

Automatic Attendance using Face Recognition

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Abstract— The Image Processing is vastly growing which is used to perform operations on an image to get an improved image or to get some useful information. Human face detection and recognition is an important technology used in various applications. The traditional technique for taking attendance is Roll Number of student and record the attendance in sheet which takes a lot of time. Because of that, system like automatic attendance is used. To overcome the problems like wastage of time and incorrect attendance, the proposed system gives a method like when person enters the class room then the system marks the attendance by extracting the image features. The system will mark and record the attendance of the student automatically. The student database is generated; it consists of name, images and roll number of the students. It makes an entry in log report of each and every student of each and every subject and generates a PDF report of the attendance of the student. The camera plays a most important role in the working of this system. The system is basically a web application so that users of this system can use it and can perform all the tasks over the internet.

Key words: Image Processing, Face Detection, Face Recognition, Image Extraction, Template Matching

I. INTRODUCTION

Among all image processing techniques, facial recognition has the best advantages in the field of education as it can be used to update and manage attendance automatically in a much-secured way. Image processing means pixel wise transformation. Face recognition means mapping face to the familiar objects with the help of database backup. Face recognition starts with face acquisition with the help of camera; these faces are then processed with the techniques like pre-processing, feature extraction, template generation and then it is stored in database for the comparison. Nowadays digital ease of use is very popular than pen and paper. This digital growth results are popular for less time consuming and accurate user identification and verification. So, we have considered Principal Component Analysis with Eigen Faces. Facial recognition is a new way of identification of people. It works by picking faces from the crowd, obtain the measures and compare it with the images already present in the database. Eigen face method has strength to avoid the difficulties related with change in pose and expressions of a person.

The quality of images can be enhanced for better results by giving extra importance to the face recognition and extraction process so that the system will be robust and good in performance.

II. LITERATURE SURVEY

We have referred following papers to get an idea about the domain. So, the knowledge we have extracted is:

1) In this paper, the Local Binary Patterns (LBP) is used for texture information. Grey-scale transformation is

used to describe texture and shape of the image. It uses binary micro patterns for optimal precision of images. Local descriptors are used to identify the unique features which are used for facial recognition and retrieval. [1]

- 2) In this paper, for good representation of facial expression it uses geometric features with LBP using auto encoders. It has considered the human brain technique for face and expression recognition and it is implemented in the system with the help of logical reasoning. It increases the detection quality of key facial areas. It uses deep network-based data fusion techniques for facial expression recognition. [2]
- 3) In this paper, with the help of facial extraction the decisions are made upon the dynamics of facial aspects. Recurrent learning has been used and it captures the facial attributes from the input sequence. Recurrent Networks are applied to image recognition and predictions. It uses queue of colour channel images with LSTM with the spatial features encoded in CNN. [3]
- 4) In this paper, two different databases are used in research on automatic age estimation, facial ageing, and age invariant face recognition. They are FG-NET and MORPH. This is very useful technique to compare the faces with elapsed times over 10+ years. It can be the most reliable and flexible system for face recognition. [4]

A. Web Application

It is an application that uses browsers, editors and technologies of the web to handle the tasks over the internet. It uses server script to perform the storage, updating and retrieve the information. It uses client script to represent the information to the user in very organized and beautiful way. Web applications supports following languages:

- 1) HTML (Hyper Text Mark-up Language).
- 2) CSS (Cascaded Style Sheets).
- 3) JavaScript.
- 4) PHP
- 5) jQuery

In our web application, we have used such languages for front end designing. For backend coding we have used MySQL structured query language for database operations.

III. PROPOSED SYSTEM

A. Algorithm

Eigenface is a set of eigenvectors. They are used in the computer vision for human face recognition. A set of eigenfaces can be developed by performing a process called principal component analysis (PCA) on a large set of images detecting various human faces.

