FACE RECOGNITION BASED AUTOMATIC ATTENDANCE MANAGEMENT SYSTEM USING RASPBERRY PI

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. ***Abstract*—**Face detection is concerned with findingwhether or not there are any faces in a given image and, if present, returns the image location and content of each face. Security and surveillance are the two important aspects of human being. In this paper we propose face detection and recognition based automatic attendance management system that will capable of processing images very fast while acquiring very high true positive face detection rate. This paper describes a simple and easy hardware implementation of face recognition based automatic attendance management system using Raspberry Pi, which itself is a minicomputer of a credit card size and is of a very low price. A specific amount of time is set and after completion of that time period the captured attendance will be directly stored and uploaded into a database automatically using ethernet and without any human interaction. camera is connected to one of the USB ports of raspberry pi. Haar Cascader and Eigen Faces algorithms are used for face detection and recognition respectively. The results reveal that the proposed system can be used for effective attendance management and shows excellent performance efficiency.

***Keywords*—Face Detection, Face Recognition, Haar Like Feature, Raspberry Pi, Eigen Face.**

I. INTRODUCTION

In associations, enterprises and many organizations are taking the whole participation utilizing RFID techniques for taking attendance, registers, Moodle based understudy ID recognizable proof and unique finger impression modules. In registers, the whole participation will be figured and reports will be assembled toward the end.
It requires greater investment for computation. RFID innovation disentangles customized remote utilizing advanced inactive and dynamic with distinguishing pieces of proof suitable pursuers. In brief span, worth's of dispersion and usage for a RFID card based passage bunch framework can be fairly costly. An RFID based passage bunch framework has the capability of genuinely abusing human's security or protection. RFID procedures at last impacts programming that permits each individual to be broke down by essential information base. This kind of condition will be under assault of programmers. In the event that the RFID per user and recipient are not legitimately coordinated then less read rate can happens. Biometric time and nearness framework is one of the most precise prerequisite in biometric innovation.
Unique finger impression acknowledgment-based participation administration framework is a running field today, yet acknowledgment of singular unique finger impression from an arrangement of selected fingerprints is a period taking procedure. Most unique finger impression-based participation frameworks store the fingerprints of a client in the unique mark module database. The unique mark framework does not uncover any information about the first unique mark of the client. This suspicion has now been appeared to be false; numerous calculations [6] have been expressed that can reestablish unique mark pictures from particulars layouts. These biometric frameworks, RFID frameworks and Moodle based understudy ID recognizable proof frameworks are close to home recognizable proof frameworks utilized for participation administration frameworks and numerous security frameworks. In resulting days for any frameworks security, protection what's more, exactness is basically ascertaining parameters yet these frameworks are damaging security and off base. In this way, it is imperative to outline a framework with exceedingly secured and exact.
The face recognition based automatic attendance management system built using raspberry pi3 implementing haar cascade and eigen faces algorithms is highly secured, efficient and accurate. this system captures the faces of students through camera which area associated manually with their roll numbers. By accessing the database, the details of the student like date and time of present or absentee is calculated. The system detects and recognizes the facial images of students that are stored associated with their names or ID codes. This system can be mainly used by organizations to take period wise attendance by setting the time period.
In this paper Section II consists of the related work, Section III consists of methodology and requirements, Section IV consists of overview of the system and Section V describes the results obtained.

II. RELATED WORK

In recent years face recognition has received substantial attention from researchers in biometrics, pattern recognition, and computer vision communities. The machine learning and computer graphics communities are also increasingly involved in face recognition.Besides, there is a large number of commercial, security, and forensic applications requiring the use of face recognition

technologies. These applications include automated crowd surveillance, access control, mugs hot identification (e.g., for issuing driver licenses), face reconstruction, design of human computer interface (HCI), multimedia communication (e.g., generation of synthetic faces), and content-based image database management. A number of commercial face recognition systems have been deployed, such as Cognate, Eyematic, Viisage,andIdentix. Facial scan is an effective biometric attribute/indicator. Different biometric indicators are suited for different kinds of identification applications due to their variations in intrusiveness; accuracy, cost, and ease of sensing [9]. Among the six biometric indicators considered in, facial features scored the highest compatibilityin a machine readable travel documents (MRTD) system based on a number of evaluation factors.

