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Automated Attendance Monitoring System using Face Detection and RFID Cards

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Abstract*: The attendance serves the most important role in the academic life of any student. Most of the colleges follow the traditional approach of attendance in which the professor speaks out student's name and record attendance. For each lecture, this repetition of attendance calling is actually wastage of time and a time-taken procedure for calculating attendance of each student. Here an automatic process is proposed which is based on image processing with radio-frequency identification to avoid the losses. In this project approach, there is a use of face detection & RFID cards. Firstly, use the pre-processing step for the face detection and RFID receiver for the RFID cards counting and the second step is to detect, recognize and then the face is matched with stored images in the database. In this paper, viola-Jones algorithm is used for face detection, in which first step of integral image is used for feature computation and Adaboost algorithm is used for feature selection in second step. Then for discarding the non-faces, cascade classifiers is used in the third step of algorithm. The working of this project is to detect and recognize the face and RFID cards then mark the attendance for the corresponding face in the database on matching the face and unique number to the stored dataset. Face detection and RFID cards will be used as input and the attendance will be marked as output. This project is being conferred as a clarification for the "Automated attendance monitoring system." Here a system of automatic face detection and recognition is proposed to mark the attendance automatically in database. This will save the time of person who is using traditional pen & paper based approach for attendance and hence is a solution for the automated attendance monitoring system. RFID cards are very helpful here for tracking or monitoring the student/teacher/employees within the campus. This system can be used in schools, colleges for students as well as for teachers also and it can be also used in companies, hospitals and malls for maintain records of accurate attendance of their employees.

***Keywords* : Automatic attendance monitoring system, radio frequency identification cards, face detection and face recognition, viola-Jones algorithm, Haar-features, PCA, LBP.**

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I. INTRODUCTION

Almost each and every academic institute has assertive benchmark for students regarding their attendance in lectures. That is why keeping an accurate attendance is very important. Usually, all colleges and organizations use the pen and paper based attendance system which is difficult to maintain due to the long dataset for the attendance record. Professors manually calculate the attendance percentage of each student and similarly for employees as well.

To overcome with this problem automatic attendance monitoring system is very useful. This will automatically update the attendance of students in their classroom and maintain the record of each and every student. Purpose of this automatic system is to minimize the fault. It saves time and maintains the accuracy of the attendance using the radio-frequency identification and face detection.

On implementing this system in schools, colleges and universities, it will be of a great help for parents and teachers both. Parents will never being confused about the prominence of their ward in the classroom in case the university is using an automatic attendance monitoring system. In traditional attendance system, the students may easily exploit registers. In case of information through emailing to parents, again there are chances that before parents could see emails; they could be made to disappear. Using the proposed system in place of traditional, the parents may receive the soft copy of information directly through mobile number or through their email accounts.

II. LITERATURE REVIEW

RFID CARD BASED ATTENDANCE SYSTEM:

In RFID card attendance system; there was a receiver which was used to detect the RFID card while it swaps on it. The main disadvantage of this system was that it supports the proxy system of students and employees of any organization [14]. Another system is automatic attendance system using the image processing; the image is detected and recognized with the help of open CV using HAAR cascade classifier and in this system the main drawback is that when the weather or quality of video camera is not good then attendance will not marked.

In Attendance System which is based on Face Recognition while monitoring students Using RFID Technology, four phases are including face database, detection,

face recognition and marking attendance and in this paper local binary pattern is used for face detection & recognition and this project works also helps in monitoring and tracking the student's location in the campus when student is carrying RFID based ID card and this will also help in monitoring the work of faculty members also SMS for students internal marks will be send by using GSM module.[18]

FACE DETECTION SYSTEM OF CLASS STUDENTS FOR MARKING THEIR ATTENDANCE:

