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Labour Contract Management System

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Abstract: Time and attendance management technology with drowsiness detection brings efficiency to the workplace by keeping track employees in a given workplace. Punch cards can be handed to friends so that the workers can use company's time and money for their personal works. Labour Contract Management (LCMS) system makes use of face detection technology for marking the attendance of the employees with the help of camera recorder on each employee's working device such as laptop or desktop. Also this system keeps track on the drowsiness of a particular employee by detection and monitoring of his eyes and an alarm will ring if the employee has his eyelids closed for more than 10 minutes. Based on this monitoring employee's working hours are calculated and salary sheet is generated.

Keywords: Face Monitoring, Salary, Attendance, Haar classifier.

I. INTRODUCTION

In many institutions the attendance is a very important factor for various purposes. In previous approach, where manually marking and maintaining the attendance records was very inconvenient task. Traditionally, employee attendances are taken manually by using biometric systems, punch cards or others systems which are time consuming event and also costlier. Moreover, it is very difficult to verify Employee with the use of punch cards; the employee can hand over the punch card to friend and go out for personal works. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. If an automatic attendance system is developed for attendance, it eliminates the need for stationary materials and personnel for the keeping of records. Attendance is marked after employee identification, which is done with the help of face detection. Once the employee logs-in on the LCMS portal, the camera will detect the employee face and will mark the in-time of the employee. Continuous monitoring of employee is done with the help of this system (LCMS). LCMS also has an advantage of monitoring of employee's drowsiness. If the employee's eyes are closed for more than 10 minutes, notifications will pop-up on the screen twice and even if after the notification, employee's eyes are detected to be closed then there is a provision that a alarm will ring so that the employee should again concentrate on his work. Based on this detection and monitoring employee's working hours are calculated and hence monthly salary of the employee is calculated depending on the hours worked by the employee on daily basis. The employee's review is given according to the attendance and work done. The review will be given by the manager who will monitor the employee's performance. The employee can also see that he/she is being detected continuously.

II. LITERATURE SURVEY

This paper introduces a time based attendance and salary generator which generates a payroll sheet based on face monitoring and recognition of the employee at the site of work. In [1], proposed by Naveed Khan Baloch and Waqar Ahmad, "Algorithm for Efficient Attendance Management: Face Recognition Based Approach", International Journal of computer Science, Volume 9, July 2012., they suggest the use of Face Detection and Recognition for the purpose of attendance management of the students, due to their popularity and availability at a considerably low cost.

In [4],proposed by, K. Senthamil Selvi, P. Chitrakala, A. Antony Jenitha, "Face Recognition Based Attendance Marking System", International Journal Of Computer Science and Mobile Computing, Volume 3, Issue 2, February 2014, they have suggested to detect real time human face is used and a simple fast Principal Component Analysis has used to recognize the faces detected with a high accuracy rate. The matched face is used to mark attendance of the employee.

In [5], "Drowsiness Detection based on Eye Movement and Yawn Detection and Head Rotation", International Journal of Applied Information Systems(IJAIS)- ISSN: 2249-0868, New York, USA, Volume 2- No.6, May 2012, they proposed the use of Eye monitoring and recognition for the purpose of detecting drowsiness on the face of the driver.

Using ideas read in these papers, we will introduce a system which will track the amount of time worked by each employee by monitoring their face. Using this system attendance is marked and depending on their attendance a payroll sheet is generated.

III. DESIGNING TOOLS

A. OpenCV :

OpenCV is an Image Processing library created by Intel and maintained by willow Garage. OpenCV library includes C, C++, and many more interfaces and supports Windows, Mac OS, Linux, iOS and Android. OpenCV newest update is its Version 2.4.10. It is an open source tool and free. It is easy to use and install. It was designed for efficient computation and with a string focus on real-time applications. Thus, it has following advantages:

1. **Speed**: Programs written in OpenCV run much faster as it is basically a library of functions written in C, C++.

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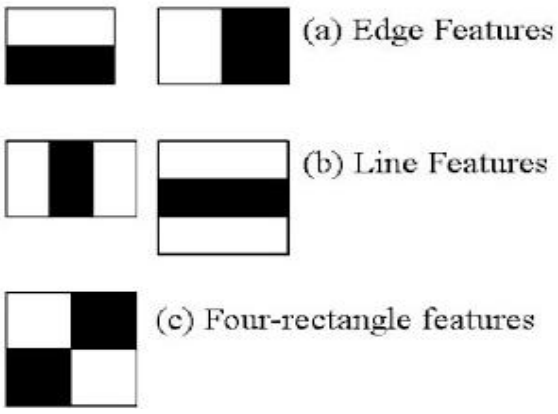
2. **Resources needed**: OpenCV programs require minimum RAM to run in real time.
3. **Cost**: OpenCV is free!
4. **Portability**: OpenCV run equally well on Windows, Mac OS, Linux and Android.

