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Automated Attendance System in College Using Face Recognition and NFC

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Abstract— An almost every institution and organization, attendance monitoring is a very important process. The current method involves the use of sheets of paper, books in taking student attendance. This method could easily allow for proxy and the attendance sheet could be lost or damaged. Taking attendance is thus time consuming using this traditional approach and hence there is a need of an reliable and a automated system. The Attendance monitoring system (AMS) will provide the needed solution. This system uses NFC along with Face Recognition to realize the functionalities. This system uses Face Recognition for the attendance of student at the college gate. The NFC Tag is used to tap on the NFC Reader while entering Classrooms, Labs, etc. The attendance taken at gate through face recognition is accessible to the Principal, HOD and class teacher. Attendance at gate through face recognition Mapped with attendance which is generated through NFC. This mapping is used to avoid fake attendance and to increase accuracy. The system consists of APK file, which contain two logins one for student and one for parent which is installed on their android devices. The AMS will be used to mark the attendance of the student and will also be used to generate weekly, monthly attendance report of student and thus will enable the teachers to keep track of students records. Rather than signing on the attendance sheets or taking attendance manually the student will mark the attendance by just a single click on his device. Also, the teachers has the facility to generate reports, and provide details of student like attendance, marks etc. to parent and also provide details to student like timetable, notes etc. on android application. Student can give feedback to the teacher using same android application

Keywords— Image Processing, NFC (Near Field Communication) Card, NFC Reader, Face Recognition, AMS (Attendance monitoring system), APK (Android Application Package) file.

I. INTRODUCTION

Attendances of every student are being maintained by every university, school and college. Faculty should be maintaining proper record for the attendance. Attendance system is a system that is used to track the attendance of a particular person and is applied in the industries, universities, schools and also in working places. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. The traditional way for taking attendance has drawback. Old conventional methods for student attendance is still used by most of the universities. As this traditional method is used, many students are gives proxy attendance of their friends by signing in their attendance in case of them absent in the institute.

Hence there is a requirement of a system that will solve the problem of student record management and student average attendance calculation. The technology-based attendance system such as smart cards and biometrics based attendance system reduced human involvement and errors. The proposed system should store the absent and present student's attendance details in electronic format so that management of attendance becomes easy. NFC or Near Field Communication, is an easy and innovative technology that allows user to use user's mobile phone for special purpose. NFC is useful in different areas like opening doors, secured locks, logging on to computer, making payment and many more. NFC is a bridge between physical and virtual world.

II. LITERATURE REVIEW

- Dela Cruz and Paglinawan[1] proposed a System provides faculty face recognition using Viola-Jones Face Detection Method and Principal Component Analysis integrated with fingerprint verification using Arduino. Test results improved accuracy of attendance system and automate faculty attendance system.
- Anirudhan Adukkathayar, Gokul S Krishnan[2] proposed system implemented as cross platform mobile application, not only allows the user to make secure transactions, but also allows him/her to make transactions from his/her multiple accounts. It uses NFC and Face recognition
- Priyanka Wagh, Jagruti Chaudhari[3] proposed various techniques like illumination invariant, Viola and Jones algorithm, PCA analysis are used to overcome previous issues. The major steps are detecting and recognizing faces. comparison of detected faces can be done by crosschecking with the database of student.
- Srinidhi MB, Romil Roy[4] Develop a safe and secure web based attendance monitoring system using Biometrics and RFID based on multi-tier architecture, for computers and smart phones. This system can maintain all the attendance records of both students and staff.
- Shireesha Chintalapati and M.V. Raghunadh [5] proposed a system based on face detection and recognition algorithms, detects the student automatically when he enters the class room and marks the attendance by recognizing him.
- Pooja G.R, Poornima M, Palakshi S, M. Bhanu Prakash Varma, Krishna A N [6] proposed a system , which is based on face detection and recognition algorithms .Different real time scenarios are considered to evaluate the performance of various face recognition systems. This paper also describes the different techniques to be used in order to handle the threats like spoofing. When we compared this to traditional attendance marking this system saves the time and also helps to monitor the students.
- Puchong Subpratatsavee, Tanabat Promjun, Wichian Siriprom, Worasitti Sriboon[7] implement a system which is based on NFC technology and run on mobile application. All instruction must have a mobile phone with an embedded NFC reader that can read student NFC card, as well as an camera device embedded on mobile phone that can take their photos and both are use for attendance mark of student.
- Anugerah Ayu ,Ismaeel Ahmad[8] proposed a smart attendance system using NFC that will simplify the attendance process, It mark attendance by simply touching an attendance poster or the lecturers NFC based mobile device in the class. The application is designed basically using a server side scripting technology (PHP), a client side language (JavaScript), and for storing and manipulating the records for the whole system database system (MySQL) is used.
- Unnati A. Patel[9] proposed system which is based on RFID technology, all the details of this technology are presented in paper. This system can be easily accessed by the lecturers via the web and most importantly ,the reports can also be generated in real-time processing, thus, It helpful for providing valuable information about the students.
- Nirmalya Kar, Mrinal Kanti Debbarma , Ashim Saha, and Dwijen Rudra Pal[10] This paper describes a method for Students Attendance System which will integrate with the face recognition technology using Personal Component Analysis (PCA) algorithm. The system will mark and record the attendance of the students in class room environment automatically and it will provide the facilities to the faculty to access the information of the students easily by maintaining a log for clock-in and clock-out time.

