Attendance Maintaining and Monitoring using Face Recognition

C. Kalpana, S.Hemavathi, K.Geerthana, T.Dhakshayini

Abstract: Technology has been playing a vital role in this world, where the work and the work place become digitalized. The paper reviews on monitoring the attendance using image processing, which involves face detection, labeling the detected face, training a classifier based on labeled dataset, and face recognition. Former methods on monitoring the attendance includes signing the attendance registry, fingerprint detection and barcode scanning where delinquency may occur. To prevail over and to take the technology to subsequent level image processing has been incorporated. Proposed system employs, capturing of the face in various dimensions, labeling of the captured images that is stored in the database for training and testing phase. Using the gathered data the machine is trained to recognize the face to provide access to the employees or students in the organization. The final phase is to take the attendance and maintain the record on attending hours using face recognition technique in which the input image of the employees or students is given.

Keywords: attendance, Boolean value, classification, face detection, regression.

I. INTRODUCTION

Many technologies that we are using today in our life are benefitted from the machine learning technology. Machine learning is a methodology in which we can accurately predict the solutions from the algorithms that are used in training the datasets which are stored in the database. The machine learning can be categorized into two: The data and The algorithm. The data is used in the algorithms in order to train the datasets. The machine learning can be used under various fields such as face recognition, optical character recognition, recommendation engines, speech recognition and medical diagnoses.

Facial recognition is used mostly in social media where photos and videos are shared. Optical character recognition is used to convert text image into movable type. Recommendations engines are used to train the datasets based on the user preferences to suggest what videos or music to be played next. Speech recognition includes voice dialing, call routing and appliance control. Medical diagnoses are used to recognize the cancer tissues in their earlier stages and provide them proper treatment to it. Our paper is based on the facial recognition technique which falls under machine learning technology. The face is recognized from the datasets that are stored in the database from which the attendance is maintained when the face matches with stored pictures in the database.

II. LITERATURE SURVEY

The below Table shows the different existing systems with their proposed system merits and its demerits,

PAPER TITLE	TECHNIQUE AND MERITS	DEMERITS
[1]An Android Based Course Attendance System Using Face Recognition	To ensure the presence of the student in the course he/she just need to scan the QR code displayed and his/her face image using smart phone then the image is sent to the server for further attendance processing the system is designed in such a way that a student who does not have a smart phone can make use of another students smart phone	The attendance is marked for the student even if he is not attending the course, by using the image of that person, the QR code is scanned in another students mobile
[2] Automatic Attendance System By Face Recognition Using Machine Learning	The face of an individual is captured and stored in the database. Later during the course when the face of the individual matches with one of the faces stored then the attendance is recorded	Any changes in the face that is not stored in the database may become a disadvantage in recognizing the face

