Smart Attendance System Using Face Recognition

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ABSTRACT

Maintaining attendance of student is very important task in every Educational Institution. As we know, when the attendance of student is taken by manually it weaste large amount of time of teacher as well as student. To overcome above issue we develop a system as smart attendance system using Face Recognition. Here we work with one of important identifier 'Human Face'. This system Detection and Recognition of face using the Raspberry pi, and also uses the open source image processing platform i.e OpenCV. The system is split into three main parts such as Face Detection, Face Train, Face Recognition. At initial stage we create face database to recognize the student faces, after that detected faces will be compared with face which was in face database and recognition of faces is done. The proposed system uses the device Raspberry pi which is more portable, user friendly and it can easily connect to device for taking attendance. In this system there are major two steps Face Detection and Face Recognition, for this system integrate algorithm of Haar's Cascade which was proposed by Viola-jones for Face Detection and LBPH for Face Recognition. In automated way attendance of student is updated in database on daily basis.

Keywords: Agriculture Face Detection, Face Recognition, OpenCV, Raspberry Pi, Haar Cascade, LBPH.

ARTICLE INFO

I. INTRODUCTION

There are lots of Biometric Techniques are available for taking attendance, RFID is one of them. In ,[1] the past days attendance of student can take by using RFID but, RFID system have some disadvantages like, Too much tracking is required due this student faces mental pressure and fear and arises some health issue. To overcome these issue Face Recognition is one the efficient biometric technique to maintain the student attendance, in Face Recognition there is main focus on the human face. So, we can use Face Recognition in Educational Field like School, Colleges etc for tacking student attendance. In every classroom there are near about 80-100 students, where marking the attendance is very difficult job. The, [3] proposed system develop a solution to maintain the attendance of student by recognizing the faces. The system uses the Raspberry Pi 3(B+), as it can be use on any

platform/devices for Face Recognition. A pi-camera can be used with Raspberry. In Face Detection process positive images are separated from negative images. At initial stage the student face database can be create for recognition purpose, the database contains the face image of every student, which can be capture by using Pi-camera. Then captured image can be enhance or train by using image processing technique like Gray Scale Conversion and Histogram Normalization. For Face Detection Viola Jon's Haar Cascade classifier and Local Binary Pattern Histogram (LBPH) recognizer used. Finally attendance of student mark by recognizing their faces.

II. LITERATURE SURVEY

Many Companies, Organization and Educational Institution are taking attendance using [1], RFID technique, [2] Biometric Fingerprint and Register. All this method

required more time for processing. As RFID uses the Electromagnetic waves to track a object, RFID will cause the violation of Human Security and Privacy. RFID also affect the software that use for each person to be analyse by database. The RFID based system can be easily hacked by the unauthorized person, if the RFID Reader and Tags unable to match then system not work properly. Biometric Fingerprint [2], system use the fingerprint as unique identity. This method can used very commonly now days, but this technique of identification requires large set of Fingerprint of each individual person, which was somewhat difficult task. Iris Recognition [3], is one another technique of taking attendance, where human Iris can be scan, stored and retrieved for comparison and attendance will maintain at server, but there is problem in capturing iris of person and hence for fast accurate result Face Recognition technique is used.

III. SYSTEM ARCHITECTURE

The proposed system is used for taking attendance of student in school, college etc. The system block diagram is shown in Figure 1, it consist of Raspberry Pi Camera is connected with to Raspberry Pi 3, Power supply, Cable(Ethernet), Micro SD card(16 Gb).