Through the OpenCV library, support provided for face detection and eye detection can be used, wherein the face and eyes of the employee can be tracked. A number of algorithms are available for these detections; the algorithm we have used is on Haar classifiers.

B. Haar Cascade Classifier

Haar feature based classifier is used for object detection that can detect the features effectively. The Haar cascade was developed by Paul Viola and Michael Jones. With help of this matching learning algorithm the cascade is experimented with positive and negative images. This feature is then used to detect a particular object in different image. In this system face detection is used. In positive face image the algorithm is provided with many faces but in case of negative image detection no face is made available for the algorithm. Then with this image the needed features can be extracted. Each pixel has its own single value which is obtained by subtracting the sum of pixels using white rectangle from sum of pixels using black rectangle.



The feature is applied on training images, to obtain this. The threshold for each image is calculated which can provide that whether the image is a positive image or a negative image. Sometimes there can also be errors and misclassification with the image. The minimum error rate feature is selected that means the feature that can best classify the image into a face image or non-face image. All the images are given equal weight in the beginning. Misclassification leads in increased weight of the image. The same process is repeated. The new error rates and weights are again calculated. This process is continued until the required accuracy is achieved. The number of features is also found.

The above classified are the weak classifiers. The final classifier is calculated by adding up all these weak classifiers. The classifiers are known to be weak because the alone are not able to classify the whole image. When these weak classifiers are added up the form a strong classifier which is able to classify the image precisely. Now we take into consideration a image. When we start processing an image first the non-face region is detected. The non-face region is the major part of the image. After this detection the non-face region is straight away discarded. This process is done in a single shot. The non-face region is not again processed. Now what remains is the region where there can be a face. We can now check for the face region. For this more time is required. We can save time by discarding the non-face region in one go.

```
import numpy as np
import cv2
face_cascade=cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
eye_cascade=cv2.CascadeClassifier('haarcascade_eye.xml')
img=cv2.im.read('img.jpg')
grey=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
```

```
faces=face_cascade.detectMultiScale(grey, 1.3, 5)
for(x,y,w,h) in faces :
cv2.rectangle(img,(x,y),(x+w,y+h),(255,0,0),2)
roi_grey=grey[y:y+h,x:x+w]
roi_color=img[y:y+h,x:x+h]
eyes=eye_cascade.detectMultiScale(roi_grey)
for (ex,ey,ew,eh) in eyes:
cv2.rectangle(roi_color,(ex,ey), (ex+ew,ey+eh), (0,255,0), 2)
cv2.imshow('img', img)
cv2.waitkey(0)
```

Algorithm

The speed is not enough for the number of features which are evaluated, but, for example, in a standard 24x24 pixel sub-window, there are a total of P=162,336 possible features, and it would be very expensive to evaluate the image while testing. Thus, the object detection framework selects the best features and train the classifier rather than using them. In this algorithm a linear combination of weighted simple weal classifiers forms one strong classifier.

$$h(x) = \text{sign}\left(\sum_{j=1}^{P} \alpha_j h_j(x)\right)$$

Based on the feature f_j each weak classifier is a threshold function.

$$h_j(\mathbf{x}) = \begin{cases} -s_j & \text{if } f_j < \theta_j \\ s_j & \text{otherwise} \end{cases}$$

The threshold value θ_j, the polarity $s_j \in \pm 1$ and the coefficients α_j are all determined in the training.
Shown below is a simplified version of learning algorithm.
Input:
N = Set of positive and negative training images

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$(\mathbf{x}^i, y^i)$= Labels of each training image.
If image i is a face $y^i = 1$, if not $y^i = -1$.
Initialization:
Let $w_1^i = \frac{1}{N}$ be the weight of each image i.
Let f_j with $j = 1, ..., M$ for each feature
Renormalize the weights till sum equal to one.
Apply the feature to each image in the training set, then find the optimal threshold Θ_j and polarity S_j which minimizes the weighted classification error. That is

$$\theta_j, s_j = \arg\min_{\theta,s} \sum_{i=1}^{N} w_j^i \varepsilon_j^i$$

where

$$\varepsilon_j^i = \begin{cases} 0 & \text{if } y^i = h_j(\mathbf{x}^i, \theta_j, s_j) \\ 1 & \text{otherwise} \end{cases}$$

Assign a weight α_j to h_j that is inversely proportional to the error rate. In this way we get the best classifier.
The weights for the next iteration, i.e. w_{j+1}^i, are reduced for the images i that were correctly classified.
Set the final classifier to

$$h(\mathrm{x}) = \mathrm{sign}\left(\sum_{j=1}^{M} \alpha_j h_j(\mathrm{x})\right)$$

