

Performance Evaluation of Face Recognition Based Attendance System using RF Communication

Darshankumar C. Dalwadi^{1*}, Niralee Bhatt²

^{1,2}Department of Electronics and Communication, Birla Vishvakarma Mahavidyalaya Engineering College, Gujarat Technological University, Vallabh Vidyanagar, Anand, Gujarat, India

^{*}Corresponding Author: darshan.dalwadi@bvmengineering.ac.in, Tel.: +91-9426478026

DOI: <https://doi.org/10.26438/ijcse/v7i5.124128> | Available online at: www.ijcseonline.org

Accepted: 12/May/2019, Published: 31/May/2019

Abstract— Automatic face recognition (AFR) technologies have seen substantial developments in performance over the past years, and such systems are now broadly used for security and mercantile applications. An automated system for human face recognition in a real-time background for an Institute to mark the attendance of the employees. So Smart Attendance using Real-Time Face Recognition is a real-world solution that comes with day to day activities of handling students/employees. The task is a bit challenging as the real-time background subtraction in an image is still a bit difficult. The proposed system maintains the attendance records of students automatically. Manual entering of attendance in logbooks becomes a difficult task and it also wastes time. So developing such an efficient module that comprises of face recognition to manage the attendance records of students. This module enrolls the student's face. This enrolling is a onetime process and their face will be stored in the database. While we go through enrolling of face, we require a system since it is only needed to be performed once. You can have your own roll number as your student ID which will be unique for each student. The presence of each student will be updated in a database. The results obtained in this method showed improved performance over the regular manual attendance management system. Attendance is marked as per the student identification. This product gives much more useful solutions with accurate and precise results in a user-interactive manner rather than existing manual attendance and leave management systems. It is then transferred to the office through RF communication which is widely using in industries recently.

Keywords— Image processing, Face Detection method, HAAR Cascade, Feature Extraction, Face Recognition Method.

I. INTRODUCTION

For checking the performance of students, maintaining attendance is very important in all the institutes. Some institutes are still taking attendance manually using the old file, paper or register based approach and some have adopted techniques of automatic attendance using biometric templates. But in these methods students have to wait for a long time in making a queue at the time they enter college. Biometric templates which are already found can be of many types like Fingerprints, Eye Iris, Hand Geometry, Signature, Face, Gait and voice [1]. In this process, it compares the biometric feature of a person with a previously stored template captured at the time of enrollment. The system consists of a camera that captures the images of the Student and sends it to the Face detection module [2] [3]. After the Face Detection, it is sent to Recognition modules and then the attendance is marked on the database server. Now, At the time of enrolment, templates of face images of individual students are stored in the database folder created. In this, all the faces are detected from the input video from the Webcam and the algorithm compares them one by one with the

information previously stored in the database [4] [5]. If any face is recognized the attendance is marked in the excel sheet and it is then transferred to the office from where anyone can access and use it for different purposes. This algorithm saves a lot of time and this is a highly secure process where no one can mark the attendance of others. In other words, the problem of proxy is solved [6] [7]. Attendance is maintained on the main computer so anyone can access it from there for purposes like administration [8] [9]. Further, it is transferred through Radio frequency transmission to the departmental office for the database maintenance and record.

The purpose of designing a system that uses Face Recognition as a biometric template instead of anything else is that a face provides a unique identity of a person, it can be used to identify and verify his/her identity. Face recognition provides a non-intrusive way to recognize a person. This can help us in multiple ways as stated below:

1. The chances of fake attendance and proxies can be reduced which is a major problem in universities nowadays.

2. In this problem, the face is recognized and is stored in an excel sheet for the maintenance of records regarding the student annual attendance report.
3. Further, the whole excel sheet is transferred to another device which is located in the same building or in a distance of 100 meters via RF Communication.

In this, I have proposed a method which takes the attendance of the students using a Face Recognition and transfers the data using RF communication. In this paper, my purpose is to obtain a record maintaining system for an Institute.

II. RELATED WORK

In this system, only one student is recognized at a time. It does not give an output if multiple faces are captured in the camera. There are many Face Recognition algorithms used recently. In this, I have used the HAAR Cascade algorithm which is much faster and reliable.

