JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 10, ISSUE 04, 2023

RECOGINITION OF FACE ATTENDANCE USING OPENCV AND DEEP-LEARNING

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ABSTRACT

Nowadays Educational institutions are concerned about regularity of student attendance. This is mainly due to students' overall academic performance is affected by his or her attendance in the institute. Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically. In this project we have implemented the automated attendance system using Deep learning. We have projected our ideas to implement "Automated Attendance System Based on Facial Recognition", in which it imbibes large applications. The application includes face identification, which saves time and eliminates chances of proxy attendance because of the face authorization. Hence, this system can be implemented in a field where attendance plays an important role. The system is designed using deep python platform. The proposed system uses Principal Component Analysis (PCA), OpenCV, Haar cascade algorithm which is based on eigenface approach. This algorithm compares the test image and training image and determines students who are present and absent. The attendance record is maintained in an excel sheet which is updated automatically in the system.

Keywords: Face recognition, Attendance system, Eigen faces,

1. INTRODUCTION

One necessary component of every business system is recording employees' work hours and activities, despite the capacity of the system. This process could be time consuming if it is managed manually. As a result of a rapid growth in information technologies, automatic solutions have become a standard option for these types of business processes. There are now plenty of systems which differ in many aspects: core technology they are based on, way of use, cost, reliability, security etc. Many of those depend on employees having to carry specific identification devices. One of the common types of the attendance systems is Radio Frequency Identification (RFID) where employees must carry appropriate RFID cards. There are also location-based attendance tracking systems. The location of an employee can be determined via Global Positioning System (GPS). The presence is determined by calculating the proximity between an employee's and the company's location. Both above-mentioned types of the attendance systems have weaknesses. Employees could forget the RFID card or the location device, or someone else could check instead of them. This could also be a potential security issue. Therefore, there are systems that exclude the usage of external devices for attendance purposes by exploiting the individual attributes: fingerprints, iris, voice, face and etc. These types of systems are heavily based on computer vision and machine learning algorithms. Recent advances in these areas, especially in deep learning, provide possibilities to use these methods searching for practical solutions. These solutions could be more flexible and could reduce human errors.

1.2 Problem Statement

Attendances of every student are being maintained by every school, college and university. Empirical evidence have shown that there is a significant correlation between students' attendances and their academic performances. There was also a claim stated that the students who have poor attendance records will generally link to poor retention. Therefore, faculty has to maintain proper record for the attendance.

The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. One alternative to make student attendance system automatic is provided by facial recognition.

2. LITERATURE SURVEY

For our project we got motivation by the research carried out by the following people and their published papers:

"Eigenfaces for recognition'' (Mathew Turk and Alex Pentland) [1], here they have developed a near-real time computer system that can locate and track a subject's head, and then recognize the person by comparing characteristics of the face to those of known individuals. The computational approach taken in this system is motivated by both physiology and information theory, as well as by the practical requirements of near-real time performance and accuracy. This approach treats the face recognition problem as an intrinsically two-dimensional recognition problem rather than requiring recovery of three- dimensional geometry, taking advantage of the fact that these faces are normally upright and thus may be described by a small set of two-dimensional characteristic views

.Their experiments show that the eigen face technique can be made to perform at very high accuracy, although with a substantial "unknown "rejection rate and thus potentially well suited to these applications. The future scope of this project was-in addition to recognizing face, to use eigen face analysis to determine the gender of the subject and to interpret facial expressions.

"Fast face recognition using eigenfaces" (Arun Vyas and Rajbala Tokas) [2], their approach signifies face recognition as a two-dimensional problem. In this approach, face reorganization is done by Principal Component Analysis (PCA). Face images are faced onto a space that encodes best difference among known face images. The face space is created by eigenface methods which are eigenvectors of the set of faces, which may not link to general facial features such as eyes, nose, and lips. The eigenface method uses the PCA for recognition of the images. The system performs by facing pre-extracted face image onto a set of face space that shows significant difference among known face images. Face will be categorized as known or unknown face after imitating it with the present database. From the obtained results, it was concluded that, for recognition, it is sufficient to take about 10% eigenfaces with the highest eigenvalues. It is also clear that the recognition rate increases with the number of training images.