III. METHODOLOGY

Face recognition for automatic attendance management methodology mainly involves (i)face detection and (ii)face recognitionThis section briefly describes about the software algorithms, opencv , Raspberry pi3 and other components used.

3.1 FACE DETECTION

Haar cascade classifier algorithm is used for face detection. Haar classifier calculation checks the picture and makes a bouncing box as returns for each distinguished face. The element extraction in face location is finished by limiting of the qualities of face parts (i.e., eyes, mouth, nose and so on) in a picture. In different terms, the component extraction is a stage in face identification and acknowledgment where the framework finds certain focuses on the countenances, for example, corner and focal point of the eyes, tip of the nose, mouth and so forth. It breaks down spatial geometry of differential component of a face as shown in figure 1. Consequence of this breaking down is an arrangement of layout produced for each face.The format comprises of a lessened arrangement of information which speak to the constant face identified in limited box.Two stages are there in this stage ID and confirmation. These two term ID to distinguish the face continuously video and check application for face acknowledgment which investigate of this paper. The setup will decide how the application ought to carry on in view of the coveted security and operational thought.

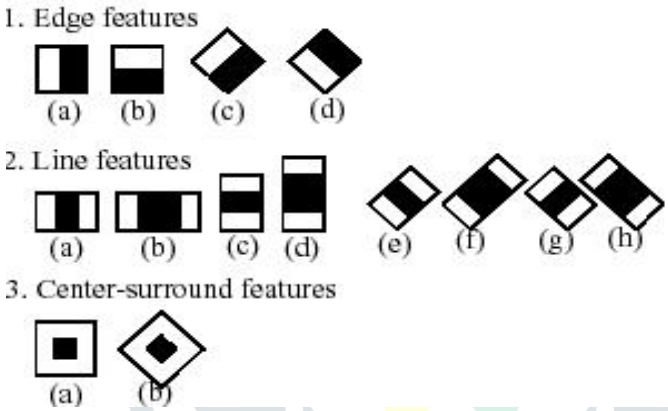

Figure 1: Haar classifier

The working of Haar cascade classifier algorithm is shown in the figure

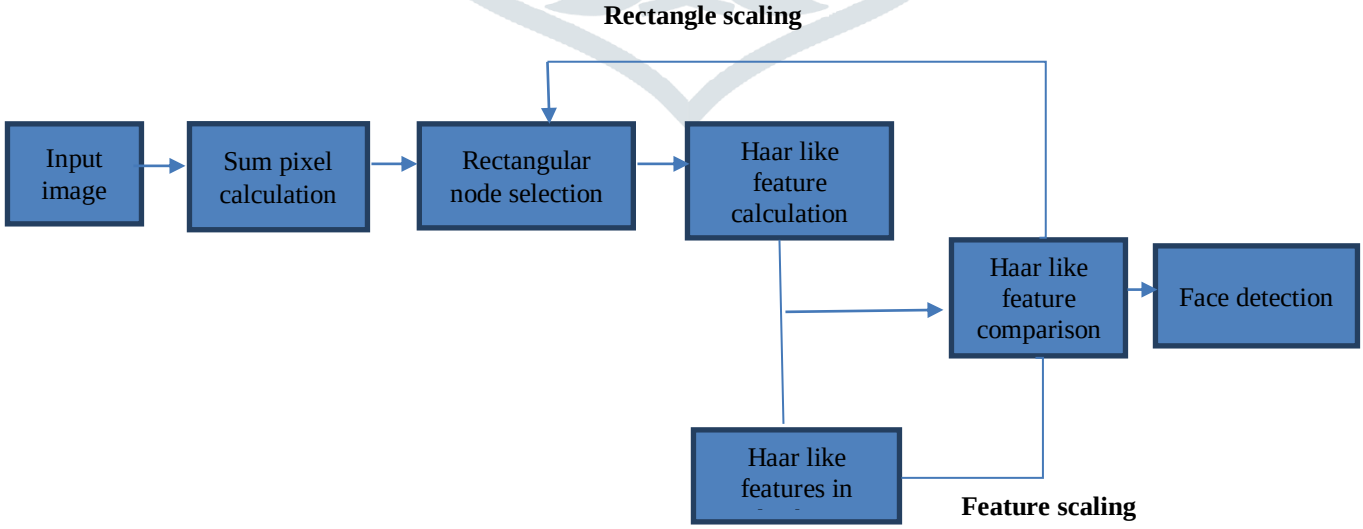

Figure 2: Working of Haar classifier algorithm

3.2 FACE RECOGNITION

Face recognition using Eigen faces algorithm can be done by the following steps.

Step 1: capture the face images named like C1,C2,C3,……. Cm, and arrange these in the form of NxN matrix. After applying haar classifier in the previous phase these faces are all centered and of same size. this image is converted into N 2x1 vector.
Now we get V which is an N 2x1 vector, for every NxN face image C.

Step 2: An average face vector Ψ, is calculated by which we will find out mean of the all images in the database.

$$\psi = \frac{1}{M}\sum_{i=1}^{M} Vi \qquad \text{Eq.1}$$

