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Implementation Of Classroom Attendance Monitoring Using Face Detection And Raspberry-Pi

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ABSTRACT: Attendance for the students is an important task in class. Thus the drawbacks arise as it consumes time, needs manual work and the most important, information or the attendance can be manipulated. Also, there are chances of students not responding to their attendance and later claiming for the attendance. So, we proposed an automation of attendance system by using face recognition. The primary identification is Face for any human. This paper describes the method of detecting and recognizing the face in real-time by utilizing Raspberry Pi. This project describes an efficient algorithm using open source image processing framework known as OpenCV. Our approach has five modules – Face Detection, Face Preprocessing, Face Training, Face Recognition and Attendance Database. The face database is collected to recognize the faces of the students. Initially, The system is trained with the student`s faces which is collectively called student database. This project can be used for many other applications where face recognition can be used for authentication.

Index Terms: Raspberry Pi, Detection, Preprocessing, Training, Database, Recognition.

I.INTRODUCTION

Checking the performance of students and maintaining theattendance is a tedious process for institute. Each institute hasadopted their own method of taking attendance i.e. calling thenames or by passing the sheets. Several very popularautomatic attendance systems currently in use are RFID, Iris, fingerprint[1] etc. However, making queue is essential inthese cases thus requires more time and it is intrusive innature. Any damage to RFID card can make inappropriateattendance. Apart from this deploying these systems on largescale is not cost efficient. In order to have a system both timeand cost efficient with no human intervention, facialrecognition is the suitable solution also face is people'spreliminary scheme [2] of person identification.

With the rapiddevelopment in the fields of image processing [3][4] such as patternrecognition, facial recognition and signature recognition theefficiency of this system is keep on increasing. This system isattempting to provide an automated attendance system thatcarries out the face recognition task through an image/videostream to record the attendance in lectures or sections andkeeping the database of attendance. After creating the databaseof the students/ candidates, it requires almost zero efforts fromthe user side. Thus intrusive nature is absent in this system andmakes the system effective.

Face Recognition technique is one of the mostefficient biometric technique for identification ofpeople. [5] We can utilize it in the field ofeducation for managing the attendance of students.There are a lots of colleges and schools in whichthousands of students are taking the education. Inevery classroom there are about ninety to hundredstudents are studying. Also in every few days, anew school or college is opened.

To maintain theattendance and records of these so many numbersof students is a very difficult task.

In [6], the process of this face recognition systemis divided into various steps, but the importantsteps are detection of face and recognition of face [9][10].Firstly, to mark the attendance of students, theimage of students' faces will be required. Thisimage can be snapped from the camera device,which will be placed in the classroom at a suitablelocation from where the whole classroom can becovered. This image will act as input to the system.For the effective face detection [8], the image needs tobe enhanced by using some image processingtechniques like grayscale conversion of image andhistogram equalization [7]. To identify the studentssitting on the last rows neatly, the histogramequalization of image needs to be done.

II.PROPOSED SYSTEM

Now days the entire period attendance is stored in register andat the end of the gathering the reports are generated. Staff is notconcerned in creating report in the intermediate of the sessionor as per the prerequisite because it takes more time incalculation. In this project, Raspberry pi is utilized asmicrocontroller which stores all the records of the students andyields the results. Pi is a tiny affordable cost computer that canbe used as a Single board computer.

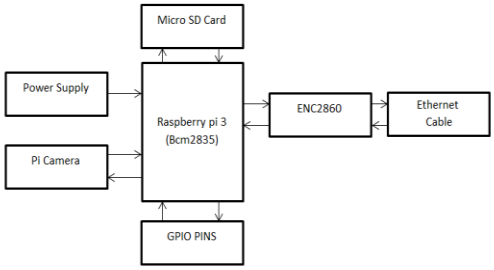

Fig 1. The block diagram of proposed system

In above figure power supply is connected to the raspberry piwhich is the heart of the proposed system. Pi camera is connected to the raspberry pi camera slot. Camera captures the images of the students who are present in the class. Raspberry pi takes those images as input images and compares the input images with the existing image. This happens due to importing the open CV packages at the initial stage of the development of the system. Admin tracks the attendance of the studentsperiodically or whenever required by the administration andfinds the result. The result is displayed on the monitor screen which is connected to the raspberry pi through the Ethernet cable.

The hardware implementation includes the camera to capture the image of the classroom, buzzer- to buzz at the set time. The main controller unit is Raspberry-pi. The software platform used is Raspbian (Linux OS), Python programming language and OpenCV image processing library. The working procedure starts with a buzzer giving a beep sound which aims at attaining attention of the students towards the camera to capture the image. The camera then captures the snapshot of classroom in which, the OpenCV detects the faces and thus are

processed and are compared with the student image database. The matched faced students are marked present and the remaining students are considered to be absent, then alert sms will be send to their parents and head of department.

The proposed system estimates the attendance of each student by observation and recording which has an improved technique such as method to obtain different weights of each focused seat according to its location. We also proposed the approach of camera planning based on the result of the position estimation in order to improve face detection effectiveness.

