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Automated Student Attendance Management System using Face Recognition

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Abstract-*As many Educational institutions facing the problem of attendance of students which takes 10 to 15 minutes by manual method as well some biometric methods which are not feasible to take attendance while class is going on for each subject throughout the day. So to reduce time and improve the performance of the teaching- learning process the automated solution proposed that covers the most important setback of a booklet which means speed and simplicity.*

The proposed system aims to tag attendees automatically and generate an analysis report. The recognition of the human face is an important background in the different manifestations of humans.. This method is designed to accommodate students in a classroom that combines facial recognition technology. The proposed system captures the image of the students in the classroom through the high quality camera and through the operation on the images, students' attendance will be automatically marked in the report.

Keywords: **Face detection, facial recognition, LBPH algorithm, Haar feature algorithm, integration, camera**

1. INTRODUCTION

In every educational organization, it is important to maintain the record of student attendance. Each class has approximately 60 students. So taking proper attendance without any fault in the classroom within stipulated time is tedious work. Another challenge is to prepare the report of all students with respect to that subject is also a time consuming task. Each organization has adopted its own Attendance Management System. Some continue with the traditional way of taking inventory by hand while others have resorted to biometric techniques. The traditional method enables the difficulty to authenticate students individually in a large classroom environment. In addition, the manual labor involved in combining the percentages becomes a huge task. The Radio Frequency Identification (RFID) helps to identify a large number of crowds using radio waves. It has high efficiency and hand-free access control. An automated biometric system will provide a solution which includes fingerprints, eye retina, voice, etc. However, each biometric method has its advantages and disadvantages.

In this digital era, automation will help to improve the attendance management of organizations. In this paper, proposed system will focus on

1. Capturing attendees' photos of class in terms of attendance.
2. Automated report generation.

The proposed system performs on training and testing databases. This system can be applicable for any kind of educational sectors, training institutes and in coaching classes.

1.1. Motivation

Attending attendees by calling every student's name or wrap often takes about 10 to 15 minutes of time. Also, calling attendees in general has many other issues that also make a false presence, losing attendance. If some automation system will successfully do the job of maintaining attendance of the students, then this saved time can be utilized for other important work such as practicing tough examples, boost up the students for career, to clarify doubt, to give knowledge beyond the syllabus. So to achieve such output and reduce time in the manual system "Automated Attendance System" will play a vital role.

2. Related work

Maintaining attendance is critical for all institutions. Every institution has its way in this regard. Manual and biometric methods are mostly available and used methods to mark the attendance. In some biometric systems, algorithms are used for classification of student images.

2.1. Manual Method

This method is using old paper or the used file method. [1]This traditional method involves the use of sheets of paper or books when taking attendance. This system can easily be man-made and the attendance paper can be stolen or lost. Taking in the number of attendees is time-consuming and difficult to convince a small number of students to pass a test. [2]

Benefits

1. This is very unlikely to happen.
2. And by always maintaining the impact of data loss can be reduced.

Disadvantage

1. It is time-consuming because calling every student on a roll takes 10 to 15 minutes.

2. Marking attendance due to this lecturer will not have enough time to take a lecture.
3. More Paperwork is required.

2.2. Biometric

Biometric systems such as thumb machines, Iris, fingerprints are mostly applicable for employees of institutions, passengers on airport, or in Industry. It is less applicable for students in an educational environment as for every lecture it is not feasible to take a thumb or recognise iris or fingerprint. Attending is a very important means used for a variety of purposes. These objectives include record keeping, test of students, and the promotion of good attendance and consistency in the classroom. In developing countries, a small percentage of class attendance is required at many institutions and this policy is not followed, due to various challenges of the current system.

Benefits

1. Improved security.
2. Customer development.
3. Don't forget or lose.

Disadvantage

1. Environment and use can evaluate measurements.
2. Installation required and / or additional Hardware.

For the concept of capturing image of class and to classify the each students from group of images different algorithms are used as below:

2.3. Adaboost Algorithm

AdaBoost is a learning machine that extends an algorithm capable of building a solid classifier by using the weighted integration of classifier. A weighted weight indicating the final output of the amplified guarantee.

AdaBoost is effective in the sense that the following weak students are allowed to allow those situations that can be described in the previous sections. AdaBoost is sensitive to noisy data and advertisers. In some cases it may be more secure from an overuse problem than other learning algorithms. Each student can be weak, but as long as the performance of each is better than random guesses, the final model can be proven to be integrated to a strong student. [3]

Benefits

1. AdaBoost is a powerful classification algorithm that enjoys its visual success applications in a variety of fields, such as biology, computer vision, and speech to process.

