Face Recognition for Smart Attendance Management System

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Abstract:

The Attendance system will always be important for educational and business sectors. The traditional calling out name kind of system is losing its value because there is always a chance of proxy attendance. We developed a method to take attendance of students by using a camera to detect the student's face and storing them in the database and maintaining the attendance records which are way better than paper records and they will not be any flaws in collection of data as we maintain the records of collected data through network it will benefit the business and educational sector when we go for individual tracking. In this system an overview of system that can achieve real time face detection and provide systematic attendance is provided. Here we used machine learning techniques for building the system, Using LBPH operations we created transactional images and this LBP image is used to extract histograms. This system saves time, it reduces the amount of work the administration should do and will replace the paperwork with electronic records.

Keywords: Face Recognition, LBPH, harr-cascade, attendance, OpenCV, tkinter, Excel sheet.

I. INTRODUCTION

In today's scenario, maintaining attendance becoming important for educational and business institutions to review their progress. Until few years back, there is only one method of attendance which is manual where teachers will call out the student's name and marked the attendance in records. But in recent times, a few systems are emerging into the market like fingerprint, iris recognition and face recognition. The Face recognition-based attendance system is gaining its importance because of its accuracy, feasibility, and low cost. We as a human recognise others by looking at their faces, similarly applying it to machines and training the system to recognise the faces is now becoming valuable. We aim to build the system that can automatically recognise the faces and mark the attendance accurately with very little manual interference.

II. Existing Methodologies

The existing methodology is using manual attendance system.

Poor manual systems of time and attendance management can lead to many problems such as:

a) Inconsistency in data entry and generate errors
b) System is fully dependent on skilled individuals
c) Time consuming and costly to produce reports
d) Entry of false information
e) Lack of security
f) Duplication of data entry

III. PROPOSED SYSTEM

The proposed work of Face Recognition for smart attendance can be broadly divided into five modules. The modules are:

a) Enrolment
b) Image Capture
c) Face Detection
d) Pre-processing
e) Post-processing

a) Enrolment:

It is also formally known as database development. In the attendance system, data of each single student is needed. While developing database individual student image will be taken along with the identifications. Using

pre-processing techniques images of students are enhanced and stored in database.

b) Image Capture:

A high definition camera is placed at a particular distance in the classroom such that it will take the frontal images of the students. The pictures are stored in Test images and further goes for face detection.

c) Face Detection:

One of the computer technologies is face detection. This is used in different applications where human faces are identified using digital images. This algorithm mainly concentrates on detection of frontal human face. Face-detection algorithm is parallel to image detection where image of human matches by it. Image of Face matches by the images stored in image Database and while doing this process if any feature of face doesn't match with the images in database then the image matching process is invalid.First, we need to know that face recognition and face detection doesn't mean the same thing, but one depends on another. Face Detection system is used by all Facial recognition system, face detection systems may or may not have a facial recognition component. The detection system uses classifiers, which are algorithms which classifies whether the part in image is face or not.

Using classifiers we can get more accuracy as they are trained to identify faces using millions of faces.

In this paper, two OpenCV classifiers are used:

1) Harrcascade 2) LBPH

1)Haarcascade:

Haar Cascade object detection algorithm is provided by machine learning which is used to identify objects from image or video.

In Haarcascade object detection algorithm we train cascade function using many negative and positive images. So that we can use it for detecting objects and faces from other images.

The four stages of the algorithm are:

i) Haar feature segment

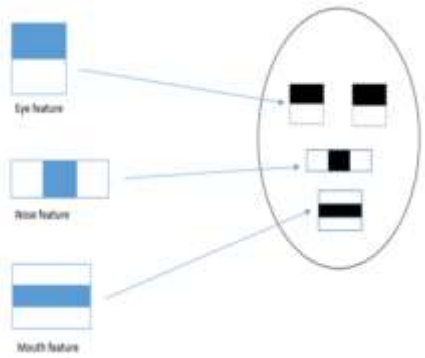
Ii) Creation of integral Images

Iii) Adaboost Instructions

iv) Cascading Classifiers

Step one Using images Haar features are collected.