Reference	Method	Disadvantage
[3] Automatic Attendance System Using Face Recognition	The camera is used to capture the picture of the whole classroom and updating their attendance the image is captured twice at the beginning and end of the class in order to ensure that the student has attended the whole class	This method cannot predict the attending hours of the student. In case if the student leaves the class for any emergency then the attendance for that student is not marked.
[4] Automatic Student Attendance Management System Using Facial Recognition	Usually the images are stored in RGB(red, green, blue) which is based on the sensitivity of color detection cells in the human visual system	The main disadvantage in RGB is that even if there is a small fluctuation in light the algorithm fails
[5] Face Recognition Based Attendance System	The camera is fixed on the center of the classroom to capture the videos then it can be converted into frame per second for easier detection and recognition	The poor lighting condition of the classroom affect the quality of the image that may reduce the process.
[6] Face Recognition Based Attendance System For CMR College Of Engineering And Technology	This system using CNN algorithm for facial recognition .biometric method provide faster and accurate result when compare with other techniques apply deep learning of face recognition algorithm for the sake of face recognition.	When there is a change in a student's face, like covering the head with the beard it reduce the system process.
[7]Real Time Face Recognition Based Attendance Monitoring System	In this model the camera and the system is installed at the center of the class room. It detect multiple face in the video frame .The image are cropped and convert into grey code and then convert into number of bits for image processing.	Before the class gets complete if a student leaves the session, even for his/her the attendance is marked.
[8] Attendance Management Using Facial Recognition	The proposed system provides features such as detection of faces, extraction of features, and detection of extracted features and analysis of student's attendance. the system's correctness in detecting and recognizing faces will be more due to use of larger number of features (shape, color, LBP, wavelet, auto correlation, etc.) of the face.	Since this method is based on some features like shape, color, wavelet, auto correlation, thus it is not applicable for identical twins, person who wears specs and those with beard.
[9] Automatic Attendance System By Using Face Recognition	It focuses on two tasks improvement of pictorial information for human interpretation processing of image data for storage, transmission and representation for autonomous machine perception	This system can detect the face of the person from a limited distance only.
[10] Attendance System Based On Face Recognition	The paper relies on the face recognition and detection by providing result using MATLAB .So we need to install the drivers from the math works website based on the type of camera we are using.	In this method, nearly 500 to 1000 captures of each person is required for getting higher accuracy and to meet their requirements.
[11]Face Recognition For E-Attendance For Student And Staff	In this system the image is captured by using the web camera on laptop and then the face recognition and image is converted into gray scale image and the result has to be seen. This has been done by using PCA algorithm	The web camera on laptop does not provide accurate result ,when there is a change in the person's face.
[12]Face Recognition Based Attendance Marking System	This model use SURF algorithm for more efficient. The face recognition consist of two step detect the face in the image and compare with the database.	The attending hours are not calculated in this method. Only the attendance is marked for the individuals.
[13] Attendance Monitoring System Using Face Detection &Face Recognition	The proposed automated attendance management system is based on face recognition algorithm. When a person enters the classroom his image is captured by the camera at the entrance. Face region is then extracted and pre-processed for further process.	The system is not able to mark the attendance , when more than two person enters the classroom at once. Their image is not captured properly.
[14]Deep Unified Model For Face Recognition Based On Convolution Neural Network And Edge Computing	Face recognition system is also able to recognize the person from a distance without touching or any interaction with the person. moreover, the face recognition system also helps in crime deterrent purpose, because the captured image can be stored in a repository and later can be helpful in many ways like to identify a person	The system managed to recognize 30 faces out of 35 detected faces, the achieved accuracy can be more enhanced by taking clearer image of students. As distance increases, the picture becomes blurry, so the system produces false results on the blurry faces in some cases.

III. EXISTING SYSTEM

A. Manual process:

One of the existing system is the manual entry for the students. The attendance is maintained in the hand written registers. But it will be a tedious job to monitor the record. The human effort is additional here. The retrieval of the information is not so easy as they are maintained in the hand written registers.

B. Attendance management system:

Attendance Management System is a software that is developed for daily student attendance in schools, colleges and institutes. It facilitates to access the attendance information of an individual. The information is sorted by the operators, which will be provided by the staffs for a particular class. The system will help in evaluating attendance eligibility criteria of a student. Another purpose of this software is to generate the report automatically at the end of the session or in the between of the session.

C. Fingerprint attendance system:

Further advancement were created, where the attendance management system was digitalized. Fingerprint Attendance System incorporates a reader that scans finger impressions of employees and determines whether they are identical to the previously stored records. This technique is efficient and quicker than the manual method. Fingerprint attendance system holds back fraud recording of working hours that employees otherwise used to do with the existing system.

D. Barcode Scanner based System:

Barcode based attendance system is a software which utilizes barcode scanner to record and maintain the attendance. The barcode scanner is used in order to read a barcode. A barcode is a machine or computer readable representation of information in a visual format that consists of a series of parallel and adjacent bars separated by spaces. Every student or employee is provided with a card containing a unique barcode. Each barcode represents a unique id , they have to scan their cards using barcode scanner and the system notes down their attendance as per dates.

