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FACE RECOGNITION FOR AUTOMATED ATTENDANCE SYSTEM USING LBPH ALGORITHM

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ABSTRACT: Day to day activities in an institution all over the world some or the other way involves in taking attendance of the students who are present in the classrooms. Traditionally the attendance is taken through a roll call, this takes a lot of time and may sometime lead to a false attendance. To overcome this tedious process this project aims to reduce the time and mistakes made by the traditional process by introducing facial recognition as a solution, this helps in many ways from keeping a large registers in short space to avoiding false attendance. This project showcases the ability of facial recognition using LBPH algorithm and Haar cascading algorithms combined, this produces a facial map of the individual which helps in improving the post image processing of the individual image taken during attendance. The result of this method showed a 92% efficiency compared to traditional methods, it also showed some drawbacks that can be easily addressed by improving the environment and using deep learning by machine computing using artificial intelligence.

KEYWORDS: Face recognition, Face detection, Deep Learning, Haar cascades, Feature extraction.

I. INTRODUCTION

Attendance is an important part of a day to day routine in an institution or cooperation. Every place has its own method for marking the attendance, in traditional face-to-face (F2F) marking of the attendance in colleges and schools are largely same and involves visually verifying individual person one by one, which usually takes quite some time, this also reduces the effective time used for conducting classes, for example if a class is conducted for 55 mins roughly 10-15 mins are used in marking the attendance, so the effective time taken will be around 40-45 mins of actual class [1], [2], [3]. This automated facial recognition would roughly take 5 mins in marking the attendance based on facial recognition, which in turn increases the effective utilization of time[4], [5].

Also, in the traditional attendance system the staff must manually enter the details either in a ledger or in the institutions webpage, this also takes time and a double duty for the staff involved[6], [7]. Over the years, many scholars have developed a variety of method to get the attendance based onface recognition algorithms, including a Local Binary Pattern (LBP) using a OpenCV which is an open source computer vision library, but here we discuss the Local Binary Pattern Histograms(LBPH) which has a good accuracy and also efficient in face recognition[8].

In general, the attendance system can be broadly classified into two different types.

Manual AttendanceSystem (MAS)

Automatic AttendanceSystem (AAS)

Manual Attendance System is a process where there will be a roll call and the students are asked to provide their attendance, but there are some instances where a student would make false attendance for his/her friend which in many cases will not be noticed by the staff due to work load or they are in a hurry to start the class due to time constrain.

To solve the above issue Automatic Attendance System was created which involves biometric scanning and id card scanning. The issue with these type of automatic attendance system is that the students have to wait in long queues to mark their attendance, biometric is foolproof but there are some privacy concern regarding this type of systems, on the other hand id card scanning also has issues regarding false attendance and at times when the student lost his/her id card it would be too difficult for them to mark their attendance[9], [10].

In the other hand Facial Recognition System (FRS) will scan the person individually and process the image taken using artificial intelligence to mark the attendance. Since the system uses artificial intelligence false marking would be none and the system would automatically store the face identifications for that person and improve the

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systems efficiency[11]. For this reason, FRS is being used in this research in marking the attendance using algorithms.

II. LITERATURE SURVEY

A. Summary of Approaches:

1. Biometric scan:

i. Students fingerprints are scanned and stored in the database.
ii. To mark their attendance, the students must use the biometric system before every class.
iii. A central system holds all the data and is responsible for managing all student records.

2. ID card swipe system:

i. College ID cards are fitted with RFID chips which are scanned by readers installed in each classroom.
ii. The cards are scanned before each class to mark the student's attendance.
iii. The server is updated every ten minutes
iv. Every teaching faculty gets a list of all the students who were present after every class is over.
v. An online portal allows access to students to view their current attendance.

B. Face Recognition-based Attendance System:

The system entirely runs on facial recognition and artificial intelligence. The continuous observation helps to estimate and improve the performance of attendance marking. The effectiveness of this system lies in the post image processing power to determine and mark the attendance for the right person. Multiple images are taken to determine the facial structures of the individual person and update the library for efficient use.

III. PROPOSED METHODOLOGY

A. Description of block diagram

The Fig 1. Shows the general idea of how the facial recognition attendance system works, the first step is to scan the area (classroom) to identify the faces, then the image scanner (camera) will detect the faces in the classroom and capture multiple images, this image is then processes by the software using artificial intelligence and recognize the images and finally marks the attendance for the right individual.