Rectangular regions are considered as Haar Characteristics which are adjacent in a specific-location of detection window, by adding the pixel intensities of all regions variations between sums can be known. Feature Extraction is a process in algorithm where function is trained using group of positive and negative images.



We use integral images to make fast selection of Haar features. We will collect many features but most of them will be irrelevant. From that features only best will be selected. This process can be done using Adaboost.We use this algorithm to builds a "strong" classifier as a combination of "weighed simple" and "weak" classifiersWe require more number of haar classifiers for describing an object with adequate accuracy and then they can be organized into cascade classifier for forming a strong classifier.Every classifier is used to label the regions distinct by existing position of sliding window as moreover positive or negative. Positive indications means we can find an object and negative indication means no object can be found, if we find negative label means sorting of the region is completed then the detector can slide the window to the subsequent location. If we find the label is positive, then the classifier moves the region to subsequent stage. The object found at the current window location is reported by the detector when its final stage is classified the region as positive.

2) LBPH algorithm:

LBPH means Local Binary pattern (LBP) is simple but it has well organised texture operator is used for labelling the pixels of image by thresholding its neighbourhood pixels by considering its results as a binary number. In order to improve the detection performance on datasets we combine both LBP and HOG (histogram of gradients).

Step-by-step process:

1. Parameters: We use 4 parameters in LBPH:

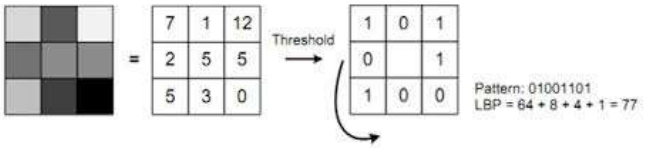
- **Radius:** Circular binary pattern is build using radius which represents radius in region of central pixel (generally set to 1).
- **Neighbours:** Total number of sample points which are used to build circular LBP (generally positioned as 8).
- **Grid X:** Total number of cells in the horizontal path (generally set to 8). As cells increase, the dimensionality of resulted feature vector will be higher.
- **Grid Y:** The total number of cells in vertical path (generally set to 8).

2. Training Algorithm:

In order to train the algorithm, we use the facial images of student's dataset. To train the algorithm with the data we need to set ID and name to the image and this information is used to recognize image using the correct ID.Image of similar person should have the same Id , image of two different persons shouldn't have the same Id and similar person should not have multiple Ids.

3. Apply LBP operation:

Initial step of LBPH is creating transitional images of the original images, such that they highlight the particular facial characteristics like eyes, nose, mouth etc. To do this, algorithm uses sliding window methods, based on parameters.



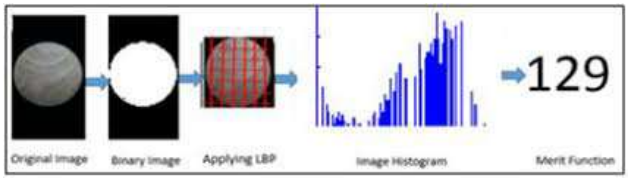
- At first, Input image is grayscale facial image.
- Image is converted into a window of 3x3 pixels.
- The values in the 3x3 matrix are intensity of every pixel from 0 to 255.
- We need to select central value as threshold value.
- Using the threshold value, compare the remaining values.
- Set 1 for values greater than or equal to the threshold and 0 for values less than threshold.
- At present the matrix is converted into binary matrix.
- Concatenate each value of binary matrix with a new binary value 10001101.
- Then the matrix is converted to binary matrix to decimal value and set the value to centre of the matrix, this value is infact a pixel from the novel image
- Finally a new image (LBP image) is generated which represent better description of novel image.

4. Extracting Histograms:

Using the resulted image from LBP, Image is divided into multiple grids for particular regions like mouth, nose, eyes then use grid x and grid y as parameters.

The image we have is in greyscales, so every histogram contains only 256 positions which represent the occurrences of every pixel intensity.

- Each histogram is concatenated to create a new one which will be bigger histogram. Characteristics of novel image are represented by final histogram.



5. Performed Face recognition:

In this step, we need to find the best possible matches of the unknown images. For this we need to form histograms of unknown images and compare them with already trained histograms and return the closely matched histogram.

