Face Recognition Based Attendance System in Schools and Organisations

Abhishek Kumar Singh, Chirag Pattanaik, SanketDarokar

Abstract: To give programmed understudy attendance framework and understudy attendance framework by actualizing a superior face discovery and acknowledgment framework. The framework takes pictures of understudies and distinguishes, examines and perceive faces utilizing picture preparing calculations. Haar course classifier and LBPH calculations are utilized for facial acknowledgment. In the wake of gathering picture handling information, the framework will create a record of definite attendance and transfer it to the cloud. In a particular time (ex: 14 minutes after class has begun) framework will send the email warnings to the understudies in the event that they are missing. After conclusive report is transferred tally of the understudies' present will be spared. On the off chance that check is diminished during address hours, at that point email will be sent to the regarded staff about the bunking of the understudy. OpenCV library will be utilized for actualizing Haar course classifier and LBPH, Python and python library Numpy will be utilized for investigating information [10]. Area Convolutional Neural Network (R-CNN) is utilized for flawlessly checking the quantity of understudies present inside the study hall and recognizing on the off chance that somebody bunks the class.

Keywords: Face Recognition,Haar cascade, Image Processing, OpenCV.

I. INTRODUCTION

Over 10 years, unconstrained outward appearance has set up a significant job in distinguishing human feelings. As one of the best uses of picture investigation, face acknowledgment has as of late increased huge consideration. Human-PC association plays a significant job like face acknowledgment, removing facial highlights, feeling location. For distinguishing faces, various methods showed up throughout the years. Presumably the best depends on feeling discoveries and perceiving. Significance of Face Recognition System as a Security Solution Face is considered as the most significant piece of human body.

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Research shows that even face can talk and it has various words for various feelings. It assumes a pivotal job for communicating with individuals in the general public. It bunches individuals' character, so it tends to be utilized as a key for security arrangements in numerous associations. These days, face attendance framework is getting expanding pattern over the

world for giving amazingly protected and dependable security innovation

Moreover, this system is providing vast benefits when compared to other biometric security solutions like palm print and finger print. The system captures biometric measurements of a person from a specific distance without interacting with the person.

A. Overview

The project is completely founded on algorithmic utilization of coding and put away databases records to accomplish face recognition. This empowers the client to store and address part of pictures under a go. The algorithmic utilization of profound learning in current period is the let through for getting quicker and exact degrees of face recognition. Profound learning frameworks are designed according to the neural systems in the neocortex of the human cerebrum, where more significant level comprehension happens. In the cerebrum, a neuron is a cell that transmits electrical or synthetic data. At the point when associated with different neurons, it frames a neural system. In machines, the neurons are virtual — essentially bits of code running factual relapses. String enough of these virtual neurons together and you get a virtual neural system. Second part includes the utilization of face highlights recommended as Haarcascade [1]. Here we will work with face recognition. At first, the calculation needs a ton of positive (pictures of appearances) and negative (pictures without faces) to prepare the classifier. At that point we have to concentrate highlights from it. For this, Haar highlights appeared in underneath picture are utilized. They are much the same as our convolutional bit. Each component is a solitary worth gotten by subtracting entirety of pixels under white square shape from aggregate of pixels under dark square shape. In conclusion the database having predefined highlights of each picture can be handled to identify the face.

B. System features

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a. Haar features on face

Haar Cascade, a machine learning object detection algorithm rule accustomed establish objects in a picture or video and supported the idea of options planned by Paul Viola and Archangel Jones. It's renowned for having the ability to observe (identify) faces and parts pictures. A Haar Cascade is largely a classifier that is employed to observe the thing that it's been trained for, from the supply. The Haar Cascade is by superimposing the positive image over a collection of negative pictures. The coaching is mostly done on a server and on numerous stages.

Higher results are obtained by victimization top quality pictures and increasing the quantity of stages that the classifier is trained.

The algorithmic rule has four stages: Haar Feature Choice, making Integral pictures, Adaboost coaching, Cascading Classifiers [3]. In general, 3 types of options are utilized in that the worth of 2 rectangular options is that the distinction total of the pixels at intervals 2 rectangular regions. These regions have same form and size and are horizontally or vertically adjacent. Wherever as within the 3 rectangular options are computed by taking the total of 2 outside parallelograms then ablated with the total in an exceedingly center rectangle. Moreover, within the four rectangles feature computes the distinction between diagonal pairs of rectangles.

b. Image processing part

The framework utilizes different ways to deal with to store the picture. The convolutional neural system is the commonest of all. CNNs exploit the way that, in some random picture, vicinity is unequivocally associated with comparability. This implies the two pixels that are close to each other are bound to be connected contrasted with two pixels that are further separated. While in an average neural system, each pixel is associated with every neuron. CNNs make picture handling helpful by sifting associations through the given closeness. Rather than interfacing each contribution to the neurons in a given layer, CNNs deliberately abbreviate associations with the goal that just a single neuron acknowledges contributions from a little subsection of the layer before it. Making every neuron answerable for just preparing a particular piece of a picture.