Applications in various fields, such as biology, computer vision, and speech to process.

2. AdaBoost can achieve the same classification results with the small tweaking or settings (unless you choose a variety of fields, such as biology, computer vision, and speech) to process.

Disadvantage

1. Time and calculation are very expensive.
2. Hard to use in real-time.
3. Confusion of Clasia's mental growth

2.4. EigenFace

The Eigenface method is used, converting the surface into a set of symbols, eigenface is considered as training data. Recognition is made by adding a new image to the eigenface subspace, where a person is distinguished by comparing his or her position with the eigenface subspace.by the position of known persons. [4]

1. This algorithm extracts the necessary information from the image and eci codes it.
2. To discover diversity, many photographs of one person are taken.
3. For a set of face images, the eigenvectors and their covariance matrices are also calculated.
4. Since every image represents an eigen veteran, the data set helps to generate a variety of results.
5. The emblem of these eigen bones is called the face of eigen. [5]

Benefits

1. It is an expression of an understanding of the action of a particular problem, which simplifies it to understand.
2. The algorithm uses the definite procedure.
3. It does not depend on any programming language, so it is easy to understand anyone without programming knowledge.
4. All steps in the algorithm have their logical sequence so it is easy to debug.

By using an algorithm, the problem is divided into smaller pieces or specific steps, that is it is easy for the program to translate it to the original program.

Disadvantage

1. Writing an algorithm takes a long time.
2. Algorithm is not a computer program, it is better than the idea that the system should.

2.5. Viola-Jonas

The Viola-Jones Acquisition Framework is a first object acquisition framework to obtain competitive real-time

acquisition prices proposed in 2001 by Paul Viola and Michael Jones. Although it has not been trained to find different object classes, it has been mainly motivated by the problem of facial recognition. The Viola-Jones algorithm is the most widely used method for detecting an object. The main property of this algorithm is that training is slow, but recovery is fast. [6]

Benefits

1. Selected features of the brain and the attack detector that receives the scales.
2. We can scale features instead of enlarging the image itself.

Disadvantage

1. Inability to adapt.
2. Sensitivity to light variations

2.6. Principal Component Analysis (PCA)

The face contains a set of important features and these are called Principal Computers or Eigenfaces. By using PCA Technique the facial features are extracted from the original database. Using the PCA algorithm

1. Data analysis
2. In data mining and machine learning.

Benefits of PCA Algorithm:

1. Very strong for marketers and data corruption
   Speed and efficiency.
2. Speed and performance are good.
3. To see things moving
4. Facial recognition.

Steps:

1. Data reduction on one computer.
2. Calculate the meaning of the information.
3. Calculate the covariance matrix.
4. Derive the eigenvalues and eigenvectors of the covariance matrix.
5. Selecting a component and creating a feature vector.
6. Find new contact details.
7. Approaching. [3]

Here, proposed system i.e. “An automated attendance management system” is aimed at reducing human effort and misconduct in attendance. The camera will capture continuous images of students sitting in the classroom. After photography the face will be extracted. The extracted faces will be compatible with the database. When a match is found there is a mark and if no match is found it is marked as missing. An automated analysis of attendees will be produced by the end of the month.

3. PROPOSED SYSTEM

In the proposed layout the design shows the method used for marking the attendees. The camera will take pictures and produce the outline and identify the student's face after which the face to be released is the same as the corresponding database..

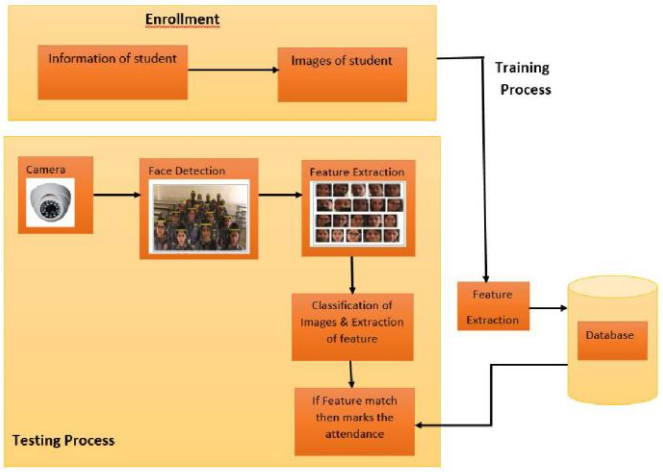

Figure 1: System Architecture of Automatic attendance management System.