"Face recognition using eigenface approach" (Vinay Hiremath and Ashwini Mayakar) [5], This paper is a step towards developing a face recognition system which can recognize static images. It can be modified to work with dynamic images. In that case the dynamic images received from the camera can first be converted in to the static ones and then the same procedure can be applied on them. The scheme is based on an information theory approach that decomposes face images into a small set of characteristic feature images called 'Eigenfaces' which are actually the principal components of the initial training set of face images. Recognition is performed by projecting a new image into the subspace spanned by the Eigenfaces ('face space') and then classifying the face by comparing its position in the face space with the positions of the known individuals. The Eigenface approach gives us efficient way to find this lower dimensional space. Eigenfaces are the Eigenvectors which are representative of each of the dimensions of this face space and they can be considered as various face features .Any face can be expressed as linear combinations of the singular vectors of the set of faces. “Face recognition using eigenface approach” (Vinay Hiremath and Ashwini Mayakar) [5], This paper is a step towards developing a face recognition system which can recognize static images. It can be modified to work with dynamic images. In that case the dynamic images received from the camera can first be converted in to the static ones and then the same procedure can be applied on them. The 22 scheme is based on an information theory approach that decomposes face images into a small set of characteristic feature images called ‘Eigenfaces’, which are actually the principal components of the initial training set of face images. Recognition performed by projecting a new image into the subspace spanned by the Eigenfaces (‘face space’) and then classifying the face by comparing its position in the face space with the positions of the known individuals. The Eigenface approach gives us efficient way to find this lower dimensional space. Eigen faces are the Eigenvectors which are representative of each of the dimensions of this face space and they can be considered as various face features. Any face can be expressed as linear combinations of the singular vectors of the set of faces, and these singular vectors are eigenvectors of the covariance matrices. The Eigenface approach for Face Recognition process is fast and simple which works well under constrained environment. It is one of the best practical solutions for the problem of face recognition. Many applications which require face recognition do not require perfect identification but just low error rate. So instead of searching large database of faces, it is better to give small set of likely matches. By using Eigenface approach, this small set of likely matches for given images can be easily obtained.

“Face recognition using eigenfaces and artificial neural networks” (Mayank Agarwal, Nikunj Jain, Mr. Manish Kumar and Himanshu Agrawal) [4], this paper presents a methodology for face recognition based on information theory approach of coding and decoding the face image. Proposed methodology is connection of two stages – Feature extraction using principle component analysis and recognition using the feed forward back propagation Neural Network. The algorithm has been tested on 400 images (40 classes). A recognition score for test lot is calculated by considering almost all the variants of feature extraction. The proposed methods were tested on Olivetti and Oracle Research Laboratory (ORL) face database. Test results gave a recognition rate of 97.018%

3. AN ATTENDANCE SYSTEM BASED ON FACE RECOGNITION USING DEEP LEARNING

One of the simplest and most effective PCA approaches used in face recognition systems is the so-called eigenface approach. This approach transforms faces into a small set of essential characteristics, eigenfaces, which are the main components of the initial set of learning images (training set). Recognition is done by projecting a new image in the eigenface subspace, after which the person is classified by comparing its position in eigenface space with the position of known individuals. The advantage of this approach over other face recognition systems is in its simplicity, speed and insensitivity to small or gradual changes on the face. The problem is limited to files that can be used to recognize the face. Namely, the images must be vertical frontal views of human faces.

3.1 PCA Approach to Face Recognition

Principal component analysis transforms a set of data obtained from possibly correlated variables into a set of values of uncorrelated variables called principal components. The number of components can be less than or equal to the number of original variables. The first principal component has the highest possible variance, and each of the succeeding components have the highest possible variance under the restriction that it has to be orthogonal to the previous component. We want to find the principal components, in this case eigenvectors of the covariance matrix of facial images. The first thing we need to do is to form a training data set. 2D image Ii can be represented as a 1D vector by concatenating rows. Image is transformed into a vector of length N = mxn as shown in (1).

$$I = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}_{mxn} \xrightarrow{CONCATENATION} \begin{bmatrix} x_{11} \\ \vdots \\ x_{1n} \\ \vdots \\ x_{2n} \\ \vdots \\ x_{mn} \end{bmatrix} = x \qquad (1)$$

Let M such vectors xi (i = 1, 2... M) of length N form a matrix of learning images, X. To ensure that the first principal component describes the direction of maximum variance, it is necessary to Centre the matrix. First we determine the vector of mean values Ψ, and then subtract that vector from each image vector.

$$\Psi = \frac{1}{M} \sum_{i=1}^{M} x_i \qquad (2)$$

$$\phi_i = x_i - \Psi \qquad (3)$$

Averaged vectors are arranged to form a new training matrix (size NxM).

$$A = [\ \Phi 1, \Phi 2, \Phi 3, \Phi 4 \ldots] \qquad (4)$$

The next step is to calculate the covariance matrix C, and find its eigenvectors ei and eigenvalues λi, Where

$$C = AA^T \qquad (5)$$

$$C * e^i = \lambda_i e_i \qquad (6)$$

Covariance matrix C has dimensions NxN. From that we get N eigen values and eigenvectors. For an image size of 128x128, we would have to calculate the matrix of dimensions 16.384x16.384 and find 16.384 eigenvectors. It is not very effective since we do not need most of these vectors. Rank of covariance matrix is limited by the number of images in learning set — if we have M images, we will have M–1 eigenvectors corresponding to non-zero eigenvalues. One of the theorems in linear algebra states that the eigenvectors ei and eigenvalues λi can be obtained by finding eigenvectors and eigenvalues of matrix C=ATA (dimensions MxM). If νi and μi are eigenvectors and eigen values of matrix ATA, eigenvector associated with the highest eigenvalue reflects the highest variance, and the one associated with the lowest eigenvalue, the smallest variance. Eigenvalues decrease exponentially so that about 90% of the total variance is contained in the first 5% to 10% eigenvectors. Therefore, the vectors should be sorted by eigenvalues so that the first vector corresponds to the highest eigenvalue. These vectors are then normalized. They form the new matrix E so that each vector ei is a column vector. The dimensions of this matrix are NXD, where D represents the desired number of eigenvectors. It is used for projection of data matrix A and calculation of yi vectors of matrix Y = [y1, y2, y3. yM] The matrix Y is given as:

Each original image can be reconstructed by adding mean image Ψ to the weighted summation of all vectors ei. The last step is the recognition of faces. Image of the person we want to find in training set is transformed into a vector P, reduced by the mean value Ψ and projected with a matrix of eigenvectors (eigenfaces):

$$\omega = E^T(P - \Psi) \qquad (8)$$

Classification is done by determining the distance, εi, between ω and each vector yi of matrix Y. The most common is the Euclidean distance, but other measures may be used. This paper presents the results for the Euclidean distance.

If A and B are two vectors of length D, the Euclidean distance between them is determined as follows:

$$d(A,B) = \sqrt{\sum_{i=1}^{D}(a_i - b_i)^2} = ||A - B|| \qquad (9)$$

If the minimum distance between test face and training faces is higher than a threshold θ, the test face is considered to be unknown; otherwise it is known and belongs to the person in the database.

S = argmini [Ɛi] (10)

The program requires a minimum distance between the test image and images from the training base. Even if the person is not in the database, the face would be recognized. It is therefore necessary to set a threshold that will allow us to determine whether a person is in the database. There is no formula for determining the threshold. The most common way is to first calculate the minimum distance of each image from the training base from the other images and place that distance in a vector rast. Threshold is taken as 0.8 times of the maximum value of vector rast:

θ = 0.8*max (rast) (11)

3.2 VIOLA- JONES ALGORITHM FOR FACE DETECTION

In 2004 an article by Paul Viola and Michael J. Jones titled [3] "Robust Real-Time Face Detection" was publish in the International Journal of Computer Vision.

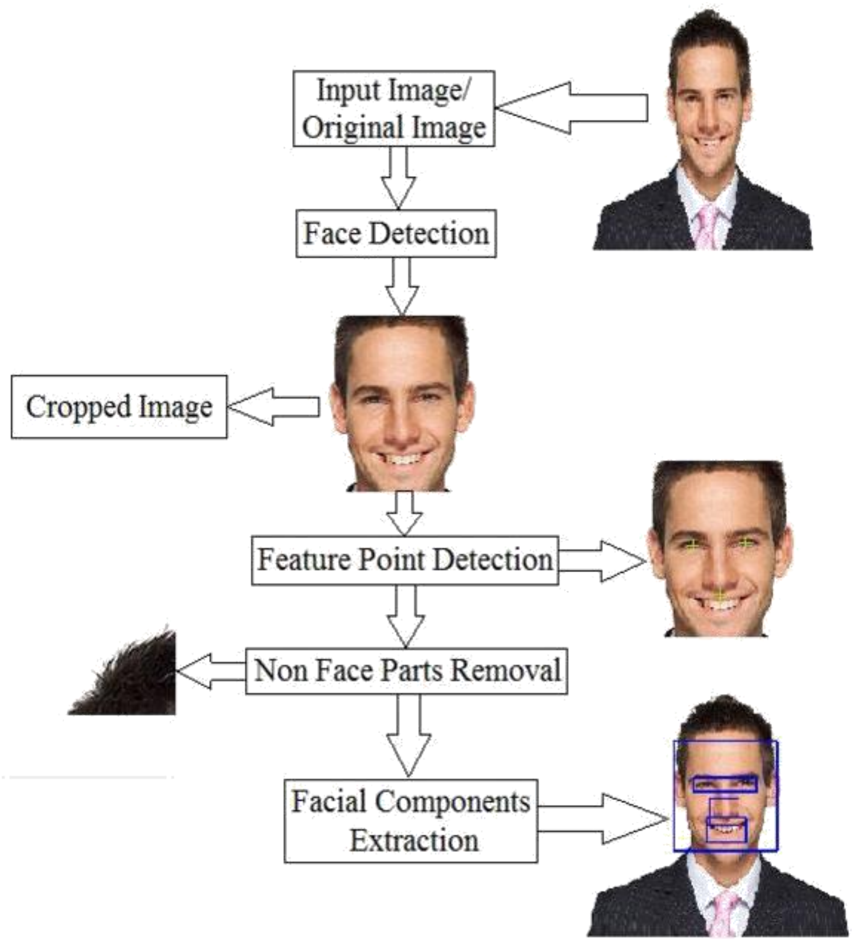


Fig. 1: Facial parts Detection using Viola Jonas Algorithm.

The algorithm presented in this article has been so successful that today it is very close to being the de facto standard for solving face detection tasks. This success is mainly attributed to the relative simplicity, the fast execution, and the remarkable performance of the algorithm.