c. Face recognition part

It's a building being utilized in different type of utilizations that distinguishes human faces in computerized pictures. Face discovery conjointly alludes to the mental technique by that people find and resolve to faces in an exceedingly visual scene. Face Detection is that the first and fundamental advance for face acknowledgment, and it's acclimated watch faces inside the photos. It's a region of item location and may be use in a few zones like security, bio-measurements, authorization, redirection, individual wellbeing, and so on [7].It's acclimated watch faces continuously for police examination and pursue of individual or articles. It's wide used in cameras to detect various appearances inside the casing Ex-Mobile cameras and DSLR's.

Initial, a picture of your face is caught from a photo or video. Your face may appear to be distant from everyone else or in an exceedingly swarm. Your picture could show you needing straight ahead or about in profile. From that point forward, personality confirmation bundle peruses the unadulterated arithmetic of your face. Key components exemplify the space between your eyes and furthermore the good ways from temple to jawline. The bundle distinguishes facial milestone, one framework recognizes fifty of them, that are vital to recognizing your face. The outcome: your facial mark. At that point your facial signature and a numerical recipe is contrasted with a data of far-cultivated appearances. Also, finally an assurance is made. Your faceprint could coordinate that of an image in an exceedingly character confirmation framework data.

C. Facial features to computer understanding

An easiest method to extricate the data contained in the picture is to by one way or another identify the example of varieties into the picture. This can prompt further classificationof hues, contrasts, haar highlights and so forth we don't pass judgment on the picture starting at now yet just extract the sourcedata[5]. This data of variety can help in further encoding and translating of other related countenances. Different countenances are just contrasted with the stores highlights.

Eigen face approach [1] is noteworthy on the grounds that eigen esteems for a vector are special ones. So, the PCs recognizes just those highlights that are novel and dispense with the time.

The picture is considered as a vector as indicated by the framework information it gives to the NumPy dataset. These vectors are considered in high dimensional space. The varieties are in this way recorded according to requesting of vectors.

The eigen face approach is basically;
1. Acquiring set of images
2. Calculating the eigen values of image set and keeping the most vital records of image.
3. Comparing the known faces into the eigenfaces and drawing the corresponding variation with respect to it.
4. While considering other unknown images the comparison may give less weighted or more weighted eigen values
5. Updating or deletion of eigen values is done if same face feature is encountered again and again.

II. MATHEMATICS OF EIGENFACES

A mathematical model is a description of a system using mathematical concepts and language.
The mathematical modelling for our system is as follows: -
S= {I:, F, 8, C}
S = Face Recognition.
I: = set of input symbols = {Image, Face Database} F = set of output symbol = {Match Found, Not Found, Attendance Marked}

After these calculations are done in the pre- programmed manner the better the results offer image recognisability.

1. Start

2. Read training set of N * N images.

3. Select training set of N * M Where,

   M: number of sample images

4. Find average face, subtract from the faces in the training set, create matrix A

5. Calculate covariance matrix: AA'

6. Calculate eigenvectors of the c covariance matrix.

7. Calculate eigenfaces = No. of training images - no. of classes (total number of people) of eigenvectors.

8. Multiply set of eigenvectors by A matrix to create a reduced eigenface.

9. Calculate eigenface of image.

10. Calculate Euclidian distance between the image and the eigenfaces.

11. Image will be recognized if Euclidian distance is minimum.

12. Output: Recognized image then compared to input face database and marked the attendance.

III. PROPOSED WORK

For executing the computerized face acknowledgment framework, we have to pursue some specific techniques. The specific advances should be performed for this procedure. The face detection and recognition are steps that works simultaneously. It becomes important to program in such a way that there is always a difference understood between these two independent procedures. The standard process proposed by our work are mentioned.

Steps for Face Recognition based Attendance System:
1. Enrolment
2. Image Acquisition.
3. Converting the picture into gray scale Image.
4. Histogram Normalization.
5. Removing Noise.
6. Classification of Skin.
7. Face Detection.
8. Face Recognition.
9. Attendance checking

Above are the means which should be pursued for effective attendance marking.

A. Enrolment:

The understudy or individual will be selected to the database utilizing their general data and one of a kind biometric highlight. This data will be spared as formats. The enrolment incorporates:
• Taking picture by camera
• Enhancement of that picture
• Feature extraction

• Maintain Database

The picture of individual will be caught from the camera and afterward it will be improved utilizing histogram adjustment and clamour sifting. At that point after this procedure, the highlights are extricated from the picture. The one of a kind highlights will be put away in the face database and a specific id will be doled out to that individual.