3.1. Registration

Student enrollment in building a What for database Started, a database of 60 students was created. This is useful for matching visual faces from existing images stored in a database. This database contains a wide range of student materials for various grades. The college during admission takes pictures of all the students, later stored in the database. The database is trained to identify students even if there are gradual changes in the student's appearance. [6]

3.2. Face detection

Face detection means the beginning of recognition of one's face. Using face detection, determine the coordinates and size of the face in a given input frame. Facial recognition can be difficult at times because facial patterns have different appearances. One of the important things is to have bright and eye-catching changes. Acquisition is achieved through the acquisition of an item using the Haar classification of casinos proposed by Paul Viola and Micheal Jones. This is a machine-based learning approach.

To find a face, we need lots of good and bad pictures, i.e. face-to-face photos. When we find this face, we need to extract the features from it as shown for the image classification. Each factor when used in training sets the best threshold is calculated, when used to classify faces as positive or negative. This process continues with repetition until an error rate or accuracy is reached. [7]

3.3. Extraction Feature

Computer recognition is not as easy as it is for people. Computer face recognition is based on the geometric features we discussed in the facial recognition section above. There are various ways to deal with face recognition including eigenface, fishing, and local binary histogram.

The main purpose is to wrap this property defined by local features with an image by comparing pixels with neighboring pixels. To calculate the value of each pixel, compare a pixel with its eight neighbors and follow the pixels in a roundabout way, if the center pixel is a larger number compared to the neighbors, then give a 0, and then give a 1. This gives us an eight-digit binary number. Calculate the histogram of each compound formed. Normalize (concatenate) a histogram for all cells, this provides an identifier for all faces present under the procedure. [8]

3.4. Meeting Or Clustering

The process of grouping objects in such a way that a group is called a cluster and the objects are the same or have the same objects compared to those of other groups or clusters. One common method is k-means clustering algorithm. This algorithm has various applications in data mining, data compression, pattern recognition, and pattern classification. In the combination of the k-means, k points are grouped into groups or clusters to reduce the mean square distance between the data range and its nearest center.

3.5. Report Generation

The faces found are the same as the person in the database, the value is updated for that particular report. When a particular student's face is recognized, attendance is marked for that particular student on that particular day. If other students are absent, no attendees are marked.

4. SYSTEM MODULE

1.Database Creation Module
2. Face Detection Module
3. Extraction and Database Matching Module
4. Report Generation

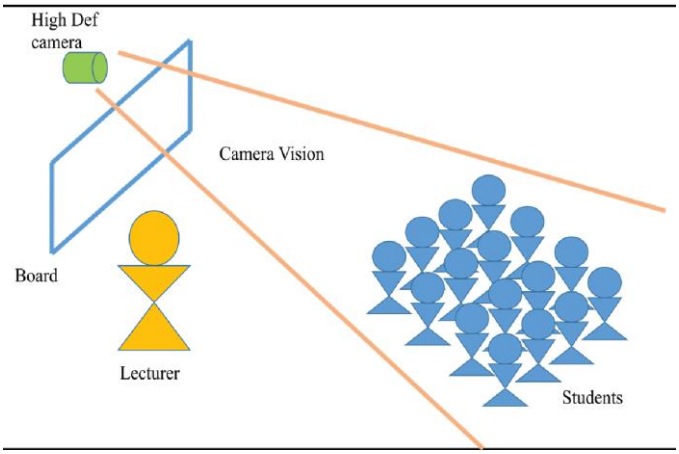

Figure 2: Basic structure

The program requires the camera to be positioned in a classroom where it is able to capture pictures of all the students in the classroom effectively. This image is being processed to get the results you want. The functionality is briefly described below:

Various system modules have the following

1. Database Creation:
• Input: Give input as an individual student image taken by the camera.
• Output: After all the process is done .A database is built and stores the features of all students.

