Auto Face identification and attendance system

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Abstract : *An attendance system is very essential for all people from students to faculties. The main issue with the traditional attendance system is it can be easily manipulated by students and creates unnecessary troubles for the teachers incharge. Our system captures the image of the person standing in front of it and grants permission to enter or leave. It identifies a student or a staff member via his or her face. With minimum effort, attendance of students and staff members can be easily managed.*.

IndexTerms **- Face identification, Eigenface techniques , Attendance system.**

I. INTRODUCTION

Image processing is an application of digital signal processing which involves filtering, enhancing etc. of images using various types of functions in addition to other techniques to extract information from the images. Face recognition is a task of identifying an already detected object as a known or unknown face in order to detect a face.

For this purpose a camera and a sensor is required. camera to capture the picture of the person standing in front of it and a sensor to tell the user to maintain a distance to take a good capture. The captured image is then cross verified with the data stored in the database and the result is shown. Based on the result the person is allowed to enter or denied entry.

The traditional method to take attendance of students and staff via a piece of paper is very flawed. It can be easily manipulated by means of proxy, it is very time consuming and very difficult to keep a track of for the long run. For this purpose, we have used a database which keeps a track of attendance of every student and staff and is updated every time a person enters or leaves. At the end of the day, a report is generated which can keep a record of everyone who used the system.

As technology is advancing and we are moving towards modernization, our methods to do anything needs to evolve in an efficient manner. For such reasons a face identification system should be used which reduces the load of students as well as teachers.

II. RELATED WORK

TABLE I :COMPARISON OF TECHNOLOGY USED FOR AUTO FACE RECOGNITION

Year	Title of paper	Technology Used	Algorithm	Accuracy
2018	Sakshi Patel [1]	OpenCV	Calling the Face Recognizer class library from openCV	Very high accuracy
2017	B Prabhavathi [2]	Ensemble learning	Histogram normalization, noise removal, skin classification, face detection, face tracking, face recognition	High accuracy
2012	Nirmalya Kar [3]	Principal Component Analysis	Principal Component Analysis, Learn and train face images, recognize and identify	Moderately accurate
2017	María José Beltrán Meneu [4]	Linear algebra	Calculation of eigenvalues and eigenvectors using eigenface technique	Moderately accurate

[1]This paper discusses a machine learning approach using IOT. It uses a python library called as openCV alongside machine learning. it captures the image data and creates its own dataset, trains it with the algorithm and then uses it to identify students and records the attendance.

Due to its machine learning capabilities, this method proves to be the best for implementation as it has a very high accuracy and very easy to implement as the functions are readily available.

[2]This paper mainly focuses on a technique from machine learning called as Ensemble Technique. This term basically means that ensemble methods use multiple algorithms to obtain better predictive performance that could be obtained from any of the constituent learning algorithms alone. So basically, they have used various algorithms like Histogram normalization, noise removal, skin classification, face detection, face tracking, face recognition into a single algorithm and the system is implemented.

[3]This paper discusses a technique called the Eigenface technique. It is used to reduce the dimensionalities of images. It refers to retaining the useful information in any image and discarding the unwanted data. Eigenface acts as a core component for dividing of face into separate feature vector

It uses a technique called modified Viola-Jones algorithm i.e. Principal Component Analysis which plays an important role in reducing the dimensionalities of the images. With this algorithm we can improve the performance of the system.

[4]This paper discusses and emphasizes on visualization and physical applications in the study of eigenvectors and eigenvalues, how these values can be used to check the orientation of any object and how mathematical concepts can be applied to various applications. This paper used a software called Geogebra which can be very helpful to calculate these values and configure the objects. Using basic matrices and their properties eigenvalues of any object in discussion can be calculated.

III. METHODOLOGY

Considering requirement and research done the proposed system consists of one major goal that is face identification.