3.3 THE SCALE INVARIANT DETECTOR

The first step of the Viola-Jones face detection algorithm is to turn the input image into an integral image. This is done by making each pixel equal to the entire sum of all pixels above and to the left of the concerned pixel. This is demonstrated in Figure 3-1.

1	1	1
1	1	1
1	1	1

Input image

1	2	3
2	4	6
3	6	9

Integral image

Fig. 2: The Integral Image

This allows for the calculation of the sum of all pixels inside any given rectangle using only four values. These values are the pixels in the integral image that coincide with the corners of the rectangle in the input image. This is demonstrated in Figure 3-2.

ISSN- 2394-5125 VOL 10, ISSUE 04, 2023

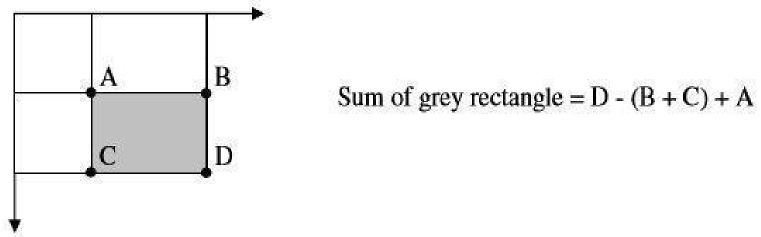


Fig. 3: Sum calculation.

Since both rectangle B and C include rectangle A, the sum of A has to be added to the calculation .It has now been demonstrated how the sum of pixels within rectangles of arbitrary size can be calculated in constant time. The Viola-Jones face detector analyzes a given sub-window using features consisting of two or more rectangles. The different types of features are shown in Figure 3-3.

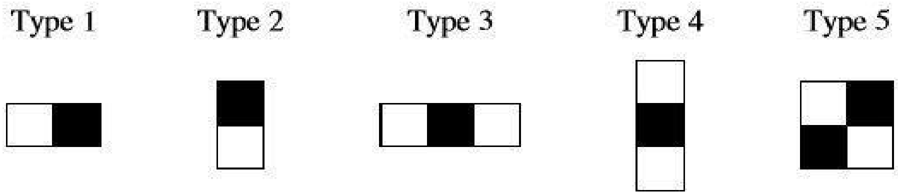


Fig. 4: The different types of features.

Each feature results in a single value which is calculated by subtracting the sum of the white rectangle(s) from the sum of the black rectangle(s).

Viola-Jones have empirically found that a detector with a base resolution of 24*24 pixels gives satisfactory results. When allowing for all possible sizes and positions of the features in Figure 4 a total of approximately 160.000 different features can then be constructed. Thus, the amount of possible features vastly outnumbers the 576 pixels contained in the detector at base resolution.These features may seem overly simple to perform such an advanced task as face detection, but what the features lack in complexity they most certainly have in computational efficiency.

One could understand the features as the computer’s way of perceiving an input image. The hope being that some features will yield large values when on top of a face. Of course operations could also be carried out directly on the raw pixels, but the variation due to different pose and individual characteristics would be expected to hamper this approach. The goal is now to smartly construct a mesh of features capable of detecting faces and this is the topic of the next section.

3.4 THE MODIFIED ADABOOST ALGORITHM

AdaBoost is a machine learning boosting algorithm capable of constructing a strong classifier through a weighted combination of weak classifiers. (A weak classifier classifies correctly in only a little bit more than half the cases.) To match this terminology to the presented theory each feature is considered to be a potential weak classifier.

- Given examples images $(x_1,y_1),\dots,(x_m,y_n)$ where $y_1=0,1$ for negative and positive examples.
- Initialize weights $w_{1,i} = \frac{1}{2m}, \frac{1}{2l}$ for $y_1=0,1$, where m and l are the numbers of positive and negative examples.
- For $t=1,\dots,T$:

1) Normalize the weights, $w_{t,i} \leftarrow \frac{w_{t,i}}{\sum_{j=1}^{n} w_{t,j}}$

2) Select the best weak classifier with respect to the weighted error:

$$\varepsilon_t = \min_{f,p,\theta} \sum_i w_i \left| h(x_i, f, p, \theta) - y_i \right|$$

3) Define $h_t(x) = h(x, f_t, p_t, \theta_t)$ where f_t, p_t and θ_t are the minimizers of ε_t.

4) Update the weights:

$$w_{t+1,i} = w_{t,i} \beta^{1-e_i}$$

where $e_i = 0$ if example x_i is classified correctly and $e_i = 1$ otherwise, and $\beta_t = \frac{\varepsilon_t}{1-\varepsilon_t}$

- The final strong classifier is:

$$C(x) = \begin{cases} 1 & \text{if } \sum_{t=1}^{T} \alpha_t h_t(x) \geq \frac{1}{2} \sum_{t=1}^{T} \alpha_t \\ 0 & \text{otherwise} \end{cases}$$

where $\alpha_t = \log \frac{1}{\beta_t}$

Fig. 5: The modified AdaBoost algorithm.