IV. PROPOSED SYSTEM

Face recognition is substantially the task of recognizing the individual based on their facial image for processing in accordance with the illumination variation, resolution, occlusion, etc. Face recognition is different from face detection.

A. Face Detection:

It has the intention of detecting faces in the images which can later be used in face recognition algorithms. The face detection is an object-class detection in which the main objective is to spot and identify the objects in a particular given class. Any facial changes in the database images will eventually invalidate the matching process.

B. Face Recognition:

The process is to convert the formerly extracted, cropped, and resized images to grayscale. After that face recognition algorithm is predominantly responsible for finding the specific or unique feature which best match the image. Face recognition can be carried out using two methods:

i. Verification

It compares the input image with the image that is already stored and saved in the database for the purpose of providing authentication to the users.

ii. Identification

It compares the given input image with all the images stored in the dataset previously in order to find the user that matches that particular face.

There are numerous face recognition algorithms that help in obtaining the image information. Each method works in its own way to match the input images with the images in the dataset. The various algorithms are:

Eigenfaces(1991)
Local Binary Patterns Histograms(1996)
Fisherfaces(1997)
Scale Invariant Feature Transform(1999)
Speed Up Robust Features(2006)

The paper relies on Local Binary Patterns Histograms (LBPH) which is one of the face recognition algorithms. Local Binary Pattern is a easy and efficient algorithm which entitles the pixels of an image by thresholding each neighbor pixel and regard the obtained result as a binary number.

It was first enforced in 1994 and it is used to represent each facial image with a simple data vector when it is compounded with the histograms of oriented gradients (HOG). Further the algorithm can be explained in step by step process as follows:

Parameters:

There are four parameters used in Local Binary Patterns Histograms (LBPH). They are:

> Radius
> Neighbors
> Grid X
> Grid Y

a) Radius:

It is used to build a circular local binary pattern which represents the radius around the central pixel. It is usually assigned to 1.

b) Neighbors:

It is the count of sample points that is used to generate the circular local binary pattern. It is generally set to 8.

c) Grid X:

It is the count of cells in the horizontal direction. The more the cells, the higher the dimensionality of the subsequent feature vector. It is generally assigned to 8.

d) Grid Y:

It is the count of cells in the vertical direction. The more the cells, the higher the dimensionality of the subsequent feature vector. It is generally assigned to 8.

Training the algorithm:

The most important part in the algorithm is to indoctrinate the algorithm. For that we need to make use of the dataset that holds the facial images of the individual that is needed to be recognized. It is also notable that each image should be given with an ID number or name with which it is easy to acknowledge the input image and give the desired output.

Applying the LBP operation:

The foremost step in this method is to generate an intervening image that describes the primary image in a better way, by highlighting the important facial features. To perform that the algorithm uses a particular concept called as sliding window that is based on two parameters which is radius and neighbors.

Extracting the histograms:

After the before step and using the image that is being generated already, we can utilize the Grid X and Grid Y parameters to categorize the image into multiple grids.

Performing the face recognition:

This is the final step in which the algorithm is previously skilled. Each histogram that is being created is used to represent each image from the training dataset. So to find the image that matches the input image we just need to resemble two histograms and return the image with the approximate histogram.