3.1 **Raspberry Pi 3**

The Raspberry Pi is a small credit card size computer that connect to Desktop or TV and it also use as Keyboard and Mouse. It has inbuilt Bluetooth, Wi-Fi and more powerful CPU/GPU pairs. It is device that enable user to explore a computing and learn how to do programming in languages like Python and Scratch. It has ENC28J60 which is Ethernet Chip to get connect with Ethernet.
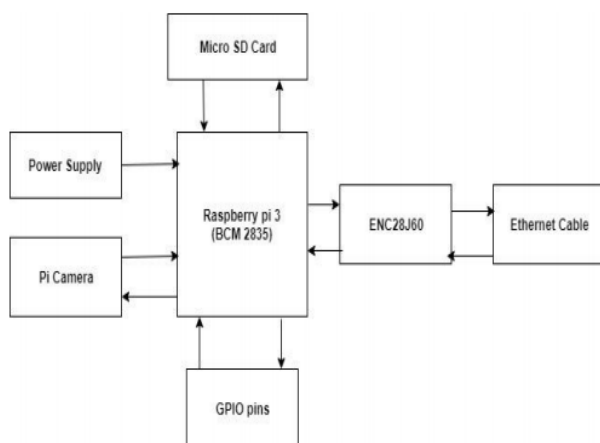

Fig.1 Block Diagram of Proposed System.

3.2 Camera

Camera (Pi-Camera) is a optical device which use for capturing or recording images, which may will store, transmit to anoth er place. The captured image may be single image or series of continuous images containing video or movie. It is type of remote sensing device that sense the object without any physical contact.

3.3 GPIO

Pins The Raspberry Pi has 40 pins General Purpose Input/ Output (GPIO) integrated with it, which can be controlled by user as per need at runtime.

3.4 Power Supply

The power supply is one of important requirement of any system to work. The raspberry pi is powered with 5 V Micro USB supply.

3.5 Micro SD Card

The Raspbian OS is required for Raspberry Pi and the minimum needed cars size is 8 GB.

IV. PROJECT MODULE

Proposed system is divided into 3 modules as Database Creation/ Face Detection, Training, Face Recognition and sending alert message as output. As shown in figure 2.
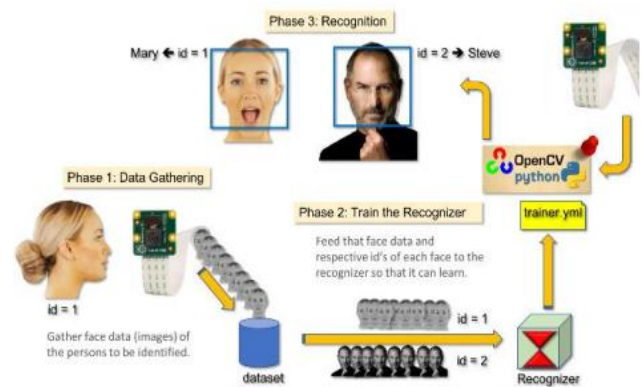

Fig.2 Block Diagram of Three Different Module.

1. Database Creation/ Face Detection

i. Initialize the camera.

ii. Get user ID as input.

iii. Convert RGB image into gray scale image.

2. Training

i. Initialize the LBPH recognizer.

ii. Feed the face data and respective Id's of each face to the recognizer.

iii. Train data will save in yml or xml file.

3. Face Recognition

i. Load the Haar's Classifier, LBPH Recognizer and data from yml file.

ii. Capture the image by camera.

iii. Convert RGB to Gray scale image.

iv. Detect a face in the image.

v. Recognize face using LBPH recognizer.

In our project the Raspberry Pi and Pi camera are two important component, the pi camera is use for capturing the

images. The Raspberry Pi GUI can be access through SSH in laptop or by using Mouse and keyboard with display devices connect to Pi.

4.1 Face Detection using Haar Cascade Algorithm

In proposed system Face Detection algorithm such as Viola and Jones [4] algorithm, called as Haar Classifiers, to detect any object, including Human faces. The face detection algorithm searches the specific Haar feature of human face. When these feature is found, the algorithm allow the face to go for next phase of face detection. Usually the algorithm needs large number of positive and negative images, positive image means image contain face and negative image are those without any face.
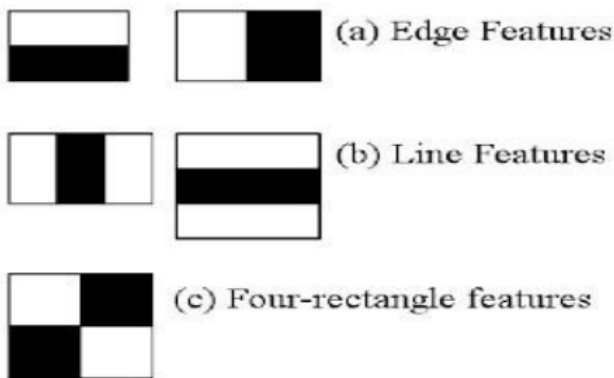

