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Automatic Attendance System using Matlab

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Abstract: In this paper we are proposing an automatic attendance system which can be used in every organization to mark the attendance of employees. The main application of Automatic attendance system is seen in teaching institutions, where the attendance of students has to be regularly monitored on daily basis. The method developed provides a secure and effective may recording attendance. Automatic attendance system uses mainly two algorithms i.e. Viola Jones Algorithm and Local binary pattern algorithm. Viola Jones algorithm is used for face detection and Local binary pattern is used for the feature extraction and face recognition.

Keywords: Viola Jones algorithm, Local binary pattern, Haar like features, Integral images, Adaptive boost, Cascading, Image segmentation, Thresholding.

I. INTRODUCTION

Face recognition is the analysis of characteristics of a person's face image taken from a camera. It measures overall facial feature like distances between eyes, length of nose, distance between mouth, and length between jaw edges. These measurements are stored in a database and used for comparison when a user stands in front of the camera. Camera can be placed a distance of 2 feet to ten feet from the person to be identified, without waiting for long periods of time or do anything more than look at the camera. Face recognition has become a popular area of research and successful application of image processing.

Traditional method of attendance is manual to maintain the record of lectures, salary and work hours. This attendance is generally maintained using attendance sheet. The traditional marking methods are monotonous & time consuming. Manually recorded attendance can be easily manipulated. Because these problems being faced in manual attendance system, some of the organizations have shifted to biometric technique but biometric system serves one person at a time.

In this paper we have proposed an automatic attendance system that can tackle all the problems faced in manual attendance system as well as in biometric system. The proposed automatic attendance system consists of a high resolution digital camera to monitor the workplace. It is embedded on a micro-controller based motor system so that it can rotate in left & right directions. The data or images obtained by the camera are used by computer programmed system for further calculation. The images are compared with reference images of each of the employees or students to mark the corresponding attendance.

The challenges of face recognition lie in the inherent variability arising from face characteristics like illumination, quality like resolution geometry like distance and viewpoint and signal to noise ratio, and image content like background, occlusion and disguise [2]. It is the ability to establish a subject's identity based on his facial characteristics. Automatic face recognition has been extensively studied over the past two decades due to its number of application domains, such as access control, visual surveillance

II. RELATED WORK

In automatic attendance system we have studied and identified face images. For this we have used two main algorithms Voila Jones algorithm for face detection and Linear binary pattern for feature extraction and face recognition. A brief discussion of the algorithms used is given:

A. Viola Jones algorithm

The Viola-Jones face detection algorithm is the first framework based on object detection that provides good detection rates in real-time is given by Paul Viola & Michael Jones in the year of 2001. This algorithm has been implemented in a software 'Matlab' [7]. This algorithm basically consist of below mentioned algorithms.

1) *Haar like feature:* Haar-like feature is defined as the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. This difference is then used to categorize subsections of an image. This modified feature set is called 2-rectangle feature. Viola and Jones also defined and used 3-rectangle features and 4-rectangle features. [1]

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2) *Integral Images :* Integral images is used to obtain the sum of the pixels in a rectangular subset of a grid quickly and efficiently. Integral images calculate all the pixel above and to the left of (*x, y*) and assign sum to the (x, y). [1]
3) *Adaptive Boost :* Adaboost or adaptive boost is a predictive algorithm for classification and regression. Adaboost is mainly used for over fitting only. Adaboost is called adaptive because it uses multiple iterations to generate a single portion of the image. [1]
4) *Cascading:* The basic principle of cascading is to scan the whole image. It may be possible that it can contain more than one face so cascading scans and detect face in the picture. [1]

