# *Intelligent Assessment: Smart Attendance management using Face Recognition*

[1]Gauri Yadav, [2]Sonal Satpute, [3]Rakshita Chinnadkathi, [4]Rashmi Bhutada,[5]Prof. Vaibhav Muddebihalkar
*Department of Computer DIT, Pimpri, Pune*

**Abstract:** *In today's education system-taking attendance in class of Students is crucial and very important task. Traditional way attendance taking is manual and even very time consuming.. And if it will be followed now also then it tends to waste an important time of decided task in short it is time consuming to take the attendance manually. And to avoid this few automatic methods are existing. Existing methodology also tends to waste of time, if we taking biometric attendance on account then it also have some pitfalls. Because program fellow have to make a queue to give attendance by touching their thumb on the electronic biometric scanning device. This approach follows same pitfall of traditional way. In the recent era of IOT solution to above problem should be take advantages of newly innovated IOT approach. Proposed methodology, which is also based on IOT and it, gives an efficient way that automatically takes the attendance of program fellows without any human interaction. In this methodology, attendance is recorded by using a smart device that is nothing but camera which is fixed in front of class venue that is continuously capturing real time data that is images of program fellow, it detect the faces and, compare it with the image database and mark the attendance. In this paper we stated real time face detection approach which is efficient and useful as well with its existing Learning Management System and a learning management system is a software application for the administration, documentation, tracking, reporting and delivery of educational courses or training programs., and also it automatically detects and registers program in which we will get to know about the student who is attending a lecture or not. The system represents a additional tool for instructors, with approach used in machine learning with adaptive methods used to track facial changes during a longer period of time. This proposed system have goal that time reduction for attendance and which is ultimately less than traditional methodology.*

***Keywords*:** Internet of Things (IOT), Face Detection (FD), Image Enhancement (IE), Enrollment, Verification.

## 1. INTRODUCTION:

Keeping record of the attendance is crucial and very important task in all the educational institutes for the purpose of checking and evaluation performance of program fellow. Every educational institute having their own methodology and approaches as per nature of institute. Most of educational Institutes taking attendance by traditional way (manually) using the paper as well as files this paper-based approach also effect on environments. Because after specific time paper become waste which is harm to environment. Some of the institute moving to the automatic attendance system using biometric approach. But this methodology leads to waste of time of program fellow (students) because to give attendance they should wait for long time in queue for making attendance. Mathematically we can state the biometric attendance require times in following manner, if for one student device taking **T** unit of time then if program offers for **N** fellows then this biometric attendance system requires total time for complete task is **T*N** unit. Existing biometric system contains first process that is process of enrolment in this unique feature and features may be Fingerprints, Eye-Iris, Face, Voice of a program fellow are fetched and store to database. And second step comes which is identification process and last one comes verification process. Identification and verification processes compare program fellow's biometric feature that was stored by process one that process of enrolment. Proposed system architecture works on the face recognition methodology for the automatic or smart attendance of program fellow in the class venue. Without instructor or program fellows intervention. We are proposing combine approach that is IOT and image processing. Once enrollment process over then Camera can detect automatically object which comes in front of it. Here as feature we are using face. Face recognition requires two steps, in first step is called identification in this faces of program fellow are detected and second step verification in this it will compare with which stored in enrolment process .Big difference in between biometrics and proposed methodology is that here no need to wait T*N unit time because of real time face capturing which comes under the IOT. This system architecture utilizes the algorithm for the detection of faces in the class venue image. Face recognition techniques can be divided into two types Appearance based which use texture features that is applied to either whole face or some specific part of face, second one is Feature based in this it takes on account geometric features like mouth, nose, eyes, eye brows, cheeks and relation between them.

System Construction:
I) System Modules
Ii) Architecture Of System
Iii) Algorithms
I) System Modules:
A) Enrollment Of Program Fellow
B) Detection Of Face
C) Recognition Of Face
D) Management Of Attendance

a) ENROLLEMENT OF STUDENT
First step comes in every biometric system is the enrollment of program fellow. With the help of camera Image is captured then it is enhanced using histogram equalization and noise filtering. In the second step face is detected in the image and features are extracted from it. These types of unique features are stored in face database for maintaining records with certain id which is provided while registration of that person while enrollment. And at the time where enrollment templates process of face images starts then it gives the records of individual students are stored in the Face database which provides the secure data from database.

