SMART ATTENDANCE MARKING SYSTEM USING FACIAL RECOGNITION

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Abstract—Nowadays, face identification has become one of the key research regions in computer technology.Due to this scientists share a keen interest in this area.In this paper,the authors have proposed an application of facial recognition in attendance marking system.Doing the task manually is a tedious one for the attendance marking system when there is a huge classroomwithmore number of students which is time-consuming. Using this facial recognition system avoids the issue of dummy attendance is possible,proxies and save time.In previous facial recognition attendance systems, there were some drawbacks such as intensity of light,head pose etc.The main research of this paper is to overcome those problems and provide the most accurate attendance marking system.Detection of the student and marking the student attendance while entering the school room is automatically made with this system.This paper defines the prototype of the device and the algorithms used at each level. Algorithms such as Viola-Jones for face detection, PCA for feature selection and SVM for classification have been used.The proposed method gives an efficient way to control the attendance and records of students to that of traditional attendance marking system.

IndexTerms: Automatic Attendance,Biometrics,Face Recognition,Smart attendance.

1 INTRODUCTION

IN the contemporary age of computerization, various novel approaches have been occupied the position to save labor and human intervention.In the same way, facial recognition(FR) is one of the key areas of development in thefield of computer science and it is the greatestwell-organized biometric method for identifying people. Using this technique in education ground as automated face recognition attendance marking system which is way different from traditional attendance marking system as it is time consuming[1].Inspite of the easiest way for using the FR system in mass manner set up, the real execution will be difficult as it requires to consider the maxi- mum exploration of differences that exists in brightness, face mask structures, differ- ences in position, copy determination, device sound, watching remoteness etc.Numerous FR attendance systems were done with everyone's contribution of their strengths and weakness[2].The main aim of this research is to overcome those prob- lems.The modern development of machine learning and neural networks and its applications in face recognition helps the process more accurate and efficient. The

attendance marking system generally consists of following steps such as Image Acquisition,Database development,Pre-processing,Face-detection,Feature extraction and classification and at last, the article end with post-processing stage[3].In the very first stage of attendance recognition system, detection of the faces of students using a voila-jones algorithm and process it through histogram normalization through 100x100size of a pixel,pre-process it finally store it in the database have been carried out.Enormous techniques were made for face detection i.e. AdaBoost algorithm, the Float Boost, Neural Networks, Bayes classifier and the Support Vector Machines (SVM). The maximum competence of the FR attendance system algorithm was raised with the fast face and robust recognition procedure.Here algorithms such as Viola-Jones for face detection, PCA for feature selection and SVM for classification are applied. The further tasks of the paper consists of study work, the in depth implementation of the proposed model and finally results,conclusion and possibility for future development.

2 LITERATURE SURVEY

In this paper[4] the research is mainly focused on the developing of a computerized attendance storing system with the outcome having an audio in the tutorial sessions or any studyhall so that the staff can calculate the undergraduate's attendance. This will be very helpful for the faculties as it saves most of the time as well as the effort especially if there are plenty of students in a class. Generally,in a class ,many students will be there,so it captures all of the student’s faces and takes the attendance only the faces which are identified.This system shows the use of facial recognition technology and how it will be helpful for the attendance marking.It can also be useful for the exam related issues. But it cannot identify the faces which are similar and have similar facial features

Here[5] the author proposed a model for face detection attendance system. Here the system is based on two databases one is student database and another one is the storage database.Firstly the process starts with capturing the images of all the students in the classand images of all the student's related masks will be calculated by the facial features in the images i.e., noselips,eyes mainly. Another database in the system is the attendance database. It uses to mark the attendance of the particular student.A camera isinstalled at the front of the classroom in order to cover the whole classroom.After the camera captures the images noise-removal techniques are applied on them. Gabor filters are applied to that images after that so that facial features are considered.

In this paper[6] they proposed a model for face detection computerized attendance system. The proposed prototypeis mainly focused on the face detection and recognition algorithms. This system works very efficiently.It can easily recognize the students when they enter the classroom.If it matches with the any of the database images

he/she will be marked as present for the particular session or else they will be marked as absent. This system mainly consists of the feature extraction,preprocessing,imageacquisition,databasedevelopment and the classification stages and then the post-processingstage.These stages are the main stages in the automated attendance marking system.

