



International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 5, May 2018

An Implementation of Smart Attendance System Based on Face Recognition Using Android Application

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ABSTRACT: The attendance mechanism in the classrooms have always been and interesting task as it includes proper marking of attendance for each candidate against his / her own roll call. Also, the major concern for the attendance marking in classrooms is the time and resources being wasted for the complete process. Many researches have been made to automate the process using various technologies such as RFID tags, person sensor, biometric sensors face detection etc. This paper presents the deep survey about the literature for the various techniques used previously and analyse the shortcomings of each to understand the implementation feasibility of the advanced system.

KEYWORDS: ZigBee technology, RFID Tags, Fingerprint identification, Speech Recognition, Attendance System, Wireless communication, GPRS System.

I. INTRODUCTION

All in most educational institutions, participation of students in learning process is regarded as a vital exercise for allowing knowledge transfer. This signifies the importance of having students to attend the scheduled lectures and classes.

Conventional methods for recording student's attendance are still adopted by most colleges. One common method is by having students to manually sign the attendance sheet, which is typically passed around the classroom while a lecturer is giving the lecture. This approach could undoubtedly allow the students to cheat about their attendance, where a student may sign for an absent student. Besides, such attendance sheet could easily be misplaced or lost.

A stricter approach specially to prevent students cheating about their attendance is additionally tedious, where a lecturer calls out the individual names from the students list and validate the presence of every single student. Such manual methods of taking students attendance have been proven to be difficult and time consuming. Thus, there is a need for a semi-automated system that would eliminate all of these troubles.

Therefore, it is author's objectives to develop a portable attendance system equipped with an online database, especially to prevent data loss as well as to promote paperless and a greener environment. Besides that, the application will help to reduce time being wasted, leading to a higher learning productivity in class. There are a few paperless attendance systems that have been developed but such systems need to be equipped with either a computer or RFID reader, resulting in additional cost for hardware and its maintenance. With that in mind, author have aimed to address this issue by having a system with minimal hardware requirement and at the same time, enhancing the mobility aspect of the existing attendance systems. In this section, author review a few related systems and their different methods in recording students' attendance. An RFID based system [1] is developed to record student's attendance during class



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Vol. 6, Issue 5, May 2018

hour as the students enter the class. This system requires each classroom to be installed with an RFID reader that is connected to a computer. The RFID reader will be used to capture the student information through the student's card. To view the overall student attendance, the lecturer may later connect their phone via Bluetooth to the computer. Another project [2] is also using RFID technology. However, this system requires an RFID reader to be mounted at the central of each classroom. The mounted RFID reader will track all RFID tags in the classroom at once and an object counter will update the number of students in the classroom based on the successfully traced tags. Both systems described earlier have the same limitation, which is the additional hardware cost to install the RFID devices. Even though RFID devices have become cheaper over the time, one whole RFID system does not just include readers and tags. Computer, cables, network or even a server might be needed in order to setup the whole infrastructure. The cost to setup the system from scratch can easily outweigh the cost of the RFID devices used in the system. An alternative approach was introduced in [3], where the system promotes fingerprint-based students' attendance recording system with GSM utilization. By using this system, each student attendance is validated once the student's fingerprint is verified by the reader. In addition to the strict attendance verification and recording, the system will send weekly attendance report to the students' guardians via GSM.

In another biometric-based system, [4] presents a remote iris acknowledgment attendance administration system, which is planned and actualized using the Daugman's calculation [5].

This system utilizes the iris acknowledgment for confirmation and RF wireless techniques, especially for employee identification. Both of these systems are utilizing biometrics qualities which make them great approach against fake data.

The obvious limitation of such biometric-based attendance system is that they cost a lot more expensive than a pure RFID based system. the attendance recording process in these systems would also be time consuming due to the fact that biometric scan would normally take a while for recognition and validation process. In spite of this, author do not deny the importance of such systems in highly secured environment.

II. LITERATURE SURVEY

2.1. Sanjay Badhe, Kunal Chaudhari, Sneha Kale, Tejaswi Mane, "Smart Attendance Management System"

Conventional attendance system followed in an educational system where the teacher calls out the name of each and every student and mark the attendance causes time wastage during lecture time. This becomes more and more severe especially in the current scenario where number of students in a class is very large. Managing the attendance data of such a large group is also very difficult. Another disadvantage of present system is the chance for the student to mark fake attendance. Fingerprint based devices are being used in corporate environments. These devices use computer to store and verify fingerprints. It can be ported to academic environment with modifications.