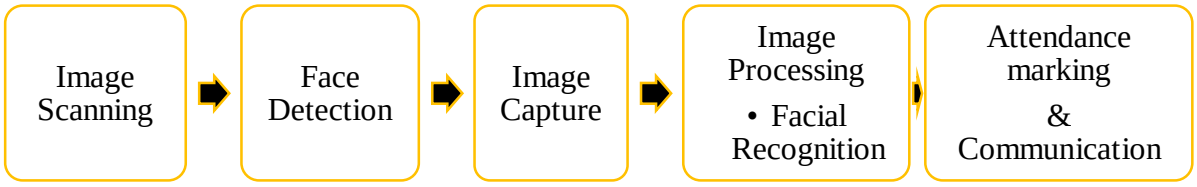

Fig 1. Block diagram for Facial Recognition Attendance System

1. Image Scanning:

Student are entering the classroom they fixed camera inside the room focused the seating position to captured the student image for the further process of face detection.

2. Face detection:

Face detection to help for identify he/she for the capturing image. Detect the haar cascading classifier for a student image.

3. Image capture:

\ Enhance the input image and get improve the image quality because they converted the image RGB to Gray Scale image because LPB algorithm not identify the RGB image.

4. Image Processing and Face recognition:

The important part of Face recognition are automated method of identifying and verifying the captured image.

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5. Attendance marking:

This module will mark the attendance for the student in database with timestamp if there is a match with the corresponding student data.

6. Communication Module

This module sends attendance information at the end of everyday to the students mail id and their parents mobile number.

B. Data Set

Data set is an important function in the FRS to be used in Haar Cascading Algorithm. This process takes multiple images of the person to train the algorithm to identify the correct individual if the captured image has multiple faces. Frontal face algorithm in harr cascading algorithm is used in detecting the face of the individual. This data set is also used in comparing the image with the one taken during the attendance session using LBPH algorithm. The images though taken in RGB will always be converted to grayscale and then stored because the algorithm does not recognize RGB image directly.

Fig 2. Data Set

C. Face detection using Haar Cascades Classifier

It's a classifier in which the cascade function is trained by superimposing the positive image over Negative image. It is used for Haar features and integrated images. It is helps for face detection and future extraction.

There are three features in the Haar cascades:

1. Edge features
2. Line features
3. Centre surround features

Integral image

Posture detection using Haar like features

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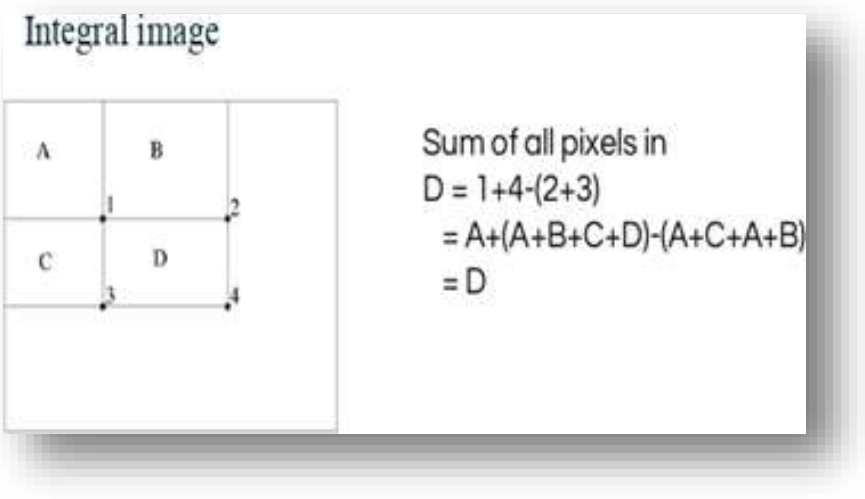

Fig 3. Integral Image

The integral image (Fig 3.) at the location of pixel (x, y) contain the sum of the pixel values above and left of the pixel, which is inclusive, integral images are super-fast among all these features we calculated, most of them are irrelevant images which are considered as images with two good features. The first feature is that of the focus on the individual's region of eyes which is often dark then the nose and cheeks, the second feature is the eyes and bridge of the nose. But the same pixel windows applying on cheeks or any other place is irrelevant.

D. *Adaptive boost training*

Since the work is based on the artificial intelligence platform the machine has to adapt in certain conditions by itself rather than a human intervention, so adaptive boosting training should be done to the system to identify the correct image this is done by few steps, like the machine only selects important feature this reduces dimensionality, this helps in removing irrelevant features, this helps in execution time reduction. The algorithm constructs a strong classifier by linear combination of multiple weak classifiers, the target image is then moved over the input image and for each subsection of the image the classifiers are constructed.