III.EXISTING SYSTEM

All This paper proposes to create a system with one server to which all mobile phone are connected, so all data will be saved in one database on mobile phone and send to the database on the server too, making the monitoring of the information effortless. All instructor must have a mobile phone with an embedded NFC reader that can read student NFC card, as well as camera device embedded on mobile phone that can take their photos. The camera device is meant to prevent a student from giving his/her NFC tag to a classmate who attends the lecture, touch the other students NFC tag to make it appear as if he/she had also attended. When a student enters class and touch his/her NFC tag on instructors mobile phone, the NFC reader reads each student NFC tag, while the camera device on mobile phone simultaneously takes his/her photo and sends it to the database in instructors mobile phone. After some time, the instructor submits all data for backup in a database server.

A. Identified Problem

Attendance system is a system that is used to track And manage the attendance of a particular person and is applied in the colleges, schools, industries, universities and also in working places. The manual attendance record system is not efficient as well as it requires more time to arrange record and to calculate the average attendance of each student. Hence we are implementing system which will take automatic attendance with high accuracy and minimize manual work.

IV.PROPOSED METHODOLOGY

Automated attendance system is a very good example of automation of modern era. It is the best replacement to time consuming, bulky, manually fed attendance system. This system is not only used for recording attendance of official personnel but is also used for security purposes. There are various automated attendance systems available in the market. Some of the examples of these automated attendance systems include biometric attendance system, punch card attendance system, swipe card attendance system etc. To overcome some problems related with these systems We are combining to techniques that are Card swap and Face recognition. It maintains the records in a large database instead of traditional method of maintaining register which further simplifies the process of searching for a particular student record. The system also helps the faculty to easily find out defaulters in a single click.

In this system we can take attendance of student at college gate by using face recognition, here input is face of student. Harr cascade algorithm is used for face recognition to match faces of student with trainee data. Again in classroom attendance is taken by NFC Reader. Mapping of these two attendances is used for final attendance mark of student. Monthly, weakly attendance report of student is generated by system, average attendance of student is calculated and teachers can give term work marks depend on average attendance of particular student. Android application is used for interaction between teacher, parents and student. Teacher can send student attendance, marks, daily record of student to parents, also can send important notes, exam timetable, notice to student. Student can give feedback to teacher using same android application.

A. Scope

With automated attendance system, teachers can more accurately and quickly track student's time on the classroom.

Automated attendance system is considered to be the most efficient and trustworthy invention and has a noticeable impact on both large and small scale industries.