It requires a camera, a system which can do all the processing work and a database. Image processing is done by software. The person stands in front of the system and the image is captured by the camera. This captured image has to go through the steps as explained. For this process a dataset has to be considered which contains information of various people. These images are converted into vectors. This dataset has to be split and trained in a random manner so that every time data is trained with a different data [2]. Principal Component Analysis, a method which allows us to represent data in a lesser size. We calculate the average of faces using the vectors and then we show the eigenfaces[4]. Finally, the accuracy of the calculated eigenface is calculated.

After calculation of this data, based on the results the images are identified. This data is then collected and updated in the database. If the capture fails or doesn't the data in the database then the image is recaptured. One can demand for registration at the college reception.

IV. FLOW CHART

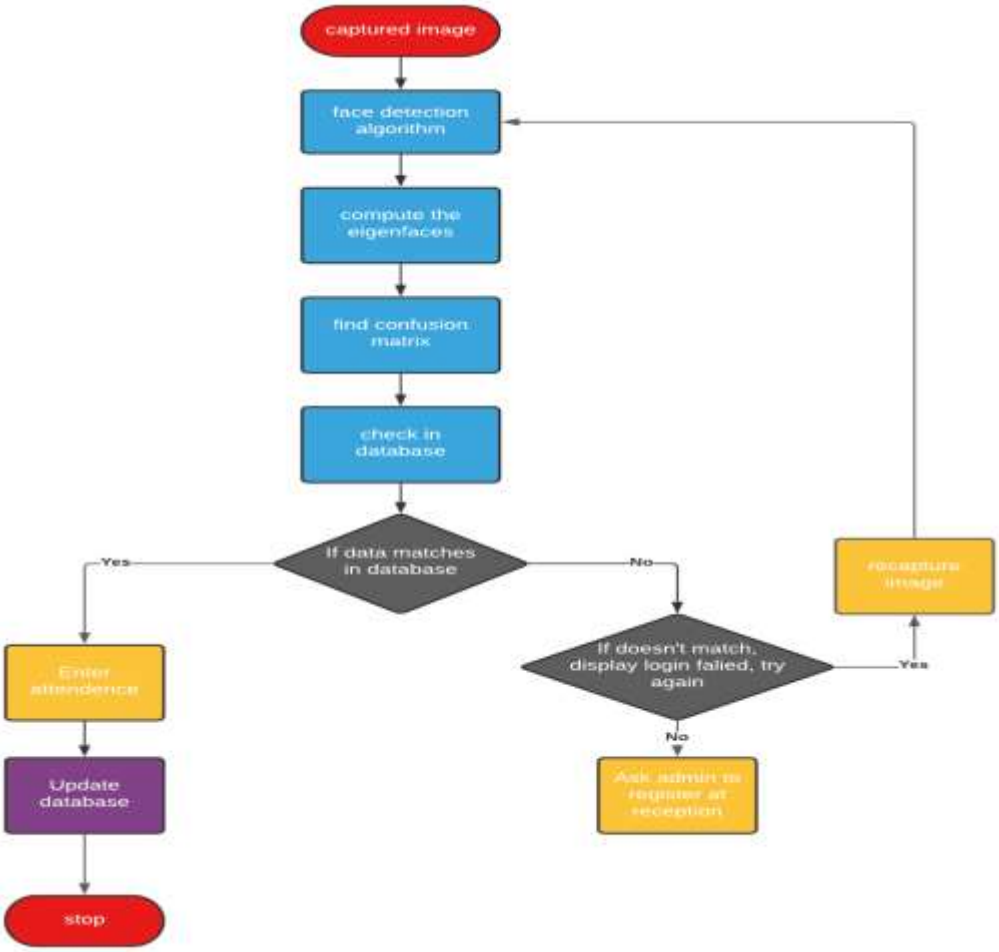

Fig. 1 Flow chart of proposed system

A. Face Identification

The image is captured using the camera and sent for its further identification. The face detection algorithm detects the face. Since our methodology depends on eigenface techniques, we calculate the eigenfaces [4] of the image.

The Principal Component Analysis technique [2] is applied to the images to the image and a confusion matrix is calculated from it. It helps us to identify the person based on it.

