

DEVELOPMENT OF IOT BASED SMART ATTENDANCE SYSTEM USING RASPBERRY PI

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Abstract-The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exist in the old system. Thus, by means of technology, this project will resolve the flaws existed in the current system while bringing attendance taking to a whole new level by automating most of the tasks. The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a database system. At the end of the day, the attendance regarding an individual can be accessed from a web server hosted by the raspberry pi. In short, this upgraded version of attendance monitoring system not only saved many resources, but also provide huge convenience to the authority as many processes are automated.

I. INTRODUCTION

According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no

enforcement practiced. Supposing the institution establish an enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The second problem of the previous system is where it is too time consuming. Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming. The third issue is with the accessibility of those information by the legitimate concerned party. For an example, most of the parents are very concerned to track their child's actual whereabouts to ensure their kid really attend the classes in college/school. However, in the previous system, there are no ways for the parents to access such information. Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for those legitimate party.

This is a project about Facial Recognition-Based Attendance Monitoring System for Educational Institution. In this chapter, the problem and motivation, research objectives, project scope, project contributions and the background information of the project will be discussed in detail.

The technology aims in imparting a tremendous knowledge oriented technical innovation these days. Deep Learning is one among the interesting domain that enables the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is considered as an important factor for both the student as well as the teacher of an educational organization. With the advancement of the deep learning technology the machine automatically detects the attendance performance of the students and maintains a record of those collected data. In general, the attendance system of the student can be maintained in two different forms namely,

Manual Attendance System (MAS)

Automated Attendance System (AAS).

Manual Student Attendance Management system is a process where a teacher concerned with the particular subject need to call the students name and mark the attendance manually. Manual attendance may be considered as a time-consuming process or sometimes it happens for the teacher to miss someone or students may answer multiple times on the absence of their friends. So, the problem arises when we think about the traditional process of taking attendance in the classroom. To solve all these issues, we go with Automatic Attendance System (AAS). Automated Attendance System (AAS) is a process to automatically estimate the presence or the absence of the student in the classroom by using face recognition technology. It is also possible to recognize whether the student is sleeping or awake during the lecture and it can also be implemented in the exam sessions to ensure the presence of the student. The presence of the students can be determined by capturing their faces on to a high-definition monitor video streaming service, so it becomes highly reliable for the machine to understand the presence of all the students in the classroom. The two common Human Face Recognition techniques are,

- Feature-based approach
- Brightness-based approach.

The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image

II. LITERATURE SURVEY

Charles Walton et.al [1] is best known as the first patent holder for the RFID (radio frequency identification) device. He also received a patent for a passive transponder used to unlock a reader near the door. When the reader detected a valid identity, number stored within the RFID tag, the reader unlocked the door.

Michael Dobson, Douglas Ahlers, Bernie DiDario, et.al [2] in 2006 gave a concept of Attendance tracking system. The system includes identification tags, with wireless communication capabilities, for each potential attendee, scanners for detecting the attendees' tags as they enter a given room.

O. Shoewu and O.A. Idowu et.al [3] presented that Development of Attendance Management System using Biometrics. Attendance

is taken electronically with the help of a finger print device and the records of attendance are stored in a database. Attendance is marked after student identification.

The idea of using principal components to represent human faces was developed by Sirovic and Kirby 1987 characteristic feature image "eigenface" are found and used by Turk and Pentland 1991 et.al[4] for face detection and recognition. It tracks a person's face and then recognizes by comparing characteristics of the face to those of known individuals. Initially, a principle component factor "eigenvector" is determined using PCA then the set of characteristic feature image "eigenface" are found.

Paul Viola and Michael Jones et.al [5] in their 2003 article titled, "Robust Real-Time Face Detection": It describes a Machine learning approach for visual object detection which is capable of processing images extremely rapidly and achieving high detection rates. It brings together NE algorithms and insights to construct a framework for robust and extremely rapid object detection. The simple features used are reminiscent of Haar basis functions which have been used by Papa Georgiou Haar-like features are digital image features used in object recognition. In the detection phase of the Viola-Jones object detection framework, a window of the target size is moved over the input image, and for each subsection of the image the Haar-like feature is calculated. This difference is then compared to a learned threshold that separates non-objects from objects.

LBP (Local Binary Pattern) et.al [6] was first described in 1994 and has since been found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets. It is a centralized approach which involves the step-by-step process.

Automated Attendance Management System Based on Face Recognition Algorithms et.al [7]. This system is based on face detection and recognition algorithms, automatically detects the student when he enters the class room and marks the attendance by recognizing him.

Robust 3D Face Recognition et.al [8]. This paper represents a face recognition system that overcomes the problem of changes in facial expressions in three-dimensional (3D) range images.