III. HARDWARE AND SOFTWARE USED

- **Hardware:**
 - Arduino Board
 - Webcam
 - RF Transmitter and receiver
 - LCD
- **Software:**
 - Open CV 3.0.0
 - Bascom
 - HyperTerminal

IV. FLOWCHART

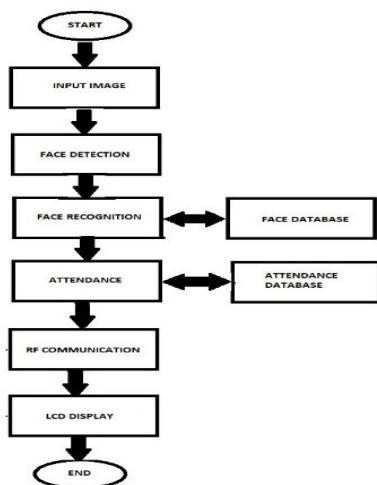


Figure 1: Flowchart

V. METHODOLOGY

To complete the following project, I have worked on 3 major phases. They are:

- Face Detection and Data Gathering
- Train the Recognizer
- Face Recognition

The most basic assignment in Face Recognition is of course, "Face Detecting". Before anything, you must "capture" a face in order to recognize it, when compared with a new face captured on the future. The most familiar way to detect a face (or any object), is using the "Haar Cascade classifier" [10] [11]. Here we have worked with face detection. In the beginning, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. And also we need to extract features from it. The thing that helped was that OpenCV comes with a trainer as well as a detector.

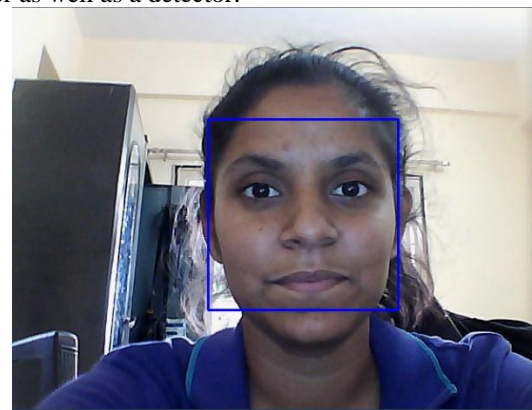


Figure 2: Face Detection

First, created a directory where I developed this project, for example, Attendance Project. In this directory, besides the 3 python scripts that I had created for my project, I had saved on it the Facial Classifier.

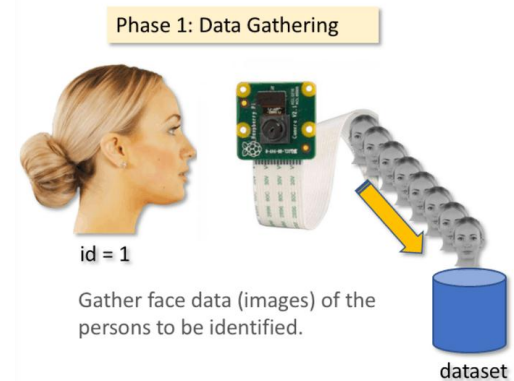


Figure 3: Data Gathering

Next, created a subdirectory where we stored our facial samples and named it "dataset".

On this code, we captured 30 samples from each id.

I took all the user data from my dataset and trained the OpenCV Recognizer. This was done directly by a specific

OpenCV function. The result was a .yml file that was saved on a "trainer/" directory.

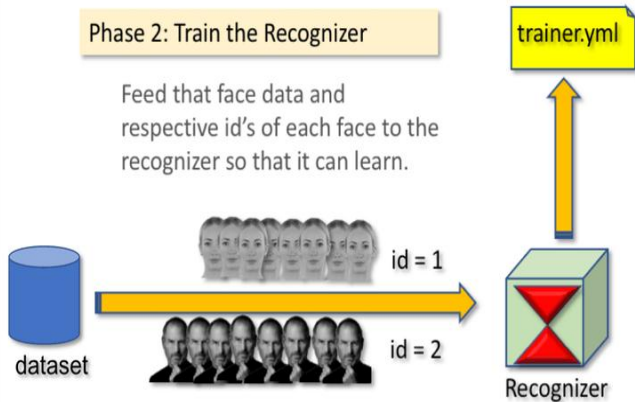


Figure 4: Training the algorithm

We used as a recognizer, the LBPH (LOCAL BINARY PATTERNS HISTOGRAMS) [12] [13] Face Recognizer, included on OpenCV package by the following command:

```
recognizer
=cv2.face.LBPHFaceRecognizer_create()
```

This was the final phase of the recognizing part in the project. Here, I captured a fresh face on the camera and if this person had his face captured and trained before, the recognizer would make a "prediction" returning its id and an index, shown how confident the recognizer was with that match.

