International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

AUTONAMY OF ATTENDENCE USING FACE RECOGNITION

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Abstract - *This paper proposes and compares the methodologies for an automated attendance system using video-based face recognition. Here input to the system is a video and output is an excel sheet with attendance of the students present in the video. Automated attendance system can be implemented using various techniques of biometrics. Face recognition is one of the biometric techniques. It does not involve human intervention.*

Key Words: face detection, haar cascade classifier, face recognition

1. INTRODUCTION

Many colleges, and schools follow the conventional face to face attendance marking. This traditional method requires a lot of time, sometimes students may not respond to their respective numbers and it involves errors during the manual calculation of attendance. So to overcome these problems there is a necessity for an automatic attendance monitoring system.

In recent years, video-based face recognition has received extensive attention and is one of the most important topics of research in the field of image processing for people's identification. We can utilize it in the field of education to maintain the attendance of students. In most learning institutions, student attendances are manually taken by the use of attendance sheets issued as part of regulation. This method is tedious, time consuming and inaccurate as some students often sign for their absent colleagues. This method also makes it difficult to track the attendance of individual students in a large classroom environment.

We propose the design and use of a face detection and recognition system to automatically detect students attending a lecture in a classroom and mark their attendance by recognizing their faces. The system is developed for deploying an easy and a secure way of taking down attendance. While other biometric methods of identification can be more accurate, students usually have to queue for long at the time they enter the classroom. The software first captures an video of all the authorized persons and stores the information into database The input image is recognized by comparing them with the face database which is our training set. After finding the valid match attendance is registered in an excel sheet.

2. RELATED TECHNOLOGY

2.1 Face Detection

Human beings have recognition capabilities that are unparalleled in the modern computing era. These are mainly due to the high degree of interconnectivity, adaptive nature, learning skills and generalization capabilities of the nervous system. Face recognition technology can be used in wide range of applications. Computers that detect and recognize faces could be applied to a wide variety of practical applications including criminal identification etc. The Haar feature proposed by Viola et al. combined with AdaBoost cascade classifier can detect face quickly. Since then, many researchers have devoted themselves to using more advanced features to improve the accuracy of face detection, such as Local Binary Pattern (LBP), Histogram of Oriented Gradient (HOG) , Scale-invariant Feature Transform (SIFT).

2.2 Harr Cascades

Each feature is represented as a single value obtained from the difference of the sums of pixels in white rectangle from the sum of all pixels in the black rectangle. All different possible sizes and locations of classifier is used for calculating of plenty of features.

2.3 Harr Feature

Haar feature is a wavelet-based feature that decomposes image. The function of cascade classification is to combine more feature efficiently. In the beginning, the image process of haar is only based on RGB value of each pixel, then process the image in rectangle shapes with some pixel in every shape. Each of the shapes is processed and the limit level is occurred after that which shows dark and light area. The formula of haar feature is the average value of the result is above the threshold, it means the haar feature exists.

2.4 Grayscale Image

One of the pre-processes in face detection of mankind object is the change of the real image room into grayscale. That is occurred since generally facial object in grayscale image has consistent pattern such as eyes color is darker than cheeks or nose color. Here is the formula to turn color (RGB) into grayscale.

Grayscale = α*RED + β*GREEN+ γ*BLUE

The image that is produced in this stage later will be processed in characteristic extraction stage of the image and face recognition.

3 LITERATURE REVIEW

In [1] we get to know about the various face recognition techniques and also realized that it is mainly two steps methodology which involves face detection and face recognition. To get high recognition rate, detection plays a major role. In recent years researchers have developed numbers of face detection and face recognition algorithm. In [2] we came to know about the two stage methodology of automated attendance system. [3] Suggests the improvised recognition rate by enhancing the quality of the image.

NFC Based Mobile Attendance System with Facial Authorization on Raspberry Pi and Cloud Server Attendance system[5] is a system that is used to track the attendance of a particular person and it is applied in many institutions. However, many systems for taking attendance has drawbacks, such as the traditional way has drawback in the data of the attendance that the list is hard to reuse, a biometric attendance system has drawback of the existence of human error such as fingerprint scans are not acceptable, due to the condition of a wet finger, dirty, too dry or peeling fingertips. In this paper, we propose mobile attendance system with NFC and face authorization to add security feature using Raspberry Pi and afford possibility to store the data in cloud. This paper first review the related works in the field of attendance management, NFC, face authorization, microcomputer and cloud storage. Then, it introduces our methodology and design system structure and plan. The result of this research is the system that reduce the amount of paper usage, eliminate the time and effort wasted in taking attendances by Mobile-based attendance system.