Hemanth Kumar Rathod[7] proposed a specific methodology for recording the attendance can be done manually either by the teacher or the lecturer.This process is time taking and need more effort.It can't guarantee that there will be no proxies in the class and any other errors.So to solve these type of issues a facial recognition with biometric feature has been found, that has a lot of phases like image acquisition,face detection,feature extraction,face classification etc. The attendance can eventually be marked.In this system,using the algorithms like voila jones and the classifiers like SVM so as to get the desired results.By using this system, considering the attendance of the student without any effort from the teacher or the lecturer.But it needs the elements like camera,laptop or the computer and the local network.This methodology is very simple to understand,use,most reliable and secure.

In this paper[8] they proposed a model for attendance management system.Thissystem requires various techniques which are already existed and can use with some modifications.The first step is to design such a system on the facial recognition.The functioning of the algorithms needs to be understood so that the face detection dynamics can be understandable.This system can work most efficiently as the authors are using the engine's face detection algorithm.It actually divides the image into smaller parts.It will be easy to compare the smaller parts rather than covering the whole face.By the implementation of the algorithm,the authors were able to track the face of the student.It can be done three ways i.e, head tracking,facial feature tracking,completetracking.It has high accuracy and can be used multiple times.It will be very useful in the online examinations and also for marking the attendance in the classrooms automatically.

In this paper[9] they proposed a model useful for real-time face identification and recognition.It mainly requires the camera that will be used to capture the images of the students that will be installed in the classrooms to capture the video frames and for capturing the multiple faces.Those captured faces will be cropped and will be converted to the grayscale so that the number of bits will be reduced that needs to be processed.Then the faces will be compared with the images which are already stored in the database.If it matches with the any of the database images it will be marked as present.It includes several phases like database creation,HOG features, face detection,SVM classifier,recognition attendance.When the system finds the image it captures the image a lot of times continuously.It records the attendance of each and every person and comes out with the best-localized image.With this system, the teacher or the lecturer will find it easy to take attendance without any extra effort and the cost.It needs the elements of thecamera,laptop,and the network connection.It is more secure and reliable and easy to use.

3 PROPOSED MODEL

The main objective of this face detection automated smart attendance system is to provide a system that is reliable,practical and eliminates time loss and disturbance in traditional attendance systems.The proposed model depends on face identification and recognition algorithms.The system architecture of proposed model is shown below.

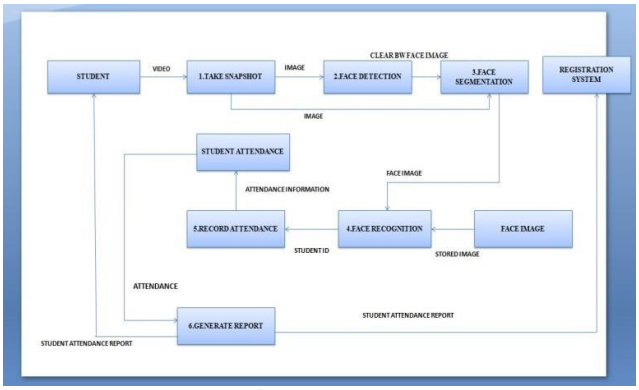

Fig-1: System Architecture for Face recognition Attendance System

In order to execute the proposed prototype,the authors have following algorithm to be considered as shown below:

ALGORITHM

Pseudo Code for the proposed prototype

1. Click the pupil's photo.
2. Implement theViola-Jones algorithm on face recognition.
3. Extracting the Region of Interest [ROI] in the form of Rectangular Box.
4. Converting it intograyscale,applying the Histogram Equalization and Resizing it to 100x100 pixels
5. Store the pre-processed Image into Database
6. Applying the Principle Component Analysis[PCA](For feature Extraction) and SVM(for Classification)
7. Post-Processing

Now the following stages to implement the proposed algorithm for face Detection and recognition are considered.

IMAGE ACQUISITION:

The camera is put in the studyhall at a separation to capture the images of people present in class. The image that is clicked is given as the input to the application.

Fig-2 Extracted and captured faces

Face Detection:

The efficiency of such FR systems is augmented by a systematic algorithm. Many numerous algorithms are proposed such as Face geometry methods,Feature Invariant methods,Machine learning based methods,etc.Among them,use of Viola - jones detection algorithm which gives high detection rate and also secure were made.This algorithm is more preferred for real-time problems for its efficiency. Viola-Jones calculation is connected to this casing, which identifies the faces in the casing. To guarantee that the recognized part is confronting, each distinguished protest is edited and further prepared for eye discovery and if eyes are identified they are considered as faces else are rejected. Highlights of the considerable number of throws are extricated utilizing diverse facial highlights, for example, the nose, eyes, the distance between eyes, and so on.