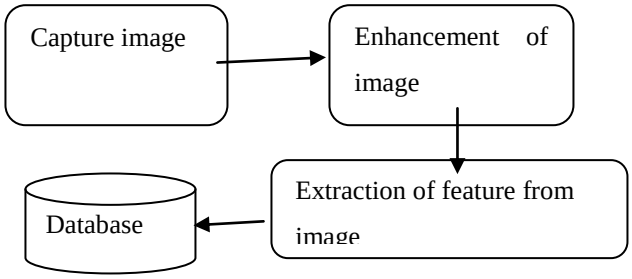


Fig.1 Process of Enrollment

b) DETECTION OF FACE
Face detection methods are often classified into two main categories and they are Feature Based Approaches and Image Based Approaches.

**Feature Based Approaches:**
Feature based approaches include some methods based on edges, lines, and curves which are important to extract feature. Basically it depends on structural matching with some higher accuracy, and even there are chances of considering some other approaches that can generate more explicit features and can provide good results as well.

**Feature analysis:**
It is used for visual features that are organized into a more global concept of face and facial features using information of face geometry of more constraints. So through feature analysis, all feature ambiguities are reduced and all locations of the face and facial features are determined in a way they are needed. Features are invariant to pose and orientation change. Also facial features are difficult to locate because of corruption techniques such as illumination, noise, and occlusion. And hence it is very difficult to detect features in complex background.

**Active shape models:**
In this technique models have been developed for the purpose of complex and non-rigid feature extraction types such as eye pupil and lip tracking which are used in large amount now a days. Also some active shape models depict the actual physical and higher-level appearances of features also get extracted. And when once it gets released within a close proximity to a feature, an active shape model will interact with local image features (edges, brightness) and gradually deform to take the shape of the feature to extract it gradually.

In such types of technique, face detection by automatic modeling of extracted facial features has been stopped due to unpredictability of face appearance and environmental conditions, which are not in our hand. Also in this, some of the recent feature-based attempts have improved the ability to provide best interaction with analysis which are ambiguous, because we make our goal at the unpredictability, most are still limited to head, shoulder and part of frontal faces. But there is still a need for techniques that can perform in more beneficial scenarios such as detecting multiple faces with intensive backgrounds. image-based approaches ignores the basic knowledge of the face generally by working and recognizing face patterns from a set of given images, constraints like textural and geometrical. For instance we consider, it in edge representation, where it works by drawing and also face lining on images to locate it on the particular facial features for particular access.

**Low-level analysis:**
Also it deals with the segmentation of all features using some pixel properties such as gray-scale and color. Because of the low-level nature, features generated from this, which is mostly known as the training stage in the detection method. After this first and very effective stage of training, the programs may be able to detect faces, which are similar to the face pattern from an input image. Also when there occurs comparison of distance between these classes and a 2D intensity array extracted from an input image allows the decision of face existence to be made. Now a days most of the image-based approaches apply for a window scanning technique for detecting faces and applying for next step. But in window scanning algorithm it is a complete search of all input images for possible face locations at all scales of algorithm. For example, these

approaches involve linear sub-space method such as principal component analysis (PCA) and linear discriminate analysis (LDA). Also it functions by expressing the principal component of face distribution by eigenvectors. And when this analysis is done, each and every training face can be represented as a linear component of largest eigenvectors, forming Eigen faces. Applying a different technique in image-based approaches, the Neural network approach, which is trained to use multiple layer with different receptive fields. Then merging is done on the overlapping detections within one network. An arbitration network has been trained to combine the results from different networks. This neural network approach is also classified as image-based approach because it works by identifying face patterns

Fig 2: A typical classroom

Fig 3: Extracted images

RECOGNITION OF FACE

Face recognition systems have three main steps which will are followed during a face recognition process.

**1] Library formation phase of various faces: -** The accession and the pre-processing of the face images that are going to be added to the face library are performed. These types of face images are stored in a face library of database in the system. We call this face database a "face library" because at the moment, it does not have the properties of a relational database. Each and every actions like training set or Eigen face formation is performed on this face library. Face library is initially empty. These types of converting and modifications on face images, there exists the "pre-processing" module.

**2] Phase of training: -** After adding face images to the initially empty face library, the system is ready to perform training set and Eigen face formations. So from the training set those face images are going to be chosen from the entire face library. Because that they face library entries are normalized, no further pre-processing is necessary at this step. Eigen faces are formed and stored for later use when we choose the training set.

**Phase of learning and recognition: -** After choosing a training set and constructing the weight vectors of face library members, now the system is ready to perform the recognition process. And when we choose a face image user initiates the recognition process by choosing a face image. Based on the user request and the acquired image size, pre-processing steps are applied to normalize this acquired image to face library specifications (if necessary). And finally when the image is histo-grammatically normalized, its weight vector is constructed with the help of the Eigen faces that were already stored during the training phase. And when we obtain the vector that is of category weight, it is compared with the weight vector of every face library member within a user defined "threshold". So when there exists at least one face library member that is similar to the acquired image within that threshold then, the face image is classified as "known". Or else, the face image is classified as “unknown".