In further work, we intend to increase face detection effectiveness by utilizing the interaction among our system, the students and the teacher. On the other hand, our system can be improved by integrating video-streaming service and lecture archiving system, to provide more profound applications in the field of distance education, online examinations, course management system (CMS) and support for faculty development (FD).

The total system is classified into 3 modules: Database creation, Training the dataset, Testing.

1. Database creation: Initialize the camera to discard empty frames and set an alert message to grab the attention of the students. Then get user id as input and convert the image into gray scale, detect the face id in it and store it in database by using given input as label up to 20 frames. If the given sample is greater than 20 frames then break and if not continue the process.

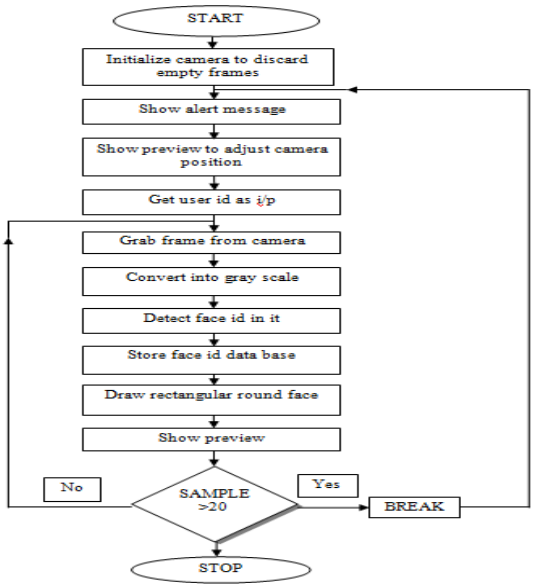

Fig 2. Flow chart for Data base

2. Training: In training, initialize LBPH face recognizer. Then get faces and Id's from database folder to train the LBPH face recognizer. Save the trained data as xml or yml file. Finally, show the message and exit.

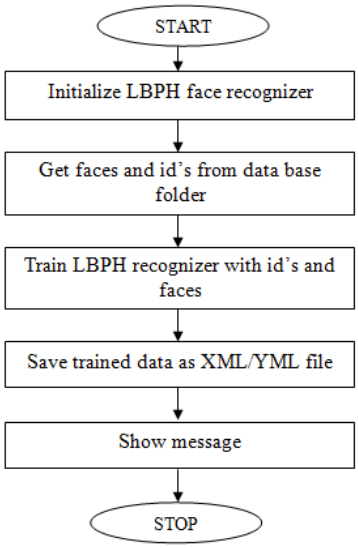

Fig 3. Flow chart for training

3. Testing: Initially, Load Haar classifier, LBPH face recognizer and trained data from xml or yml file. Then capture the image from camera and convert it into gray scale. Detect the face in it and draw rectangles around faces. Predict the face using the above recognizer.

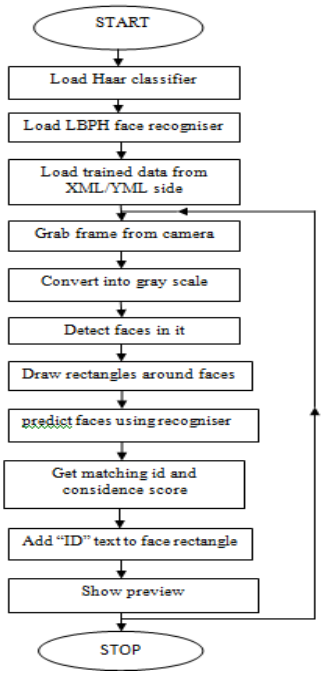

Fig 4. Flow chart for testing

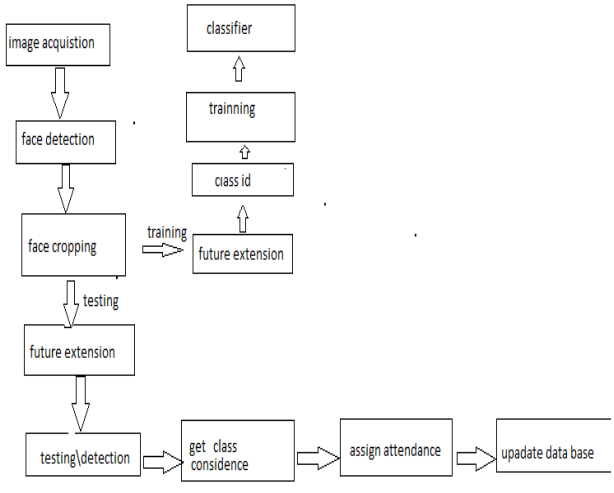

Fig 5. Algorithm

Initially, capture the image of students from camera and image acquisition is done. Then after detection of faces, each student's facewill be cropped from that image, and all thosecropped faces will be compared with the databaseof faces. In that database, all students' informationwill be already maintained with their image. Bycomparing the faces one by one, the attendance ofstudents will be marked on server.