Fig-3 Face detection for training the data

Pre-Processing:

The facial features detected in the captured image are extricated and subjected to pre-processing. In this stage, histogram equalization, which is one of the most popular histogram normalization methods is applied on the picture and its resolution will be changed to 100x100. This expands the span of potency of the picture thereby making it clearer with a better contrast.

Development of the Database:

In this stage, the picture of each pupil is clicked and the biometric attribute is extri-cated from it. Preprocessing is applied on these attributes and then they are stored in the database. We have used pictures of a few students captured in dissimilar angles, facial expressions and lighting.

Feature selection and Extraction:

Now the feature selection and extraction of the captured image is the important mod-ule of the total attendance recognition system.For a reliable,compatibleand error-free face recognition system this paper need good feature extraction attributed and good classification and detection algorithm.The performance of a face recognition mainly depends upon good classification algorithm.Now here the article used Viola-jones Algorithm for face detection as it is the most accurate face detection algorithm for real-timeapplication.High detection rate and low false positive rate are notable fea-tures of the viola-jones algorithm. Here the manuscript take the implementation of HAAR features. Most of the faces of individuals have a few common properties. For e.g., the skin around the eyes is slightly darker than that of the upper cheeks and the skin on nose bridge is slightly brighter then that around the eyes.Here, using PCA for feature extraction and SVM for pattern classification have been made.

PRINCIPAL COMPONENT ANALYSIS

It is commonly known as the method of selection of the features as well as the reduc-tion of the dimensions.It will be used for the extraction of principal components of multidimensional data.It was the first algorithm which is used for the representation of the faces economically. In PCA the faces will be captured by the camera and by using the eigenfaces the captured faces will be shown along with the corresponding

projections of the image.Only the meaningful dimensions will be considered instead of all the dimensions of the image.The image will be represented mathematically using PCA as

$$\chi = WY + \mu$$

Here the face vector is χ,theeigenface vectors areY, the featurevector is W and the average face vector is μ.In the recognition of the faces, these will be used as the features for classification.Eigenfaces have introduced early for the use of the analysis of the principal components to solve the problems of the recognition of the faces.

SUPPORT VECTOR CLASSIFIER

Support Vector Machine (SVM) Classifier is a binary classifier. Here the hyper plane will be used like decision function.Regarding the presence of an object such as the human after the training of the images containing the particular object, the decisions will be taken by the SVM classifier. Here the PCA will be used for the extraction of the features and SVM will be used for the classification.SVM has been proposed recently that it is the best and the most effective classifier for the recognition of the patterns. For the recognition of the patterns, SVM finds the closest points which are there in the training set that can be done linearly or non-linearly.The recognition of face has two stages.They are classification and the extraction of the features.The previously mentioned feature extractors joined with classifiers are thought about in different true situations, for example, lighting conditions, Unintentional facial element changes, Expressions.

System Performance is additionally assessed with respect to acceptance rate,distance, false positive rate,time which is required for the planning. Detachment additionally plays as a basis in this structure show as the picture diagrams are caught when an individual goes into the room and face region is resized. So the face region got at around 4 feet and 7feet gives better results. For the Training, data of 150 pictures preparing time is determined.

Face Recognition:

After face detection and pre-processing of the captured image,depending upon the features of face ,feature comparison will happen. So, whenever it detects the face it matches the faces captured in the database if it matches, the attendance is marked.As per the experiment, most of the faces are recognized correctly. Fig 4 shows the recognized face along with the registered number.

Fig-4 Face Recognition with Registered number

Post Processing:

In our proposed system, the details of pupils are updated in the database after their faces are detected. The database system uses exporting mechanism and creates a sheet bearing all those details.

GRAPHICAL USER INTERFACE[GUI]

The GUI is used for face detection and recognition as shown below figures.The first part of the GUI is where the authors register the student name and Registration number along with the face for training the detected faces.

Fig-5 GUI for registration number and Name of Students

Now after capturing all the faces as shown in fig 3 the faces should be trained with the algorithm and extracted features for more accuracy of face detection.For training of these faces present in the database as shown in the figure-6 below

Fig-6 Captured images in thedatabase after pre-processing

The authors developed a GUI which traces the images in the database before face recognition after adding to each new face in the database for increasing the accuracy of detection as shown in below figure-7.

