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AUTOMATIC ATTENDANCE SYSTEM BY FACE RECOGNITION USING MACHINE LEARNING

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ABSTRACT

Uniqueness of an individual is in his face. In this project, face of an individual is used formarking the attendance automatically. Attendance of the student is considered to be an important tool for various institutions such asschool, college and university. Conventional method requires calling outloud the name or roll numberof students in order to record attendance. This process consumes at least 5-10 minutes of a 60 minute lecture. To stay away from such losses, an automatic process is used in this project which is based on image processing. In this project facialdetection and recognition is used. Face detection is used to locate the position of face region and face recognition is used for marking the understudy's attendance. The database of all the students in the class is stored and when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded

1. INTRODUCTION

Attendance is of prime importance for both the teacher and student of an educational organization. The problem arises when we think about the traditional process of taking attendance in the classroom. Calling name or roll number of the student for attendance not only wastes time, but also it requires energy. So an installation of an automatic attendance system will solve all these problems. There are some automatic attendance taking systems which are currently being used by multiple institutions. Example of one such system is the use of biometric technique. Although it is automatic and a step ahead of the traditional method, it fails to meet the time constraint. The student has to wait in queue for giving attendance, which is time taking. This project introduces an involuntary attendance marking system, devoid of any kind of interference with the normal teaching procedure.

This system can also be implemented during exam sessions or in other teaching activities where attendance is highly essential. This system eliminates classical student identification, which can not only interfere with the ongoing teaching process but can also be stressful for students during examination sessions.

An automatic attendance system by facial recognition using machine learning is a smart and organized way for any organization which demands the regular maintenance of the attendance of the employees, worker or students. This approach will save the money of organization, save time and spare you with the frustration of the manual input of attendance, which is being followed since ages. The automatic approach of attendance will increase efficiency, by the implementation of the electronic, integrated time and attendance system resulting in profit in every aspect.

Modules:

- Student Login
- Faculty Login
- Face Recognition System by Camera
- Attendance record
- Identity check

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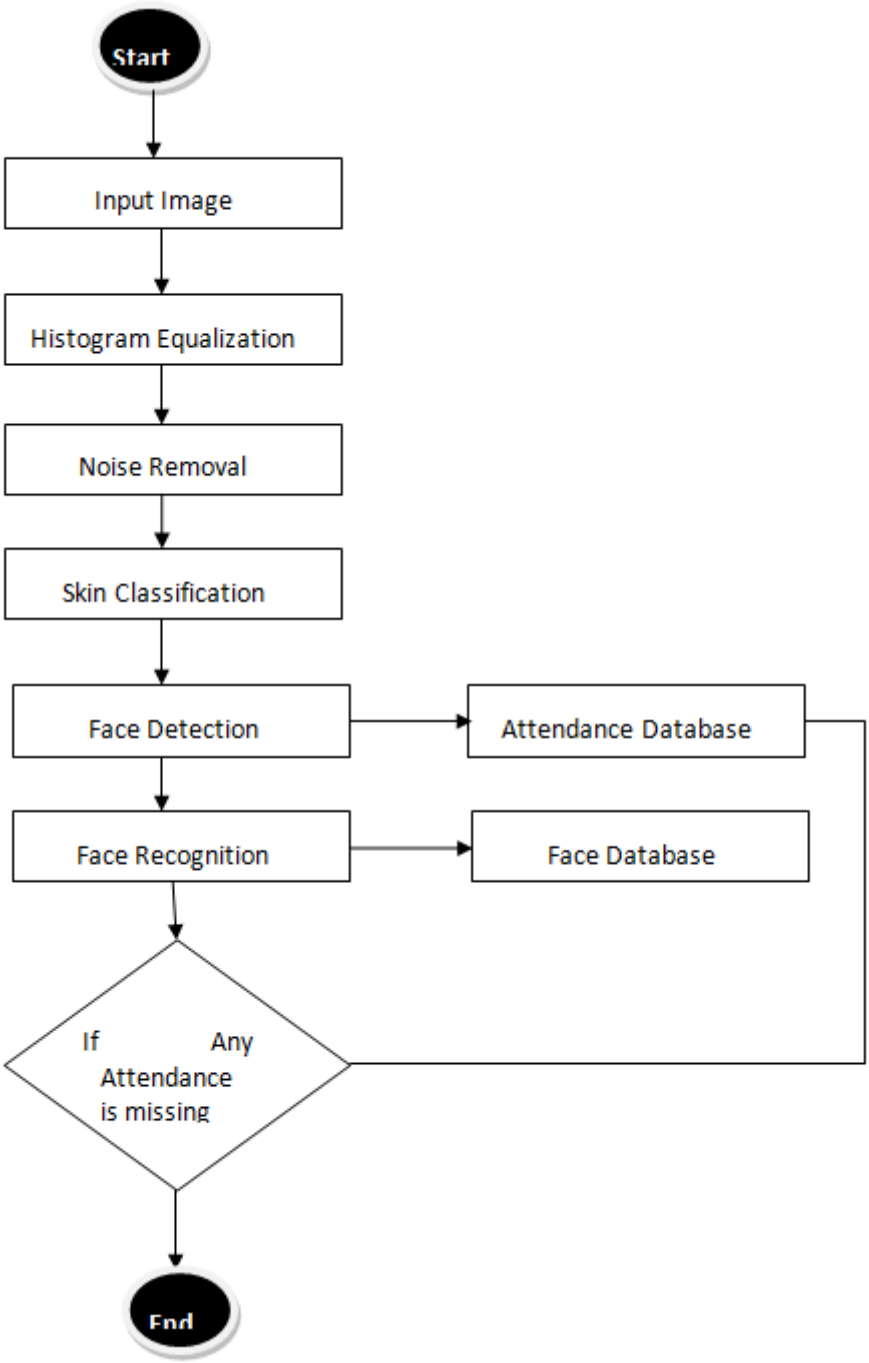