B. Image Acquisition:

A top-notch camera gadget will be introduced before the study hall. The camera gadget will catch the picture of entire homeroom. This caught picture is given as a contribution to the framework.
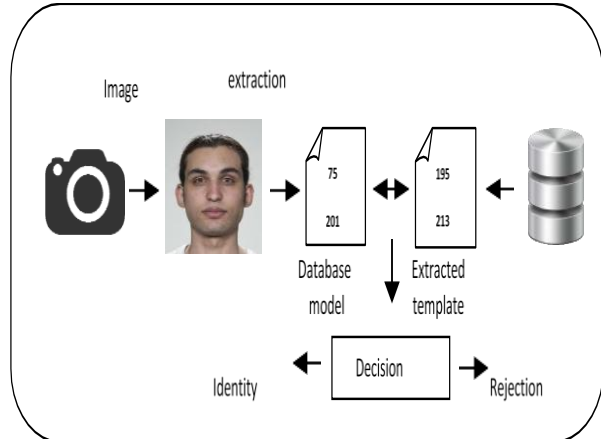

Fig 1: Image acquisition process

C. Grayscale conversion of image:

The image which is captured from the camera device sometimes may have the brightness in it which needs to be removed for the appropriate result. Therefore, the Captured image is converted to grayscale image for the enhancement.

D. Histogram Normalization:

Histogram Normalization is a system utilized for differentiate upgrade. After this the picture will be evened out for expelling the complexity with the goal that the understudies sitting on the back columns can be plainly observed and it will be anything but difficult to remember them. At that point it produces the histogram of the balanced picture. Noise Removal: When the information picture is caught by camera, it might contain the commotion which must be separated from picture. The middle sifting is one of productive systems for evacuating the noise.

F. Skin Classification:

In the skin grouping procedure, every one of the pixels are made dark aside from the pixels which are firmly identified with the skin. Those pixels become white.

The exactness of face recognition calculation is improved after skin arrangement. Face Detection: After the improvement of picture, the picture comes to confront identification module.

This module will distinguish the essences of understudies from picture. The Viola and Jones Algorithm is utilized with the end goal of face discovery. It is otherwise called the Ada-Boost calculation for face discovery which is made by Viola P. furthermore, M. 1. Jones [3].

G. Face Recognition:

Face acknowledgment is the subsequent stage after face location. The face acknowledgment can be accomplished by editing the countenances from the picture and contrasting them and the selected pictures in the face database. For the face acknowledgment, the idea of choice of district of intrigue is utilized, and the countenances are confirmed individually utilizing the Eigenface strategy.

V. PROPOSED SYSTEM ARCHITECTURE

All the hardware requirements are mentioned in the step wise order of our proposed system. The project went in order of these broad classifications. Straight from getting the input of dataset to managing the recognition and detection process the hardware should work independently with each other. This basically allows the network of each hardware with each other and makes its study easier. In the developmental prospect, it guarantees easierintegration of hardware with enhanced technology as and when required.
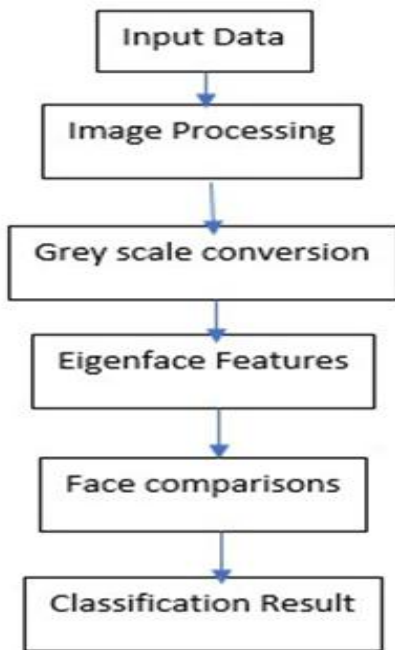
Fig 2: Standard procedure for face recognition

V. RESULT AND DISCUSSION

The brilliant and mechanized attendance framework can be demonstrated as a productive framework for homeroom attendance. By utilizing this framework, the odds of phony attendance and intermediaries can be decreased. There is a load of Biometrics Systemswhich can be utilized for overseeing attendance, however the face acknowledgment has the best execution.

The database is kept ready with the pictures of the students in the class. These folders are managed and authorised only by login and password known exclusively by the staff.

