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Students Attendance System Using Face Recognition

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Abstract: *The management of the daily attendance is a big task in any organization. The image processing based attendance marking system takes the daily attendance of students in educational institutions automatically. It proposes a method to automatically take the attendance of students in a class. The system uses face recognition technology for identifying the students who are present in each class. It is an efficient way to record and manage the attendance in a class. The system stores the details of each student as well as their facial features in the database. It compares the new patterns with the previously stored patterns as per the demand. The implementation is done using concept of client-server model along with concept of Haar Cascade. The system used is technologically very simple, easily installable and maintainable. The same system with some modifications, can be used in a wide range of applications such as to prove the identity of a person to log in to a computer; to draw cash from an ATM; to identify the presence of criminals at airports, railway stations, LOC areas at country border, to enter a protected site and so on. Among the person identification methods, face recognition is known to be the most natural ones, since the face modality is the modality that is used to identify people in everyday life. Although other methods, like fingerprint identification can provide better performance, those are not appropriate for natural smart interactions due to their intrusive nature. This face detection differentiates the faces from non-faces and is therefore essential for accurate attendance.*

Keywords: *Face detection, Face recognition, Haar cascade, Client-Server.*

1. INTRODUCTION

Traditionally, student's attendance are taken manually by using attendance sheet given by the faculty members in the class, which is a time consuming. Moreover it is very difficult to verify all the students in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. Using face recognition it proposes a method to automatically take the attendance of the students in a class. The system stores the details of each student as well as their facial features in the database and it compares the new patterns with the previously stored patterns as per the requirement.

Face detection method can be broadly classified into two categories: Appearance based approach and feature based approach. In the appearance based approach, the whole image is used as an input to the face detector. In feature based approach face detection is based on the features extracted from an image. Features can be i.e. skin color or edges and sometimes they have a knowledge of the face geometry [1].

Face recognition is as old as computer vision, both because of the practical importance of the topic and theoretical interest from cognitive scientists. Despite the fact that other methods of identification (such as fingerprints, or iris scans) can be more accurate, face recognition always remains a major focus of research because of its non-invasive nature and because it is people's primary method of person identification. Face recognition technology is gradually evolving to a universal biometric solution since it requires virtually zero effort from the user end while compared with other biometric options. Biometric face recognition is basically used in three main domains: time attendance systems and employee management; visitor management systems; and last but not the least authorization systems and access control systems

2. LITERATURE SURVEY

The first attempts to use face recognition began in the 1960's with a semi-automated system. Marks were made on photographs to locate the major features; it used features such as eyes, ears, noses, and mouths. Then distances and ratios were computed from these marks to a common reference point and compared to reference data. In the early 1970's [2] created a system of 21 subjective markers such as hair color and lip thickness. This proved even harder to automate due to the subjective nature of many of the measurements still made completely by hand. [3] approaches to measure different pieces of the face and mapped them all onto a global template, which was found that these features do not contain enough unique data to represent an adult face. Another approach is the Connectionist approach [4], which seeks to classify the human face using a combination of both range of gestures and a set of identifying markers. This is usually implemented using 2-dimensional pattern recognition and neural net principles. Most of the time this approach requires a huge number of training faces to achieve decent accuracy; for that reason it has yet to be implemented on a large scale. The first fully automated system [5] to be developed utilized very general pattern recognition. It

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compared faces to a generic face model of expected features and created a series of patters for an image relative to this model. This approach is mainly statistical and relies on histograms and the gray scale value.

This system has a key advantage of reducing the manual overhead of the faculties and resolving the authentication issues to some extent.

3. ARCHITECTURE

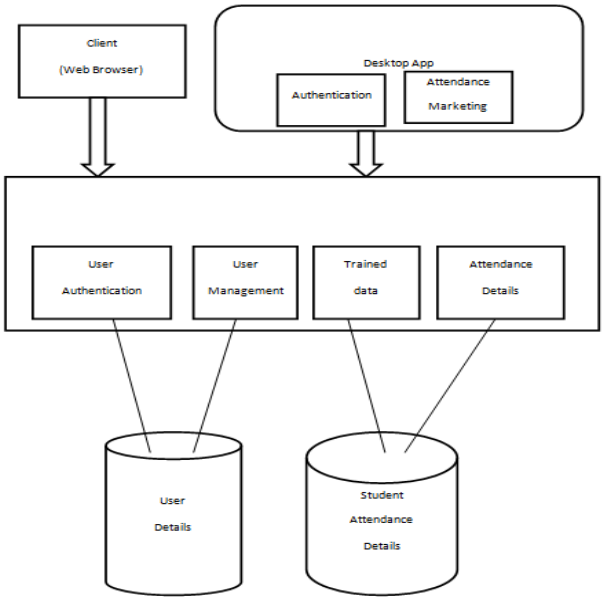

Figure 3.1. System architecture

The architecture of our proposed system consist of three tier client server model. It has application layer, presentation layer, and data layer. They have the following functionalities:

- **Presentation Layer**- This is the topmost layer. It is the main application that the user interacts with and feeds the input and queries. The client or user (teacher, student, parent) access the application via various browsers available with him/her, followed by which is the main application that user access to. This application first requires authentication, i.e it gives access to the authorised user that has a legal or valid id and password.
  In the next step, if the user is a faculty member, then that faculty will start the process of attendance marking of the students.
  If the user is a student or corresponding parent, with their respective ids they can view the attendance and/or analyse and compare the same with the attendance of other students as well.
- **Application Layer**- This is the middle layer sandwiched between presentation layer and data layer. It takes the input from presentation layer and forwards the same to data layer.The main task of this layer is to manage different users according to their categories, i. e teacher, student, and parent. It stores the details of these users in user details block as shown in the above diagram.
  The next task that this layer performs is managing the attendance details of the students. It includes maintaining and managing the trained data of students that is given as an input to the system and managing the attendances of respective students as shown in the above figure.
- **Data Layer**- This is bottom most layer of our system architecture. It includes block called user details and student attendance details which consist of data that is required for the processing of information. It takes input from presentation layer.

4. PROPOSED SYSTEM

4.1 Face Detection

In this paper, Open Source Computer Vision Library[6] is used to implement the haar cascade classifier. It is originally given by Paula voila and Michael jones [7]. For the detection of the face, haar features are the main part of the haar cascade classifier. Haar features are used to detect the presence of feature in given image. Each features result in a single value which is calculated by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle as shown in (1). Haar like features are the rectangle features for rapid face detection. Some haar like feature are shown in fig 4.1.

Instead of applying all the 6000 features on a window, group the features into different stages of classifiers and apply one-by-one. (Normally first few stages will contain very less number of features). If a window fails the first stage, discard it. We don't consider remaining features on it. If it passes, apply the second stage of features and continue the process. The window which passes all stages is a face region.

P(x) = Sum black rectangle – Sum White rectangle (1)

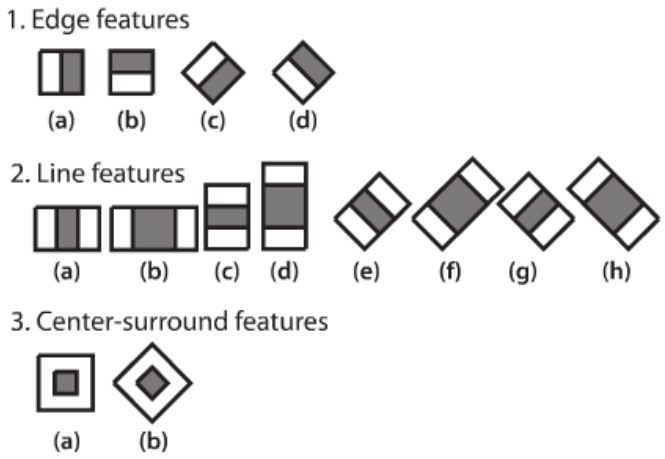

Figure 4.1. Haar features

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The Haar feature starts scanning the image for the detection of the face from the top left corner and ends the face detection process bottom right corner of the image as shown in fig 4.2. The image is scanned several times through the haar like features in order to detect the face.