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Vol. 6, Issue 5, May 2018

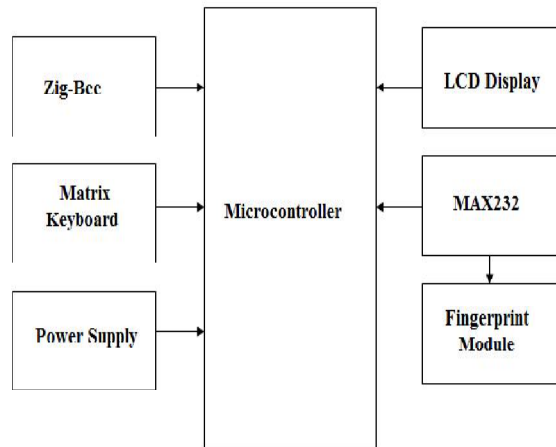


Fig 2.1. Finger Print Based Attendance System

Wireless attendance management system, a style methodology of wireless fingerprint sensible of attendance management system using Zig-Bee technology. It achieves sensible attending management system, by fingerprint identification. It understands low-priced, power and high-performance fingerprint information transmission and recognition operate. During this paper complete development and implementation of the sensible attending management system is provided by the employment for fingerprint module and GPS system. This numerous module that represent completely different components of the sensible attending management system square measure explained victimization their hardware demand as shown in Fig.1.block diagram.

2.2. ChatratiSaiKrisha, Naidu Sumanth, C. Raghava Prasad, “RFID based student monitoring and attendance tracking system”

India has many numbers of colleges and teaching is one of the major activities providing employment to number of people who like to give knowledge to the people. Today many colleges of rural area are facing common problem like bunking the college lectures also meet with the accidents. Indian department of education arises question to the department for their irresponsibility. Education department also seeks records of all the students which are very difficult to maintain. This describes a prototype development of maintain the record of all the students titled RFID based Tracking & Attendance with GSM Module exclusively catering the need of Indian teachers.

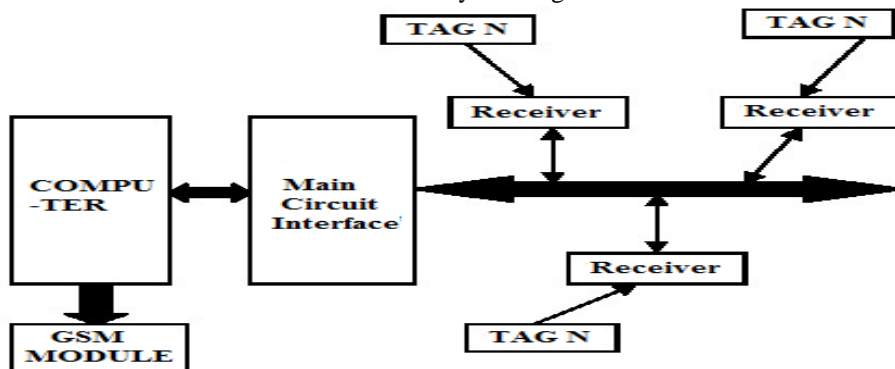


Fig 2.2. Working of RFID Based Attendance System

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

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Vol. 6, Issue 5, May 2018

Sr.No	Unit	Description
1	Main System	It acts an interface between the computer and the receiver Circuit. It also latches the Data.
2	Receiver	It receives the location of the Tags (I-cards).
3	Transmitters	These are the transmitters (I-cards) which transmit their location.
4	GSM Module	It is used to send messages of the data.

Table 1. Individual Unit and its working

The applicant's automated attendance monitoring system uses tags (worn or carried by students or other attendees) and readers to monitor the whereabouts of individuals. Thus, for instance, as students enter a classroom, the antenna of a reader placed on the ceiling of classroom would interact with Radio Frequency Identification ("RFID") tags that are worn or carried by the students. The system would then track which students have entered the classroom, and by comparing the list of entering students with the class list, the system could generate a provisional list of absent students and further the information can be forwarded to the parents.