B. Local Binary Pattern

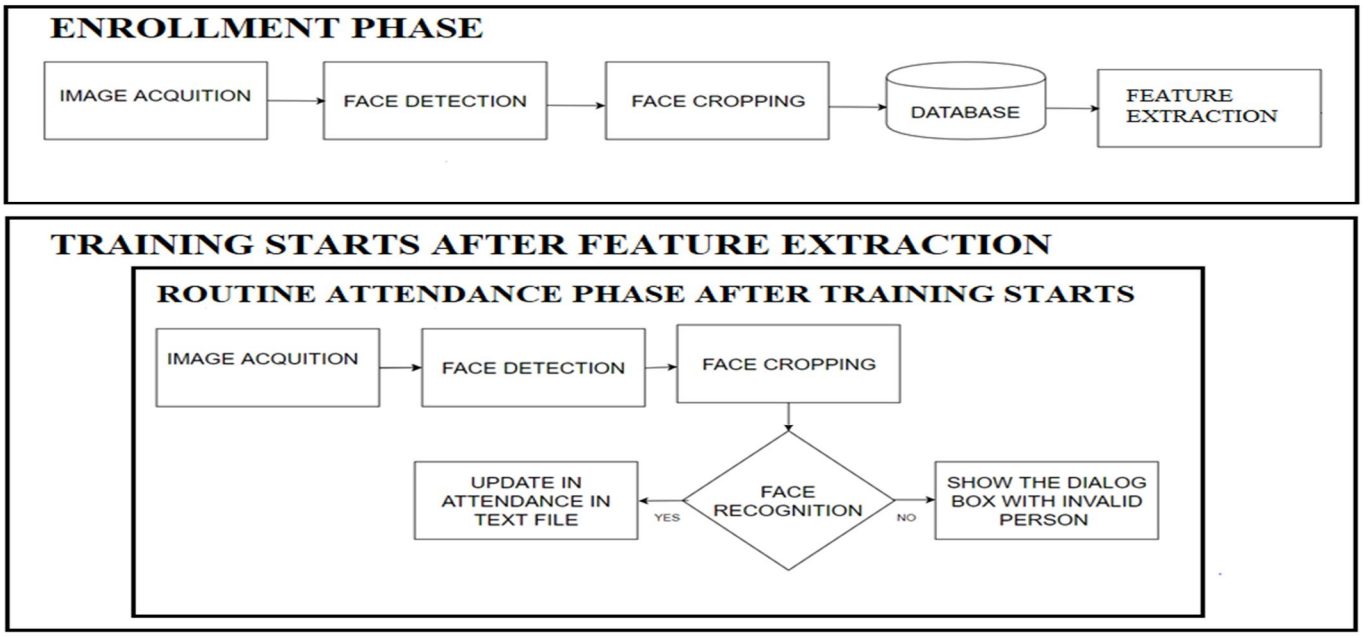
Local binary pattern is used for the feature extraction and face recognition. In this algorithm an image is divided into multiple parts and on each part LBP is applied. First we make 3 X 3 top left corner window is then each pixel is converted into equivalent grey level. After this we compare centre pixel value is with all the neighbourhood values and as result if centre pixel value is greater than surrounding pixel then it is 1 otherwise 0.In next step , the 8-bit code is converted into decimal equivalent and further this procedure is repeated for the whole image. After this all the decimal values are plotted on histogram. [4]

Image segmentation is mainly used in partitioning a digital image into multiple segments (sets of pixels, also known as super pixels).The goal of segmentation is to modify the representation of an image into more meaningful and easier to analyse. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics. Thresholding is the simplest method of image segmentation. From a grayscale image, Thresholding can be used to create binary images. The simplest thresholding methods replace each pixel in an image with a black pixel if the image intensity is less than some fixed constant or a white pixel if the image intensity is greater than that constant. [4]

III. SYSTEM OVERVIEW

A. Enrollment Phase

1) *Image Acquisition:* For Image acquisition, camera is used to capture an image of the employees working in an organization.
2) *Face Detection and Face cropping:* For face detection cascading algorithm is used. Further face cropping is done using ***imcrop*** (image) command that separates the facial area from the rest of the background image. This faces is stored in the database.
3) *Feature Extraction:* Feature extraction is done by using linear binary pattern algorithm. Feature extraction is helpful for face detection and recognition.
4) *Database:* Extracted features of employees or persons will be stored in Database.



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B. Routine Attendance After Enrollment Phase

Routine attendance will start after extracting the features of all the images stored in the database. We have followed the same steps as given in enrollment phase i.e. image acquition, Face detection, and face cropping

1) *Face recognition:* Face recognition is done by using the Local binary pattern by taking 3x3 block a time and comparing central block with surrounding blocks and compare with features stored in the database. If after face recognition face of the person is matched in the database then update the attendance otherwise show the dialog box with invalid person.

IV. RESULT

A. Test image for enrollment phase

Twenty images were tested from which only two of them are included in this paper. These two images indicates successful enrollment of the persons.

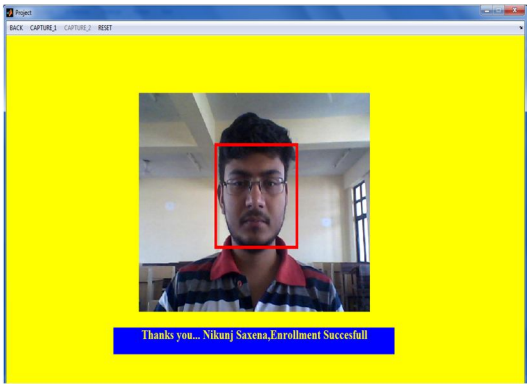


Figure 1 Test image 1

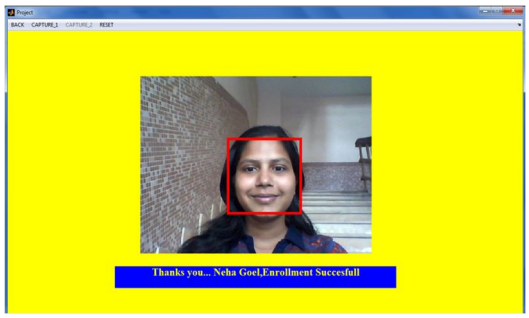


Figure 2 Test image 2

B. Test Image for Routine Attendance phase

Following are the test results of the routine attendance phase. These two images indicates that their attendance has been marked successfully.

