,(h,x),(y,w),(0,255,0),2)
result=face_recognition.compare_faces([encoding],encoding1)
cv2.imshow("face datector",a)
cv2.imshow("facedete",a)
print(result)
cv2.waitKey(0)
```

The above code recognizes the face from the image feed into the system using libraries cv2, Dlib, NumPy

Dlib-ml is a move platform open supply software program library written in the C++ programming language.

Its layout is closely motivated by using ideas from layout by settlement and aspect-based totally software Engineering[5].NumPy is a python library used to calculate complex arrays, here we used NumPy to calculate the face encodings

The next module will be facedetect.py, in this module as explained in refer (B.Face Encodings) the code will compare the face encodings and shows the result with the name of the person,where it reads from the file where pic is uploaded

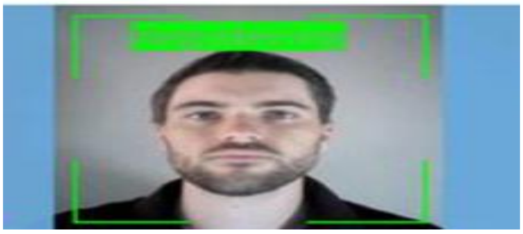


Fig 4: detected face through web cam

And after that the code enters the live time and name of the person directly into the excel file as.csv,just need to use open()file function and readlines,writelines function

F.System architectures

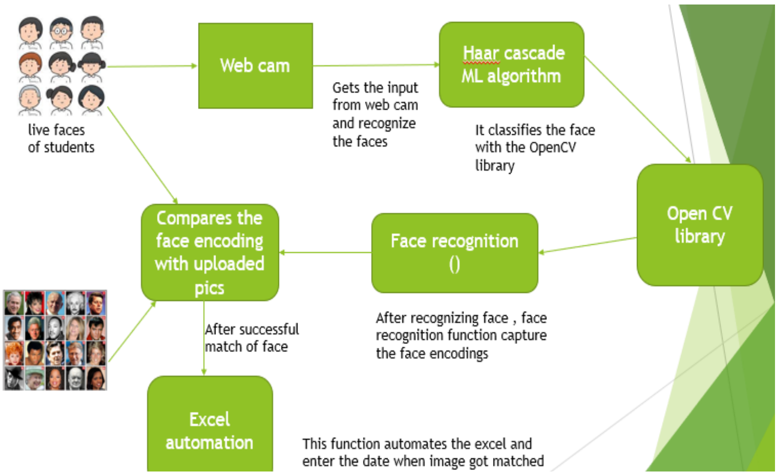


Fig 5:the above slide mentions system architecture of our methodology

IV. REAL TIME APPLICATION AND ADVANTAGES

A. Adavntages

- In manual attendance process it consumes a lot of time and human efforts so using this methodology the process is completely automated
- AI attendance register using face detection is proposed to avoid the manual attendance process,
- it saves time and automates the process of marking attendance
- Multiple faces can be detected
- The name of the person will be visible in the webcam screen
- It automatically registers our name and time in excel as soon as our face got detected
- Haar –cascade is one of the best open source algorithms which is implemented in this system
- No need of physical touch, whereas in thumb impression bio metric system it’s not possible (avoid infections)
- It can detect multiple faces at one instance, It is not required to show faces one by one so it saves a lot of time

B.Real time application

The motivation of this project is to produce an complete automated attendance registering using the help of AI with certain methodologies such as face recognition, chatbot and machine learning algorithm, This methodology save time, budget friendly and gives effective result, This system can be used in schools, colleges and organizations,

Schools/colleges: In schools this application will create an great impact on the education, it takes about 15 mins to take attendance on an average in an 45 mins class ,15 mins is wasted but if our application is installed it captures the attendance of the students present inside the class through the web cam installed inside the class and it automatically enter the attendance data into the excel file ,so there is no tension for students and teachers

Office/organizations: In the office and organization the productivity of the work will be increased and can avoid thumb impression system in the situation of Covid, there is no human contact involved in this type of attendance systemand every details of the employees can be stored and it can be checked in excel we can also setup payroll generation in the excel by the hours and days the employee worked for the company, Through this the productivity of employees will increase upwards, since our system is cost efficient it can installed all over the office in the reasonable rates

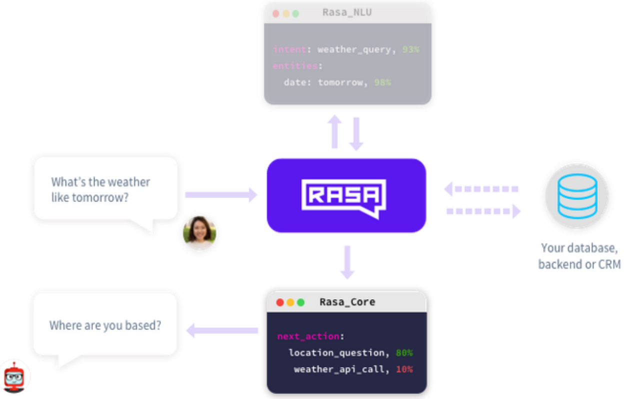
C.Disadavntages of existing methodologies:

- Face detection is been done with just 60-70% accuracy
- The process is slow for capturing the face measurement data
- Multiple faces are not be detected in most of the application
- Date and time are not accurate in the existing applications under our observation
- The existing system is not user friendly, whereas in proposed system a person with minimal knowledge can function this system
- The expense is too high for the existing application proposed to our application

D.Further update

In further update we are planning to connect this system with the chatbot where u can get the attendance details from the chatbot, it collects data from excel through API call and output the desired result to the user, this chatbot can be build using NLU (natural language Understanding) which is an AI methodology, it can be done by already available open source NLU environment such as RASA NLU[6]. Rasa is a machine learning framework for automated text and voice-based dialogues that is open source. Connect to messaging channels and APIs, understand messages, and hold conversations' (Natural Language Understanding) is a technique for extracting structured data from user messages. This usually comprises the user's intent as well as any entities contained in their message. You can supplement your training data with additional information like regular expressions and lookup tables to help the model accurately detect intents and entities.

When query or data is received by rasa from the end user, rasa will predict the values of entities and intents from the message, all this handling is done by RASA NLU unit[7].



```
intent: weather_query, 93%
entities:
  date: tomorrow, 98%
```

What's the weather like tomorrow?

Where are you based?

```
next_action:
  location_question, 80%
  weather_api_call, 10%
```

Fig 6: Basic architecture of RASA (source:RASA.com)

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