B. System Architecture

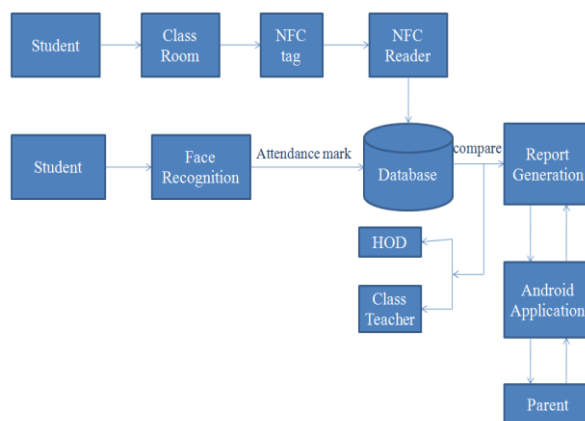


Fig. 1 Architecture Diagram

C. Objectives

- 1) To reduce paperwork and save time with mobile and web portal.
- 2) To Eliminate duplicate data entry and errors in time and attendance entries
- 3) To Improve visibility to track and manage student attendance & absenteeism across multiple campuses.
- 4) To provide easy attendance recording using NFC & Biometric based attendance system.
- 5) To Keep the parents informed about the student's performance via Android application.

D. Technologies To Be Used

1) NFC:

IT works on the principles of sending information over radio waves. The technology used in NFC is based on Radio Frequency Identification (RFID) idea which used for the electromagnetic induction to transfer information. Application need NFC card reader, to read information inside the NFC card.

2) Face recognition:

A facial recognition system is a computer application able to identify and verify a person from a digital image or a video frame from a video source. It can be done by comparing selected facial features from the image and a facial database. In this way of face recognition, local features on face like eyes, nose and lip corners are portioned and then given to face detection system to easier the task of face recognition.

3) Arduino:

It is an open-source platform used for building electronics based projects. Arduino consists of physical programmable circuit board as well as piece of software, and also IDE (Integrated Development Environment) used to write and upload computer code to the physical board.

E. Softwares

- 1) Windows Operating System
- 2) Visual Studio
- 3) MSSQL Server
- 4) Android Studio
- 5) JDK

F. Mathematical Representation

Let S =system for automated attendance using NFC and Face Recognition.

S= s ,e ,I ,o ,f ,success, failure.

Where s=start state

e=end state

i=input

o=output

f=functions

i=student face and NFC id

f1=face recognition

f2=NFC attendance

F3=student, parent and teacher communication.

o=Final report generation.

Success: Attendance mark successfully.

Failure: Attendance not marked.

G. Algorithm used

1) *K-Means*:

k-means is one of the simplest unsupervised learning algorithms that solve the well known a clustering problem. The procedure follows the simple and easy way to classify a given data set through a certain number of clusters. Algorithm aims at minimizing an objective function know as squared error function given by:

$$J(V) = \sum_{i=1}^c \sum_{j=1}^{c_i} (\|x_i - v_j\|)^2$$

• *Algorithm*:

1. Start
2. Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.
3. Assign each object to the group that has the closest centroid.
4. When all objects have been assigned to its closest centroid, recalculate the position of the K centroids.
5. Repeat steps (2) and (4) until the centroids no longer move.

2) *HAAR Cascade*:

Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in 2001. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is used to detect objects in other images.