Monitoring Driver Distraction in Real Time using Computer Vision System et.al [9] :This article presents a real-time non disturbance drowsiness monitoring scheme which exploits the

driver's facial appearance to identify and aware tired drivers. This presented work worn the Viola-Jones Algorithm to identify the driver's facial appearance.

III. BLOCK DIAGRAM OF THE SYSTEM

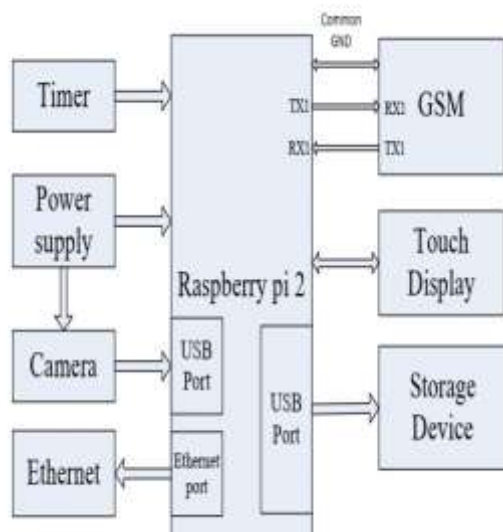


Fig. 1 Block Diagram of the System.

Working of the system

The system consists of a camera that captures the images of the employee and sends it to the image enhancement module. After enhancement the image comes in the Face Detection and Recognition modules and then the attendance is marked on the database server. This is shown in the experimental setup in Figure. At the time of enrolment, templates of face images of individual employees are stored in the Face database. Here all the faces are detected from the input image and the algorithm compares them one by one with the face database.

The total system is divided into 3 modules- Database creation, Training the dataset, Testing, sending alert messages as an extension.

1. Database creation

- a) Initialize the camera and set an alert message to grab the attention of the students.
- b) Get user id as input
- c) convert the image into gray scale, detect the face and
- d) Store it in database by using given input as label up to 20 frames.

2. Training

- a) Initialize LBPH face recognizer.
- b) Get faces and Id's from database folder to train the LBPH face recognizer.
- c) Save the trained data as xml or yml file.

3. Testing

Load Haar classifier, LBPH face recognizer and trained data from xml or yml file.

- a) Capture the image from camera,

- b) Convert it into gray scale,
- c) Detect the face in it and
- d) Predict the face using the above recognizer.

This proposed system uses Viola Jones algorithm for face detection which uses modified Haar Cascades for detection.

IV. PROPOSED SYSTEM

IOT based smart attendance system using raspberry pi is being designed and built taking price point in accounts. It is cheaper and reliable. Also the proposed system requires following elements.

1. Hardware Requirements
2. Software Requirements

1 Hardware Requirements

a. Power Supply Design:

Power supply is the first and most important part of our project. For our project we require +5v regulated power :- supply with maximum current rating 500mA. basic building blocks are required to generate regulated power supply.

b. Raspberry pi

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

c. LCD

Our project also sends the sensed and analysed data from the solar to the LCD screen, mediated by Arduino UNO. It displays Current Value, Voltage Value and The Total Power generated by the system.

d. GSM

Communication between a computer and a GSMGPRS system. Global System for mobile communication (GSM) is an architecture used mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. GSM/GPRS module consists of a GSM/GPRS modem assembled together with power supply circuit and communication interfaces (like RS-232, USB, etc) for computer GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM

and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification

2 Software Requirements

a. Raspbian

- Raspbian is a Debian-based computer operating system for Raspberry Pi. Since 2015 till now it is officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers.

- Raspbian was created by Mike Thompson and Peter Green as an independent project.

- The initial build was completed in June 2012.

- The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.

Raspbian uses PIXEL, Pi Improved Windows Environment, Lightweight as its main desktop environment as of the latest update.

- It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new theme and few other changes.

- The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

Basic features:

Developer Raspberry Pi Foundation

- OS family Unix-like
- Source model Open source
- Latest release Raspbian Jessie with PIXEL / 16.02.2017
- Marketing target Raspberry Pi
- Update method APT
- Package manager dpkg
- Platforms ARM
- Kernel type Monolithic
- Userland GNU
- Default user interface PIXEL, LXDE
- License Free and open-source software licenses (mainly GPL)