An important part of the modified AdaBoost algorithm is the determination of the best feature, polarity and threshold. There seems to be no smart solution to this problem and Viola-Jones suggest a simple brute force method. This means that the determination of each new weak classifier involves evaluating each feature on all the training examples in order to find the best performing feature. This is expected to be the most time consuming part of the training procedure.

The best performing feature is chosen based on the weighted error it produces. This weighted error is a function of the weights belonging to the training examples. As seen in Figure 3-4 part 4, the weight of a correctly classified example is decreased and the weight of a misclassified example is kept constant. As a result, it is more 'expensive' for the second feature (in the final classifier) to misclassify an example also misclassified by the first feature, than an example classified correctly. An alternative interpretation is that the second feature is forced to focus harder on the examples misclassified by the first. The point being that the weights are a vital part of the mechanics of With the integral image, the computationally efficient features and the modified AdaBoost algorithm in place it seems like the face detector is ready for implementation, but Viola- Jones have one more ace up the sleeve.

3.5 THE CASCADED CLASSIFIER

The basic principle of the Viola-Jones face detection algorithm is to scan the detector many times through the same image – each time with a new size. Even if an image should contain one or more faces it is obvious that an excessive large amount of the evaluated sub-windows would still be negatives (non-faces). This realization leads to a different formulation of the problem: Instead of finding faces, the algorithm should discard non-faces.

The thought behind this statement is that it is faster to discard a non-face than to find a face. With this in mind a detector consisting of only one (strong) classifier suddenly seems inefficient since the evaluation time is constant no matter the input. Hence the need for a cascaded classifier arises.

The cascaded classifier is composed of stages each containing a strong classifier. The job of each stage is to determine whether a given sub-window is definitely not a face or maybe a face. When a sub-window is classified to be a non-face by a given stage it is immediately discarded. Conversely a sub-window classified as a maybe-face is passed on to the next stage in the cascade. It follows that the more stages a given sub-window passes, the higher the chance the sub-window actually contains a face. The concept is illustrated with two stages in Figure 3-5.

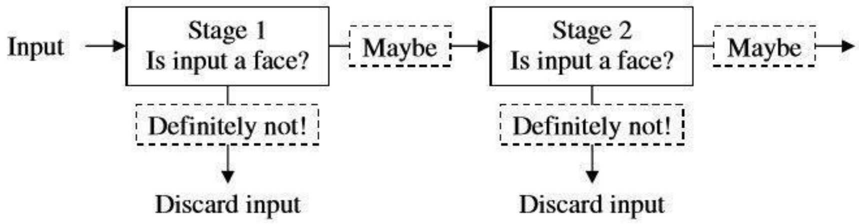


Fig. 6: The cascade classifier.

In a single stage classifier, one would normally accept false negatives in order to reduce the false positive rate. However, for the first stages in the staged classifier false positives are not considered to be a problem since the succeeding stages are expected to sort them out. the AdaBoost algorithm.

Therefore, viola-jones prescribe the acceptance of many false positives in the initial stages consequently ,the amount of false positives in the initial stags consequently , amount of false staged classifier is expected to be very small Viola-Jones also refer to the cascaded classifier as an attentional cascade. This name implies that more attention (computing power) is directed towards the regions of the image suspected to contain faces. It follows that when training a given stage, say n, the negative examples should of course be false negatives generated by stage n-1.

The present system of attendance marking i.e., manually calling out the roll call by the faculty have quite satisfactorily served the purpose. With the change in the educational system with the introduction of new technologies in classroom such as virtual classroom, the traditional way of taking attendance may not be viable anymore. Even with rising number of course of study offered by universities, processing of attendance manually could be time consuming. Hence, in our project we aim at creating a system to take attendance using facial recognition technology in classrooms and creating an efficient database to record them.

Block diagram

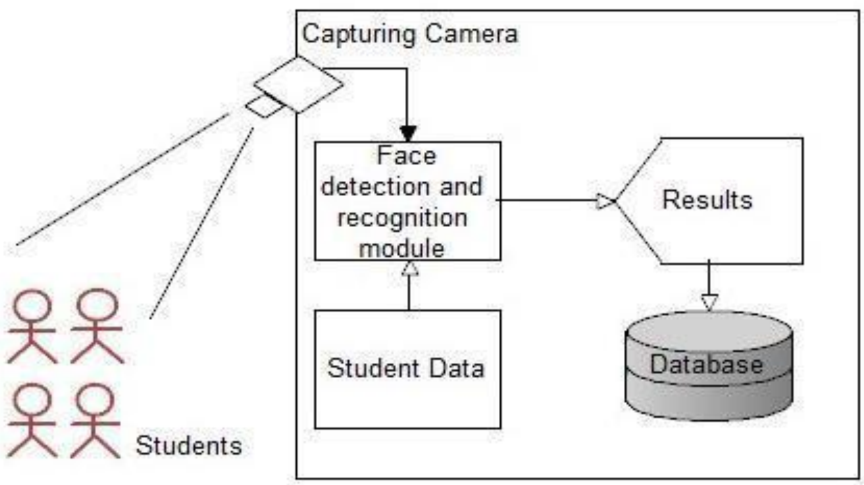


Fig. 7: Proposed system.