Fig.3 Haar Classifier

Each feature that extracted from image represented by a single value which will calculated by from difference between sum of pixel in white box and sum of pixel in black box. As number of classifier increases ultimately arithmetic calculation are also increases and takes more time. In order to overcome from such problem concept of Integral Image is used. The integral image is a sum of pixel values of original image. The value at location (x, y) of integral image is summation of image pixels above and left to location (x, y). Integral Image can derived by using formula.

$$C_\Sigma(x, y) = \sum_{x' \le x, y' \le y} c(x', y')$$

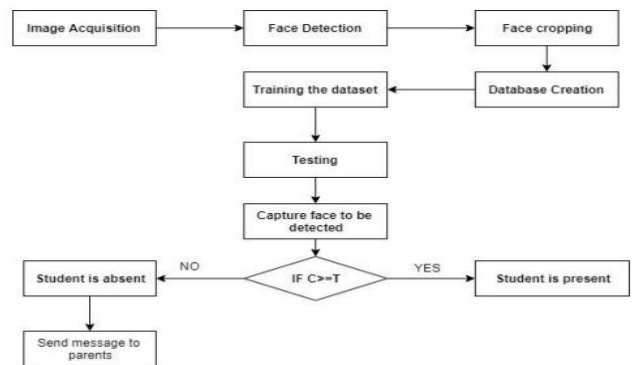Sum= D-B-C+A

Fig 4. Integral image

Fig 5. Flow Chart

4.2 Face Recognition using LBPH Recognizer

After successful face detection phase detected faces are passes to next step i.e Face Recognition. Here we use the Local Binary Pattern Histogram (LBPH) for face recognition. LBPH is simple, easy and efficient texture operator which assign pixel of a image by comparing with neighbour pixels as threshold and which will result as binary number. The detected integral image is feed to the Local Binary Pattern which will result in decimal that represented as histogram for each integral image. Central value of 3×3 matrix is treated as the Threshold value. Face Recognition may affect by the changes in surrounding environment like noise, brightness, facial expression and position. After training face data and face Id's the trainer will generate yml file which will send to the recognizer.
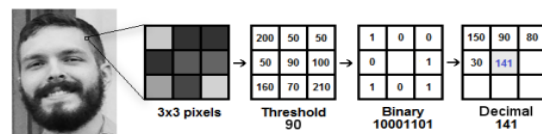

Fig 6. Computational Flow of LBPH

The histogram is created from each training dataset, the distance between two histograms is calculated by using Euclidean distance is given by formula

$$D = \sqrt{\sum_{i=1}^{n}(Hist1 - Hist2)^2}$$

Calculated distance is called as confidence, lower confidence means distance between histogram is lower. Algorithm correctly recognize image if confidence is lower than threshold. LBPH is provided by OpenCV.
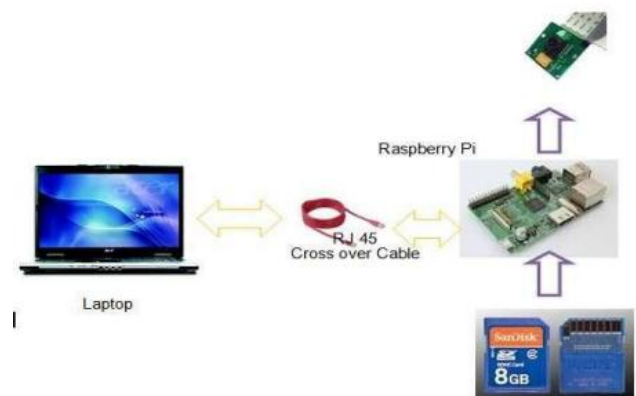
V. SYSTEM DESIGN

Fig 7. Face detection system with Raspberry Pi

5.1 Python IDE

Python is easy, interpreted, high level programming language created by Guido Van Rossum. It has simple to use syntax and it is one of best language for person who first time work with computer. It can be used in many areas such as web development, scientific and mathematical computing like NumPy, SciPy, Orange etc. The python interpreter is come up with new data type and functions which being used in C and C++.