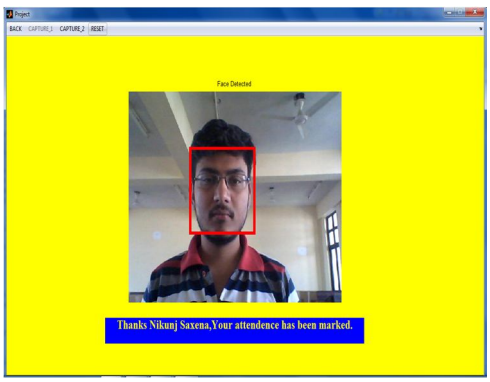


Figure 3 Test image 1

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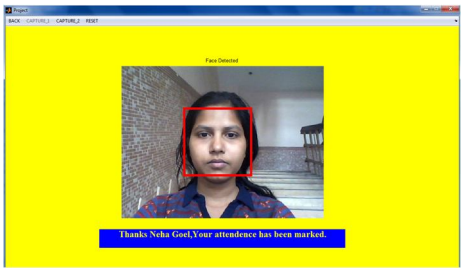


Figure 4 Test image 2

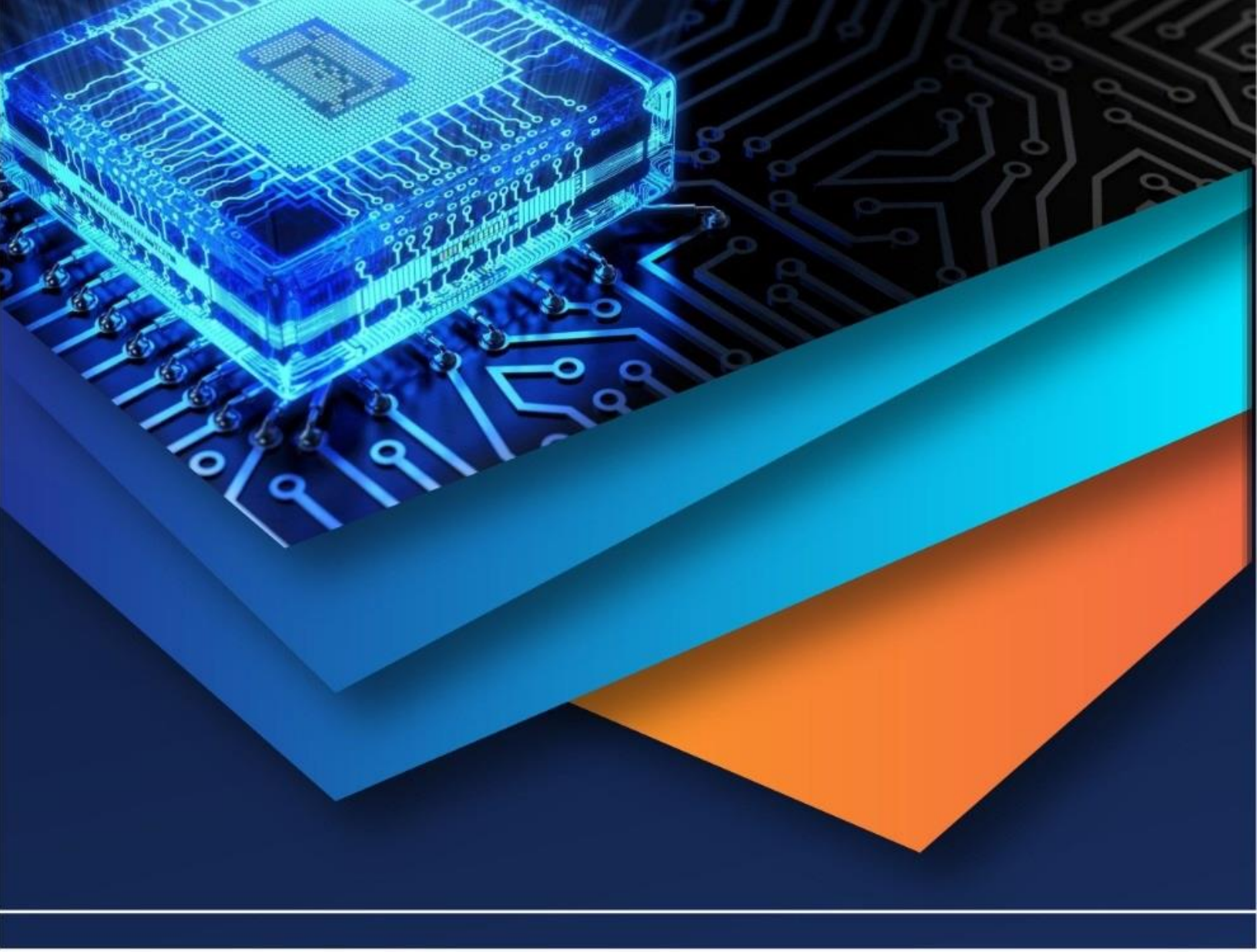
V. CONCLUSION

The complete system is implemented in MATLAB. We have implemented the algorithm on MATLAB 2013a version. This attendance system shows the use of facial recognition techniques. The project was developed in reference to the various aspects of its need & applications in the present scenario. Implementation of our project is developed as in accordance with our proposed block diagram.

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