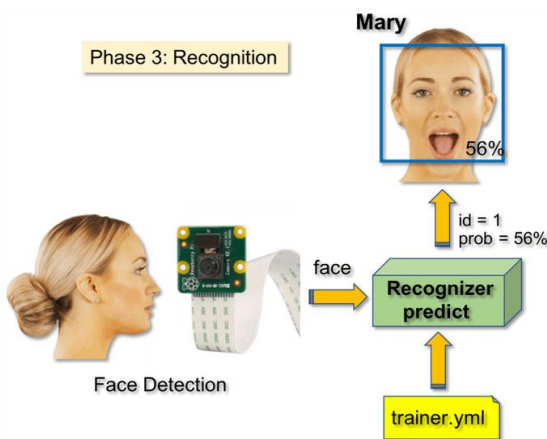


Figure 5: Recognition

Now, in the next step, the data is transferred through the Hyperterminal to the RF transmitter and which on the other side is received by RF Receiver which is then processed by the Arduino UNO and given to LCD as an output.

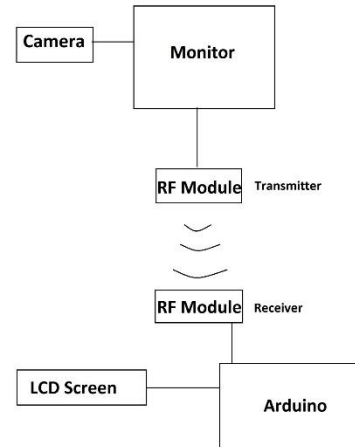


Figure 6: Block Diagram

VI. RESULTS AND DISCUSSION

First of all, we need to register a face to create a database with a webcam attached to the computer. It takes 30 photos per ID. Each student is allocated with one ID each as followed regular attendance system.

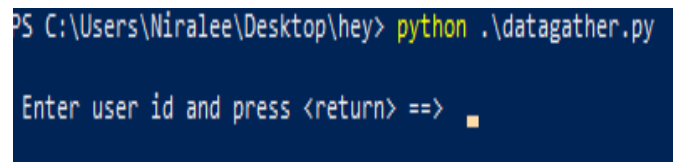


Figure 7: User ID Input

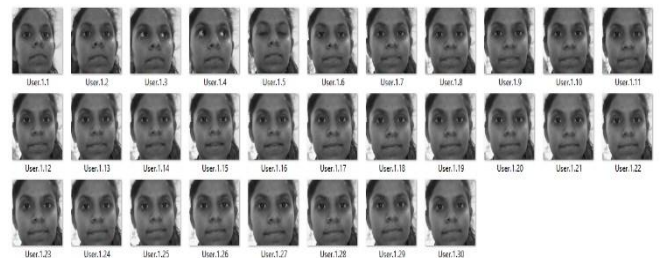


Figure 8: Database

After the data is stored in the database, we need to train our program. For that, a folder named trainer is created in the main folder. When the program is trained a '.yml' file is generated in that trainer folder.

In the final step of recognition, it registers one student at a time and creates an excel sheet with the present number of students.

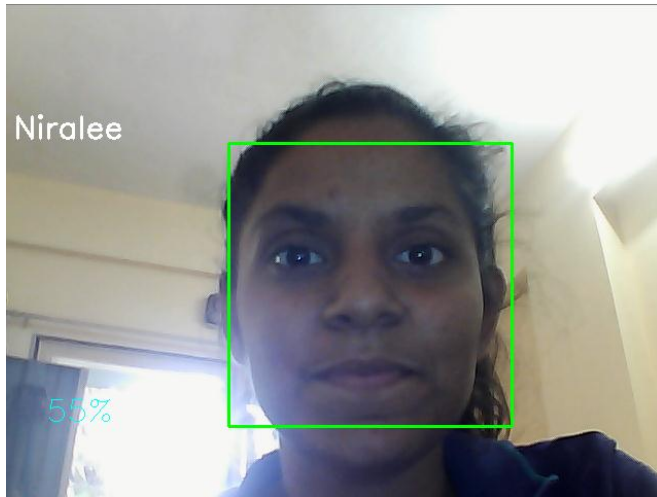


Figure 9: Face Recognition

The excel sheet is generated as shown below:

| | A | B | C | D | E | F | G |
|----|---------|---------|---|---|---|---|---|
| 1 | NAME | PRESENT | | | | | |
| 2 | Niralee | yes | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

