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Image Processing Based Student Attendance System using Raspberry PI

P Prudhvi Kiran[1], Ravi Kumar G[2]
[1]Vignan's Institute of Information Technology,
Visakhapatnam, India
pasamprudhvi@gmail.com
[1]Vignan's Institute of Information Technology,
Visakhapatnam, India
Ravikumsr.1246@gmail.com

Abstract: Image processing based student attendance System is the easiest way to keep track of attendance for organizations such as Educational Institutions, Business organizations. Among the person identification methods, face recognition is known to be the most natural ones; since the face modality is the modality that uses to identify people in everyday lives. Although other methods, such as fingerprint identification can provide better performance, but they are not appropriate for natural smart interactions due to their intrusive nature. This face detection differentiates faces from non faces and is therefore essential for accurate attendance [6].
Our Proposed strategy involves face recognition for marking the student attendance. Raspberry pi is used for face detection and face recognition. The camera will be connected to the raspberry pi module. The student database is collected. The database includes name of the students with their registered numbers and their face images. Camera will be placed in front of the class in such a way that it can capture the entire class, which is connected to the raspberry pi. Thus with the help of this system time will be saved and it is so convenient to record the attendance at any time throughout the day.

Keywords: Student Attendance, Raspberry pi, Camera, Face Detection [1], Face Recognition, Image processing, Open CV, Python.

1. Introduction

Now days the entire period attendance is stored in register and at the end of the gathering the reports are generated. Staff is not concerned in creating report in the intermediate of the session or as per the prerequisite because it takes more time in calculation. Here in this project Raspberry pi is used as microcontroller which stores all the records of the students and yields the results. Pi is a tiny affordable cost computer that can be used as a Single board computer.

1.1 Overview of Problem Statement

The attendance systems are used by many organizations to record the start and stop timing of the work done by employees or to record the presence of student in the class. In some organizations, the detailed records of attendance system are maintained to know who comes late and who calls in sick. The organization gets more benefits of using attendance system. It will take time while recording the attendance of the students and employees in/on the registers using RFID methods, fingerprint [2][3] modules. The entire attendance will be calculated and reports will be gathered at the end. It takes more time for calculation. These methods can provide better performance, but they are not appropriate for natural smart interactions due to their intrusive nature.

2. Proposed System

The proposed system will uses two step mechanisms [3]. The first method is to detect the face from the real time environment and followed by the face recognition. The first method is achieved by using Camera which is connected to Raspberry pi. It captures the images of the students, who are present in the class is used for face detection. Then the detected face is compared with the stored data of every student. The student database is collected and stored into the pi at the initial stage. The database includes name of the students, their images and registered number. This raspberry pi is fixed at the front side of class in such a way that we can capture entire class. Thus with the help of this system, time will be saved and it is so convenient to record attendance. We can take attendance on any time without any human Intervention.

2.1 Advantages of proposed system

- Easiest method to keep track of attendance.
- Provides accurate attendance of the students.
- Proxy attendance is completely eradicated by this system.
- There are no physical interactions with the system.

3. System Architecture

From the **Figure 1** power supply is given to the raspberry pi which 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 students periodically or whenever required by the administration and finds the result. The result is displayed on the monitor screen which is connected to the raspberry pi through the Ethernet cable or HDMI to VGA converter.

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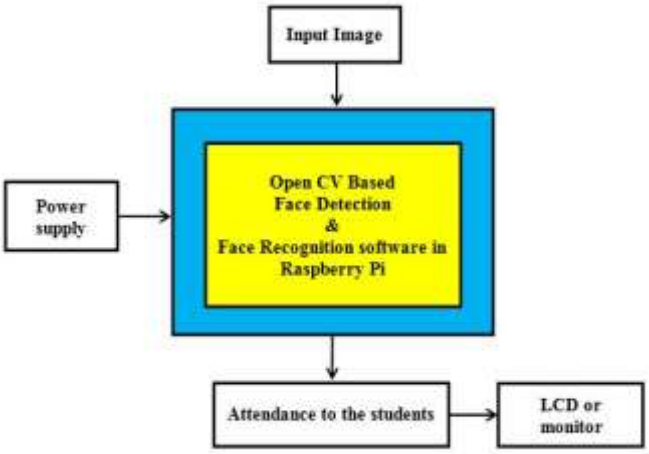

