Live Feed E-Attendance Using Facial Recognition

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Abstract: **The seminal is based on designing and implementing of attendance capturing system using live feed electronic systems. This process of face recognition involves the inspection and study of facial features in an image, and the recognizing those features with comparing them to one of the many faces in the database. Some of the algorithms capable of performing face recognition are the Discrete Cosine Transform, Gabor Wavelets method, the Principal Component Analysis (PCA), 3D recognition methods, etc. Some real issue to be consider in this live feed face recognition method are: Speed Process and Availability. Accuracy, Time limitations, putting all these in action the PCA based method of face recognition provides real quality and better result because: it is a more Efficient, Simpler and easer method to implement it and it has a Very fast computation down time. The PCA has the ability to recognizing a face with a different background and environment.**

Keywords**: Image Acquisition, Face Detection, Principal Component Analysis (PCA) Facial Feature Extractions.**

I. INTRODUCTION

Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores other things, such as buildings, trees and bodies. Various government agencies are now actually more motivated to improve security data systems centered on body or behavioral characteristics, often called biometrics. It is capable of deriving multi-orientation information to various analyses of sources from a face image at different rules with the derived information being of local nature from a particular source. The common approach helps using neural network. Face recognition is to construct a filter bank for different scales and orientations to filter all that has been given face image with all filters from the bank storage.

Many of the biometric method have an ability of high accuracy and security. But in comparison to biometric applications face recognition system have variety of applications in security of information, enforcement of law, various cards like smart cards and observations, surveillance.

The biometric authentication has been drawback worked on round the world for several persons, this problem has emerged in multiple fields and sciences, particularly in applied science, others fields that are terribly inquisitive about this technology are: Mechatronic, Robotic, criminalities, etc. For this reason, Face recognition system has been used.

Live Feed E-Attendance is an application developed for organization's daily attendance. It helps to maintain the accurate record and generate summarized attendance report by applying various criteria. It is meant to take automatic pictures of any persons coming into the Organisation or within the environment and store in the data base for management use.

Though there is increasing interest in other areas of use, but the facial recognition technology has received significant attention as it has potential for a wide range of application related to law enforcement as well as other enterprises. Facial recognition live feed is also known as face recognition and does not need your cooperation to take your attendance.

There are many advantages associated with facial recognition. Compared to other biometric techniques, facial recognition is of a non-contact nature. Face images can be captured from a distance and can be analyzed without ever requiring any interaction with the user/person. As a result, no user can successfully imitate another person. Facial recognition can serve as an excellent security measure for time tracking and attendance. Facial recognition is also cheap technology as there is less processing involved, like in other biometric techniques.

1.1 Face Recognition

The face area plays a very important role in carrying out the identity of persons. Humans have ability to acknowledge the faces. Humans can recognize dozens of faces and identify familiar faces despite large changes in the visual stimulus as a result of viewing conditions like: aging, sex, facial expression, and distractions such as eye glasses, or another hair style. This is also very important for security purposes. Persons have the natural ability to acknowledge the face but developing a computer algorithm to do the same is difficult but much easier than the human approach.

1.2. Facial Acknowledgement

Facial acknowledgment is a sort of biometric programming application that can distinguish a particular individual in a computerized picture by examining and contrasting examples. Facial acknowledgment frameworks are normally utilized for security purposes yet are progressively being utilized as a part of a mixed bag of different applications.

- Motivation Factors
- Cooperative Face
- Controlled pose
- Controlled position
- Controlled lighting

- Non-Cooperative Face

1.3 Face Recognition System

Face recognition system comes in Five (5) different steps, in a particular order:

1. Image Acquisition Process

The input can be recorded video or any image. It involves retrieving an image from database.

2. Face Detection Process

In this step the face is detected whether the human face appears in given image or where these faces are located.

3. Facial Feature Extractions Process

After the face is detected the alignment is done to justify the scales and orientation of patches. In this the face is need to be turned at 360 degrees, and will be viewed using the PCA and the Haars Cascade Method.

4. Registrations and Represent Process

After the normalization is done of the face by using light the system converts the data into the unique code.

5 Classification Process

The systems are used to classify the features respectively, and compare with faces and features in the data base with the help of PCA and Haars Cascade Method.