V. FLOWCHART AND ALGORITHM OF THE SYSTEM

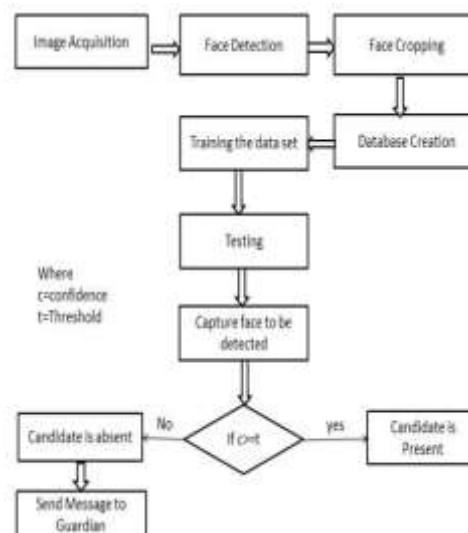


Fig. 2 Flowchart of the system

Algorithm

- 1) Face Recognition is used for all existing ones for identification of people.
- 2) then Database of student is created before the recognition process, which includes one image of each individual.
- 3) During this process admin will simultaneously enter the student's name and their parent's email id.
- 4) After taking images using a camera, an excel sheet will be created giving the database of all the students.
- 5) As students enter the class, teacher will switch on the camera and it will continuously detect and recognize the face. After recognizing all the students present in the class an excel file is created giving the attendance of the class with date.
- 6) As the attendance sheet is ready, within one minute email will be send to the absentee's employer or parent declaring that their employee or child is absent in today's job assignment or class.

VI. RESULT

Results obtained by the model are shown in the following figures

```
Python 2.7.9 Shell
File Edit Shell Debug Options Windows Help
Python 2.7.9 (default, Sep 17 2016, 20:26:04)
[GCC 4.9.2] on linux2
Type "copyright", "credits" or "license()" for more information.
>>> ----- RESTART -----
>>>
enter student name shelesh
enter parent mail id shelesh97garg@gmail.com
Escape hit, closing...
Writing complete
Writing complete
>>> ----- RESTART -----
>>>
enter student name sakshi
enter parent mail id thesakshipate@gmail.com
Escape hit, closing...
Writing complete
Writing complete
>>> ----- RESTART -----
>>>
enter student name prateek
enter parent mail id joshi.prateek36@gmail.com
Escape hit, closing...
Writing complete
Writing complete
>>> |
```

Fig.3: Database created with parent email

Student Name	Image of student	email id
1 shelesh	shelesh.png	shelesh97garg@gmail.com
2 sakshi	sakshi.png	thesakshipate@gmail.com
3 prateek	prateek.png	joshi.prateek36@gmail.com

Fig.4: Excel of database created



Fig.5: Recognition

Student Name	04 24	04 25
0 shelesh	P	P
1 sakshi	P	P
2 prateek	P	A

Fig.6: Attendance record generated

VII. CONCLUSION

Automated Attendance System has been envisioned for the purpose of reducing the errors that occur in the traditional (manual) attendance taking system. The aim is to automate and make a system that is useful to the organization such as an institute. The efficient and accurate method of attendance in the office environment that can replace the old manual methods. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the office. It can be constructed using a camera and computer.

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REFERENCES

1] Yohei KAWAGUCHI, Tetsuo SHOJI, Weijane LIN, Koh KAKUSHO, Michihiko MINOH ,'Face Recognition based Lecture Attendance System, Department of Intelligence Science and Technology, Graduate School of Informatics, Kyoto University. 1-5.

[2] Naveed Khan Baloch, M. Haroon Yousaf, Waqar Ahmad and M. Iram Baig ,'Algorithm for Efficient Attendance Management: Face Recognition based approach'',IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No1,pp. 146-149, July 2012.

- [3] Neelesh S Saliyan, Priyank Patel, Shrenik Shah, Kavita Sonawane, "Automated Attendance System using Fuzzy Logic and Content based Image Retrieval", International Journal of Computer Applications (0975 – 8887) Volume 37–No.12 pp. 17-20,, January 2012.
- [4] J. G. RoshanTharanga, S. M. S. C. Samarakoon, T.A. P. Karunaratne, K. L. P. M. Liyanage, M. P. A. Gamage, D. Perera. "SMARTATTENDANCE USING REAL TIME FACERECOGNITION (SMART - FR) ", SAIMT Research Symposium on Engineering Advancements, pp. 41-43, (SAITM – RSEA 2013).
- [5] Thomas David Heseltine BSc. Hons. "Face Recognition: Two-Dimensional and Three Dimensional Techniques", The University of York, Department of Computer Science For the Qualification of PhD, pp, 35-56, September 2005.
- [6] Zhiming Qian¹, Dan Xu "Research Advances in Face Recognition" Chuxiong Normal University, Chuxiong Yunnan 675000, China
- [7] Tim Rawlinson, Abhir Bhalerao, Li Wang "Principles and Methods for Face Recognition and Face Modelling" Warwick Warp Ltd., Coventry, UK Department of Computer Science, University of Warwick, pp. 1-8, UK. February 2009
- [8] <https://www.raspbian.org/RaspbianFAQ>
- [9] Phillip Ian Wilson, John Fernandez, Facial Feature Detection Using Haar Classifiers. Journal of Computing Sciences in Colleges; 2006