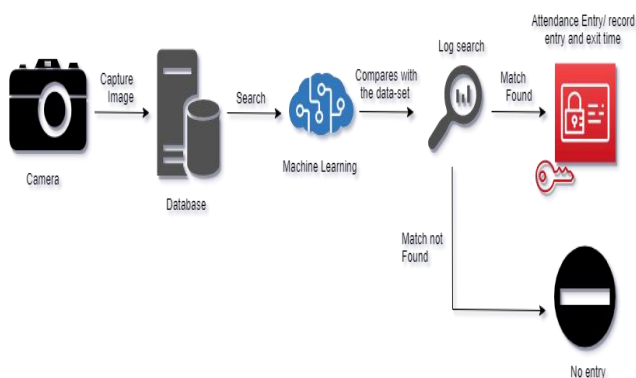There are various approaches available to compare the histograms:

Euclidean distance
Chi-square
Absolute vale

The Local Binary Pattern Histogram is considered to be one of the easiest and efficient face recognition algorithms which can symbolize local features in the images.

V. ARCHITECTUERE

The proposed system architecture is as shown in the above figure. The dataset consists of the information about the employees along with his/her face image. The input image can be acquired using any of the conduct. For example, We can take the image by using direct camera directly or we can take the image from the stored database folder. The maintaining and monitoring of attendance includes the following steps. The face image of the employee is captured using the camera. In real time, we make use of two high tech cameras, one for monitoring the entrance and another one for monitoring of the exit. The captured image is compared with the datasets in the database using the machine learning algorithm. We have used the LBPH algorithm, since it is simple and easy to use. If his/her face is recognized, then the entry/exit time of the employee is noted. Entry/ exit depend on the IN/OUT button clicked on the GUI during face recognition. At the end of each day, the working hours of an individual is calculated automatically.
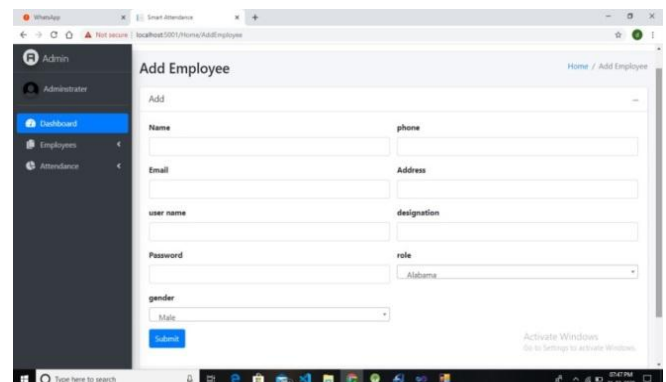
VI. MODULES

The Attendance Maintaining and Monitoring using Face Recognition consists of the following modules:
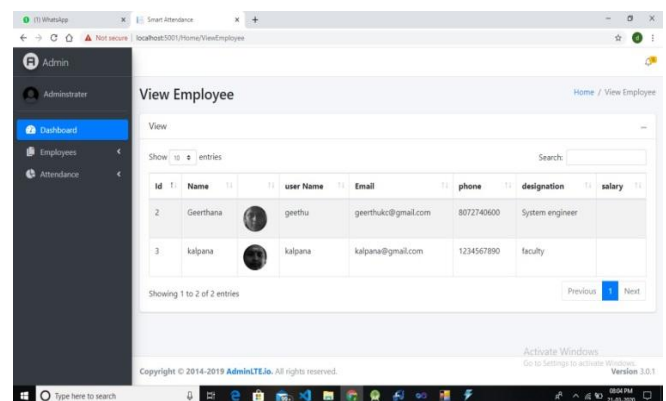
A. Admin portal

There are four tasks that are performed in the admin portal. They are

- Add Employee
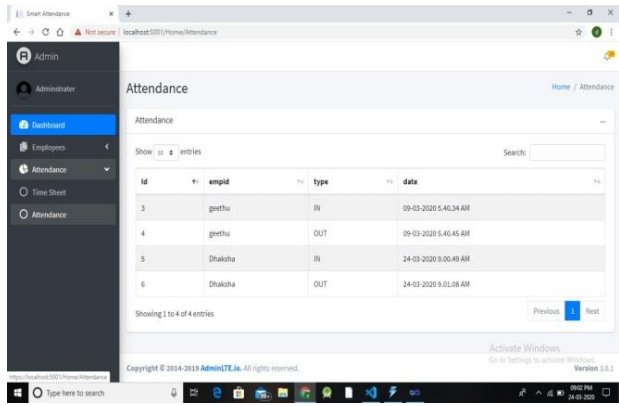- View Employee
- Time Sheet
- Attendance