IV. SYSTEM DESCRIPTION

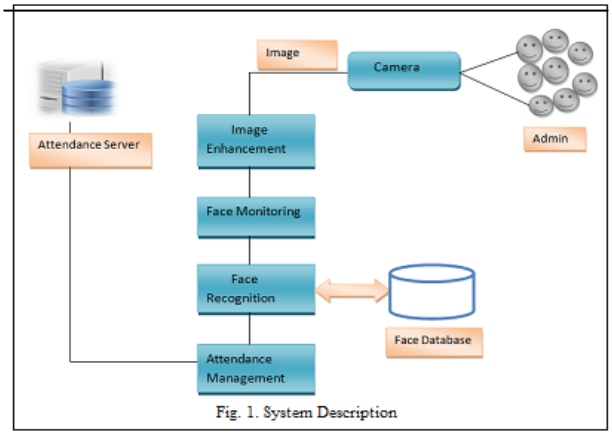

Fig. 1. System Description

The system consists of a camera that captures the images of the employees and sends it to the image processing module. After the image processing comes in the Face Monitoring and Recognition modules and then the attendance is marked on the database server. This is shown in the in Fig 2. After the employee login the image of the individual employee are stored in the Face database. Here the algorithm compares the input image of the employee with the face database. If the input image is matched with the face database the attendance of the employee is marked on the server. Camera is used to monitor the employee continuously. This technique enhances the efficiency and accuracy of the monitoring process. Face Database is the collection of face images and extracted features at the time of employee registration and the second attendance database contains the information about the employee details and is used to mark the attendance.

In the above Fig. 1.1 the result of the Admin portal is shown. The Admin has the authority to approve or disapprove a particular employee's leave request. Only the admin is responsible for adding or removing the employee and calculate the monthly salary.

Fig. 1.1 Admin Portal

Fig. 1.2 Login Page

Above Fig. 1.2 depicts the Employee Login portal where the employee's face is monitored and his in-time is marked.

V. LAYERED ARCHITECTURE

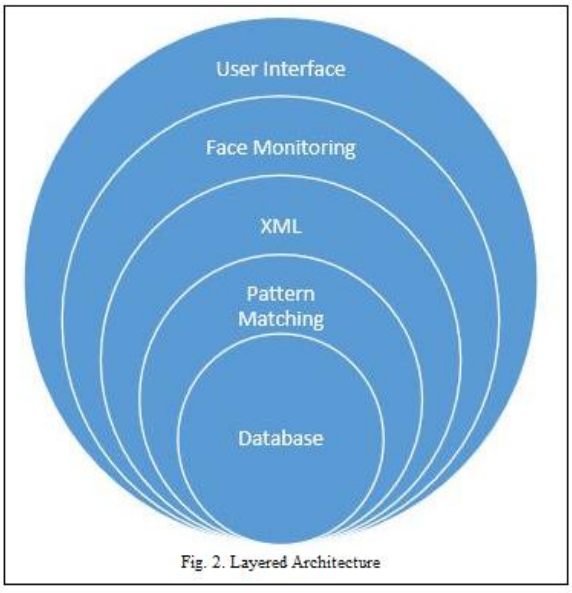

Fig. 2. Layered Architecture

A. User Interface:
User interface is designed for humans to interact with the underlying software which can be in a form of display screen, help messages, keyboard etc. In this system the user interface is used for maintenance and management of employee information by attendance marking, salary generation and leave grant-request. The employees and the admin both are able to make use of the interface provided, where employees can view attendance and apply for leave and the admin is able to keep a track of employee's performance and approve requests.

B. Face Monitoring:
Using open CV libraries face detection and monitoring is enabled in LCMS. With the help of face monitoring we are able to continuously keep a track on employee and mark their performance. If drowsiness is detected on face of the employee then warnings and ultimately alarm is generated. The total time detected after monitoring the employee's work, helps in salary generation.

C. XML:
Extensible Markup Language is a markup language used for web designing like HTML. The user interface is designed using XML. It allows user to create dynamic web pages which helps in communication with database.

D. Pattern Matching:
Pattern matching is capable of detecting and verifying a person from a digital image. In our system we analyse the relative position of eyes, nose, cheekbones etc. The analysed part is matched with a fix pattern to detect the result.

E. Database:
The database is used to store the employee's information. In this system MySQL database is used to keep records of employee's performance, attendance and salary.

VI. CONCLUSION

Hence our system provides automated attendance using continuous face monitoring. This system helps in attendance and salary generation with keeping a track on employees. The system is capable of detecting drowsiness and marking attendance accordingly. It generates an alarm if the employee is found to be drowsy even after warnings. Thus, this system can be implemented in any organizations or companies. It helps in replacing manual attendance and encourages more secure and precise attendance and salary generation. This system is working properly and meeting all the requirements.

VII. FUTURE SCOPE

Currently Labour Contract Management System, i.e., LCMS will monitor working hours of all the employees through their workstation's camera. We have used open CV libraries for eye detection mechanism. In future, features such as differentiating between actual face and a photographed face when detected by the camera to avoid misuse of the system, better picture quality to avoid wrongful detection etc. can be integrated. Also if more than one face is detected it should not affect the functionality of the system. These features will make the system even more resourceful.

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