In 2012, N. Kar [6] introduced a automated system, which uses two libraries, OpenCV and FLTK. In this system, there are two processes, namely request matching and adding new face to database. In request matching, the first step is opening the camera and capturing the photo, then the face is extracted from the image. The next step is recognizing the face with the training data and projecting the extracted face onto the principal component analysis. The final step is displaying the face that closely matched the acquired image. Meanwhile, adding new face to database process is started with capturing the photo, then the face is extracted from the image. The Haar cascade method then performed to the image to find the object in the image in different window size. The next step is storing the image into the database, then learning the face, and followed with application of principal component analysis algorithm. The final step is storing the information inside the face XML file. The system is focused on the algorithm to improve the face detection from acquired images or videos.

In [4], Priyanka Thakare proposes a method using Eigenface and principal component analysis with architecture as follows. The camera is installed in the front, which is used to capture entire face of the students inside the class. Then, the captured images are transferred into the system as inputs. The images captured from the camera could be too dark or too bright, thus enhancement is needed to convert them to gray images. In the next step, histogram normalization is used to remove the contrast of the images, thus it is easy to recognize the students who sit in the back row. The median filter is used to remove noise from the images. Noise sometimes still occurs even when high definition camera is used. The system also implements skin classification that changes all pixels to black, except the pixels that are close to the skin.

4. SYSTEM DESIGN AND IMPLEMENTATION

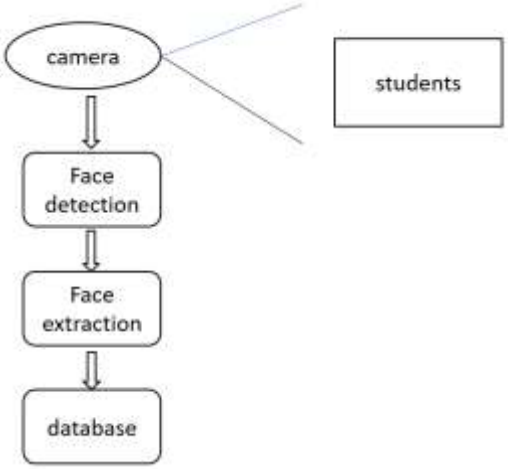


Fig-4.1 Capturing face image and storing in database

4.1 Training Data

For the database, we capture the image from the webcam or the external camera. It can be done using cv2 functions in opencv library. Next, we need at least 500 to 1000 captures of each person for getting higher percentage of accuracy and meet the purpose we are doing in this project. We can store the image data in separate folders for each person.

4.2 Image Capture

We need a high resolution camera to capture good quality images or video. We can capture the images from the video stream or by capturing each and every image from the webcam manually. By capture the frame from video will give us results in less time but we won't be able to capture the face properly.

4.3 Face detection

The faces in the image are detected by Haar cascade classifier proposed by Paul Violaand and Michael Jones First we will convert the image from the RGB to gray scale image. Then faces from the gray image is to be collected. The captured faces are cropped into small images of resolution 126x126. It would be around 10 KB of size.

4.4 Face Recognition

Face recognition involves two steps of training and feature extraction. To recognize face we need to train the system. The face images in the database are needed to be loaded into our workspace for training the system. Many face recognition algorithm are available for extraction face features like eigenfaces, Fisher faces, local binary pattern histogram(LBPH). We are using LBPH algorithm. In this algorithm, the grayscale image is divided into cells of the 3X3 matrix. The obtained matrix is represented with the range of pixel intensities. The center value of the matrix is considered as the threshold and each pixel value is compared with the threshold. If the pixel value is greater than the threshold it is given 1 otherwise 0. This matrix gives us a 8-bit binary value which is converted into decimal value. Similarly, histogram values for all other cells are calculated to obtain feature vector. This feature vector is processed to classify the images.