5.2 OpenCV

OpenCV (Open Source Computer Vision) is a library with different programming functions. It mainly designed for both academic and commercial use. It has flexible structure as it includes the package with different libraries. In our system we done the linear and non-linear filtering with the help of image processing module. In the proposed system Viola Jones Haar Classifier, LBPH face recognizer, HOG are comes up with OpenCV

5.3 NumPy

NumPy is package for scientific calculation with python. NumPy is stands for "Numerical Python" or "Numeric Python". It is an extension module available for python which provide precompiled numerical and mathematical functions. NumPy includes programming language python with powerful data structure for implementation of multi-dimensional arrays and matrices. It is module that provide libraries with high level mathematical function to perform on array and matrices.

VI. CONCLUSION

We came to know that as there are wide variety of method for maintaining a student attendance for example RFID, biometric, iris based and so on, which are difficult and non-protective. Attendance system using face recognition based on Local Binary Pattern extracted the features from face region and eliminate illumination changes. Above system provide the better arrangement from different view of time and security, hence we have, develop a productive framework that provide real time image handling algorithm to identify the student faces in classroom. This system is secure for present scenario which automatically update the student attendance.

VII. FUTURE SCOPE

The future scope of our project is, it can be utilized for different security application, where authentication is necessary to gain access to the particular system. It can be used in army area for access control, know terrorist by comparing surveillance image. It also used in recognizing the guilty parties involved in unauthorized business. We can also detect particular student in institution quickly with the help of this system.

VIII. ACKNOWLEDGEMENT

REFERENCES

[1] Arulogun.O. T, Olatunbosun. A., Fakolujo O. A, Olaniyi, O. M, "RFID–Based Attendance Management System", IJSER, ISSN:2229-5518, Vol.4, Issue 2, February 2013.

[2] Mohamed Basheer K P, Raghu C.V, "Fingerprint Attendance System for Classroom Needs", ResearchGate, December 2012.

[3] Seifedine Kadry, Mohamad Smaili, "Wireless Attendance Management System Based on Iris Recognition", Scientific Research and Essays, Vol.5(12), ISSN:1992-2248, pp. 1428-1435, 18 June 2010.

[4] Tiwari Priti Anilkumar, Kalyani Jha, Karishma P Uchil, Naveen H., "Haar Features Based Face Detection and Recognition for Advanced Classroom And Corporate Attendance", IJIRCCE, Vol. 3, Issue 5, May 2015.

[5] Ajinkya Patil, Mrudang Shukla, "Implementation of Classroom Attendance System Based on Face Recognition in Class", IJAET, ISSN:22311963, Vol.7, Issue 3, pp. 974-979, July 2014.

[6] Nidhi, "Image Processing and Object Detection", International Journal of Applied Research, ISSN: 2394-7500, Vol. 1(9), July 2015.

[7] Priyanka Wagh, Jagruti Chaudhari, Roshani Thakare, Shweta Patil, "Attendance System based on Face Recognition using Eigen face and PCA Algorithms", IEEE conference,Vol 4, 2015.

[8] Priya Pasumarti, P. Purna Sekhar, "Classroom Attendance Using Face Recognition and Raspberry Pi", IRJET, Vol.5, Issue:3, March 2018.

[9] Vishal D. Bikkad, Dr. S.B.Sonakamle Snehal A.Mane, Surabhi S. Sarada, "Smart Attendance System using Face Detection On Raspberry Pi", IJIRCCE, ISSN:2320-9801, Vol.6, Issue:5, May 2018.

[10] https//:www.raspberrypi.org.