B. Attendance Registration

If this calculated data matches to that of the data stored in the database, attendance is registered. If this data does not match then image is recaptured for another try.

V. Block Diagram

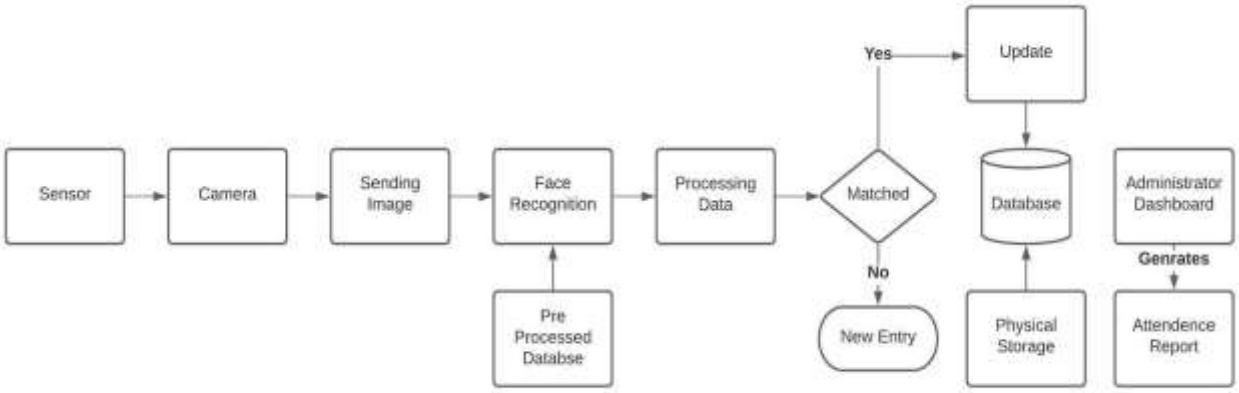

Fig. 2 Block Diagram Of Automatic face recognition

The sensor is used to calculate the distance between the person standing and camera. The image is captured with the help of camera. This image is sent to the Face recognition algorithm.

The face once detected will perform the Principal Component Analysis technique to calculate the vectors [2]. These values will be compared to that of the processed values in the database. If the data matches then the attendance will be registered and will be stored in the database. If it does not, image will be recaptured. If a person affiliated to the institution wishes to register themselves then they can go to the institution reception for further inquiry.

VI. Result

A. Dataset

Olivetti dataset was taken from Kaggle for this research paper. This data set contains images of 40 people and.in addition to that we have added Name attribute for image mapping with the person.

These are the 40 Random names that we have used.

["Hinata Hyuga", "Sakura Haruno", "Kakashi Hatake", "Naruto Uzumaki", "Sasuke Uchiha", "Shikamaru Nara", "Shino Aburame", "Eren Jeager", "Neji Hyuga", "Itachi Uchiha", "Obito Uchiha", "Shin Uchiha", "Madara Uchiha", "Armin Arlelt", "Zeke Jaegar", "Levi Ackermann", "Mikasa Ackermann", "Annie Leonhart", "Bertholdt Hoover", "Naofumi iwatani", "Subaru natsuki", "Tanaya Degurechaff", "Kazuma Sato", "Megumin", "Roswaal L Mathers", "Kuma Chan", "Lelouch vi Britannia", "Sawamura Daichi", "Sugawara Koushi", "Azumane Asahi", "Nishinoya Yu", "Tanaka ryunosuke", "Ennoshita Chikara", "Kinnoshita Hishashi", "Kazuhito Narita", "Kageyama tobio", "Hinata shoyo", "Tsukkishima Kei", "Yamaguchi Tadashi", "Capeta Taira", "Rimuru Tempest"]

B. Implementation of system.

Part A: pre processing

Firstly random images from the dataset are displayed. The dataset consists of images and their corresponding IDs. So, in order to work on images we had to split the images and their corresponding IDs from the dataset.

The next step was to split the images into training and the testing dataset.

The dataset contains 10 faces for each subject. From the face images for each subject 70% will be used for training and 30% for testing. Thus there will be 7 training images and 3 test images for each subject.