Figure 1: Flow Chart of Automatic Attendance System Using Face Recognition

2. LITERARY SURVEY

There are multiple approaches being employed for dealing with the disparity in images subjected to illumination changes. These approaches are implemented in object recognition systems and also by systems that are specific to faces. A method for dealing with such variations includes utilizing Gray level information to extract a face or an object from shading approach. The main reason why Gray scale representations are used for extracting descriptors instead of operating on colour images directly, is because Gray scale simplifies the algorithm and

reduces computational requirements. Here in our case, colour is of limited benefit and introducing unnecessary information could increase the amount of training data required to achieve good performance. Being an ill-posed

Problem, the proposed solutions assume either the object shape and reflectance properties or the illumination conditions.

It is important to note that these assumptions made are too strict for general object recognition and therefore it doesn't prove to be sufficient for face recognition.

The alternative approach is the Edge-Map of the image which is a useful object representation feature that is insensitive to illumination changes in certain events. Edge images could be used to achieve similar accuracy as Gray-level pictures. The edge map information approach possesses the advantage of feature-based approaches, such as invariance to illumination and low memory requirement. It integrates all the structural information with spatial information of a face image by grouping pixels of face edge map to line segments. After thinning the edge map, a polygonal line fitting process is applied to generate the edge map of a face. One final approach to deal with the image disparities due to illumination differences is by using a model of several images of the same face which is taken under various illumination conditions. Herein, the images captured can be used as independent models or as a combined model-based recognition system.

3. PROBLEM STATEMENT

The classical process is very tedious and hard to keep a track of. The task of every day attendance is a real struggle as it frustrates the one who is calling each name in every class that too in every single lecture. This leads in pure wastage of time, also the manual process leads to several miss-placing of the names and the marks of the attendance which irritates both students and the respective faculty. The application isn't scalable to the most. Perfect attendance marking requires concentration and even the smallest of lapses can help proxies happen. Concentration lapses are natural and also the students sometimes forget to call out their names. This is again irritating for the teacher to revisit the page after a long lecture to mark the attendance of the students who 'forget'. The new system introduced will solve the problem to a greater extent.

