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Automated Attendance System using Facial Recognition: A Survey

Divya Baheti[1], Sanika Bansod[2], Suyash Bhandari[3], Aditya Bodke[4] Prof. Dr. R.V. Pujeri[5], Prof. Dr. Uma Pujeri[6]
[1, 2, 3, 4]Student, [5, 6]Asst. Prof, Dept. of Computer Engineering, MIT- College of Engineering, Pune, Maharashtra, India

Abstract: Maintaining attendance is an important task in all the educational institutions. Our system uses the facial recognition method for the automated attendance of students in the classroom without student's intervention with the help of image processing. It is easy for a human to recognize whether a person is a male or female but it is very difficult for a machine or robot to do so.
This paper gives the survey of different techniques used by the researcher for automated attendance system and abstract view of the system which we are going to implement for increasing the accuracy in marking the attendance.
Index Terms: Face recognition, Support Vector Machines (SVM), Local Binary Patterns Histograms, Haar cascade Classifier.

I. INTRODUCTION

Authentication is an issue in computer-based communication. Face recognition has drawn the attention of researchers in fields where security is the most important such as door control system. In most learning institutions, student attendances are taken manually by the use of attendance sheets issued by the department heads as part of the regulation. The students sign in these sheets which are then filled or manually logged in to a computer for future analysis. 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. So there is a need to implement an easy attendance system which avoids all the above problems, by recognizing and identifying the face automatically. The system uses image processing through which the grayscale image is acquired which makes easy for detection of the face. The System has used Haar Classification to detect the face. The system uses the LBP features i. e. Local Binary Patterns for generating histograms of faces and Support Vector Machine i.e SVM for face recognition. The features generated by Haar Cascade Classifier are analyzed with the LBP feature which helps in recognition of face to mark the attendance and generate corresponding report.
Use of the face detection and recognition system instead of the traditional methods will provide a fast and effective method of capturing student attendance accurately while offering a secure, stable and robust storage of the system records, whereupon authorization; one can access them for purposes like administration, parents or even the students themselves.

II. LITERATURE REVIEW

Yueqi Duan, et al.[1] gives a context-aware local binary feature learning (CA-LBFL) method for face recognition. The main feature of CA-LBFL is that it exploits the contextual information of adjacent bits by constraining the number of shifts from various binary bits so that eventually additional robust information can be exploited for face representation. It also gives two methods to heterogeneous face matching by coupled learning methods (C-CA-LBFL and C-CA-LBMFL).
Xiang-Yu L et al. [5] proposed the face recognition system based on gradient direction histogram (HOG) features extraction and fast principal component analysis (PCA) algorithm [9]. The Haar-feature classifier is used to extract the background interference data and then the HOG features are extracted from the image data. The PCA algorithm is used to extract the main feature components of the data. The Support Vector Machines (SVM) algorithm is used to recognize the face. The paper gives a conceptual model for automated attendance system through facial recognition using an integral validation process which enhances the reliability of face detection.
Samuel Lukas et al.[3] propose a method for student attendance system in the classroom using the face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT). The features of student's face are thereby extracted and by applying the Radial Basis Function (RBF) facial objects are classified.
Hemantkumar Rathod et al.[4] proposed an Automated Attendance System by using algorithms like Viola- Jones and HOG features along with SVM classifier. Features of all the faces are extracted using HOG features[5]. Finally, by using SVM classifier, we can recognize the face.

Omar Abdul Rahman Salim et al. [6] propose a class attendance system using facial recognition along with controlling the door access by using Raspberry Pi with a connected camera. The camera will capture the image then pass it to the Raspberry Pi which is able to recognize a face by implementing the Local Binary Patterns algorithm LBPs. If the student's input image matches with the trained dataset image then the door will open using Servo Motor, and attendance results will be stored in the MySQL database.
Mashhood Sajid et al.[7] proposed an Attendance marking system in a classroom during a lecture. After capturing the image preprocessing is done on the image to remove noise and for background subtraction. Gabor Filters is used to calculate facial Fiducial points from students face. The calculated the measurements of the facial features will be matched to the image information stored in the storage database to mark student's attendance.