The add employee portal helps in getting the information about the new employee and add it to the database to provide authentication and attendance for that employee. It gets the basic details of the employee such as name, email-id, phone number, address, user name, designation, password and gender. With the provided information mentioned above the entry can be made for that individual in the database with which the attendance is maintained for that employee.

The view employee portal act as a platform which displays the information of all the employees that are previously provided in the add employee portal along with their image.

The time sheet holds the entry and exit time of the employee along with his/her working hours The Attendance portal shows, along with in and out time, the breaks he/she takes during the working hour.
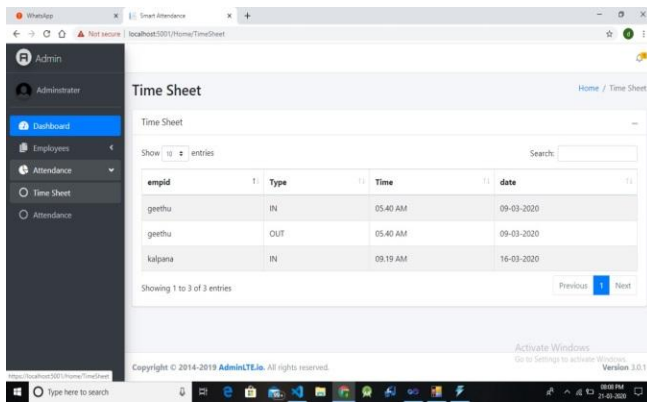
B. Employee portal

The user i.e, employee login to the employee portal using employee ID and password. The employee portal contains the attendance record of that particular employee .Employee portal consists of

- Time sheet
- Attendance

The time sheet holds the entry and exit time of the employee along with his/her working hours The Attendance portal shows along with in and out time, the breaks he/she takes during the working hour.
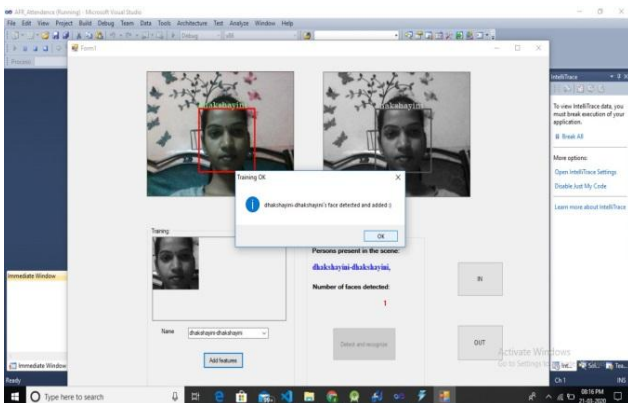

C. ace recognition

The face recognition module plays vital role in two cases:

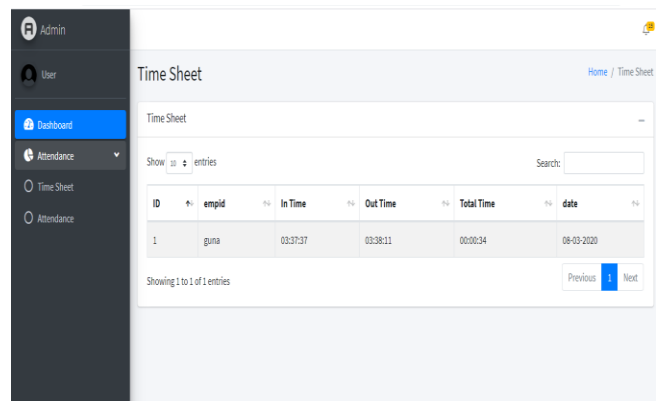- Add new employee
- Attendance management

When a new employee is added along with his/her personal details, the face image i.e., the grey scale image needs to be included. Thus this portal comes into play, with the help of add features the face image of the employee is added, which in turn is stored in the database.