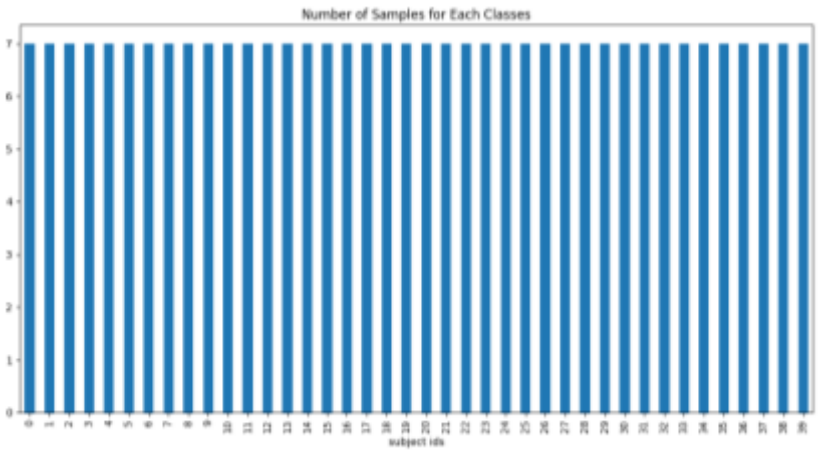

Fig. 4 Training samples

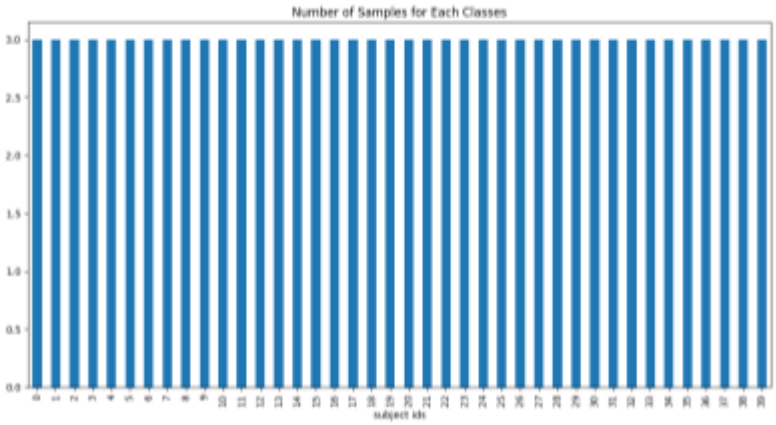

Fig. 5 Test samples

The representation of the data which was split was plotted as shown in fig 4.
Then the next step was to find the optimum number of components for principal component analysis. To find the optimum number of components PCA was performed on the whole image dataset with the help of sklearn decomposition libraries. Then, the graph of variance vs components was plotted as shown in the figure below.