II. LITERATURE REVIEW

Nevogt (2018) In recent times there has being an emergence of more state-of-the-art and sophisticated methodology for time collection which includes clock, mobile devices, biometric touch screen, GPS location trackers, magnetic swipe card and more. Ideally, information generated are transmitted and transferred automatically to a payroll system to enable proper computation staff man-hour from clock-in to clock-out time on the electronic attendance system. He also reiterates that the some of the functions of the time attendance management systems to includes;

Management of paid time-off

Administration of employee schedules

Monitoring of overtime expenses

Provision comprehensive reports on labour costs

Integration with payroll system

Tracking of mobile workforces through GPS locating system

To ensure the system is in compliance relevant labour legislations

The availability of cloud based services for time tracking has made it more available for smaller business organizations to use these technologies to track and manage its employees contrary to the earlier view held that only multinationals and large corporations with massive workforce can afford the technology. Small business need not to worry about the cost involved in acquiring the right technology since the system employs a SaaS models. This cloud computing infrastructure allows the user organization or business to login from a remote computer to the internet to deploy and utilize the system.

Brooks (2015) avers that as organizations differ in their operations so also they differ in their time and attendance management needs. This project, reviewed many time and attendance systems and came up with the ones that are preferable to some institutions. Here is an assembly of the best picks and an explanation of how we chose, they are; Stratus time, the uAttend, Mobile Workforce TSheets, Kronos Workforce Ready, TimeAttend- Replicon's, Acroprint's Acro Time, ClockVIEW, Easy Clocking, EmpCenter, TimeClock, TimeForce II.

Josh et al. observed that the human face is inherently symmetric and they wish to exploit this symmetry in face recognition. The average-half-face has been previously shown to accomplish just that for a set of 3D faces when utilizing eigenfaces for recognition. They build upon that work and present a contrast of the utilization of the average-half-face to the utilization of the initial full face with six different algorithms in placed of two or three.

Yaniv Taigman, Lior Wolf, Ming Yang, and Marc Aurlio: Have recognized an ideal face classifier that would recognize dimensional (2D and 3D) databases faces in accuracy that is only matched by humans. The underlying face descriptor would need to be proportional to pose, illumination, expression, and quality of image.

Wang et al. in 2008 year proposed to inspect a correlation matrix constructing a bank of Bayesian Networks with the aim of detecting such various filter parameters used in decreasing the filter bank would be as possible. The same methodology can also be used to visualization and found difference between the classical and the principal Bayesian Networks.

Ramya Srinivasan, Abhishek Nagar, Anshuman Tewari, Donato Mitrani, Amit Roy-Chowdhury in 2014 : analyzed the feasibility of a new set of face descriptors called sigma sets constructed from simple image features. Experiments show promising performance on the challenging LFW database.

Surabhi Varshney, Deepak Arya, Rashmi Chourasiya in 2014 : The artificial neural network based technology has played a main role in this inclusiveness and sustainability of intelligent and expert system to recognized & satisfy human need is concerned in this competitive arena. In present era Face recognition is widely used due to its numerous ability to cope up with various other techniques associated with it.

Yamin Taigman et al. in 2014 have presented closing the gap to human level performance in face verification which is based on conventional pipeline. The conventional pipeline consist detection, alignment, representation and classification to face images. This pipeline methodology was used for the 3D face image to fill the remaining difference for the accurate and best performance. The same methodology can also be used to visualization and found difference between the classical and the principal Bayesian Networks.

Mallat et al. in 2010 has presented Singularity detection and processing with wavelet and proposed the use of denoising and face detection. He also discussed the current status and future directions to simply the various tasks. He discussed and analysis the image features as color, texture, and shape in details. He also gives a summary of all the features with examples. For e.g. in texture recognition there are texture co-occurrence, Fourier power spectrum, Bayesian Network features and tamura features.

In the existing facial recognition algorithms we experience some problem while doing the Acquisition, lighting, Sensor. Lighting – simply it is a lighting effects of the given image. Like that lot of problem is there in the facial recognition in real time approach.

2.2 Proposed System

This system will be used in two different step mechanisms. The first mechanism/method is to detect the face from the real time application and followed by the face recognition steps. The method is achieved by using Camera that is connected to PCA, Haars Algorithm and NLP. It captures the images of the people/persons, who are present in or around the premises and used for face detection. Using the algorithm the detected face is compared with the stored data of every employee and employer. The database is collected and stored into a folder at the initial stage. In the database includes names, their images and registered numbers. This live cameral is fixed at the front gate of the entrance in such a way that it can capture as many person that are coming in at the same time. And with the help of this system, time will be saved and easier to record attendance. It can take attendance at any time of the day without any human Intervention.

Advantages of proposed system

- Easiest method to keep track of attendance.
- Provides accurate attendance of every person.
- Proxy attendance is completely eradicated by this system.
- There are no physical interactions with the system.
- It boosts security cheeks.