In attendance management, the entry and exit time of the employee is noted with the help of face recognition module. While entering, the IN button which is present in the GUI is entered, that notes the time of entrance. Similarly while leaving, the OUT button is entered, that notes the time of exit.
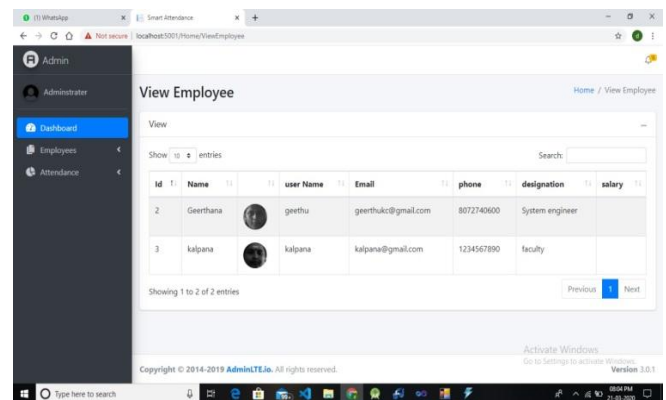
D. Attendance management

Attendance management portal helps in marking the attendance and calculation of working hours. The entry and exit time along with the breaks they take are noted with the help of face recognition module. With the help of Attendance page, the difference in the first in and last out time is calculated and the time duration of the breaks are subtracted from the total hours. Thus the calculated value is produced as a result for the working hours.
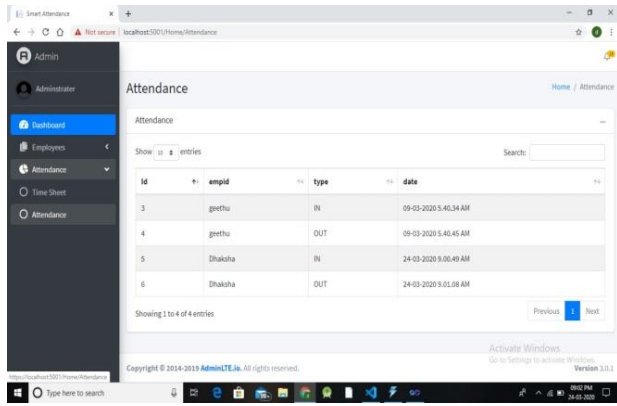

VII. RESULT

The Attendance system using face recognition has been tested by adding two employees. The two employees were added with the help of the add employee portal. Their name, email-id, phone number, address, user name, designation were entered. Then using the face recognition portal the two employees face image was captured and stored in the database as grey image.

For the attendance portal, the face of the employees were detected and recognized. After successful recognition, the attendance was entered for them along with entry time. At the end of the day, their total working hours, considering the breaks, was calculated and displayed.

VIII. CONCLUSION

Hence the project works by capturing the face of an individual in various dimensions that is stored in the backend database. These images are later used in maintaining the attendance which is done through recognizing the faces with the dataset of images. After the processing of the images the attendance is provided to the individual when the face matches any of the datasets otherwise no attendance will be provided to that particular individual. The process takes place in steps such as capturing image, processing of the captured image, recognizing the image and providing attendance.

IX. FUTURE ENHANCEMENT

The Attendance Management and Monitoring using Face Recognition focuses only on the maintaining of attendance and the total working hours calculation. In future , the alert system can be added, i.e., if he/she tends to take more breaks and leaves , then the alert message has to be sent to them. The message describes their current situation and the scenario they may have to face. And instead of LBPH algorithm, some advanced machine learning algorithm can be used.

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