4. OBJECTIVES

- To create a dynamic student portal that acts as a gateway for just-enough, just-in-time information for all students.
- To save time and efforts that were supposed to be put by instructors during each lecture.
- To prevent unauthorized attendance registration using multi-factor authentication.

5. PROPOSED SYSTEM

Countless systems have been developed in schools and industries to keep a track of the attendance. These systems are good but they are plagued with performance and scalability problems. The Fingerprint System is the closest representation to my proposed system. This system has high usability and proxy removal techniques can be included to make the system perfect. However, the system is notes efficient as finger print scanning because it also consumes time.

Therefore, Automatic attendance through facial recognition seems to be the most promising alternative. Given below is the description of the algorithm I utilized for facial recognition. This algorithm is the combination of RGB and HSV algorithm. The efficiency of the proposed algorithm is more when single face in a given image is taken into consideration. In case of more than one face, the acquired input image may result in detection of some false faces. The steps of the algorithm are discussed as follows:

STEP1: (Acquisition of the input image)

The input image can be acquired using a variety of conduct. For example, we can take the image by using camera directly or we can take the image from the stored database folder. The second way is more effectual as the debugging process becomes much faster.

STEP 2: (Extraction of the skin type using HSV color space)

In this algorithm, the HSV color model is used which takes into account the effect of light. In MATLAB 'rgb2hsv' command is used to get the HSV image from that of the RGB image. Later, each of the three H,S,V component is extracted and the extracted image gives information for the color of skin . A pixel whose H and S component satisfies the equation is considered as a pixel of the individual.

$$0<=H<=0.25;\ 0.15<=S<=0.9$$

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STEP 3: (Output image is transferred to the RGB color and produce binary image based on the value of R, G and B)

After getting the skin color region, the image is converted into the RGB image i.e. only the skin color region is converted. Then, the R,G, and B values are extracted by assigning the value of the three channels into three variables. If the R,G, and B value of the pixel satisfies the below equation then it will classified as skin.

"R>95 and G>40 and B>20 and max(R,G,B)-min(R,G,B) and |R-G|>15 and R>G and R>B".

If the pixel satisfies the condition, it will become white. Otherwise, it will be of black color.

STEP4: (Filling of black dot inside the white region)

The converted binary image contains black spot that can create problem in next processing. To fill the black spot I used the 'imfill' command of MATLAB.

STEP 5: (Morphological operation is done to remove the small areas which are very small to be a face)

This step is the most critical and the best module in the entire face identification process. This algorithm based on skin color. Therefore if other exposed parts of the body are more than the pixel value of the face region than it would create problem.

Step6: (Drawing bounding box around each face region)

"bwboundaries" command is used to get the boundary around the detected face.

I. Algorithm for Face Recognition

The recognition of a human face is challenging in a computer-human interaction. The face is our essential center of consideration in societal life, playing a critical part in assigning identification and emotion of the person. We can perceive various appearances that we adapt all through our lifespan and distinguish faces impeccably even after following quite a while of detachment. This expertise is very vigorous notwithstanding of substantial varieties in visual boost because of evolving condition, maturing, and diversions. For example, facial hair, glasses or changes in haircut.

Computational models of face acknowledgment are fascinating in light of the fact that they can contribute to hypothetical learning as well as to functional applications. PCs that identify and recognize the face could be connected to a broad assortment of undertakings together with criminal recognizable proof, security framework, image and film handling, identity confirmation and human-PC interaction. Tragically, adding to a computational model of face recognition and acknowledgment is very troublesome in light of the fact that faces are perplexing, multidimensional and important visual stimuli.

This project uses the principal component analysis (PCA) for face recognition. There are many other face recognition algorithm, but principal component analysis (PCA) based face recognition is the simplest one for face recognition.

Step1: Acquire training set of 'N' number of images at the initial stage. In this project, the images are of 92*112 pixels each. Training set is shown in the figure.

Step2: Calculation of the Eigen face from the "N" training set images keeping only few M images that is correspond to that of the highest Eigen values. The M images describe the "face space". When new faces encountered, the "Eigen faces" can be recalculated accordingly.

Step3: The corresponding distribution of the "M" dimensional weight space for every known individual is calculated by projecting their respective face images onto "face space".