Fig 3: Managing the database of attendees in

The image collected by the machine/ camera generates the running records of faces that are kept in recognised folder. The recorded faces as seen in the image below are automatically given matching name and database is updated.
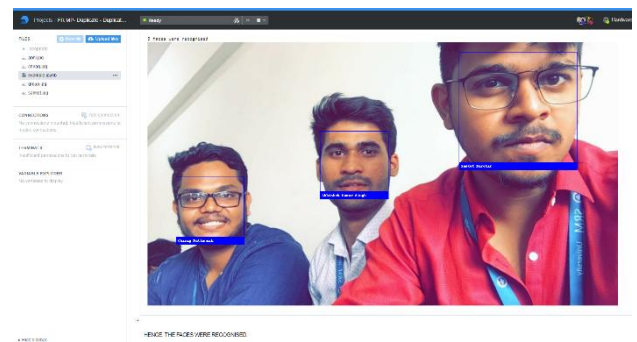
Fig 4: Detection and Recognition phase

The accuracy of the system showed good results under the light conditions. Classroom and offices could make of good lighting near and around the places designated for attendance recording. These processes were further enhanced by the use of good camera.

Table 1: Noted accuracy of the proposed system

CASES	NO. OF IMAGES IN DATASET	NO OF IMAGES MATCHED	ACCURACY
1	50	48	96%
2	50	48	96.20%
3	50	47	94.20%

The graph representation of face detected vs the faces fed into the system clearly demarcate the successful performance showed by the proposed work.
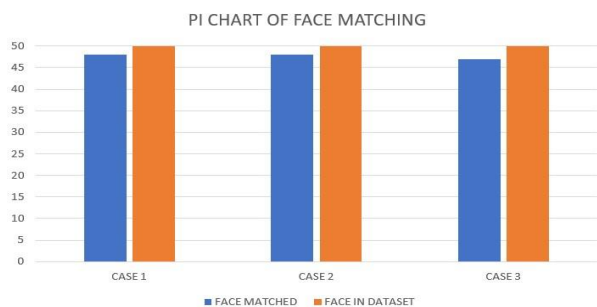

Fig 5: Success measurement of system through comparison

VI. CONCLUSION

We have with the help our researchexecuted a solid and productive attendance framework for class room attendance which can work for different face acknowledgment at once. We found the answer for light power issue and head present issue for which we can utilize the Illumination Invariant calculation. Additionally, to execute this framework, no other particular equipment is required. A camera gadget and an independent PC, database servers are adequate for building the goodattendance framework.

VII. FUTURE WORKS

There is an impassioned need to diminish time taken in inconsequential things. Attendance despite the fact that is most significant for any association, it must be done in a manner by which ordinary work isn't affected. Utilizing quicker biometric such face location there is future extent of attendance mean enormous groups and assembling as well. Since we have proposed a measured methodology, we can improve various modules until we arrive at a satisfactory recognizable proof and confirmation rate. The correlation of the info picture and the picture put away in database ought to be quick and dependable enough. This methodology plans to comprehend the issues by incorporating face acknowledgment all the while. Despite the fact that this framework still does not have the capacity to distinguish every understudy present on class, there is still significantly more opportunity to get better. Since we actualize a measured methodology, we can improve various modules until we arrive at a satisfactory discovery and identity rate.

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AUTHOR'S PROFILE

ImAbhishek Kumar Singh, being a student of engineering at SRM IST, I aspireto explore the latest technologies in the industry after my graduation. I'm regularly in touch with the newsletters and articles about the new innovations that are taking place. Our project on Face recognition technology is a step towards having more automated method of attendance. Although there are technologies already working in this domain, but I believe constant research on it becomes vital as it can help make the technology more enhanced and adaptable to changing times. I'm an avid reader of Novels, particularly of Historical and political domain. Society and various cultures in our country have always inspired me a lot. I dream of working for innovation that can help eliminate the burden on our society. Great scientists and engineers like Dr. APJ Abdul Kalam and Mr. Sonam Wangchuk are some of the best examples of people who've actually worked as bridge between technology and society. I believe its high time weengineer see people like them as our motivation and work for betterment of India.

Chirag Pattanaik, 20yrs old, pursuing my Bachelor's degree in Computer Science Engineering (CSE), from SRM Institute of Science and Technology, Chennai-600089, presently in 3rd year. My fields of interest are artificial intelligence, machine learning, python, data encryption, software testing, scripting, and cybersecurity. I did my research work in image neural processing, data mining, android development. I also did my research work on the Face recognition system using haar-cascades, viola jones and expression processing system algorithms which can be implemented in Attendance system and in keeping the entries updated automatically rather than manual updating manually with advancement in the algorithm.

SanketDarokar, B.Tech Computer Science student, currently in 3rd year from SRM Institute of Science and Technology, Ramapuram. I've been keen about computers and various software used around us on day to day basis, from a very young age. I'm a tech enthusiast who is currently traversing through IOT and Machine Learning. Lately, Machine Learning has caught my eye because it is an enabling technology. It allows us to develop software faster than before. IOT provides a platform that connects people and their devices and allows to control them using big data. I've have been developing my skills to use IOT, Machine Learning, Big Data Analytics. As my personal favourite, I would like to explore the world of Artificial Intelligence soon.