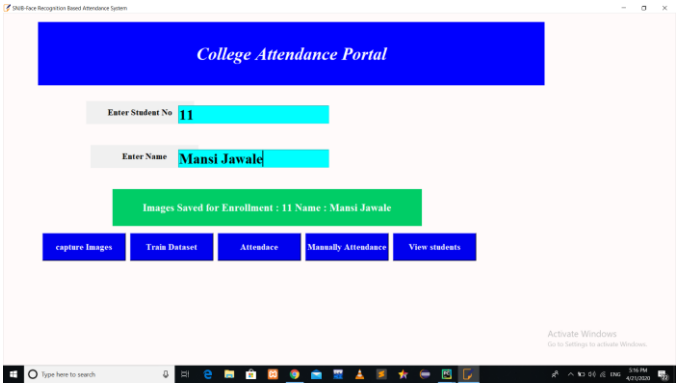

Figure 3: Database Creation

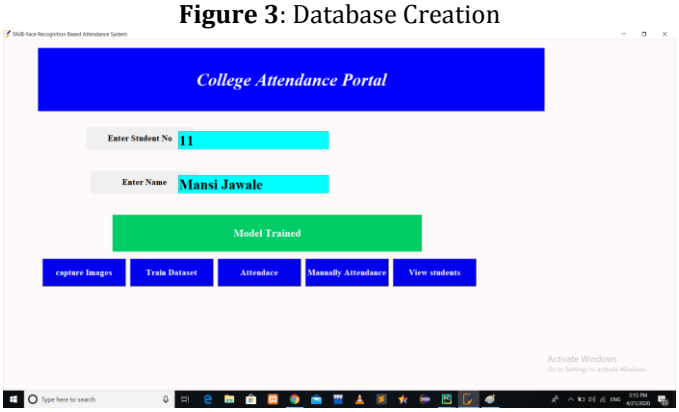

Figure 4: Train Database

Figure 5: Store Train Images

2. Face detection:
• Input: Input frame
• Output: Find the Face and divide the images from a group of images..

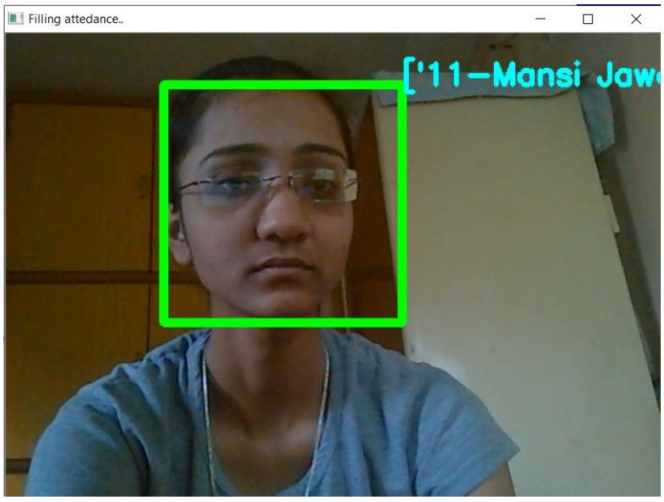

Figure 6: Face Detection

3. Face Extraction:
• Input: Result of face detection module
• Output: Extract the identified image of students which match with the database.

4. Excel sheet Generation:
• Input: An extracted image as an individual.
• Output: Attendance mark for present or absent and store data and Generate report.

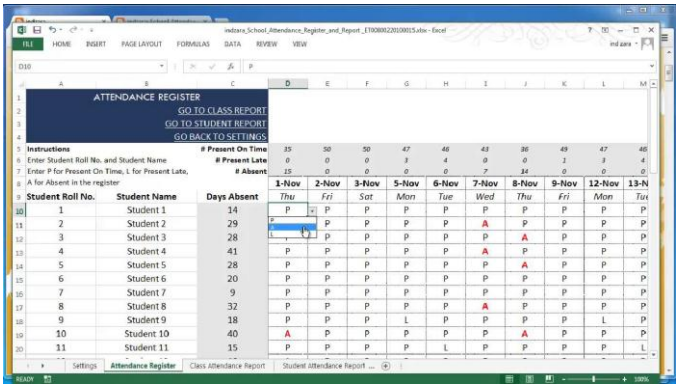

Figure 7: Report Generation

5. ALGORITHM

To recognised face is important task in proposed system.So following algorithm works on recognition.

1 Features of the Cascade Classifier
2 Linear Binary Pattern Histogram

5.1. Haar Feature Cascade Classifier

Haar Cascade is an algorithm-based learning algorithm used to identify objects in a picture or video and is based on the concept of objects suggested by Paul Viola and Michael Jones in their paper "Accelerated Acquisition using the Expanded Cascade of Simple Features" in 2001.

It is a machine learning technique where Cascade's work is trained from many positive and negative images. After that it is used to find objects in other images. It is known for the ability to see faces and body parts through a photograph, but it can be trained to detect almost anything. [9]

• Haar Feature Cascade Classifier
Step1: -Enter the XML file for the haar feature classifier.
Step2: -Enter the input as pictures.
Step3: - Convert RGB image to GRAY image.
Step4: - Look Face.
Step5: - Draw a triangle around the face.
Step6: -Show the result.