The block diagram in figure 4-1 describes the proposed system for Face Recognition based Classroom attendance system. The system requires a camera installed in the classroom at a position where it could capture all the students in the classroom and thus capture their images effectively. This image is processed to get the desired results. The working is explained in brief below:

Capturing Camera: Camera is installed in a classroom to capture the face of the student. The camera has to be places such that it captures the face of all the students effectively. This camera has to be interfaced to computer system for further processing either through a wired or a wireless network. In our prototype we use the in-built camera of the laptop.

Image Processing: Facial recognition algorithm is applied on the captured image. The image is cropped and stored for processing. The module recognizes the images of the students face which have been registered manually with their names and ID codes in the database. We use MATLAB for all the image processing and acquisition operations. The whole process requires the following steps:

Train Database: Initially we take facial image of the enrolled students. In our system we have taken three images each. This data is used later used in the facial recognition algorithm. It is done using Image Acquisition Toolbox of the MATLAB. All the cropped image of the face is resized to a 240 X 300 image.

Face Detection and cropping: The captured image of the classroom is initially scanned to detect faces. This is done using Computer Vision Toolbox by the function vision.CascadeObjectDetector(). This function work on the basis of Viola-Jones algorithm. This algorithm focusses more on speed and reliability. The detected faces are cropped and resized to a 240 X 300 image, same as the train database.

Face Recognition: For recognition, the feature locations are refined and the face is normalized with eyes and month in fixed locations. Images from the face tracker are used to train a frontal Eigen space, and the leading three eigenvectors are retained. Since the face images have been warped into frontal views a single eigen space is enough. Face recognition is then performed using the Eigen face approach with additional temporal information added. The projection coefficients of all images of each person are modelled as a Gaussian distribution and the face is classified based on the probability of match.

Attendance Recording: We use Excel spreadsheet to store the recorded attendance for easy-to-use output format, which is also the software which is familiar to majority of the institution staffs. This is done using Spreadsheet Link EX toolbox. If a student is recognized, the corresponding cell is updated with ‘1’, else a ‘0’. Using the formatting in the Excel, we can effectively retrieve the information effective.

4. RESULT AND ANALYSIS

The attendance system has been implemented in a Lenovo laptop computer with the following specifications: Intel core i5-7200U CPU @2.50GHz, RAM 8.00GB, Windows 10 Pro. The system consists of three programs developed in Python 3.

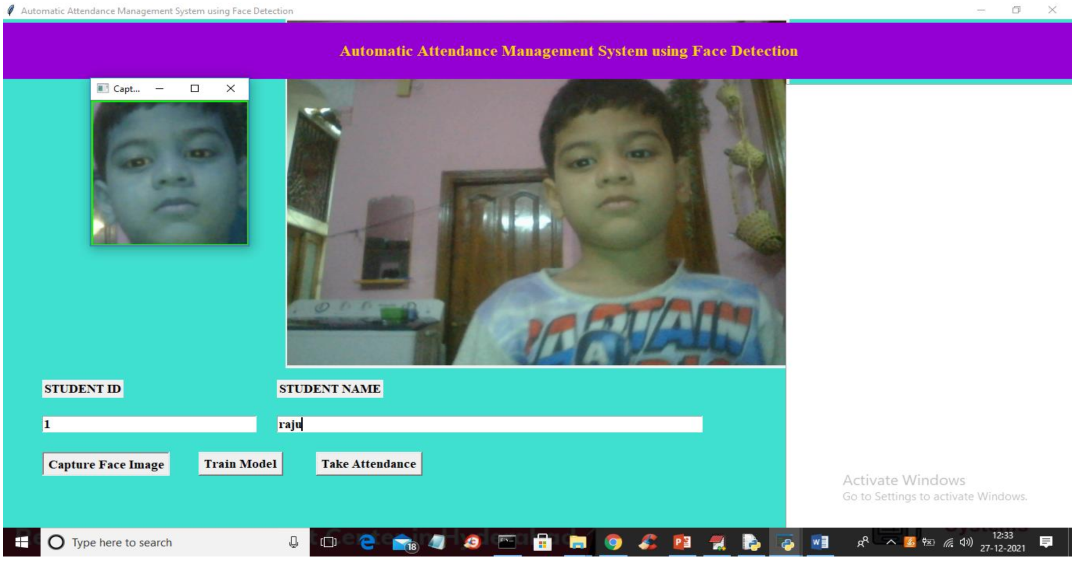
The first program captures 10face pictures for each student in the class. The second one compiles Face Net model and loads parameters. The third one generates the database based on the pictures captured by the first program, recognizes the face at the real-time web camera, and updates the attendance record in the excel file. Thus, all visible results are delivered by the third program. Fig.4.3 is a screenshot that shows the result of a face recognition.