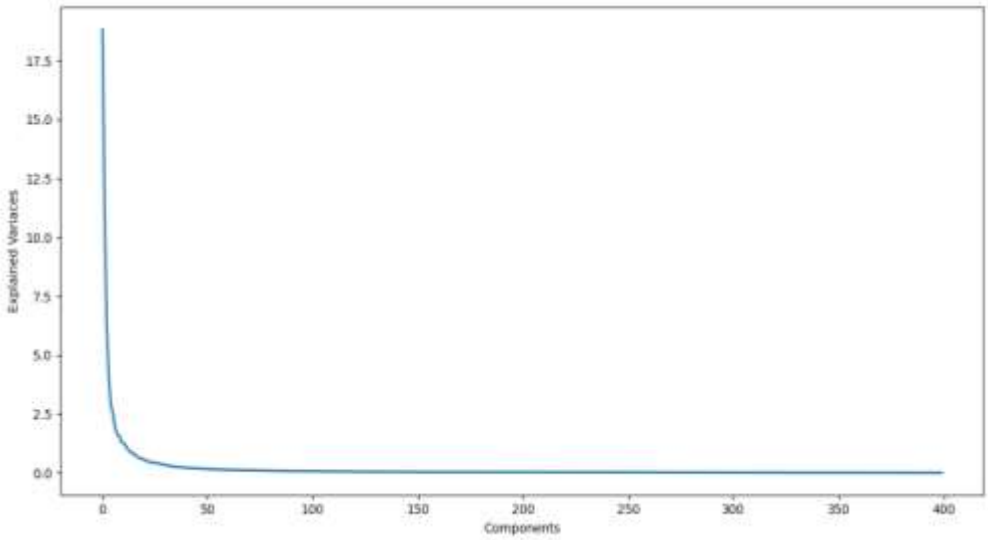

Fig. 6 Graph: variance vs components

Here, as we can see that at around 90th component we get the constant variance values. Which means, from around 4096 components we can represent each image with only 90 unique components.
Eigenfaces of each component were plotted after computing the PCA.

Fig. 7 All eigenfaces from the dataset

For classification process, we used SVC(Support Vector Classifier). The training set was given to the classifier in order to train it. The classifier was used to predict the test data and we achieve accuracy score of around 92% [3]. That means the classifier can now predict the test images.

After that the confusion matrix was obtained, which contains eigenvalues of each component.

Part B-
Then the random image chosen for classifier from the test dataset and it was compared with the trained dataset as shown in fig. 8

Fig 8. Face identification from database.

The function returns the match faced ID and then it gets compared with the list of Names and then the Name to whom that ID belongs is given to another function that marks their attendance inside the Report.txt file. Final output is shown in fig 9

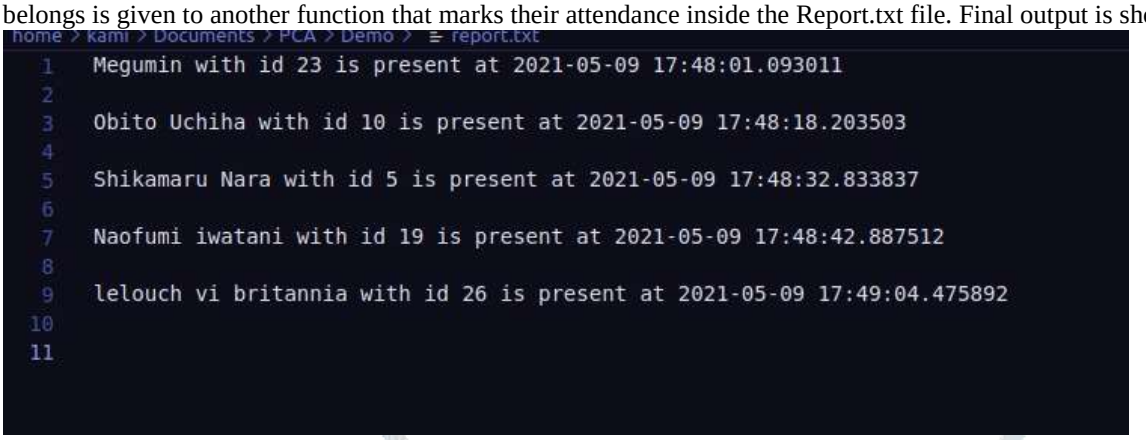

Fig. 9 Attendance Report.

VII. ADVANTAGES, LIMITATIONS AND FUTURE SCOPE

A. Advantages

It is a very simple system to operate and can operated by anyone who has a basic knowledge of technical things. Identification process is very simple and easy to understand as well. It requires no human contact so such a system can be used in any organization in the time of COVID-19 pandemic.

B. Limitations

Accuracy due to camera quality can be deviated. The algorithm used is very simple and hence the accuracy can fall. Front view of the face is required with good lighting conditions for the algorithm to work properly. Identical Twins cannot be identified individually as they share the same face.

C. Future Scope

Our project can be improved in various ways. Better algorithms with higher accuracy rates can be used. Better camera system can be used to capture high quality images. A self training algorithm can be used which can train images automatically when a new person is registered as a student or a faculty.

VIII. ACKNOWLEDGMENT

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