5.2. LBPH (Local Binary Pattern Histogram)

The Local Binary Pattern (LBP) is a simple yet efficient text formatting applied to image pixels by mapping the border of each pixel and viewing the result as a binary number. It was described in 1994 (LBP) and has since been found to be a potent component of brain texture. It was also noted that when LBP is integrated with the histogram of oriental gradients (HOG), it improves the performance of the detailed detection of other data. Using LBP combined with histograms we can represent facial

images with a simple data vector.As LBP is a visual description and not used for facial recognition tasks. [4]

Good light conditions are required for both Eigenface and Fisherface and we cannot always guarantee optimal conditions [5]. LBPH face recognition is an improvement to overcome the barriers of light conditions.It is based on the idea of finding the local features of the image and not looking at the whole picture. The LBPH algorithm works by finding the location of the image and does so by comparing each pixel with all neighboring pixels [7].

In this case, a 3x3 window is taken and moves one image, in each motion (each part of the image area), the pixel at the center compared to the neighboring pixels. Neighbors whose value is less than or equal to the center pixel is indicated by 1 and others are indicated by 0. Then read these 0/1 numbers under the 3x3 window in chronological order and we will have a binary pattern similar to 11000011 and this method is a local alternative to the image. After doing this for the whole picture, we will have a list of local binary patterns.

• LBPH (Linear Binary Pattern Histogram)
Step 1: Insert the face image.
Step2: Split the face image into blocks.
Step3: Calculate the histogram for each block.
Step4: Combine the LBPH histogram into a single histogram.
Step 5: Processing face image.
Step6: Effect of Recognition.

6. APPLICATION

6.1. Institutions

Institutions have a traditional way of marking attendees at each student's name to check their attendance. This type of telephone call is time-consuming and tedious. By using facial recognition, the attendance process can be greatly enhanced to save time and provide a seamless way to tag attendees. As the number of students at the institution is higher, using the automated system improves productivity and college quality.

6.2. Companies

At most companies, employees have a habit of using their biometric or ID card to enter their check-in and check-out time. During peak hours the number of people entering and leaving the office is usually high. This causes a breakup in the workplace and people reach the line waiting for their turn. Face Recognition Systems provides an easy way to manage this attendance process. Employees do not have to worry about entering their time as an automated process. The system will monitor the time of entry and exit when the employee enters or exits the office.

6.3. Prison

In jail, daily the head of inmates is counted to see if all the prisoners are present. Facial recognition is used to activate the process of performing head counting to increase efficiency and trust. Security is also increasing as the tabs can be kept in each prisoner at all times.

7. RESULT

The current management system is simple and efficient. The camera captures the photos after 20 minutes of lecture started. After receiving and recognizing staff, students are identified and attendance is entered into the database and generate report student wise as shown in figure 3.

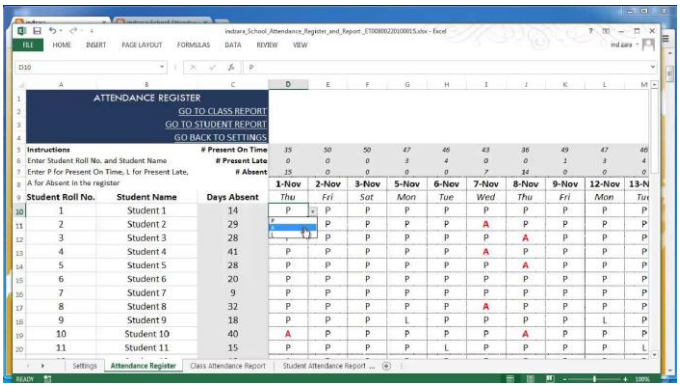

Figure 8: Automated Report Generation

The level of accuracy depends on the quality of the images taken by the camera. In order to see the face properly, it requires adequate lighting conditions. Performance is expected to increase when using a high-resolution camera.

8. FUTURE SCOPE

Automated attendance systems help teachers with respect to saving time and reducing work.but definitely this system can make more advance by displaying count of attended students immediately on the display board of class.So teacher may recognise the count of absent students for further improvement.

9. CONCLUSION

To complete manual work that involves recording presence, using an automated management system that includes facial recognition and facial recognition technique.The proposed system improves the performance of existing attendance management systems by minimizing manual labour and pressure on the lecturer for accurate marking the attendance also minimize the time required

for marking attendance and utilization the time for actual teaching-learning process.

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