## 2. MANAGEMENT OF ATTENDANCE

Last phase comes in this process is nothing but management of attendance. By detecting and recognizing face of program fellow attendance is marked on the attendance management server. Proposed system applies specific protocol for the management of attendance. Program time table is also with the proposed system, which gets the subject, class, date and time by its own. The program instructor of program venue comes in and it just press a button to start the attendance process and the system by its own gets the attendance without any the interference of program fellow and program instructor. By this way a too much time will save. And notable importance is that this is very highly secure process and hence not a single student can give the attendance of other. And finally attendance is maintained on the server or in databse so anyone can access it for it purposes like administration, parents and students themselves.

## 3. ARCHITECTURE OF SYSTEM

While many previous face recognition systems have been designed and quoted their superior performances using extremely optimized and controlled environments, our system has been developed to match such successful performances with a number of conditions unconstrained. With the implementation of various normalization stages, the face recognition system has been designed to perform recognition on images where the faces are subjected to different scaling, rotation and illumination. Images containing more than one face can also be processed, but only one face will be identified per input image. Due to the difficulty in producing a robust system that can operate under any environment and face orientations, two modes of operations have been devised for this system, static mode and dynamic mode. Under static mode, recognition is performed on still images captured under a constrained environment. It is assumed that faces are properly scaled and without rotation, such that the unreliable scaling and rotational normalization modules can be omitted during static mode operations.

## 4. SYSTEM ALGORITHM

This section describes the software algorithm for the system. The algorithm consists of the following steps

- Image acquisition
- Upgrade Contrast
- Skin classification
- Connected Region Analysis
- Face detection
- Face recognition
- Attendance

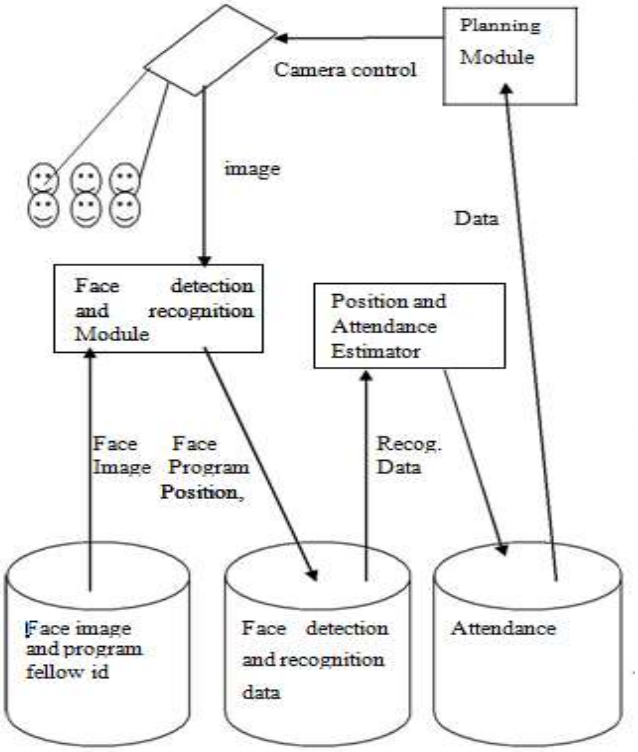


Fig 4: Architecture Of System

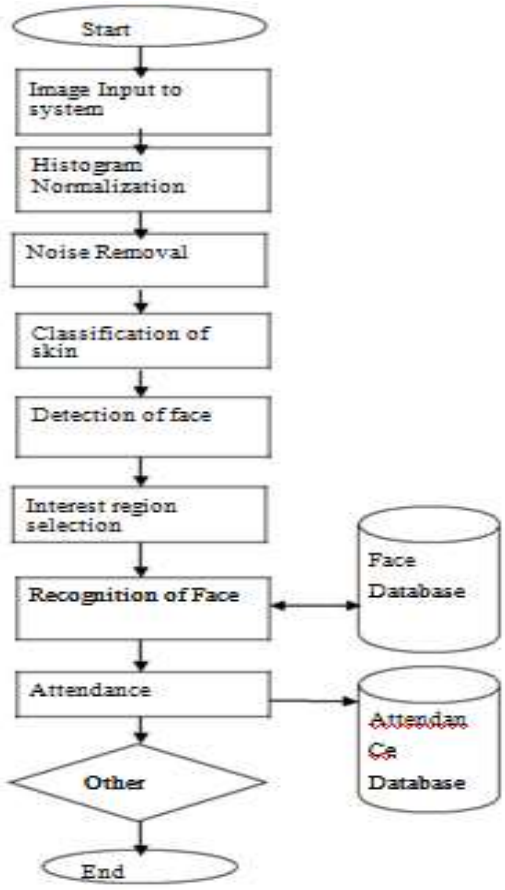


Fig 5: SYSTEM ALGORITHM

**Image Acquisition:**

Image is acquired from a high definition-capturing device

that is connected in the classroom. This device is connected to the system. It captures images after some time interval and sends these images to the system for processing.