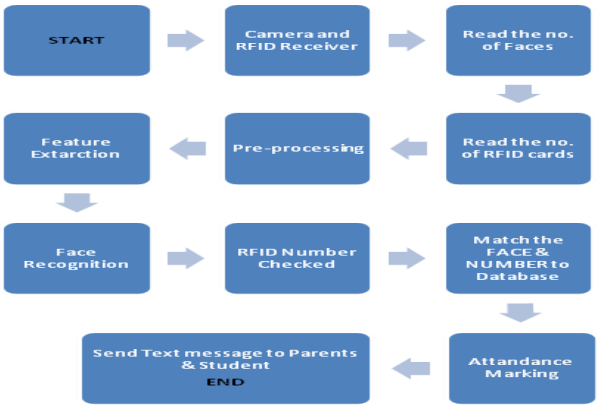
While recognizing faces, the students' image is captured, while entering the classroom or of everybody already occupies in the classroom. The students' attendance will be automatically recognized [11]. The camera will capture the image and if the image detected matches with the sample image stored of the database then attendance will be marked.

In this project work the attendance is updated automatically by using the face detection using the Eigen face identifier in which face are matched with the stored database and then automatically attendance will be marked. This work reduces the work of the professor of taking traditional or manual attendance.[16] This system has author added a new feature of recognizing whether the student is sleeping during the lectures or awaken. In this system for recognizing the student's face there are two techniques are proposed that are feature based and brightness based approach and in this project human faces are fast and precisely recognized from the real-time video. In this project Deep learning concept for face recognition is applied.[17]

III. MOTIVATION

The main motivation behind this project was to find an alternative for traditional and manual approach of taking pen and paper based attendance system which is very slow and inefficient. To accomplish this automated fast and efficient attendance system is designed. Face detection technique is in continuous use to detect and recognize the crime scene using the CCTV footages. 'Deep Face' is an algorithm which is used by Facebook. Its accuracy for recognizing the face is near about 97.3% which is approximately similar to the human which is 97.5%. This work is being carried out due to the problems that have been highlighted on the traditional method which teachers use to take attendance during every lecture.

IV. PROPOSED SYSTEM



A. Overall Flow Diagram

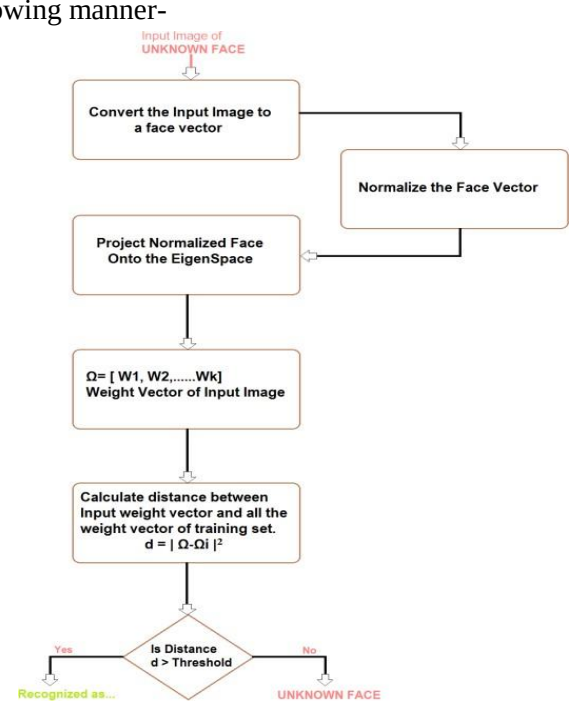
B. Construction

In this work, the framework includes one or two cameras.

One camera is mounted simply over the access; therefore, it can detect and catch the pictures of students coming into the class. Another camera is mounted on the opposite side of the entryway in the same as it can detect and catch the images of active students. RFID card receiver will check the total number of card present in the classroom [8].

C. Flow Chart of Algorithm

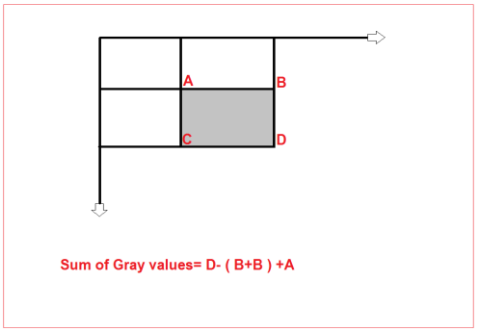
Complete flow chart of the algorithm with mathematically equations can be explained in such a following manner-



Step by step explanation of Algorithm in details is as follows:

STEP-1: Integral Image from feature computation

Viola-Jones algorithm for face detection involves this integral image processing step in which input image is turned into 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.