For comparing whether the Histograms are a match or not, use Euclidean distance method:

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

The final output will be the Id of closely matched histogram

c) Pre-processing:

The face detected is subjected to pre-processing. Pre-processing involved in histogram equalization of face image and resized extraction. Histogram equalisation is one type of technique in histogram normalization.

. Histogram normalization is used to enhance fine facts within an image. The pre-processing improve the gap of the image as it stretch the range of intensities in image which makes it more faultless for identification.

e) Post-Processing: After recognising the students faces accurately, we can update the names of identified individuals into excel sheet. Then the records of attendance can be maintained with particular date and time so that it can be viewed by faculty anytime.

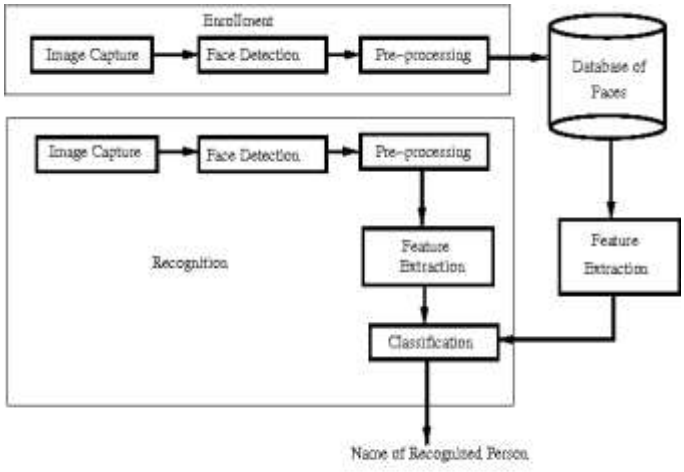


Fig. 1 System Architecture

IV. RESULTS

Recognition rate= (number of correctly identified images/total number of images) x100

Experiment times	Training time (Taking images + training)	Recognition Time (ms)	Average Recognition Rate (%)
1	7 sec	66	89
2	9 sec	51	84
3	9 sec	49	86
4	11 sec	48	89
5	13 sec	45	82

V. CONCLUSION

In this paper, an overview of system that can achieve real time face detection and provide systematic attendance is provided. The above system is portable, secure, faster and a well-organized system which is developed by replacing a physical and defective system. This system saves time, it reduces the amount of work the administration should do and will replace the paperwork with electronic records. Hence we developed a system with expected results but still we have some room for improvement.

VI) FUTURE WORKS:

We proposed a system that can recognise faces of students and mark their respective attendance. We can extend the accuracy of face recognition so that it can detect faces even in less intensity conditions, detecting students even farther away from camera and using high processing systems to speed up the recognition process.

VI. REFERENCES

1) Wikipedia.” Adaboost”. Wikipedia, Wikimedia Foundation,13 Jan.2018, en Wikipedia.org/wiki/Adaboost.
2) Ahonen, Timo, Abdenour Hadid, and Matti Pietikainen. “Face recognition with local binary patterns”. Computer vision-eccv 2004 (2004): 469-481.
3) Local Binary patterns: http://www.scholarpedia.org/article/Local_Binary_Patterns
4) Tiwari PritiAnilkumar, KalyaniJha, Karishma P Uchil, Naveen H., "Haar Features Based FaceDetection and Recognition for AdvancedClassroom And Corporate Attendance", IJIRCCE,Vol. 3, Issue 5, May 2015.
5) Abdur Rahim, Najmul Hossain, Tanzillah Wahid, ShafiulAzam, “Face Recognition Using Local Binary Patterns” International Journal of Computer Science and Technology Graphics and Computer Vision, Volume 13, Issue 4, pp.817-823, 2013.

6) Docs, OpenCV. "Face Detection Using Haar Cascades." *OpenCV: Face Detection Using* Haar *Cascades*, 4 Aug. 2017, docs.opencv.org/3.3.0/d7/d8b/tutorial_py_face_detection.html

7) Face Recognition based Attendance Management System using Machine Learning Anushka Waingankar1, Akash Upadhyay2, Ruchi Shap, Nevil Pooniwala4, Prashant Kasambe5.