III. PROPOSED SYSTEM

We are developing an application that can be used in educational institutes and companies for attendance or for keeping the records for in and out the timing of the employees. The application has features like capturing an image and based on facial features, the system is able to detect the face of the user and mark its attendance. The main purpose of the system is to avoid attendance proxy and gives easy attendance maintenance without manual work. We use the Haar Feature Algorithm for detection of the faces from the images and feature extraction can be done using the LBP. Finally, by using SVM we can detect the face of the user and mark its attendance. Figure 1 shows the structural design of the proposed system.

Figure 1.Block Diagram of Proposed system

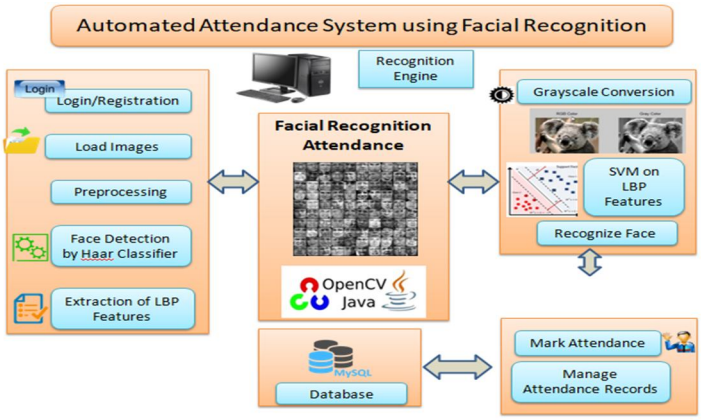

Figure 1: System Architecture

A. Face Detection

In this system we used Haar classifier algorithm for face detection. The algorithm scans the entire image and denotes each respective section as a face candidate. A face candidate is a rectangular section of the original image called a sub-window. When one of these features is found, the algorithm allows the face candidate to pass to the next stage of detection. It uses a cascade of stages which is used to eliminate non-face candidates quickly. Each stage consists of many different Haar features. Each feature is classified by a Haar feature classifier. The Haar feature classifiers produce an output which is provided to the stage comparator. The stage comparator sums the outputs of the Haar feature classifiers and compares this value with a stage threshold to determine if the stage should be passed. If all stages are passed the face candidate is concluded to be a face.

B. Conversion Of Faces To Histogram

For further processing of the faces, Local Binary Patterns (LBP) Histograms are generated. The LBP feature vector is created by first dividing each scanned window into cells. Every pixel in the centre is compared to each of its 8 neighbours. The pixels are followed along a circle, i.e. clockwise or anticlockwise. When the centre pixel’s intensity value is greater than the neighbour’s value, ’1’ is written else ’0’ is written. This gives an 8-digit binary number which is later converted to decimal value. A histogram is computed over the cell, of the frequency of each decimal value occurring. This histogram can be seen as a 256-dimensional feature vector. The histogram can be normalized for better accuracy. The histograms of all cells are then concatenated to generate the feature vector for the entire window.
The feature vector can now be processed using the Support vector machine to classify images. Such classifiers can be used for face recognition.

C. Face Recognition

An SVM classifier is a linear classifier where the separating hyper plane is chosen to minimize the expected classification error of the test patterns that unseen. SVM is a strong classifier and it is able to identify two classes. SVM classifies the test image to the class which has the maximum distance to the closest point in the training. SVM training algorithm built a model that predict whether the test image fall into this class or another. The SVM is a learning algorithm for classification. It tries to find the optimal separating hyper plane such that the expected classification error for unseen patterns is minimized.

IV. FUTURE SCOPE

A. The automated attendance system can be extended to a mobile application wherein the teacher could directly upload a video into the system using the phone and get the attendance reports as well.

B. This application can be implemented by using cloud computing system encompassing an entire educational institution.

V. CONCLUSION

Automatic attendance system for educational or commercial organizations is more efficient as compared traditional methods. It saves time and effort, especially if the number of students is high.