Fig 6: Input image

**Upgrade Contrast:**

In this, we convert RGB image into binary image. For this process, we calculate the average value of RGB for each pixel and if the average value is below than 110, we change it by black pixel and else we change it by white pixel. By this method, we get a binary image from RGB image.

Histogram is a technique used in the spatial domain for contrast enhancement.

Fig 7: Histogram Equalized Image

This can be easily seen that the students sitting on the back rows are now clearly seen and in this way their face can be easily recognized.

**Noise Filtering:**

Many sources of noise may exist in the input image when captured from the capturing device. There are many techniques for noise removal and they are noise reduction, filtering, image noise, median filtering, etc. In our system median filtering in is used for the purpose of noise removal in the histogram image.

**Skin classification:**

This is for increasing the efficiency of the face detection Algorithm using classification. As shown in the Figure pixel which are closely related to the skin becomes white and other becomes black. This binary image is used for the threshold value of skin colors.

**Connected Region Analysis:**

The image output it by morphological processing, but it still contains quite a few non-face regions. Most of these are hands, arms, regions of dress that match skin color and some portions of background as well.

In connected region analysis, classification of each connected region is necessary and hence image statistics from the training set are used to classify each connected region in the image.

**Face Detection:**

In this section when we mark the circles on the faces of students face gets detected. Artificial neural networks, Open CV, Viola Jones, etc are used for classification of face detection. and in this technique we used Haar classifiers for detection. Initially face detection algorithm was tested on variety of images with different face positions and lighting. Conditions and then algorithm was applied to detect faces in real time video that is important in a way to detect the face.

Fig 8: Face Detection

After the detection of faces from the images there is next step that is cropping of each detected face to apply a classification algorithm of Haar Classifier. The algorithm uses the technique of threading to enhance the speed of algorithm that really enhances the speed to provide best results in particular time. And for recognition of image each cropped image is assigned to a separate thread.

Fig 9: Cropped Faces

**Face Recognition and Attendance:**

As there are many steps which need to be followed and hence after the face detection step the next is face recognition. It first crops the first detected face from the image and compares it with database in face recognition step. And this is known as the selection of region of interest. In this way the faces of students are verified one by one by comparing it with the face database using the Eigen Face method and attendance is marked on the server. Face

Recognition techniques are used in our system for face is recognized or not and even for giving best results. And when face recognition completed, faces that are recognized will be marked as present and the other faces that are remaining will be marked as absent which provides attendance of students. Also as today technology is increasing and giving many new techniques and hence SMS option. Will be provided so that is student present or absent status will be sent automatically to registered mobile number. And in this way export to EXCEL sheet is provided to take the print out of attendance status for the purpose of proof or security.

## 5. CONCLUSION

Proposed system gives efficient and best results. And in this paper we presented the efficient and best methodology of attendance in the program venue and this is replacement of traditional way of attendance making which is very efficient and useful now a days. This kind of proposed methodology aims to give the advantages like secure, reliable, robust and user-friendly service that is also very useful now days. And here we don't require extra hardware or software. And hence it can be done using a separate camera or laptop camera also, which is very effective.

## REFERENCES

[1] QuratulainShafi, Javaria Khan, Nosheen Munir and NaveedKhan Baloch," Fingerprint Verification over the Network andits Application in Attendance Management "InternationalConference on Electronics and Information Engineering 2010.

[2] Tabassamnawaz, SaimPervaiz, ArashKorrani, Azhar-ud-din,"Development of Academic AttendenceMonitoring SystemUsing Fingerprint Identification," IJCSNS InternationalJournal of Computer Science and Network Security, VOL.9No.5, May 2009.

[3] Phillip Ian Wilson, John Fernandez, "FacialFeature Detection Using Haar Classifiers". Journal of Computing Sciences in Colleges;2006

[4]Alexander Kuranov, Rainer Lienhart, and Vadim Pisarevsky. "An Empirical Analysisof Boosting Algorithms for Rapid ObjectsWith an Extended Set of Haar-like Features" Intel Technical Report MRL-TR-July02-01;2002

[5] M. Turk and A. Pentland (1991). "Face recognition usingeigenfaces". Proc. IEEE Conference on Computer Vision andPattern Recognition