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Automated Attendance Management System Using Face Recognition

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Abstract - *Maintenance and monitoring of attendance records plays a vital role in the analysis of performance of any organization. Traditionally student's attendance is taken manually by using attendance sheet, given by the faculty member in class. The Current attendance marking methods are monotonous time consuming. Manually recorded attendance can be easily manipulated. Nowadays, Fingerprint based recognition is used for driving attendance management system, but it is very time taking process to recognize individual fingerprint from enrolled fingerprints sets. Therefore automatic attendance management system is developed to computerize the traditional way of taking attendance. Automated Attendance Management System performs the daily activities of attendance marking and analysis with reduced human intervention. This attendance is recorded by using a camera attached in front of classroom that is continuously capturing images of students, detect the faces in images and compare the detected faces with the database and mark the attendance. When compared to the current system, the proposed system saves time and help to monitor students.*

***Key Words*: Face Detection, Face Recognition, LBPH algorithm, Camera**

1. INTRODUCTION

Facial recognition or face recognition is the process of analysing characteristics of a person's face image which is given as input through a camera. It actually measures overall facial structure, distances between eyes, nose, mouth, and jaw edges. These measurements are stored in a database and used for comparison when a user stands before the camera. One of the strongest positive aspects of facial recognition is that it is non-intrusive. Identification can be accomplished from two feet away or more, without requiring the user to wait for long periods of time or do anything more than look at the camera. Every institute has its own method of maintaining the attendance for monitoring the performance of students. Most of the institutes maintain attendance using the pen and paper or file based approach .while some institutes use biometric techniques. But in these methods students have to wait for long time in making a queue at time they enter the classroom. Many biometric systems are available but the key authentications are same in all the techniques[1].The enrolment process in every biometric system is similar which stores the unique features of a person in the database. Then there are processes of identification and verification[3]. Both these processes compare the biometric features of a person with previously stored template captured at the time of enrolment. There can be many types of Biometric templates like Fingerprints, Signature, Gait, voice, Eye Iris, Face, Hand Geometry.

The existing system represents some face space with higher dimensionality and it is not effective too[2]. These face images have high dimensionality, but in reality they span very low dimensional space. So instead of comparing whole face space with high dimensionality, it is better to compare only a subset of face space with lower dimensionality to represent this face space. Our goal is to implement a system that can detect a particular face from an image and distinguish it from a large number of stored faces with some real-time variations as well. Face recognition consists of two steps, detection and verification. In the first step faces in the image are detected and then these detected faces are compared with the database for identification. The proposed system utilized Voila and Jones algorithm for the detection of faces in the classroom image and LBPH algorithm for face recognition[8].

2. PROPOSED SYSTEM

The proposed system aims at creating a system that maintains attendance using face recognition technology in classrooms and creating an efficient database to store them. First step in every biometric system is the enrollment of persons using general data and their unique biometric features as templates. This work uses the enrollment algorithm as shown in the Fig-1.

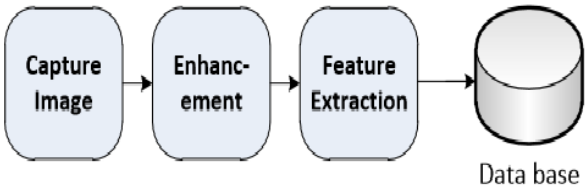

Fig-1:Enrolment process

Image is captured using the camera and then it is enhanced using histogram equalization and noise filtering. In the second step face is detected [8] in the image and features are extracted from it. These unique features are then stored in the face database with certain id of that person.

2.1 System Algorithm

• Image acquisition

• Face detection

• Face recognition

• Attendance

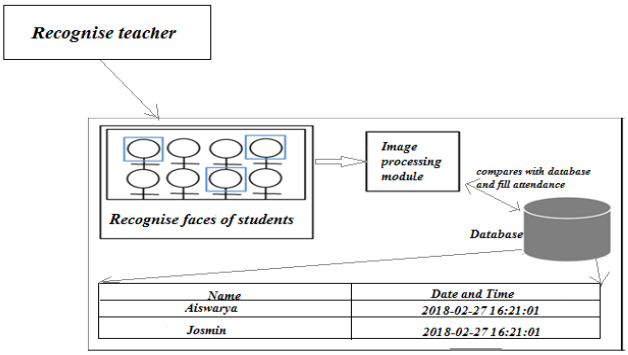

Fig-2: Basic structure

The system requires a camera to be installed at a position in the classroom from where it could capture the images of all the students in the classroom effectively. This image is processed to get the desired results. The working is explained in brief below:

• Capturing Camera: Camera is installed in a classroom to capture the faces of the students. The camera has to be placed such that it captures the faces of all the students effectively. This camera is interfaced to computer system for further processing either through a wireless network. In our prototype we use the in-built camera of the laptop.