Figure 1: Architectural Outline of Proposed System

3.1 Proposed System Algorithm

STEP 1: Write Raspbian OS on to the SD card and fix the card into the SD slot
STEP 2: Install all the open CV libraries into the raspberry pi
STEP 3: Fix the entire hardware setup
STEP 4: Enroll the images using face detection [4] program
STEP 5: Resize the faces of the persons
STEP 6: Store the images into the file system
STEP 7: Train the images for face recognition
STEP 8: Run the face recognition program
STEP 9: Track the attendance of the students

3.2 Proposed System Flowchart

Camera captures the images in the video streaming, while the face detection resizes the captured image up to certain point. The segmented image is compared with the present data sets and faces are recognized.

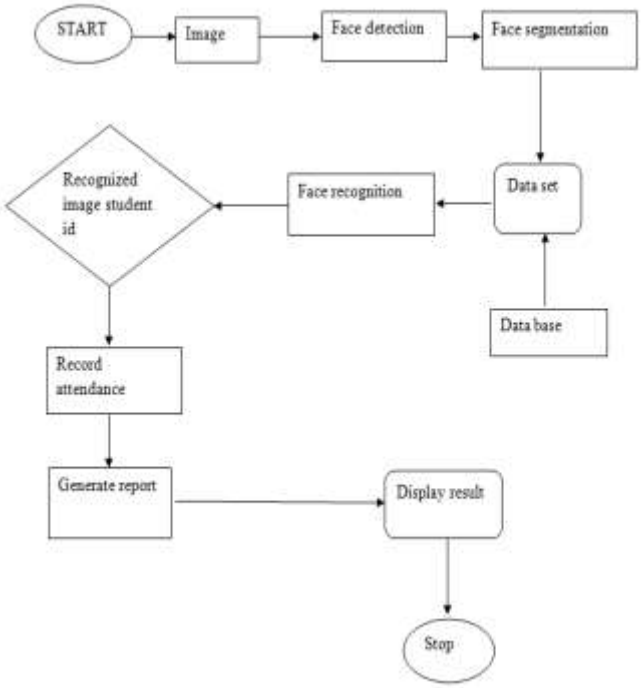

Figure 2: Flowchart in detail

Admin records the attendance if the particular student and generates the report. The result is displayed in the monitor.

4. Test cases

This process of developing test cases helped us to find problems in the requirements and design of application [5].

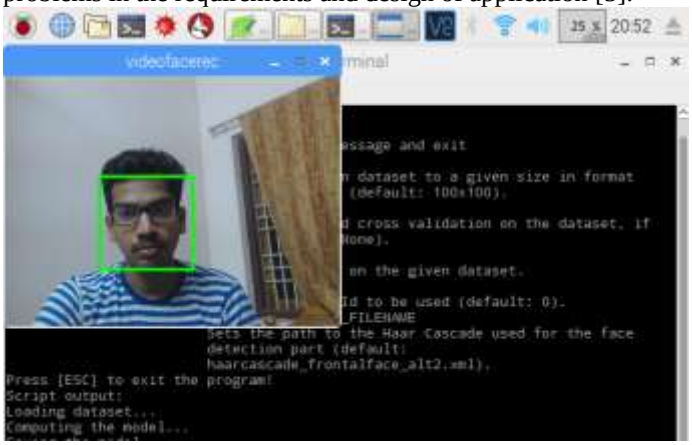

Figure 3: Test case 1

Objective: To test if single face is being detected well
Input: Faces which are exposed during video streaming
Expected Result: To detect the faces with rectangle box
Actual Result: Same as expected - TEST PASSED