Step 3: the average face vector thus obtained is the mean image. now, subtract mean image from the N 2x1 vector

$$\varphi i = Ti - \psi \qquad \text{Eq.2}$$

Step 4: calculate the co variance matrix S

$$S = \frac{1}{M}\sum_{n=1}^{M} \phi n \phi n^{T} = AA^{T} \qquad \text{Eq.3}$$

$$A = [\Phi 1\ \Phi 2 \ldots \Phi M]$$

Step 5: calculate the Eigen Vectors of the covariance matrix. The Eigen face algorithm compares the faces captured by the camera with all matching images and returns the nearest matching image.

3.3 REQUIREMENTS:

3.3.1 OPEN CV

Open CV 'open source PC vision library' is an open source picture preparing library made by Intel 8109 what's more, kept up by Willow carport accessible for C, C++, what's more, Python. OpenCV is need a compiler like DevC++, code squares, visual C++. In this paper
utilizes C++ dialect furthermore, DevC++ compiler. In OpenCV there are four modules. Predominantly utilized are CV: primary OpenCV capacities, picture handling calculations, vision calculations and highgui: GUI capacities, Image and Video I/O. Utilizing this OpenCV, we will stack pictures caught by camera. These pictures are in three configurations paired picture, dark scale picture and shaded picture. The hued picture contain R G B with pixel values containing 0-255. It has profundity of the picture with 8 bits and 3 channels. For stacking the picture utilizing Open CV, the taking after program is utilized.

3.3.2 RASPBERRY PI 3

The raspberry pi 3 is a little Mastercard measured PC that attachments into screen, console or touch show. The Raspberry pi 2 display B is utilized as a part of this venture also, it gives six times the handling velocity of other past models. The raspberry pi 2 demonstrate B has Broadcom BCM2836 processor. BCM2836 is high fueled ARM cortex-A7 based quad-center processor and keeps running at recurrence of 900MHz with memory ability to 1Gbyte. It has 40 stick GPIO Header for interfacing the outside gadgets to speak with processor. The correspondence media's resemble I2C, CAN, SPI and in this extend GSM is utilized by direct association with TRX and RXI sticks in GPIO. It has quad USB ports, 10/100 Base T Ethernet attachment, DSI Display connector, Micro SD card space, 5v Micro USB, HDMI port, CSI camera connector what's more, 4-shaft 3.5mm jack All of these are appeared in