Figure 10: Attendance Excel sheet

It is then transferred to another device using Hyperterminal and RF communication [14]. In this paper, I have shown that the data is displayed on the LCD with the name of the student.



Figure 11: Digital Output on the LCD

The final model of the proposed system looks like:



Figure 12: The Model

VII. CONCLUSION AND FUTURE SCOPE

As face provides a unique identity of a person, it can be used to identify a person and verify his/her identity. Face recognition provides a non-intrusive way to recognize a person. By using this system, the chances of fake attendance and proxies can be reduced. However, the system accuracy is still not up to the mark owing especially to the face detection method sensitive to head tilt problems. Another robust face detection method can be implemented for better results. Other supervised methods may tend to be quite useful in the system. Besides, this project can be simplified, made more efficient by taking advantage of multiple face detections to mark attendance of all the visible faces in a single attempt. This will be an economical and more efficient use of face recognition for attendance marking. We also consider developing an android application for this system in the near future.

REFERENCES

- [1] Z.Wang, D.L.Huang, Research on Key Technology of Image Transmission Based on Arduino, Computer Technology and Development, 2015.05, pp183-186.
- [2] W. Z.S, Research on the Network Layer Topology Measurement Based on SNMP, AJETR 2013.
- [3] Xiao Shang Research of AS level Network Topology, AJETR-2014.
- [4] Pei, Donghui, The Design and Implementation of Serial Monitoring Software Based on Arduino, ICICEE2012.

- [5] Holman R, Stanley J, Ozkan-Haller T. Applying video sensor networks to nearshore environment monitoring[J].IEEE Trans. on Pervasive Computing, 2003.
- [6] Akyildiz I. F., Melodia T., Chowdhury K. R., A survey on wireless multimedia sensor networks [J]. Computer Networks, 2007.
- [7] Z.S., D.L. H, AMR, Research And Implementation Of Image Transmission Key Technological Based On WSN, PP 4759-4762, 2014.
- [8] Chen Guoshao, The Design of Greenhouse Environment Monitoring System Based on Arduino, AJETR2014-01, PP86 -91.
- [9] J. Goldstein, L. D. Harmon, and A. B. Lesk, "Identification of Human Faces," Proc. IEEE, May 1971.
- [10] L. Sirovich and M. Kirby, "A Low-Dimensional Procedure for the Characterization of Human Faces," J. Optical Soc. Am. A, 1987.
- [11] M. A. Turk and A. P. Pentland, "Face Recognition Using Eigenfaces," Proc. IEEE, 1991, 586-591.
- [12] Md.T. Akhtar, S.T. Razi, K.N. Jaman, A. Azimussan, Md.A. Sohel,"Fast and Real life object detection system using simple Webcam",ISROSET Journal (JSRCSE)
- [13] Suma S L, Sarika Raga," Real Time Face Recognition of Human Faces by using LBPH and Viola Jones Algorithm", ISROSET Journal (JSRCSE).
- [14] R. Chellappa, C. L. Wilson, and S. Sirohey, 1995. "Human and Machine Recognition of Faces: A Survey", Proc.of the IEEE.

AUTHORS PROFILE

Darshankumar C. Dalwadi pursued PhD in Electronics and Communication in year 2018. He pursued Master of Engineering and Bachelor of Engineering in the field of EC in the year 2010 and 2006 respectively. He is currently working as Associate Professor in BVM



Engineering College. He has published more than 40 research papers in reputed international journal and conferences. His main research work focuses on RF, Wireless, latest 4G and 5G mobile communication system etc. He has 12 years of teaching experience and 5 years of Research experience.

Niralee D. Bhatt is a final year Bachelor of Engineering student in the field of EC at BVM Engineering College, Vallabh Vidyanagar. His main research work focuses on RF, Wireless communication system, IOT etc.