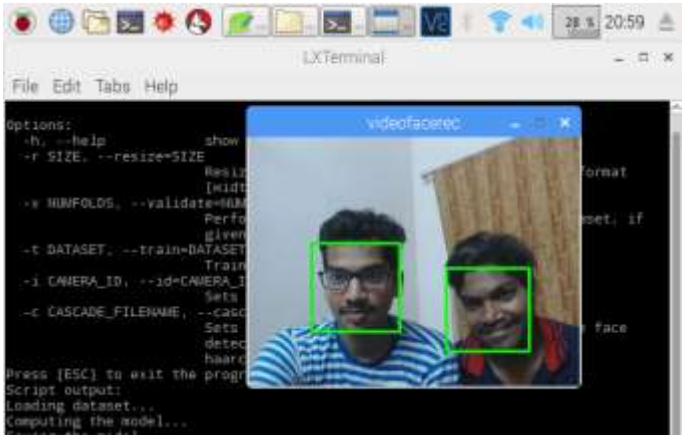

Figure 4: Test case 2

Objective: To test if multiple faces are being detected well
Input: Faces which are exposed during video streaming
Expected Result: To detect the faces with rectangle box
Actual Result: Same as expected - TEST PASSED

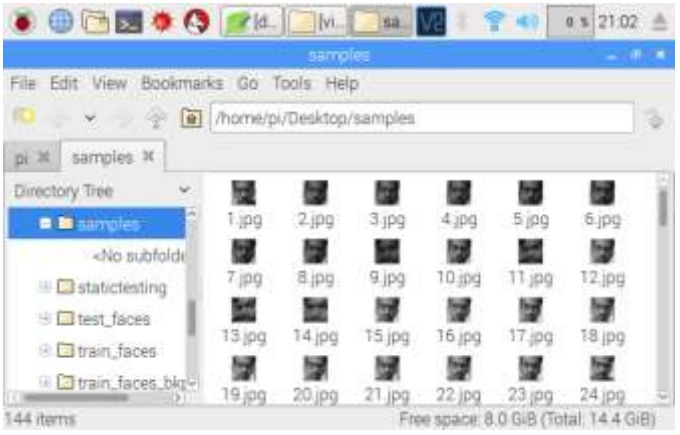

Figure 5: Test case 3

Objective: To test if detected faces are storing or not
Input: Faces acquired during face detection process
Expected Result: Store the cropped images in the specified folder

Actual Result: Same as expected - TEST PASSED

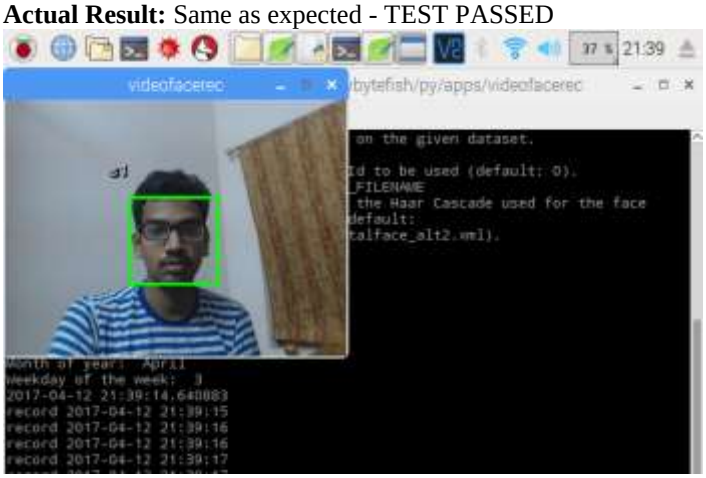

Figure 6: Test case 4

Objective: To test if single faceis recognizing or not.
Input: Face which is exposed during video streaming.
Expected Result: Display the registered number of the specified student.
Actual Result: Same as expected - TEST PASSED