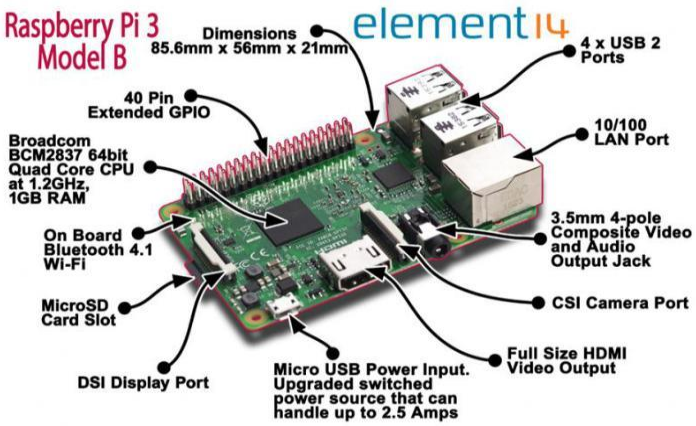

Figure 3:Raspberry pi 3

4. OVERVIEW OF SYSTEM

The overall functionality of the system can be explained with the help of a block diagram as shown in figure-4 .At one corner of the class, A camera interfaced to raspberry pi3 is placed. whenever the timer is set every individual faces are captured by the camera. This can be done by setting the internal timers present in the Raspberry pi3. when the recognition process starts, both face detection and recognition is done on the images captured by the camera. Using Qt creator an application is developed for showing the student

details like name or roll number time of present or absent. After completion of the specific time a file which contains the student details as said above is generated. In order to post the attendance in server, the Raspberry pi 3 is connected to LAN by ethernet port. Camera and external storage devices are connected through USB PORTS of Raspberry pi 3.