STEP-2: Adaboost Algorithm for feature selection

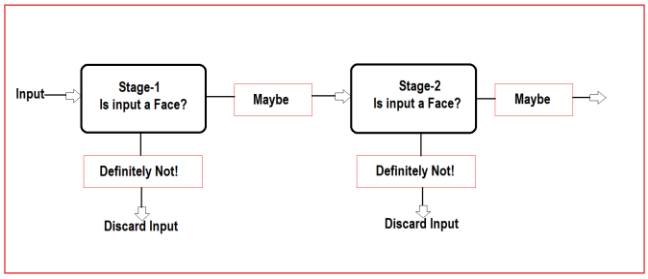
In this algorithm approximately 160.00 feature values within a detector can be calculated at base resolution. Adaboost algorithm is a machine learning algorithm which is capable of constructing a strong classifier through a weighted combination of weak classifier. Weak classifier can be mathematically represented as –

$$h(x,f,p,t)= 1 \; pf(x)>t$$

$$0 \text{ else;}$$

Where x ix 24*24 pixel sub-window, f is applied feature, p the polarity and t the threshold that decides whether x should be classified as a positive (a face) or a negative (a non-face).

STEP-3: Cascade Classifiers for discarding non-faces



V. STPES OF PROPOSED SYSTEM

An attendance monitoring system which is fully automated is proposed here using RFID cards and image processing using computer vision toolbox as [6]:

- Student's database formation.
- Capture pictures using video camera in class rooms.
- Number of RFID cards detected by RFID receiver.
- Frame selection from the video.
- Face detection.
- Feature extraction.
- Recognized face will be compared to the stored database features.
- RFID card's unique number compared with features stored in database.
- Mark attendance in the database.
- Send text message to respective their parents and students also.
- Report of attendance will be sent to their respective professor.

VI. PROCESS OF PROPOSED SYSTEM

A. HAAR cascade classifier

There is focus on examination towards adding to associate in nursing unsupervised pattern acknowledgment technique that doesn't believe upon supernumerary pure mathematics and calculations like deformable layouts. Eigen-faces arrange perceived to be an adequate technique to be utilized as a vicinity of face acknowledgment owing to its easiness, speed, and brain.

During this paper, there is a proposal that first the entry gate camera can take the pictures of the students getting into the room so it'll extract the options of the face and record them. Students may enter one by one or may enter within the cluster conjointly. It simply faucets the image because it detects associate in nursing understand in its sensing element.

B. Face detection

Object Detection utilization Haar characteristic-based cascade classifier is an efficient object recognition technique anticipated by Paul Viola and Michael Jones in their research work, "Rapid Object Detection employs a Boosted Cascade of simple Features" in 2001[18]. It is machine learning primarily based approach wherever a cascade exercise is trained from heaps of the positive and negative pictures. It is then neglect objects which are in alternative pictures.

The instrument is a server supported account of the focused occupation of the processor for the face location calculations, detection endeavor, the article of enthusiasm for this case is that the face. Be the because it could, varied variable will interface the face recognition calculations, components, for instance, image hues position, scale, turn, face postures, light-weight so forth[7].

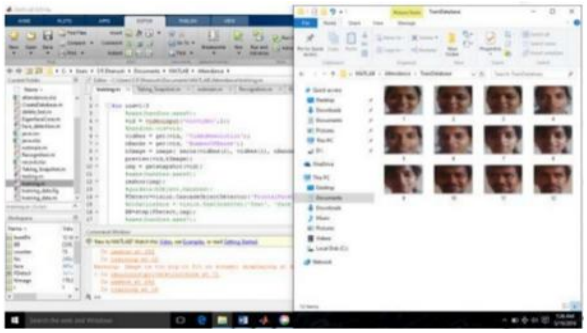


Fig: Database Creation of Student's Faces

The procedure of detection work faces from still photos containing completely different faces may be isolated in a very few stages. There square measure loads of face identification calculation which may viably distinguish a face in a very exposure. Within the framework introduced, most students face the camera.