The information of the result includes the frame identifying the location of the detected face, the recognized name (Amilie) at the up left corner of the frame, and the corresponding distance (0.4891317) to Amilie"'s face encoding in the database. This distance gives a confidence on how surely the person is "Amilie": the smaller it is, the more likely he/she is "Amilie". The bigger word "Amilie" at the top center is the result based on the 10 consecutive recognitions.

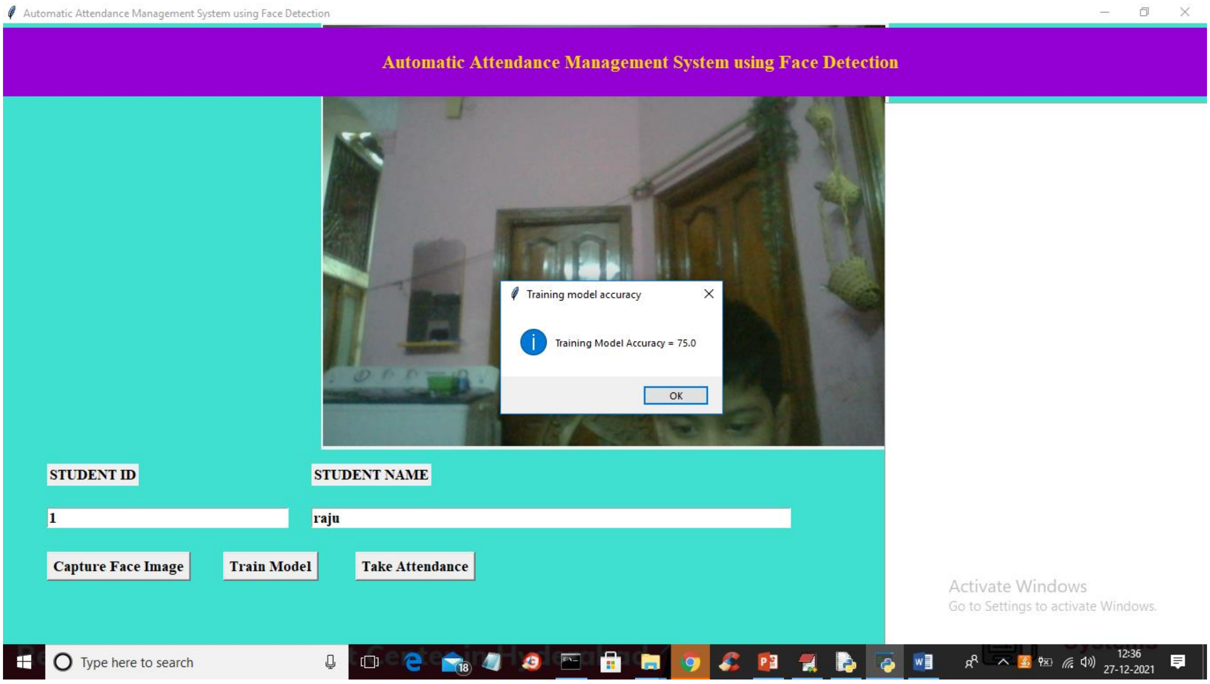
A portion of attendance record in an excel file created by the attendance system. The first column is for students' names and the second is the attendance record. The number for a student is the number of recognitions among 10 trials. A blank for a student means that either the student did not check the attendance, or the number of recognitions is less than 5 (i.e. face recognition failed). In case of the failure of recognition, the student needs to inform the instructor for a manual attendance marking. The test results in one class with 28 students showed that the accuracy of face recognition is about 95%. However, the attendance system is sensitive to the changes of lightening and the distance between face and camera. Dramatical change of these conditions can significantly reduce the accuracy.

To run project double click on 'run.bat' file to get below screen.