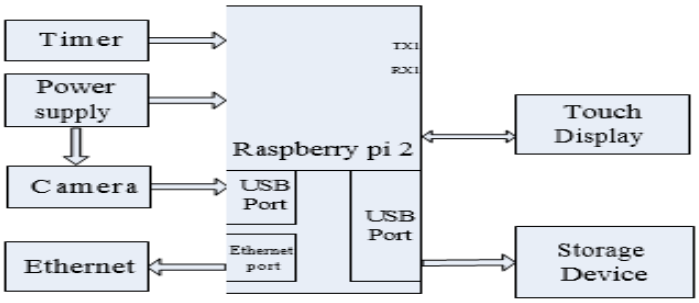

Figure 4: Block diagram of entire system

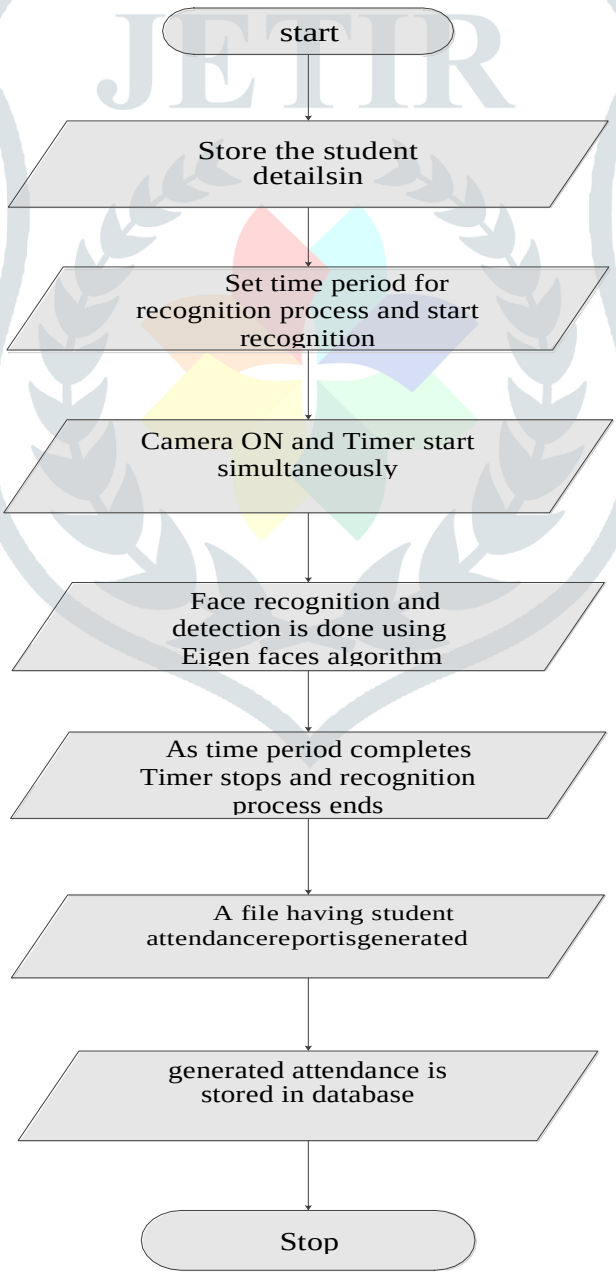

Figure 5:workflow of system.

V EXPERIMENTAL RESULT

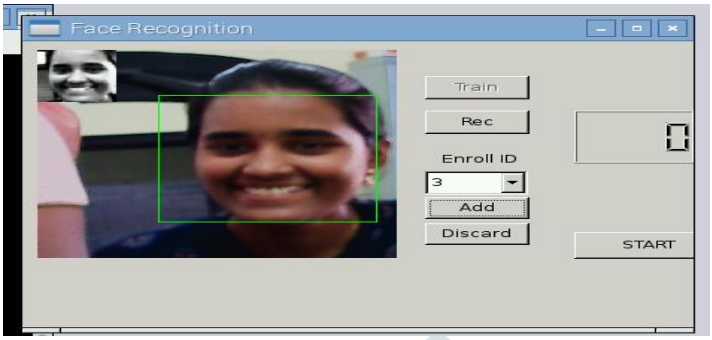

Figure 6: Enrollment of student with ID

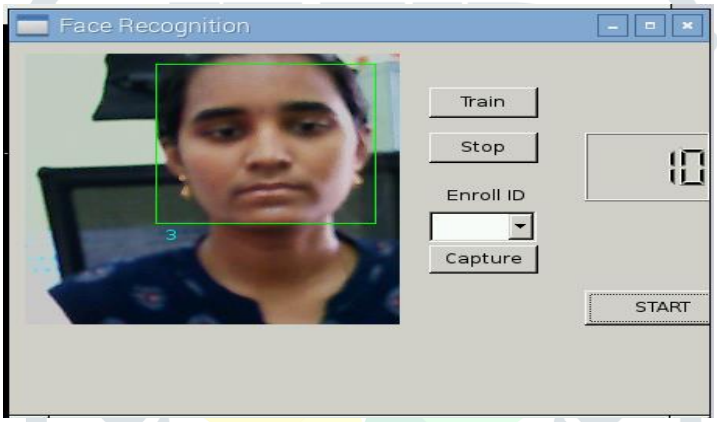

Figure 7: Recognizing student

V1.CONCLUSION

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It can be concluded that a reliable, secure, fast and efficient class attendance management system has been developed replacing a manual and unreliable system. This face detection and recognition system will save time, reduce the amount of work done by the administration. The camera plays a crucial role in the working of the system hence the image quality and performance of the camera in real time scenario must be tested especially if the system is operated from a live camera feed. The major threat to the system is spoofing. For future enhancements, anti-spoofing techniques could be used to differentiate live from static images in the case where face detection is made from captured images from the class room. From the overall efficiency of the system i.e. 83.1 % human intervention could be called upon to make system foolproof. A module could thus be included which lists all the unidentified faces and the lecturer are able to manually correct them.

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