Steps:

- 1) Data (image of person) reduction into single vector
- 2) Calculate mean of the data:

Let the training set of face images be $I_1, I_2, I_3 \dots I_M$.
We calculate the average of the set as,

$$\psi = \frac{1}{M} \sum_{N=1}^M I_n$$

- 3) Calculate the covariance matrix of the data
 $C=AA^T$
- 4) Calculate the reduced values of Covariance matrix to generate a template
- 5) Choose components from template
- 6) Deriving new data co-ordinates
- 7) Match this with original image which is present in a database.

B. System Architecture

First camera will capture the images of students by detecting the faces; these captured images will be pre-processed and stored into the database. These stored images will be used for further processes like Feature extraction, classification and template matching. Once the image is verified the attendance of that particular student will be marked as Present. Then the PDF report will be generated and send to their parents and staff through email.

1) Image Acquisition:

Images can be acquired by facial-scan technology from camera that captures images of better quality and resolution.

2) Pre-processing:

First Image is cropped from acquired image. Then cropped images are resized to some pixels for face recognition. These resized images are converted from RGB to Grey level.

3) Face Recognition:

For face recognition or detection is done by comparing particular facial aspects from the image and database, it identifies or recognizes a human in an image.

4) Face Database Generation:

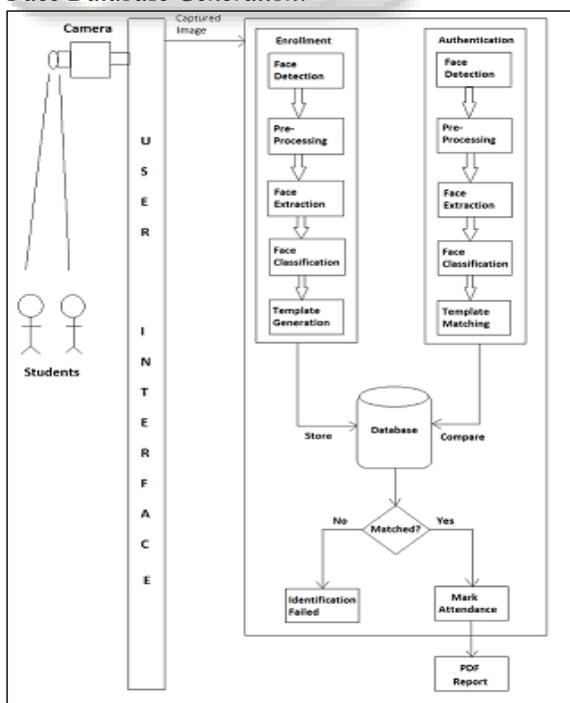


Fig. 1: System Architecture

Original face database consists of images of all students having 5 images per student. With change in intensity of light and various facial expressions, the original database images are acquired at various interval of time.

C. System Overview

The important blocks of the architecture and their explanation are as below:

1) Face Detection:

Face detection begins by searching human eyes by testing valley areas in the grey-level image. It then implements a genetic algorithm to detect facial areas consisting eyebrows, nose, mouth and iris. It would first identify certain facial areas and then uses more testing for validation purpose. As soon as a face is detected, it can be used for important regions searching like the nose and eyes.

2) Feature Extraction and Classification:

For finding the correct or appropriate patterns among the data necessary to decrease the amount of data and extract the exact relationship or variations between two data sets. Classification is describing whether particular facial aspects are present or not. For example, a face can be classified according to whether its eyes are open or closed. One more example is whether the face is smiling or not. For this purpose, we have used Principal Component Analysis (PCA) and Eigen Faces.

3) Template Matching:

The test image which can be indicated in the form of two-dimensional array of intensity values and can be compared with the help of suitable measure like Euclidean distance, with a one template consisting the complete face can be a simple version of template matching.

4) Database:

The important part or we can say backbone of the system is database where all the data is added, updated and stored for the various operations. We have used Xampp Controller software to create the database using MySQL commands.