Step 4: Compute set of the weights anticipating or projecting the data picture or input image to M "eigen faces".

Step5: Determine if the given image is face image or not by checking to the closeness of given image or picture to "face space".

Step 6: If the image is sufficiently close enough, then classify the weight pattern as either an unknown or as a known person based on measured Euclidean distance.

Step7: If the image is sufficiently close enough then refer to the recognition as successful and give applicable information about recognized face from the database which holds data of faces.

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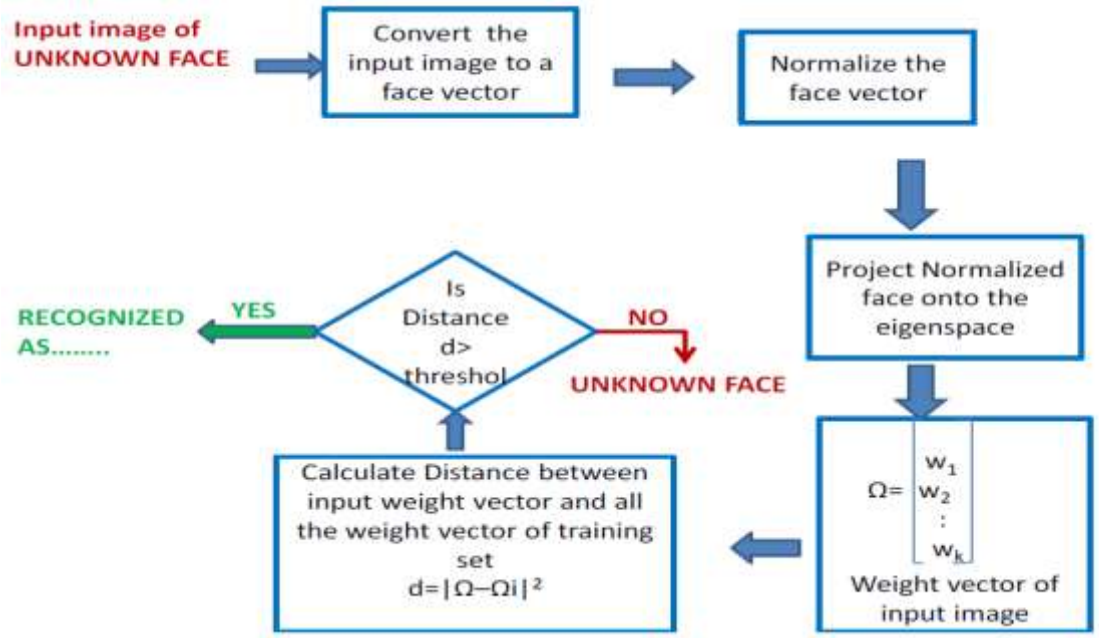

Figure 2: Algorithm for Face Recognition

6. EXPERIMENTAL ANALYSIS & RESULTS

Here, the database or training set of NIT Rourkela students has been created. The data base contains photograph of nine students, each student having ten images. So, the total image is equals to 90. The training set is shown in figure 3. As mentioned earlier, each image is of 92×112 pixel.

The images, now operated on, in the test set is different i.e. they are not taken from the database. The test set can be shown in figure as follows:

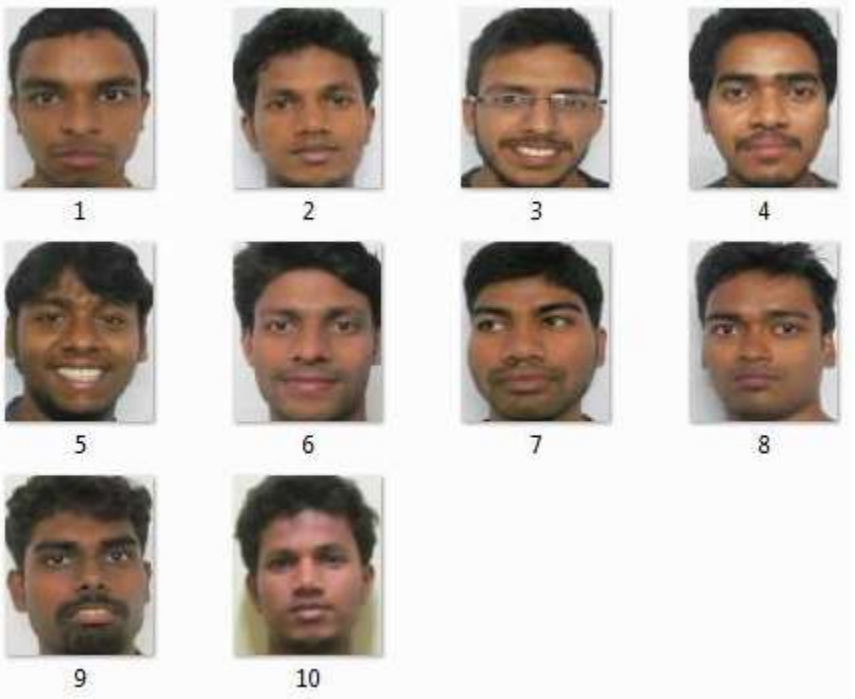

Figure 3: Training Data Set

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When an input image is given, which is not present in the data base, the input image is processed and the best matching is considered as the recognized image. The experimental result is shown in figure. Where the recognized image is 16th image from the database and the recognized image is Himanshu, which is shown in the command window of the MATLAB.

```
the recognized image is :16.jpg
Himanshu
    16
```

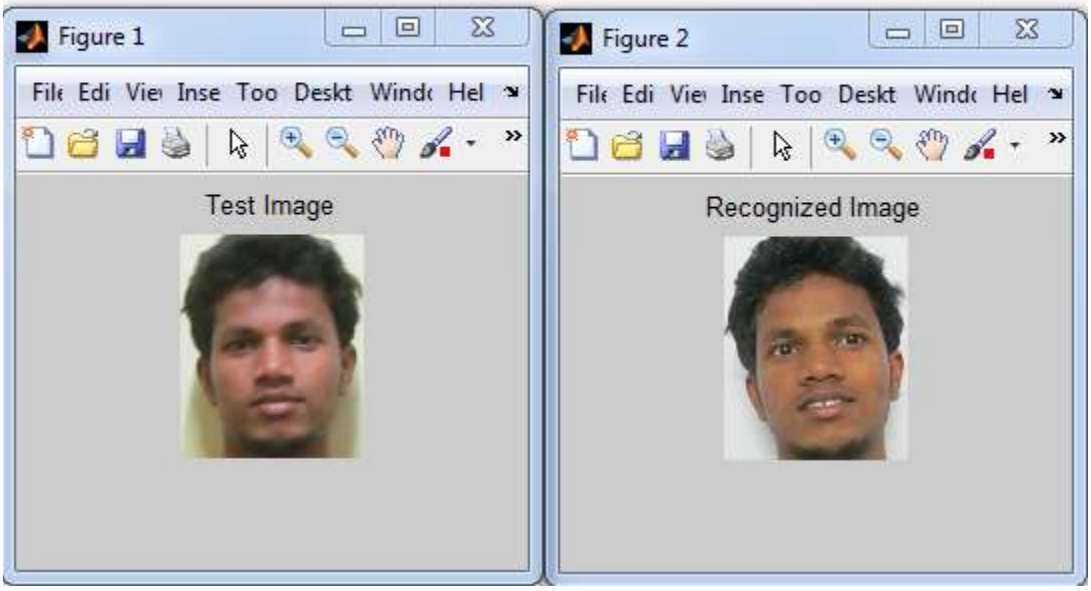

Figure 4: Showing the input & output image

7. CONCLUSION

The offline attendance system using facial recognition is a very effective tool which can be used to a great extent. The system is portable and can be easily accessed and used on any mobile phone or computer. Using this application, proxies are completely avoided with a pure software approach. It will reduce the time, effort and resources such as paper for both the parties involved in the process. Moreover, it will eliminate the tedious work of the teachers for maintaining different attendance sheet for different classes and different subjects.

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