• Image Processing: Face recognition algorithm is applied on the captured image. The image is captured each faces are cropped and stored for processing. The module recognizes the images of the students face which have been registered manually with their names and ID codes in the database. We use Open CV for all the image processing and acquisition operations. The whole process requires the following steps:

a)Training Data Gathering: Gather face data (face images in this case) of the persons you want to recognize

b) Training of Recognizer: Feed that face data (and respective names of each face) to the face recognizer so that it can learn.

c) Recognition: Feed new faces of the persons and see if the face recognizer you just trained recognizes them.

Open CV comes equipped with built in face recognizer, all we have to do is to feed it with the face data. It's that simple and this how it will look once we are done coding it. We use cv2.face.createLBPHFaceRecognizer()[4] of Local Binary Patterns Histograms(LBPH)Face Recognizer. The basic structure is shown in fig-2.

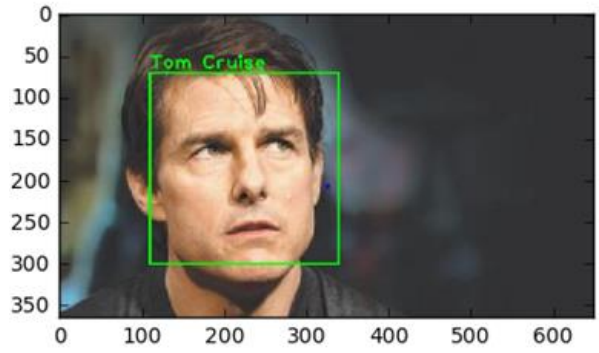

Fig-3:

Do not use abbreviations in the title or heads unless they are unavoidable.

2.2Local Binary Patterns Histograms Face Recognizer

Good lighting conditions are required for both Eigenfaces and Fisherfaces and we can't ensure perfect lighting conditions all the time[5]. LBPH face recognizer is an improvement to overcome the constraints of lighting conditions.

It is based on the idea of finding the local features of an image and not to look at the image as a whole. LBPH algorithm works by finding the local structure of an image and it performs that by comparing each pixel with all its neighboring pixels[7].

For this, a 3x3 window is taken and move it one image, at each move (each local part of an image),the pixel at the center is compared with its neighbor pixels. The neighbors with intensity value less than or equal to center pixel are denoted by 1 and others are denoted by 0. Then read these 0/1 values under 3x3 window in a clockwise order and we will have a binary pattern like 11000011 and this pattern is local to some area of the image. After performing this on whole image,we will have a list of local binary patterns.

2.3 LBP Labelling

First we need to obtain a list of local binary patterns.Then each binary pattern is converted into a decimal number (as shown in above image) and then a histogram is made from all of those values.

So in the end we will have one histogram for each face image in the training data set. That means if there were 100 images in training data set then after training, LBPH will extract 100 histograms and store them for later recognition. Algorithm also keeps track of which histogram belongs to which person[6].

During recognition, the LBPH algorithm generates new histogram for the input image given and compare it with the stored histograms. It finds the best match histogram and

returns the label associated with the corresponding histogram as shown in fig-3.

The Face Recognition process is divided into three steps.

- Prepare training data: Input training images for each person along with their labels. Detect faces from each image then assign each detected face an integer label of the person it belongs to.

- Train Face Recognizer: Train OpenCV's LBPH face recognizer by feeding it the data prepared in step 1.

- Testing: Pass some test images to face recognizer and test if it predicts them correctly.

3. RESULT AND EVALUATION

The attendance management system is simple and works efficiently. The camera captures images throughout the sessions. After detecting and recognizing the staff, students are identified and attendance is entered into the database as shown in fig-4.

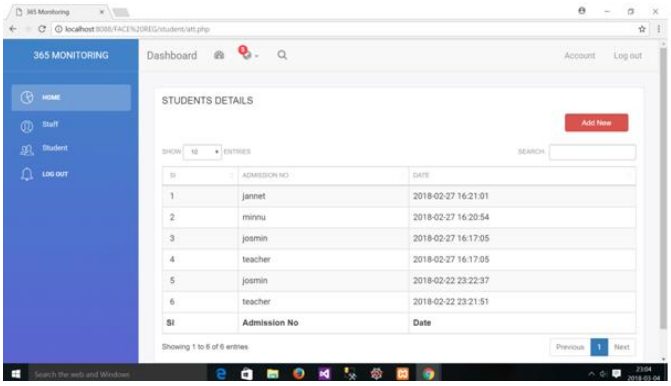

Fig-4:Attendance Entry

The degree of accuracy depends on the quality of images captured by the camera. In order to detect faces accurately, it requires adequate lighting conditions as well. The performance is expected to increase if a high resolution camera is used.

4. CONCLUSION

The proposed system introduces a secure, fast and an efficient attendance management system using face recognition techniques .This face detection and recognition system thus reduces the amount of work done by the administration .The only hardware requirement for installing the system is a camera. The camera plays a important role in the working of the system hence the image quality and performance of the camera in real time scenario must be tested. In real time scenarios LBPH algorithm has better recognition rate and low false positive rate than other algorithms. In future work can be done to improve the recognition rate of algorithms when there are inadvertent changes in a person like shaving head, using scarf, growing beards, moustache etc.

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