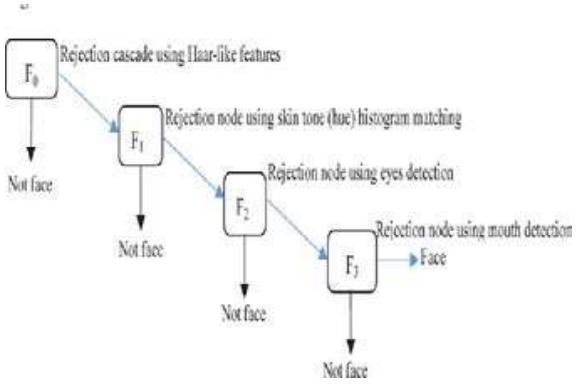

Fig 4. Image of the subsection

They focus on a image to find whether is it the right one or not, all the process are based on system following the Haar cascading algorithm, if the system identifies the correct image then it moves to next process until then the iteration goes on.

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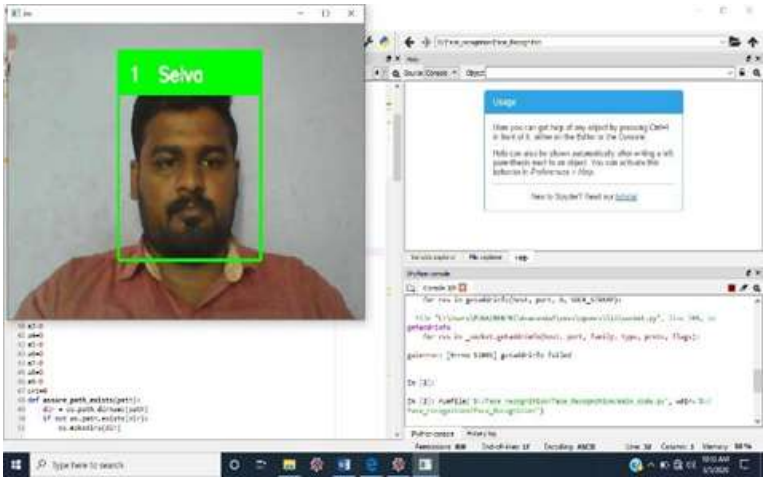

Fig 5. Image Known

IV. LOCAL BINARY PATTERN HISTOGRAM:

In this proposal system, for face detection we use the Local Binary Pattern Histogram (LBPH) algorithm for detecting the face of the individual. LBP is a descriptor for describing the texture of a rectangular block. Encode every point in block as a pattern called LBP. The technique counts occurrences of gradient orientation in localized portions of an image. It's a basic element for LBP encoding it consist of a point P and its 8 neighbours, who are in a circle with radius R.

Four parameters used by LBPH:

Radius

The radius used for building the circular local binary patterns. The greater the radius the neighbor's the numbers of sample points to build the circular local binary pattern from, an appropriate value is used 8 sample points.

Neighbors

The number of sample points to build the circular local binary pattern. It is usually set to 8.

Grid X

The number of cells to horizontal vectors. The circular local binary pattern. It usually set to 8 sample point.

Grid Y

The number of cells to vertical vectors. The circular local binary pattern. It usually set to 8 sample point.

Local binary pattern histogram is a simple yet very efficient texture operation which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number and the visualizes the result as histograms. The accuracy for the algorithm is very high which shows that the LBPH classified is an efficient and accurate face recognizer.

First, we need to train the LBP algorithm. To do so, we recognize the facial image to the data set .we need to set images to unique id and name, so the algorithm will use this images to same id and a name to recognized and marked a correct id and name. The first step we need to intermediate image to original image to highlighting the facial characteristics. we have a facial image to the grayscale image in 3x3 pixels. Representing as a 3x3 matrix containing the intensity of each pixel (0~255). We need to take for a centre value of the matrix to be used as the threshold. The value will be used for the new from the 8 neighbours, the centre value of each neighbours called threshold. A new matrix value as 1 is higher values and so is the lower values of threshold matrix are containing only the binary values.

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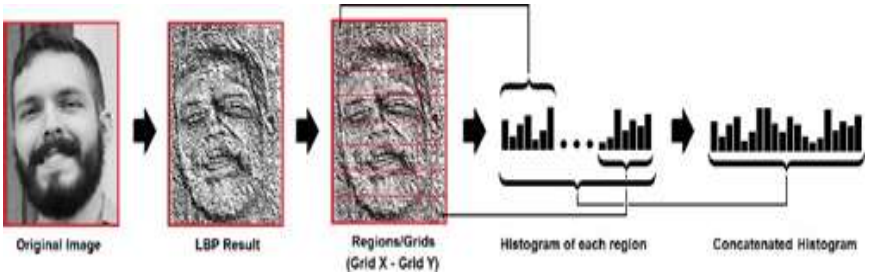

Fig 7. Example of LBPH

V. RESULTS:

Once the image is taken then the system automatically runs the algorithm and generates the data, the data is then logged in excel sheet for ease with maintain, the actual time of attendance is also shown in the excel file. The details are stored in .csv format and the results with good accuracy is then electronically mailed to the staff in charge automatically.