The input image which was previously in RGB format is first converted to image which is in gray-scale. For the same, the common worth of RGB for every picture element is calculated and if common worth is below than any specific worth like 110, it tend to replace it by black picture element and otherwise replace it by white picture element. Using this method, from RGB image, a binary image is obtained.

Fig: Gray Scaled image

A prime technique for distinction improvement in special domain is Histogram formalization. Once the video is given as an input to computer, by the dynamic frame generation of video, frame generation is formed. Approx 30 to 40 frames are generated by the dynamic frame generator per second and if the video length is 1 min, then huge number of frames will be generated so that the frame numbers between 99 to 1300 may be selected. Hence the frames will be processed in that frame range [12].

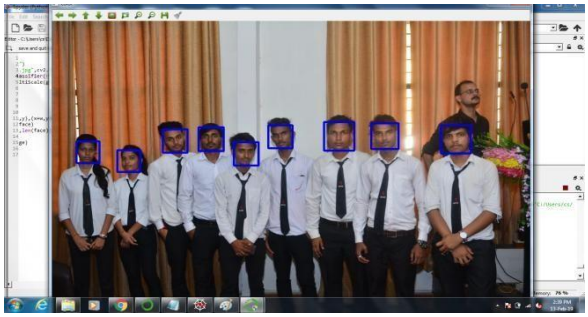


Fig: Face Detection

C. RFID Receiver

RFID receiver will check the number of faces present in the lecture room and that receiver will check the unique number which is inbuilt with that card and then unique number will be stored and then that number will be matched to the stored unique number of the database. If the number is not matched to the stored unique number of that room then attendance will not be marked and text message in associated contact number will be send. This integrated system will reduce the proxy system and if there is an extra card present and one is not present then another sheet of those students will sent with the attendance report to their respective professor [1].

D. Image Pre-processing

Feature of image extraction will be done after the pre-processing phase. In this phase unwanted noise is removed using the Gaussian blur function and then segmentation can be done of an image using threshold function. Following steps are included in pre-processing phase:

- Read image
- Resize image
- Remove noise from the image(Denoise)
- Segmentation of images
- Morphology of image(Smooth edges)

E. Feature extraction

There will be total six features that will be extracted in the processed image, features of eyes, mouth and nose by using algorithms HOG and LBP and for face recognition it will be stored in the database.

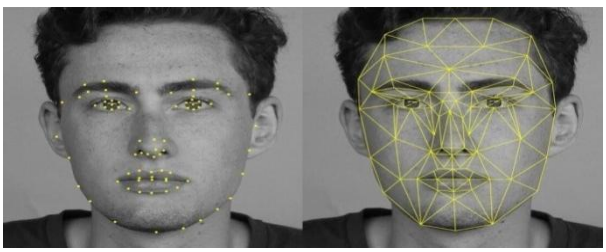


Fig: Feature Extraction of Face

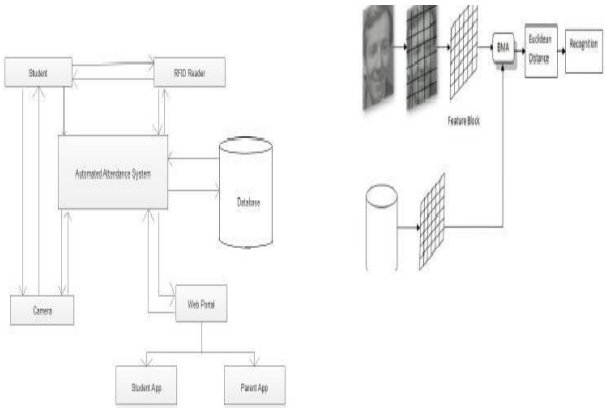
F. Face recognition

The extracted Features of image then will be compared to the available stored image of the database with the help of Support vector machine. On recognition of the features by system, after matching both faces and card number the attendance will be marked in the database.