III.RESULTS

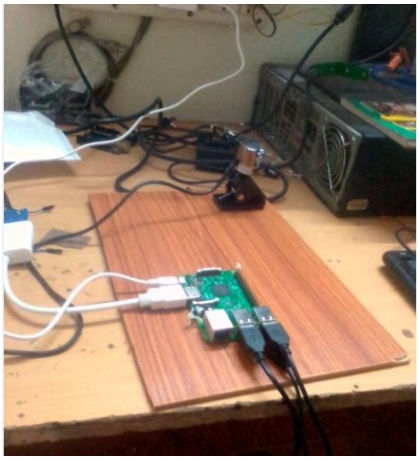

Fig 6. Hardware Implementation

The above fig (6) shows the hardware implementation of the proposed system.

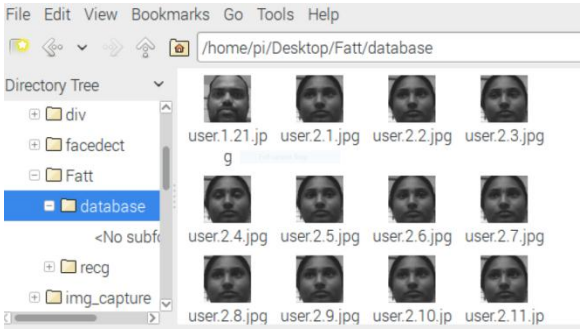

Fig 7. Data Base created

The above Fig (7) shows the data base which is initially created and stored in the

Raspberry pi. It shows single face of each student present in database.

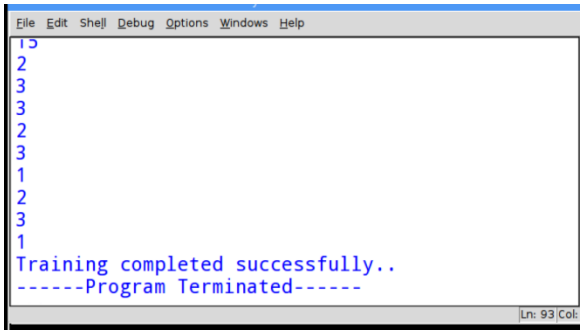

Fig 8. Train Output

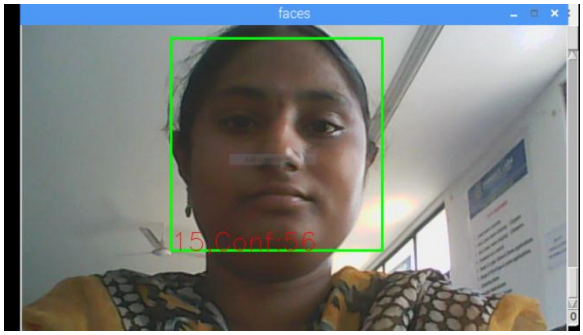

Fig 9. Test Output

Figure 9 shows the extraction of face region and updating tothe database after pre-processing.

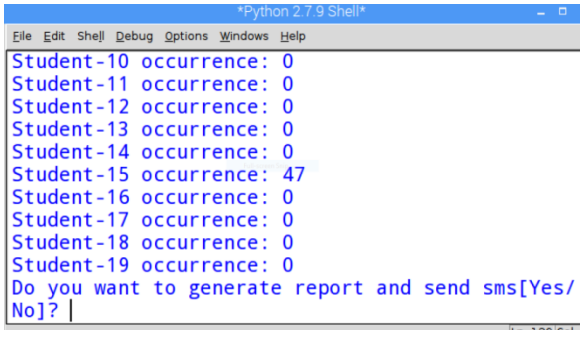

Fig 10(a). Final Output

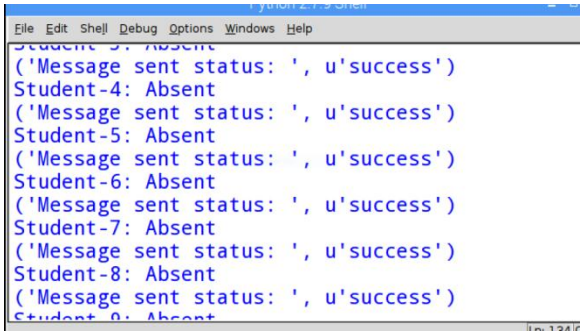

Fig 10(b). Final Output

Theresult of face recognition with corresponding attendance is shown in Fig10.

IV.CONCLUSION

The smart and automated attendance system canbe proven as an efficient system for classroomattendance. By using this system the chances offake attendance and proxies can be reduced. Thereare a lots of Biometrics Systems which can be usedfor managing attendance, but the face recognitionhas the best performance. So we need to implementa reliable and efficient attendance system forclassroom attendance which can work for multipleface recognition at one time. We found the solutionfor light intensity problem and head pose problemfor which we can use the Illumination Invariantalgorithm. Also to implement this system, no anyspecialized hardware is required. A camera deviceand a standalone PC, database servers are sufficientfor constructing the smart attendance system.

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