The following image Fig 8., and Fig 9., are the results that will be sent, the first one is the .csv formatted file and the next one the email that will be sent at the end of the run.

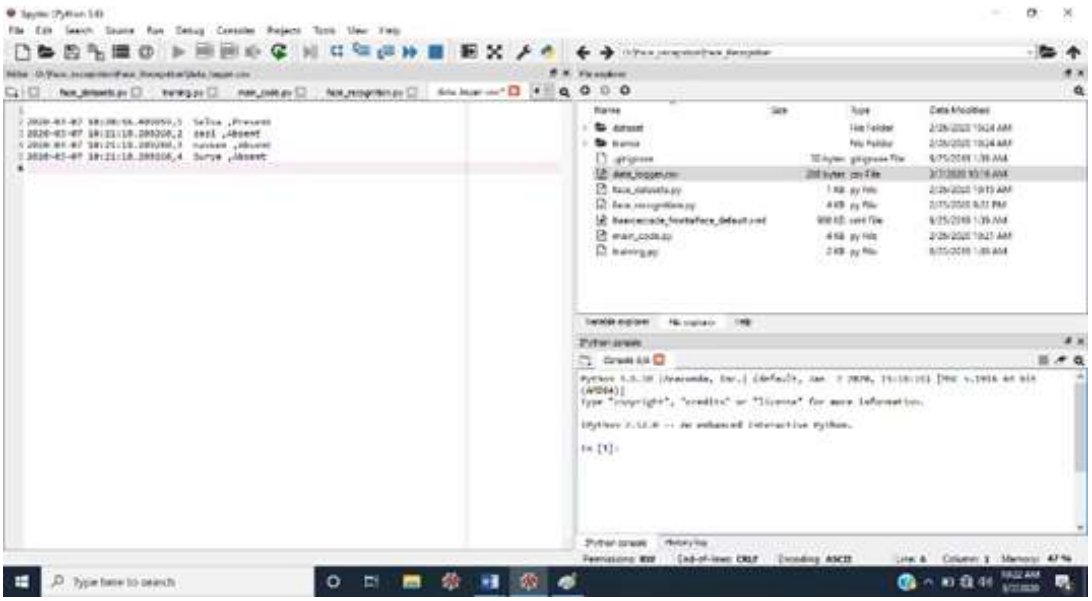

Fig 8. .csv file formatted data

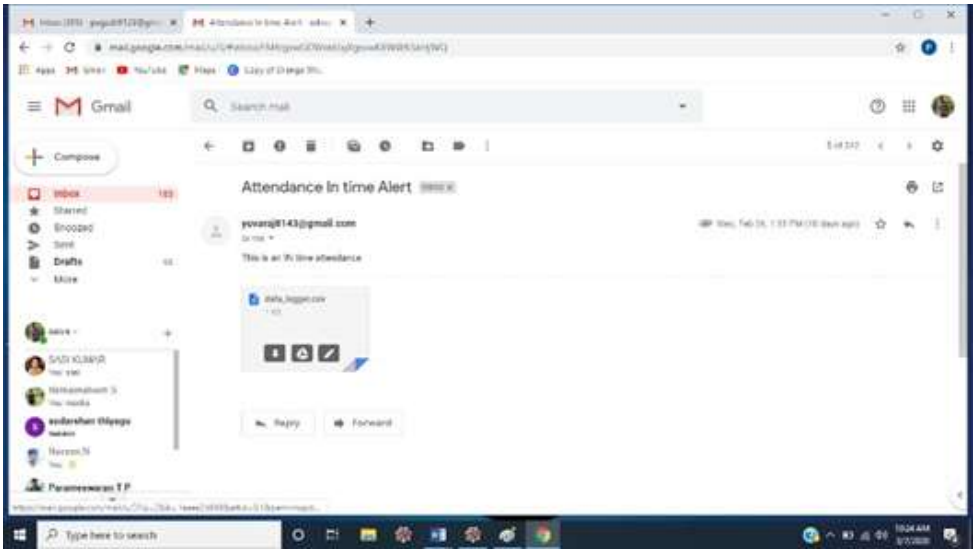

Fig 9. Email that will be sent to the staff in-charge

VI. CONCLUSSION:

Face recognition attendance management system can easily replace the existing manual attendance system by reducing the time, removing false attendance, and by creating a log that can be stored which reduces the usage of paper and storage. The data can be easily retrieved at any time with ease, the software developed will be easy to install and maintain. The system will provide excellent accuracy, which was 92% during trials. The lighting of the classroom was found to be an issue especially during noon where sun light was so bright and the glare was evident in the images taken, rainy days are also a problem if the lighting in the classroom was not quite good. But all these issues are fixable which will also improve efficiency.

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