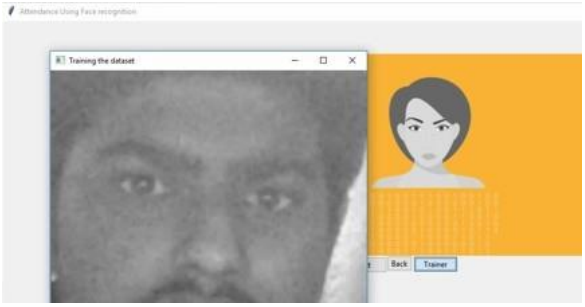

Fig-7 Training the dataset

4 RESULTS

The face detection and recognition system are simple yet efficient than other attendance systems. Here, development of a GUI as shown above to manage the total system. After face registration with the name and Reg no, extraction of the detected image and pre-processing with Histogram equations for storing in the database have been made.Now the feature extraction and classification of these images can be done

by PCA and SVM as shown above then this paper deals with training of the dataset for accurate results.Finally after detection of theface as shown in fig-8 the attendance is marked and stored in anExcel sheet as shown in the fig-9 below.

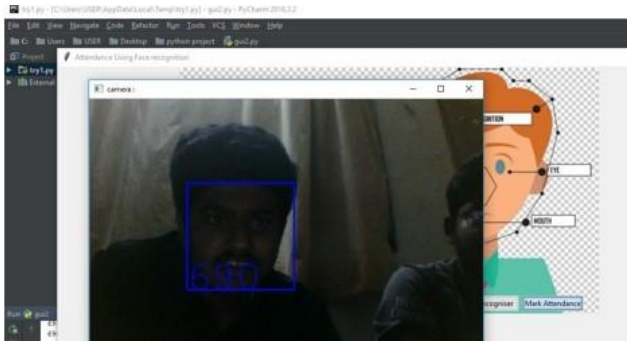

Fig-8 Showing the student is recognized along with the registration number.

A	B	C	D
S.NO	REG NO	NAME	DATE
1	690	PRUDHVI	12-03-2018
2	513	ASHISH	12-03-2018

Fig-9 Excel Sheet showing the attendance w.r.t time and date

5 PERFORMANCE EVALUATION

Performance Evaluation Conditions	PCA + Distance Classifier	LDA + Distance Classifier	PCA+Bayes	PCA+SVM
False Positive Rate	55%	53%	52%	51%
Distance of object for correct recognition	8 feet	8 feet	8 feet	8 feet
Training time	2015 millisec	1290 millisec	29870 millisec	24570 millisec
Recognition Rate(Static Images)	93%	90%	94%	95%
Recognition Rate(Real time video)	60%	57%	65%	69%
Occluded Faces	2.5%	2%	2%	2.8%

Table. 1 Performance Evaluation

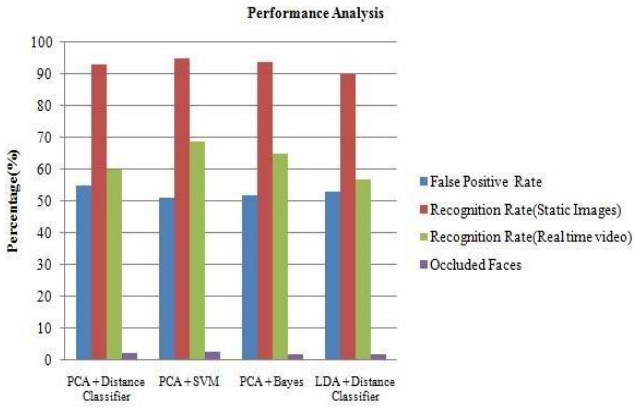

Fig -10 Performance Analysis of PCA + SVM with other algorithms

6 CONCLUSION AND FUTURE WORK

The smart face recognition system is proven as most efficient attendance system among all other attendance systems due to its consistency,robust and accuracy but also it can have its own limitations.In this system,algorithms such as Principal Component Analysis for feature extraction and SVM as classifiers which outperforms

other algorithms in real-time applications have been applied and proved as best for this attendance systems.The overall system is implemented in python.

The future work is to improve the recognition rate with other algorithms as human changes as time such as growing beard, glasses,scarf etc. This system is too developed to recognize 3-4 people at a time and in future the authors canimprove its recognition rate and achieve greater performance and efficiency.

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