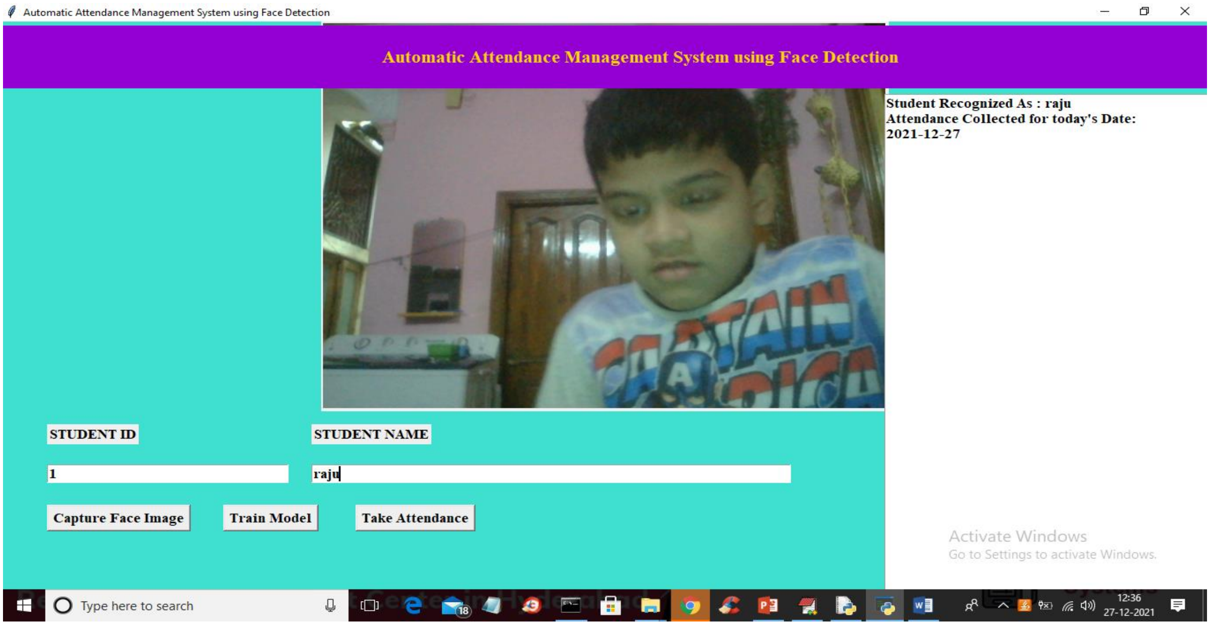
In above screen enter student id and name and then click on 'Capture Face Image' button to capture face like below screen.



In above screen face is detected and now click on ‘Train Model’ button to perform training like below screen.



In above screen training completed with accuracy 75% and then any time click on ‘Take Attendance’ to recognized student and mark attendance.



In above screen in text area, we can see student identified as Raju. Similarly, you can capture N student and take attendance.

5. CONCLUSION

The system we have developed has successfully, able to accomplish the task of marking the attendance in the classroom automatically and output is obtained in an excel sheet as desired in real-time. However, in order to develop a dedicated system which can be implemented in an educational institution, a very efficient algorithm which is insensitive to the lighting conditions of the classroom has to be developed. Also a camera of the optimum resolution has to be utilised in the system. Another important aspect where we can work towards is creating an online database of the attendance and automatic updating of the attendance into it keeping in mind the growing popularity of Internet of Things. This can be done by creating a standalone module which can be installed in the classroom having access to internet, preferably a wireless system. These developments can greatly improve the applications of the project.

Maintains Overall Records: An automated face recognition attendance system maintains the overall presence record of the students in the institution. Leaves taken by the students, date of absent each data is stored in the system.

Get Rid of Pen & Paper System: The newest technology helps in replacing the older paper register method efficiently. It also saves money that the organization uses to spend on the paper. Face-recognition time attendance system gives better maintenance of data as it supports the electronic medium of data storage. Also the system gives a good impression about the organization in front of the business clients and other concerned people.

Financial Benefits: The face-recognition time attendance system helps in saving time, eliminates the manual mistakes and controls the overall system. Since the face recognition system controls every single event electronically, therefore, reduces the possibility of error. The attendance is noted down electronically therefore it saves time of the lecturers which they can use efficiently in lecturing.

Easy Integration: Integrated Biometric facial systems are also easy to program into any computer system. Usually, they will work with existing software that one has in their place.

High Success Rate: Facial biometrics technology today has a high success rate, especially with the emergence of 3d face recognition technologies. It is extremely difficult to fool the system, so one can feel secure about the system.

Proxy Attendance Is Eliminated: Attendance is taken automatically by the camera placed in the classroom therefore there will be no chances of proxy attendances.

Saves Time: In traditional attendance marking system Lecturer calls each student's name with respect to their ids which is a very much time-consuming job this system restores the time consumed for calling attendance by automatically marking attendance.

Less Mistakes: here will be chances of making mistakes while manually marking attendances by lecturers, while taking attendance automatically there will not be any chances of mistakes since the system is computer based**.**

Virtual Classroom: Virtual classrooms are the classrooms without the lecturers to teach as students will be learning online. This system is very useful in virtual classrooms where there will be no lecturers to take attendances this system will automatically manage the attendances of the students.

Simple Algorithm & Flowcharts

This system uses a simple algorithm and flowchart which is easy to understand as there are no complicated sections, information flow is simple as there is less hardware's components used therefore each section is clearly understood.

We see the system have lot of advantages of the system. But as in most systems some drawbacks have been observed in the system.

Sensitive to Light – If the ambient lighting in the training images and the images taken during the processing varies, there is a high possibility in face recognition incorrectly. Hence, we need to keep in mind the lighting conditions of the classroom during the process of collecting the database of the students.

In this system we have implemented an attendance system for a lecture, section, or laboratory by which lecturer or teaching assistant can record students' attendance. It saves time and effort, especially if it is a lecture with huge number of students. Automated Attendance System has been envisioned for the purpose of reducing the drawbacks in the traditional (manual) system. This attendance system demonstrates the use of image processing techniques in classroom. This system can not only merely help in the attendance system, but also improve the goodwill of an institution.

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