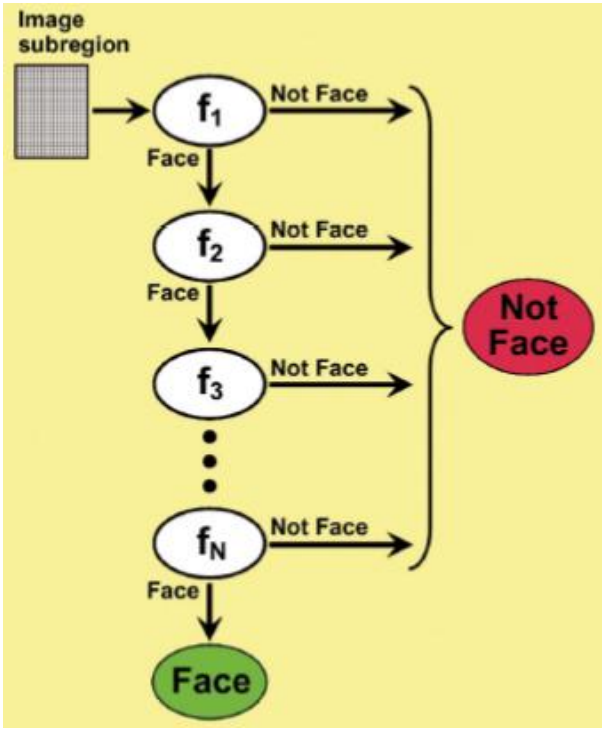

Figure 4.2. Cascade classifier

In the proposed system, we leverage the benefits of Webcam usage to capture image and for validating it from stored image and marking of an attendance. Each student's trained data is already stored at server, which would further be used for automating the registration cum notification process.

We have proposed three different models for our project:

1.Admin

- Teachers and parents registration
- Student Creation
- Students, Teachers and Parents mapping

2.Attendance Marking

- Start Attendance
- Student Verification
- Attendance Marking

3. Parents Module (JSP)

- View Attendance
- Attendance Analysis

5. METHODOLOGY

As this system uses haar cascade concept, the implementation steps will be as:

1. Read coloured image and convert it into gray scale image.
2. Haar cascade is used to identify facial structure.
3. Normalise each input face image.
4. Conversion into comparative image vector.
5. Calculate similarity ratio with other vectors.
6. Identify minimum ratio from calculated ratios.
7. Identification of valid or invalid image structure.
8. If valid, system will identify user details from trained data.

The future deployment of our system will be as:

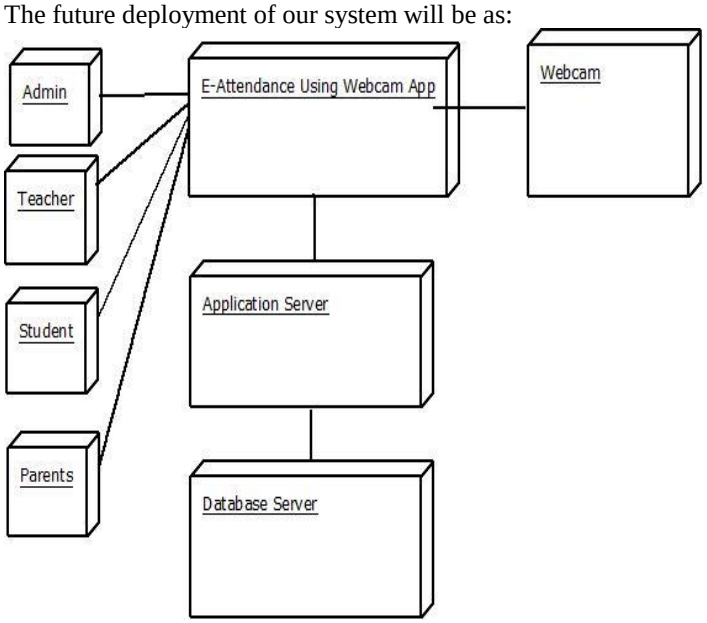

Figure.5.1.Deployment Diagram.

6. CONCLUSION

The automated attendance system is a smarter way for marking attendance.

The attendance supervision system can reduce unnecessary doubt by allowing parents to receive real-time information on non-attendance of the pupil from school/college.

The service also facilitates teachers' work by offering technology and a system for gathering the information about children's attendance and keeping a log about their possible tardiness at school.

The future scope of this system is as follow:

- The future advancements can be done using fully automatic web-camera to capture the images.
- It can be done by building an appropriate application and embedding it into mobile devices.
- And the biggest scope of this project is using cloud for a bigger database(i.e. for all the branches in a college).
- Our system can be improved by integrating video streaming service and lecture archiving system, to provide more profound applications in the field of distance education, course management system (CMS) and support for faculty development (FD).

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