International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 06 Issue: 04 | April - 2022 Impact Factor: 7.185 ISSN: 2582-3930

FACE RECOGNITION BASED ATTENDANCE SYSTEM

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Abstract : In the traditional system, it is hard to be handle the attendance of huge students in a classroom. As it is time-consuming and has a high probability of error during the process of inputting data into the computer. Real-Time Face Recognition is a real-world solution which comes with day to day activities of handling a bulk of student's attendance. Face Recognition is a process of recognizing the students face for taking attendance by using face biometrics. In this paper, a computer system will be able to find and recognize human faces fast that are being captured through a surveillance camera. Numerous algorithms and techniques have been developed for improving the performance of face recognition but our proposed system uses Haar cascade classifier to find the positive and negative of the face and LBPH (Local binary pattern histogram) algorithm for face recognition by using python programming and OpenCV library. Here we have used the tkinter GUI interface for user interface purpose.

Keywords – Face Detection, Face Recognition, Haar Cascade Classifier, Local Binary Pattern Histogram (LBPH).

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,

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. Over the years, many scholars have developed a variety of method to get the attendance based on face 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 Histogram (LBPH) which has a good accuracy and also efficient in face recognition.
In general, the attendance system can be broadly classified into two different types.

Manual Attendance System (MAS)

Automatic Attendance System (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 types of automatic attendance system is that the students have to wait in long queues to mark their attendance, biometric is fool proof 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.

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 systems efficiency. For this reason, FRS is being used in this research in marking the attendance using algorithm.

II. LITERATURE SURVEY

Summary of Approaches:

Biometric scan:

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

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 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 user.

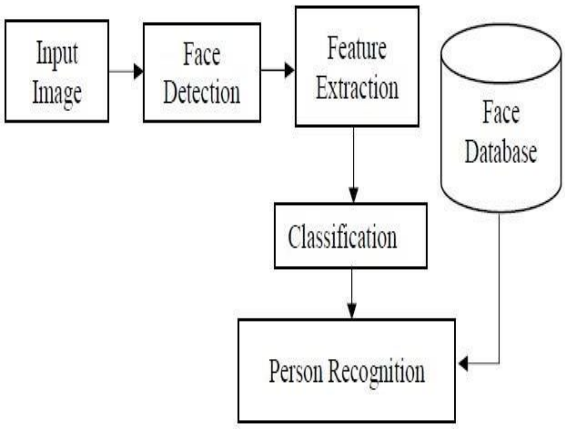


Fig 1. Flow chart and processing of algorithm

The input image is read by the camera. After the image is read it is converted into gray scale. The faces in the image are detected using the Haar Cascade frontal face module. Using the LBPH algorithm, the faces in the image are predicted. After the images are predicted, the recognized faces are shown in a dataset with their names.

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.

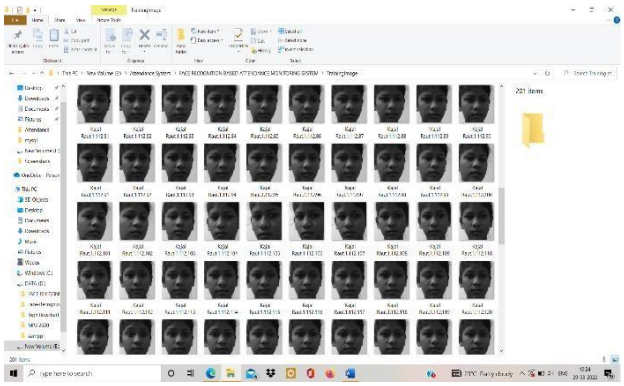


Fig 2. Dataset

C. Face detection using Haar Cascades Classifier

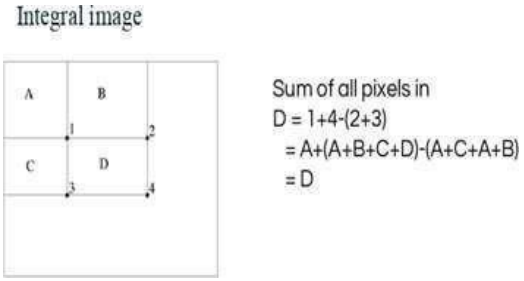
It's a classifier in which the cascade function is trained by superimposing the positive image over Negative image. It is used for Haar features and integrated images. It is helps for face detection and future extraction.

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



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 irrelevan.

D. 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.

1. Four parameters used by LBPH:

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

Neighbours - 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.

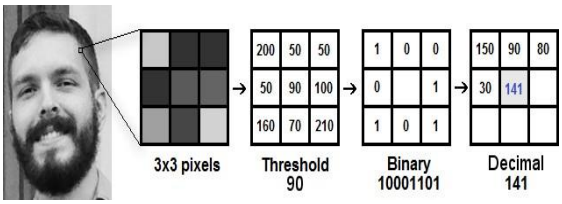
2. Training the Algorithm:

First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

3. Applying the LBP operation:

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbours**.

The image below shows this procedure:



Based on the image above, let's break it into several small steps so we can understand it easily: Suppose we have a facial image in grayscale. We can get part of this image as a window of 3x3 pixels. It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255).

Then, we need to take the central value of the matrix to be used as the threshold. This value will be used to define the new values from the 8 neighbours. For each neighbour of the central value (threshold), we set a new binary value. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold. Now, the matrix will contain only binary values (ignoring the central value). We need to concatenate each binary value from each position from the matrix line by line into a new binary value (e.g. 10001101). Then, we convert this binary value to a decimal value and set it to the central value of the matrix, which is actually a pixel from the original image. At the end of this procedure (LBP procedure), we have a new image which represents better the characteristics of the original image.

IV. RESULT AND DISCUSSION

To develop a face recognition system, first we have to prepare the face dataset for training. To develop face dataset, we used Face detection method that detects the face in real time camera and captured face images. That captured images are saved into dataset folder for feature extraction and training processes.