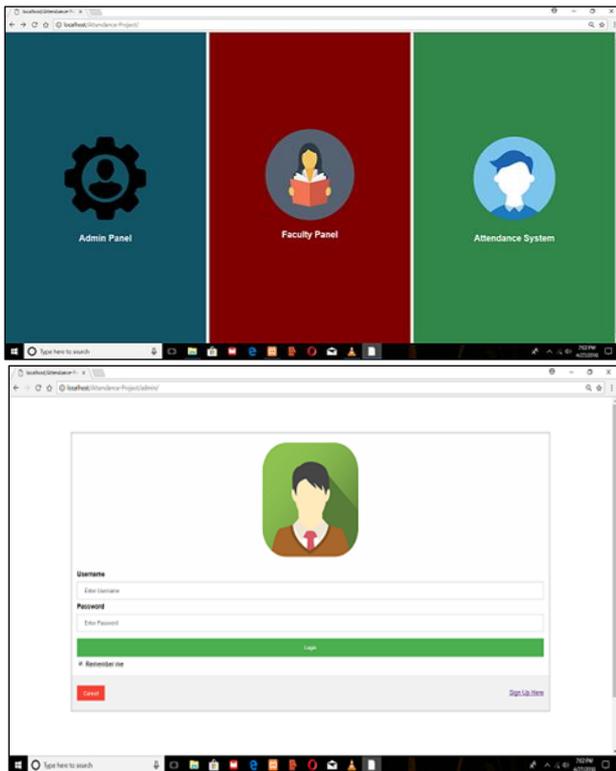
During enrolment phase, the detected face is pre-processed (cropping of image, converting into grey-Scale). Then from this image important features are extracted and classified according to the previous knowledge and creates various templates. These templates are then stored in the database for the further process. During the authentication phase, newly created template is compared and matched with the previously stored template. If it is matched, then the attendance of a particular student will be marked.

D. Methodology

The working of our system is given below with the help of screenshots of our system and explanation in brief manner:

1) Login:

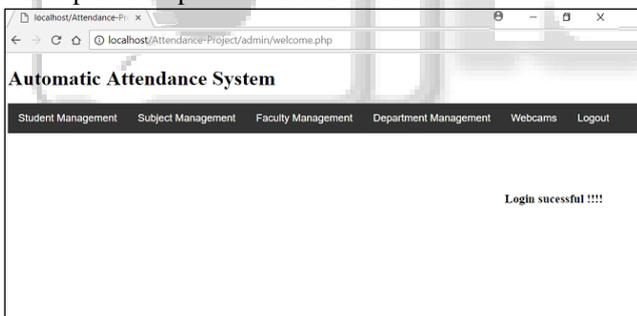
This is the very first window when system gets started. Every student or faculty is provided with their unique user ID and password for login.



2) **Menu:**

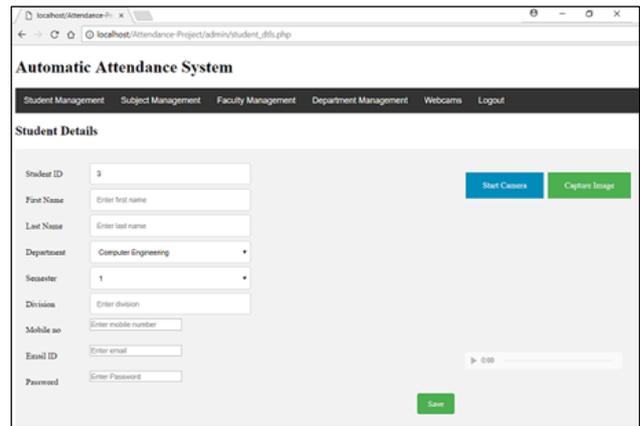
User can select one of the menus from the several menus. With the help of this user can perform the appropriate operations.

Student management, subject management, faculty management, department management, webcams, logout are some operations provided for the user.