2.3 Proposed System Algorithm

STEP 1: Write/install PCS and Haars Program on to System
STEP 2: Run all the Classifier in the System, Connect PCA and NLP
STEP 3: Install Complete hardware setup
STEP 4: Register all the images with face detection program
STEP 5: Reshape the faces of the persons
STEP 6: Save all images into the file system
STEP 7: Tutor images for face recognition
STEP 8: Install and Run the face recognition program
STEP 9: Monitor the Time and attendance of the students

2.4 Proposed System Flowchart

Camera captures the images in the video streaming, while the face detection resizes the captured image up to certain point. The segmented image is compared with the present data sets and faces are recognized.

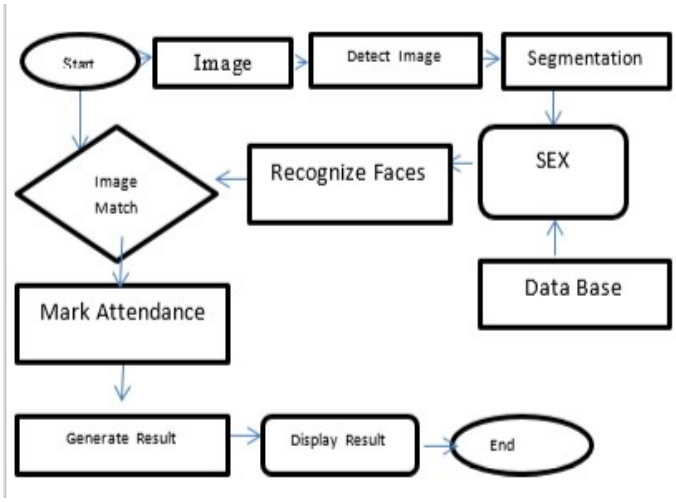

Fig 1. Proposed System Flowchart

III. METHODOLOGY

This Method is an independent application and web based application. This Independent application deal with the face recognition process and the attendance marking process. In The Web based application it deals with the NLP process and they are linked to a centralized database where information's on every images have been properly documented and stored as shown in fig 1.

3.1 System Design of the Face Recognition

This is the most important part of this work, which is The system design of face recognition, it explain the system design of face recognition process with the two main structures involved in the system; detecting faces/training process and recognition process. See Fig 1a for the view of the program.

3.2. Face Recognition Implementation Methodology

The ideal method that is efficient in this program is Principal Component Analysis (PCA) is an ideal method for recognizing statistical patterns in data. The concept of face recognition with PCA is used in this approach. PCA is a

useful statistical technique that has found application in fields such as face recognition and image compression, and it helps in finding patterns in data of high dimension.

These are steps that will take you through the steps you needed to perform a PCA on a set of data.

- Step 1: Minus the Mean of the data from each variable
- Step 2:Add and form a covariance Matrix
- Step 3: Add Eigenvectors and Eigen values from the covariance Matrix
- Step 4: Select a Feature Vector ie name for a matrix of vectors
- Step 5: Multiply the Vectors transposed Feature by the adjusted transposed data.

3.3 Cascade Haar Method

Capturing the human face require that Haar classifier cascades be trained first. By training this classifiers, the PCA algorithm and Haar feature algorithms must be part of the structured program. See Fig 1b for capturing moments for data base.

Haar Classifier is the same as a machine learning algorithmic approach which is used for the visual object detection.

This program is originally intended for the facial recognition but it can be used for any other object.

The most interesting part of the feature of the Haar Classifier is that, it quickly rejects regions that are highly unlikely to be contained in the object.

The core basis for Cascade Haar classifier object detection is the Haar-like components. These components, rather than using the intensity values of a pixel, uses a kind of change in contrast values between adjacent rectangular groups of Images.

The variance of contrast between the Image groups are used to determine relative light, grey and dark areas.

The face detection algorithm looks for specific Haar features of a human face. When most of these components is found, the analysis is said to be okay. See Fig 1c Haars Classifier

IV. RESULTS AND DISCUSSIONS

Choosing PCA for face recognition and analysis is because it is the most reliable and efficient method, of dimension reduction, in terms of compressing data.

This allows the high dimension data, the images, to be represented by lower dimension data and so hopefully reducing the complexity of grouping the images. And also PCA gave better results for varying processes.

The proposed system is a real-time system. It takes and input image through a web camera continuously. The main camera that marks attendance and identification is placed at the entrance of the organization to get better result.