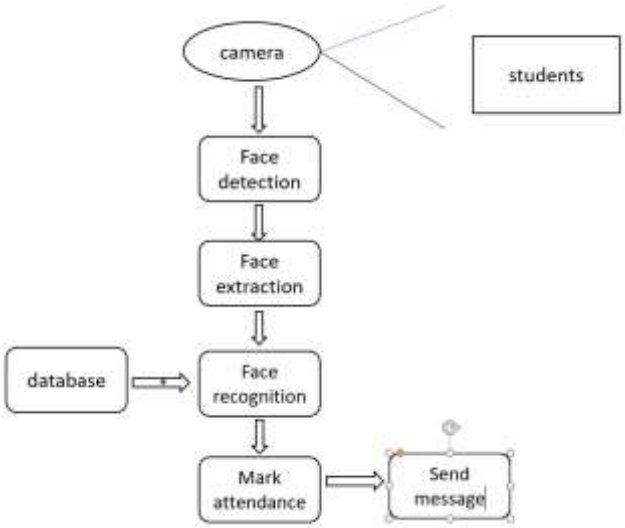


Fig-4.2 face recognition and mark attendance

4.5 Attendance marking and sending message

We *use* predict method to compare an classified data with the *input* data . Finally it returns a label to which the given data matches or nearly matched. *After recognizing the faces, these labels are used to mark attendance in the Excel sheet. Twilio is a developer platform for communications. We utilize this API to send text message to the absentees parents.*

5. RESULT ANALYSIS

First, we need to register the student into the database. To do so, we need to give name and his/her registered number and store these details along with their face images. In this work a total of 6 students along with 500 images of each individual students are taken and are stored in the database with their respective identity number or enrollment number. These 500 image are trained to recognize faces. The camera module which is placed in the classroom captures the video clip of the classroom and recognize the faces in the captured video clip. If the probability of face is greater than 90 then it is marked as present otherwise marked as absent. As a result the attendance excel sheet is updated and message is sent to the parents.

Fig-5.1 Registration form and face detection phase

Now we enter the details of the new student and take their photos, from which only face part is taken and stored in the database.

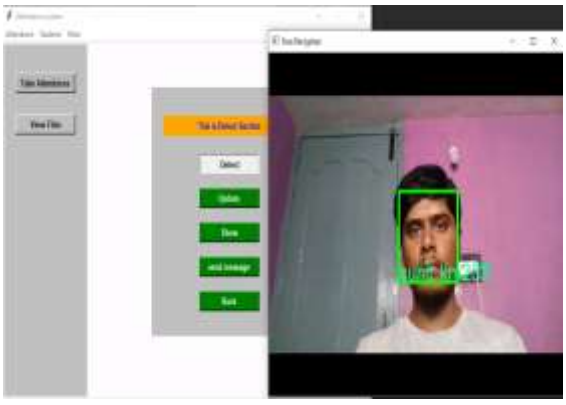
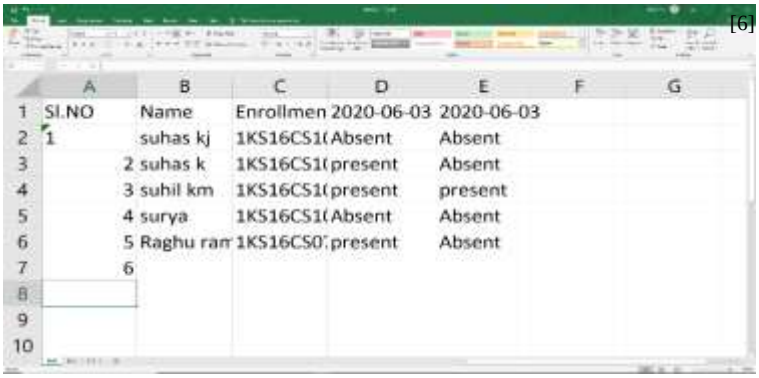


Fig-5.2 face recognition

Now let us click on the "*DETECT*" and the camera starts and takes the *video. Then the students faces are detected and* undergoes the predict process *where the detected face images are compared with trained data* to give the results.



	A	B	C	D	E	F	G
1	Sl.NO	Name	Enrollmen	2020-06-03	2020-06-03		
2	1	suhas kj	1KS16CS1(	Absent	Absent		
3	2	suhas k	1KS16CS1(	present	Absent		
4	3	suhil km	1KS16CS1(	present	present		
5	4	surya	1KS16CS1(	Absent	Absent		
6	5	Raghu ram	1KS16CS0	present	Absent		
7	6						
8							
9							
10							

Fig-5.3 View attendance

If we click "View Attendance", an excel sheet containing the attendance of the students opens up.

6. CONCLUSIONS

Capturing the video clip from the camera and applying the techniques of face detection and face recognition we can actually lessen the work of a teacher. The system is using haar classifier and LBPH algorithms for face detection and face recognition. The implemented attendance monitoring system is performing with 90 percent accuracy with less hardware and software requirements. So the implemented system is economical and very useful to implement with low cost.

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