Fig: Recognized Faces of students

G. Attendance marking

After the face recognition method completed, the attendance will be automatically marked in the database after matching the face and unique identity card number to the stored SQL database and if any record will not matched then attendance will not mark in the student's database.



H. Attendance status

After the attendance marking of student and employees the computer-generated text message will be sent to that student and their parents also, in which the attendance status of that person will be mentioned clearly. Before the completion of the lecture, final report of attendance sheet will be sent to that respective professor using his mail account in proper manner.

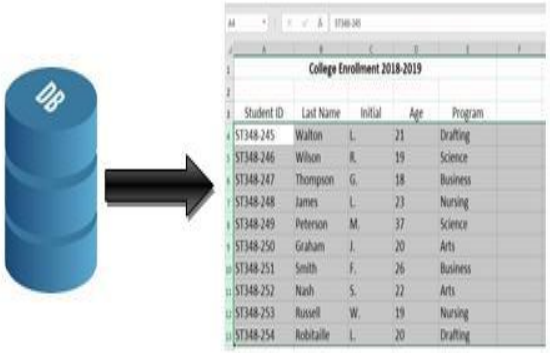


Table: Attendance Status Updation Record

UPDATE

SrNo	RollNo	Date	P1	P2	P3	P4
1	Vaibhav	04/04/2020	A	P	A	P
2	D.K.	04/04/2020	A	P	P	A
3	Fahad	04/04/2020	A	P	P	P
4	Asif	04/04/2020	A	A	A	A
5	Shivansh	04/04/2020	A	A	A	A
6	Shreya	04/04/2020	A	A	A	A
7	Mansi	04/04/2020	A	A	A	P

VII. RESULT DISCUSSION

Face detection & face recognition is the most difficult task due to unimpeded condition in the project "Automated Attendance monitoring System using face recognition and Rfid card" using viola-Jones method and local binary pattern algorithm for face detection and Yale database will be used which will provides overall 85% efficiency.

Table: Performance evolution table of proposed system

Number of faces	Number of faces detected	Number of faces recognized	Percentage of correct recognition	Number of incorrect acceptance	Percentage of incorrect acceptance	Number of incorrect rejections	Percentage of rejections
10	10	9	90%	0	0	0	0%
20	19	18	90%	0	0	1	5%
30	29	28	93.33%	0	0	1	3.33%
40	38	36	90%	0	0	2	5%
50	47	45	90%	0	0	2	4%
60	55	52	86.66%	1	1.92%	2	3.33%
70	63	60	85.71%	1	1.67%	3	4.23%
80	69	67	83.75%	2	2.98%	5	6.25%
90	78	75	83.33%	2	2.67%	6	6.67%

VIII. CONCLUSION

There can be different types of seating arrangements, different environment and low or high lightning conditions in different classrooms. Here most of the conditions of the classrooms have been tested and found overall accuracy of approx 90%. Similarly, students also have different types of facial expressions, different hair styles, beard or beardless, and spectacles etc.

Though accuracy of face recognition is low in comparison to alternative biometrics techniques, this automated attendance marking system is workable with an accuracy of approx 90%. This is as out of 10 faces, 9 are recognized. This system is easy and straightforward to use. The system is reliable that provides privacy, much more security and well-ordered knowledge on the board.

The main aim of this project is to capture the real-time video of students who are present in the classroom and then face detection and recognition process held and RFID card's unique number will be matched to their allotted unique number. When face and respective unique number will be matched then that will ensure presence and absence of students. Then the attendance will marked of particular student to maintain the record and status will be shared to respective students as well as their parents.

This project eliminates any credibleness of proxy and additionally keeps the record of attending of scholars during a well viable approach. The attending is ready apart on the premise of in and out times record by the cams. The project is likewise acceptable putting in an alternate record everywhere for detainment list. This project will decrease the clerical work of school, colleges and organization [2].

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