When the employees are entering through the main gate, the camera captures their faces and attendance will be marked automatically. It is shown in Fig 2 to 5, Attendance Marking

The Facial Recognition Attendance Marking, Marks Red, Green and White frames are shown in the Figure 2 to 5, it represents different attendance type.

The Red automatically picks photos of the persons coming into the premises for the first time, and store into the data base until a name and number is allocated to it. See Figure 7 for Database.

The white is an indication that the face exists on the database but has no identification tag to it on the existing program in the system. See Figure 8

The Green is a sign of acceptance and it automatically generates attendance and time as shown in the Figure 6 Attendance and Time. See Figure 8

Therefore when you see some key words displayed on the particular colored frames. It is a way of identifying different conditions of attendance marking.

This Program is developed in a way that the employee should face directly at the camera. They should appear as same as their photos saved in the system. For example if the employee is not wearing glasses in the photos then he should remove the glass when he marks attendance.

And also if there's a significant change in the face such as growing a beard then it is recommended to change the saved photos of him in the system, so that the particular employee can check, whether their attendance is marked or not.

This system could detect faces with 68% of accuracy so far. The accuracy depends on the clarity of the picture. The camera is always installed in a place with good light in the background and free of obstacles.

Nevertheless the system also consists of a component where the employee can manually mark attendance by entering the employee number in case of a delay or mal-functioning in the detection system. This is done to avoid any inconvenience caused in the day to day activities of the company. see Figure 9 for Manual Attendance Entry.

There is also facility which allows employees to request leaves via a SMS message. So it is a huge task to convert those messages to a language which computers can understand. For that NLP and Tokenization method is used.

4.2 System Testing

This includes Integration and Testing of all the units developed in the implementation phase, that they are properly integrated into a system after the testing of each unit. Post

integration the entire system is tested for any faults and failures and they are;

Output Testing; Unit testing is the testing of individual hardware or software units or group of related units. Thorough testing has gone into the project to ensure there are no lapses in the capturing of information. Various features such as: attendance marking, enrollment, adding and pay slip generation. This is done to ensure that each feature is performing correctly and working in real-time. Testing was also done to ensure that both functional and non-functional requirements are all met.

Integration Testing; Integration testing is when all software components are combined and tested to check the level of interactivity between them. This testing determines that the applications involved are all functioning well with each other. This testing includes interface testing and usability testing.

The user uses the bottom-up approach where testing was done on lower levels before higher level components.

User Acceptance Testing; There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. User Acceptance Testing is done to deliver these changes in the different environment.

4.3 For Detailed System Design of Face Recognition

When a leave request comes to the system initially spell checking is done to correct the wrong key words of the messages. Then the message is split into words (tokens) and removes unnecessary words. Then the Leave type, reason, request date were discovered by comparing separated words with token words which were already stored in database. Each of these tokens are assigned an integer value and sum of the values of each word is calculated as the final result. This sum (integer value) is the output for forward processes.

NLP is mainly used in decision making process and within this system it is used to imitate the brain and to make decisions. If this decision making process gives correct result within the system, sometimes it is not compatible with solutions of real world problems, because machines cannot think exactly like the human brain.

The NLP system tested with various test cases. These cases include various types of leave request messages. Out of 100 it successfully processed 88 cases. So the accuracy of this NLP system as percentage is 88%.

V. CONCLUSION

It can be concluded from the above discussion that a reliable, secure, fast and an efficient system has been developed replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance and leaves. This system will save time, reduce the amount of work the administration has to do and will replace the stationery material with electronic apparatus. Hence a system with expected results has been developed.