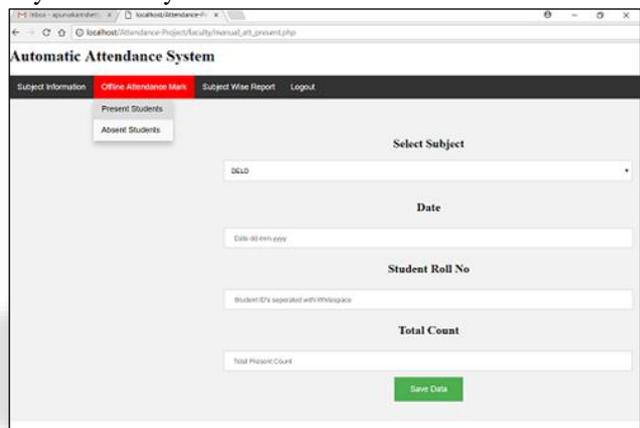
3) **Student and Faculty Details:**

User (student or faculty) can register himself after login. Personal information, professional information and basic information should be typed and submitted by the user. By clicking on Start Camera, camera will be able to capture and store his/her face image in database.



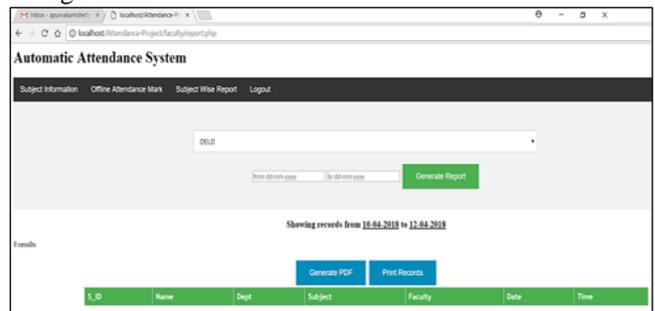
4) **Offline Attendance:**

In case of technical errors or network problem, the system is provided with the offline access to the faculty and admin only so that they could mark the attendance of students.



5) **Report Generation:**

After marking the attendance, the PDF report will be generated which consists of attendance of each student for each lecture and aggregate attendance of each student. This report will be send to their parents as well as to all faculties through email.



E. **System Requirements**

1) **Xampp Controller:**

XAMPP Controller is open source cross-platform, web server solution database free software which contains the MariaDB database Apache HTTP Server, and interpreters for scripts which are written in the Perl and PHP programming languages.

2) **Notepad++ or Sublime Text3:**

Notepad++ or Sublime Text3 is an editor. Coders can write and execute their code in this editor. For our system, we have used Notepad++ editor.

3) Frontend:

For this system we have used html5, css3, JavaScript and php to represent the web view that is front view of our web application.

4) Backend:

For database purpose we have used MySQL structured query language. Using different queries, insert, delete, update operations on data can be performed.

5) Hardware:

The hardware used for this system is camera with high quality and good resolution.

IV. CONCLUSION

The automatic attendance system using face recognition technique works nicely. The automatic attendance management web application will replace the traditional method, which takes a lot of time and which is hard to maintain. It is improved for better result particularly by doing more concentration on feature extraction or recognition process. This improvement may help the recognition process become more robust and good in performance. The current developed software is a web application, and it will be used for some institute. But later it can be updated so that it will be operate as mobile application. Now, the system has reached up to some great accuracy level for partial and dense images. It can further be improved to obtain higher accuracy level. It can be automatically updated by the use of the concept of Internet of Things.

ACKNOWLEDGMENT

The project on Automatic attendance using face recognition is a source of trending and immense information to us. We would glad to express our sincere gratitude to the Trinity College of Engineering and Research department of Computer Technology for the guidance and most valuable support in the help for this project work. We acknowledge with a pleasant gratitude, the encouragement and inspiration received from our guide Prof.Krushana Belerao, project coordinator Prof.Suchita Wankhede, Head of the Department Prof.Pavan Kulkarni and colleagues.

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