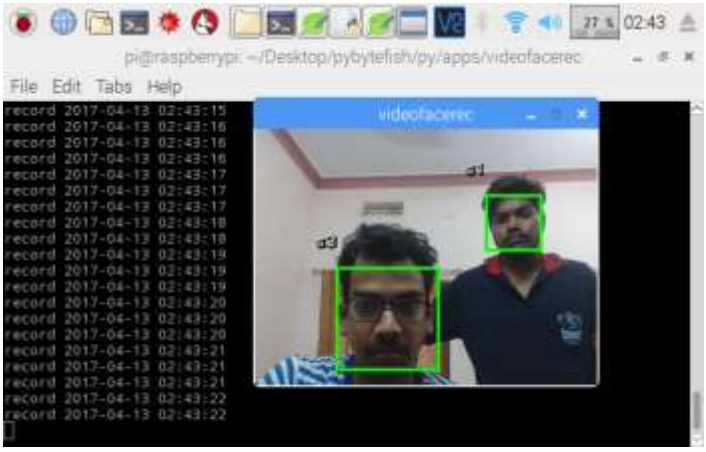

Figure 7: Test case 5

Objective: To test if multiple faces are recognizing or not.
Input: Faces which are exposed during video streaming
Expected Result: Display the registered number of the specified students
Actual Result: Same as expected - TEST PASSED

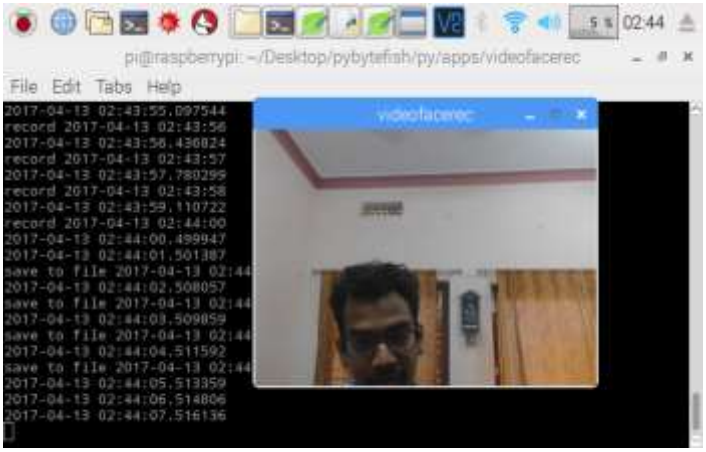

Figure 8: Test case 6

Objective: To test if multiple faces are recognizing or not.
Input: Faces which are exposed during video streaming
Expected Result: Display the registered number of the specified students
Actual Result: Same as expected - TEST PASSED

Figure 9: Test case 7

Objective: To test if the data is storing into a file or not
Input: Faces which are exposed during video streaming
Expected Result: Tracking whether the student is present or not
Actual Result: Same as expected - TEST PASSED

5. Results

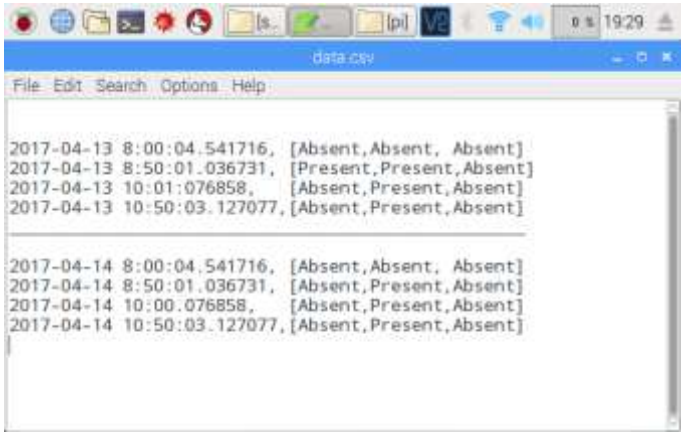

Figure 10: Results in Output file

Conclusion

We conclude Image processing based Student Attendance System using Raspberry pi using Open CV tool as software for image processing and attendance is provided to the students. We can track the attendance of the students by using the language python and Open CV software, which is very easy to install and is open source software and can be used in real time application in a quick manner. In this project we have shown the tracking of the students in the class by using camera in the system. This proposed system reduces the possibilities of proxy attendance of the students, who were not present in the class and reduces the time. Raspberry pi is used as a microcontroller which provides live streaming of the students as an input to the program. The input image can be converted into a black and white image by applying grey scale filter. Then we have applied fisher faces feature extraction to subtract background. The extracted faces are saved and trained. Then according to the live streaming of video in class gives te attendance to the students.

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