Figure 1a System Overview

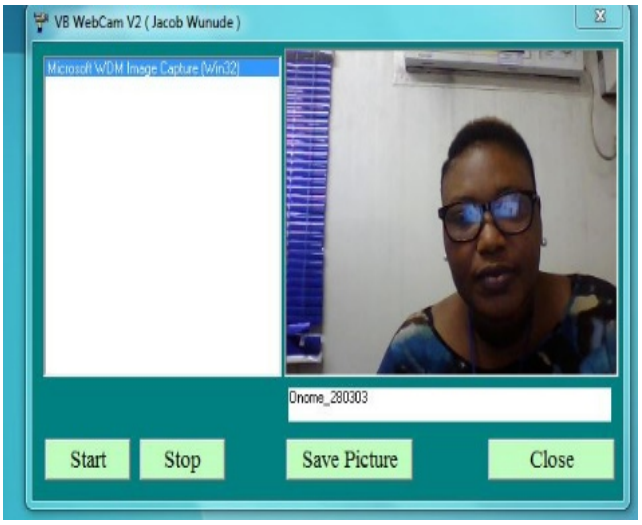

Figure 1a Capturing Moments

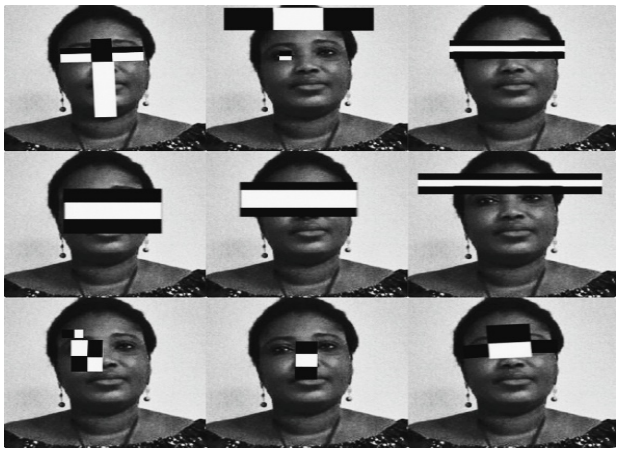

Figure 1c Haars Classifier

Figure 2 Attendance Marking 1

Figure3 Attendance Marking 2

Figure 4 Attendance Marking 3

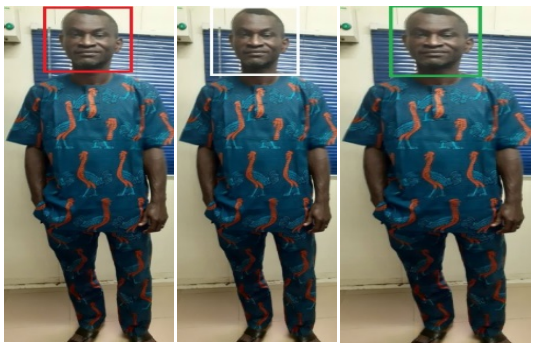

Figure 5 Attendance Marking 4

Figure 6 Attendance and Time Taken

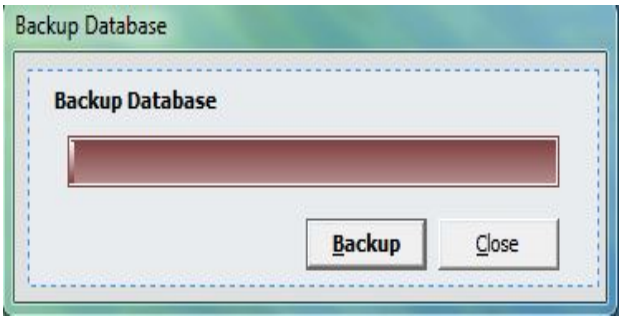

Figure 7 Data Base Storage

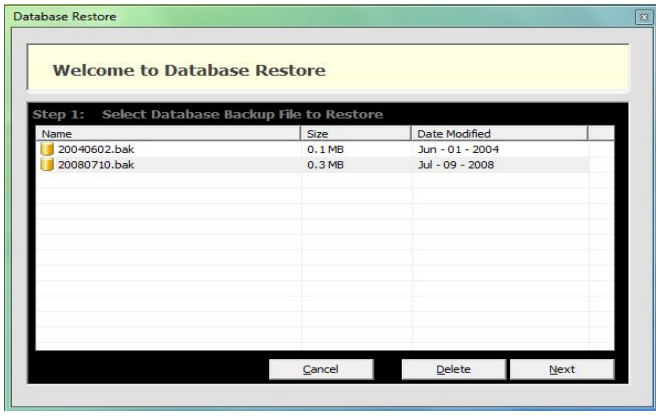

Figure 8 Data Base Storage and Backups

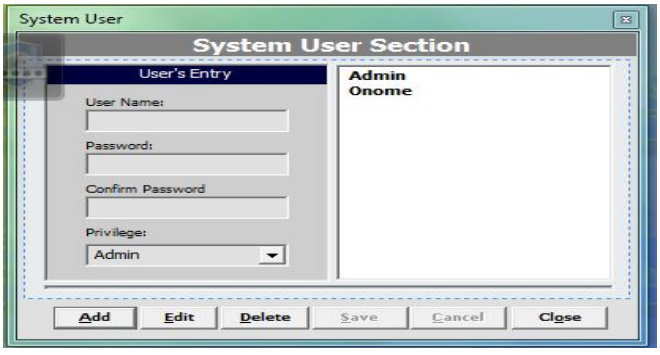

Figure 9 Manual Attendance Entry

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