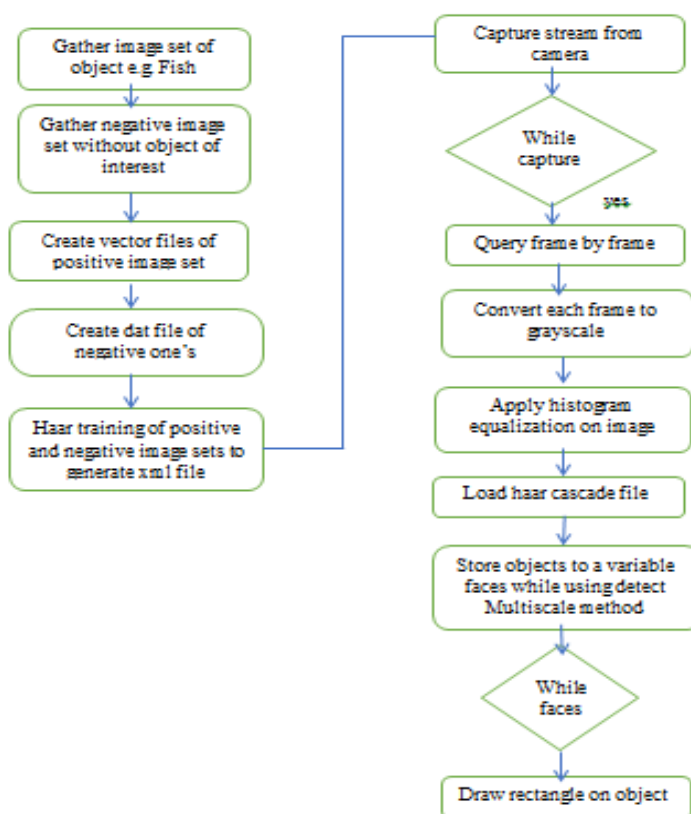


Fig. 2 Flow chart

V. RESULTS AND DISCUSSIONS

For generating Final Attendance of student there is a three phase as below:-

A. College Attendance

Attendance of every student is taken at college gate using face recognition. It capture face of student at college gate and check that face with faces store in database, if face match with one of the face in database, college attendance of that student will marked by system. Then record of every student Store in database if student present then value is 1 and if absent value is 0.

Table 1: College Attendance

Student ID	Name	Face Matching	College Attendance
1	Savitra	Yes	1
2	Jitesh	Yes	1
3	Chaitali	No	0
4	Surabhi	Yes	1
5	Neha	No	0
6	Rohini	Yes	1
7	Shital	No	0
8	Rohan	No	0
9	Monika	Yes	1

B. Class Attendance

After college attendance at gate is done then class attendance of student taken by subject teacher and it also store in database with value 0 and 1.

Table 2: Class Attendance

NFC ID	Student ID	Name	NFC Tapping	Class Attendance
154961315	1	Savitra	Yes	0
154961316	2	Jitesh	Yes	1
154961317	3	Chaitali	No	0
154961318	4	Surabhi	Yes	1
154961319	5	Neha	No	0
154961320	6	Rohini	Yes	1
154961321	7	Shital	No	1
154961322	8	Rohan	No	0
154961323	9	Monika	Yes	1

C. Report Generation

Both attendance are store in database and map these values to calculate final attendance of student. If value of both attendance is 0 then final value is 0, if one value is 0 and another is 1 then final value is 0, if both values are 1 then final value is 1. When final value is 0 the student is absent and if value is 1 then student is present.

Table 3: Report Generation

Student ID	Name	College Attendance	Class Attendance	Final Attendance
1	Savitra	1	0	0
2	Jitesh	1	1	1
3	Chaitali	0	0	0
4	Surabhi	1	1	1
5	Neha	0	0	0
6	Rohini	1	1	1
7	Shital	0	1	0
8	Rohan	0	0	0
9	Monika	1	1	1

College attendance marked with the face recognition at the college gate is shown in Figure 3.

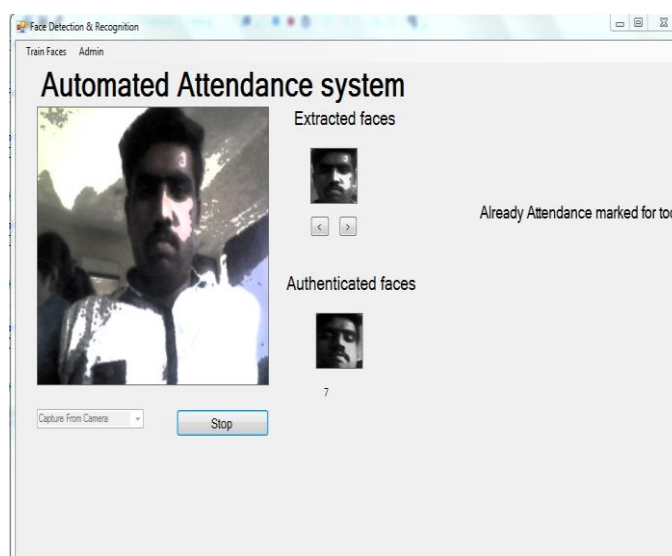


Figure 3: Face recognition of student

VI. CONCLUSION AND FUTURE SCOPE

Typically, students attendance is marked manually which spends a lot of time. Proposed system gives automated attendance of students via NFC and face recognition. Accuracy of attendance will increase. This system useful for automatic attendance and report generation. important document will be send to student as well as parent by the teacher. This system introduced the NFC technology which gives flexibility that is it can be extend with more modules. these tag can be put to used at the university and may replaced with student id card.

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