This paper gives a survey of different techniques used by the researcher for face detection that can be used for monitoring students' attendance in a lecture. We are trying to increase the accuracy with the help of the proposed solution.

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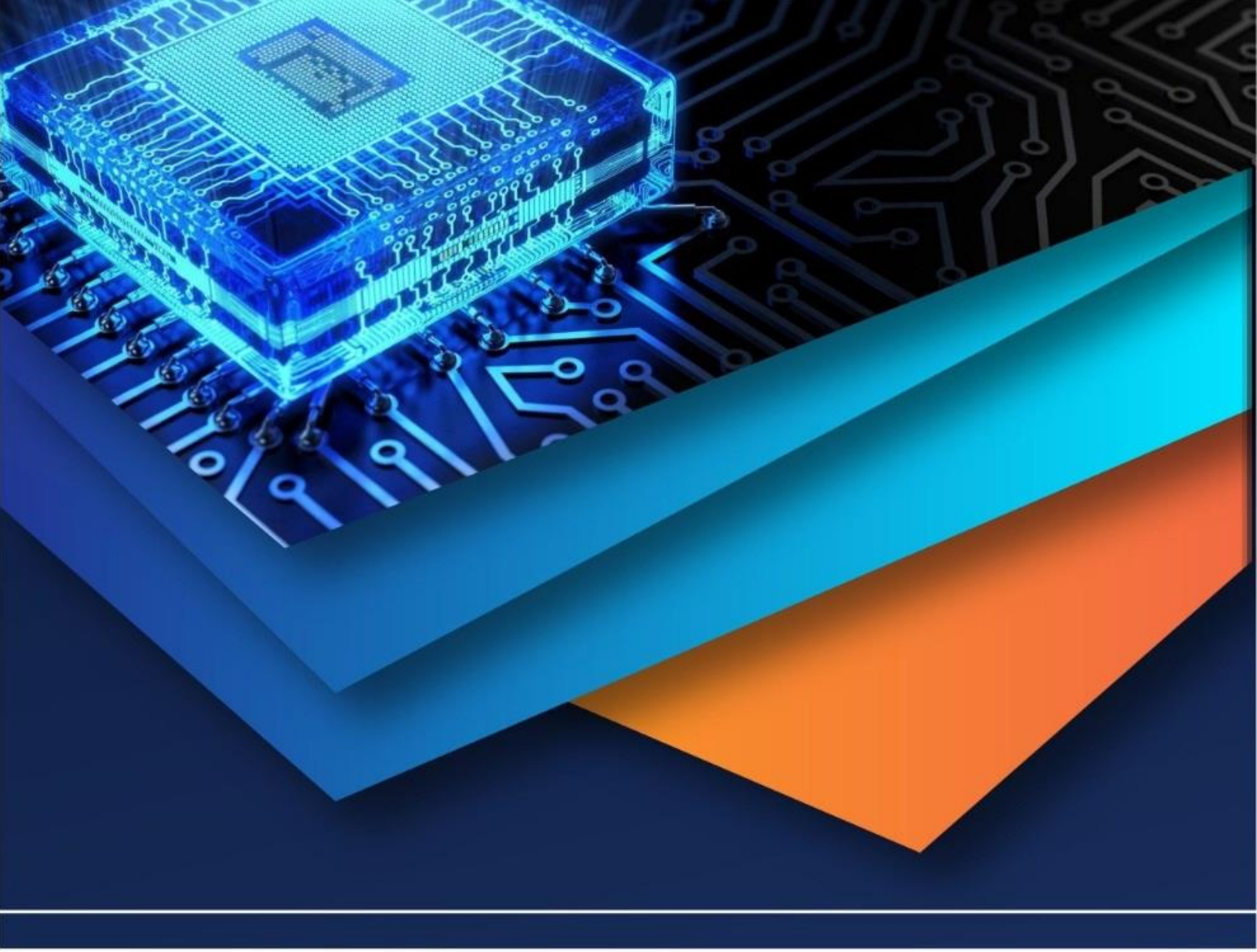

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