2.3. SubhadeepDey, Sujit Barman, Ramesh K. Bhukya, Rohan K. Das, "Speech Biometric Based Attendance System"
In this paper author present the development and implementation of a speech biometric based attendance system. The users access the system by making a call from few pre-decided mobile phones. An interactive voice response (IVR) system guides a new user in the enrolment and an enrolled user in the verification processes. The system uses text independent speaker verification with MFCC features and i-vector based speaker modelling for authenticating the user. Linear discriminant analysis and within class covariance normalization are used for normalizing the effects due to session/environment variations. A simple cosine distance scoring along with score normalization is used as the classifier and a fixed threshold is used for making the decision. The developed system has been used by a group of 110 students for about two months on a regular basis. The system performance in terms of recognition rate is found to be 94.2 % and the average response time of the system for a test data of duration 50 seconds is noted to be 26 seconds. Biometric person authentication is the task of verifying a person's identity using human characteristics or traits to restrict the access to an intended service. Automatic attendance system is one of the applications of biometric person authentication systems. Traditionally fingerprint [1], [2] or face image/video [3] are being used as the biometric for such applications. Person authentication using speech biometric is commonly termed as speaker verification (SV). Recent developments in SV research motivates the use of speech as a biometric for using in practical person authentication systems such as attendance systems with reasonable reliability. Based on the constraint on the text content of the speech data, S V systems can be classified into two: text-dependent and text-independent. In a text-dependent SV system the text is fixed or known to the system while in a text-independent SV system the user is free to speak anything.



Fig 2.3.a. Architecture of Speech Biometric Based Attendance system

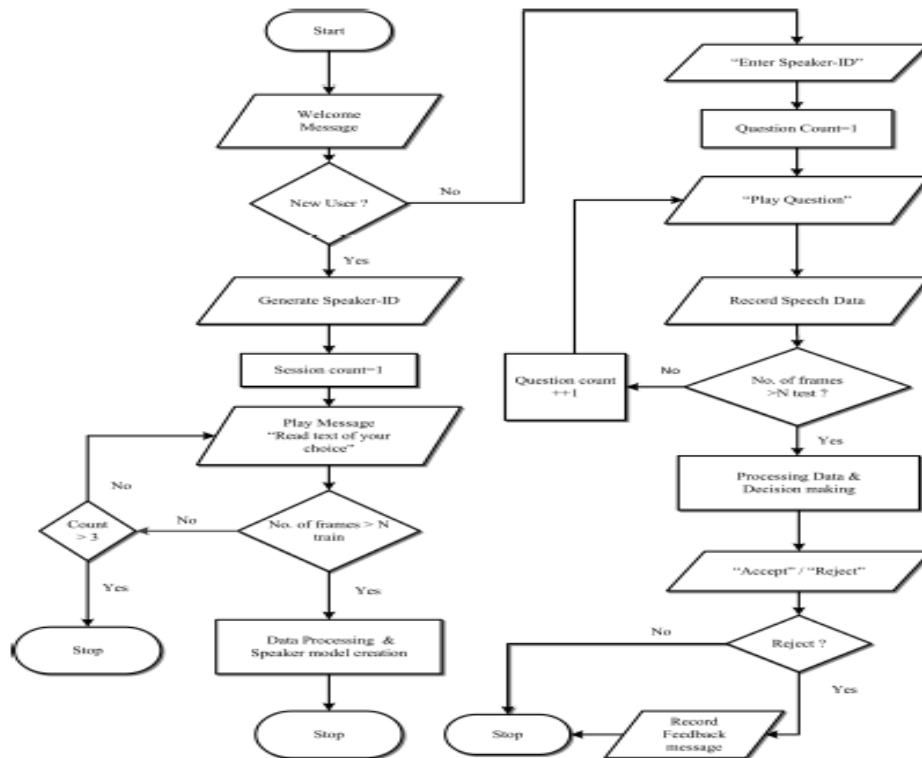


Fig 2.3.b. Flow of Speech based recognition system.

2.4. SitiAisahMohd Noor, NorlizaZaini, MohdFuad Abdul Latip, NabilahHamzah, “Android-based Attendance Management System”

Until today, most lecturers in universities are found still using the conventional methods of taking students’ attendance either by calling out the student names or by passing around an attendance sheet for students to sign confirming their presence. In addition to the time-consuming issue, such method is also at higher risk of having students cheating about their attendance, especially in a large classroom. Therefore, a method of taking attendance by employing an application running on the Android platform is proposed in this paper. This application, once installed can be used to download the students list from a designated web server. Based on the downloaded list of students, the device will then act like a scanner to scan each of the student cards one by one to confirm and verify the student’s presence. The device’s camera will be used as a sensor that will read the barcode printed on the students’ cards. The updated attendance list is then uploaded to an online database and can also be saved as a file to be transferred to a PC later on. This system will help to eliminate the current problems, while also promoting a paperless environment at the same time. Since this application can be deployed on lecturers’ own existing Android devices, no additional hardware cost is required.

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Website: www.ijircce.com

Vol. 6, Issue 5, May 2018

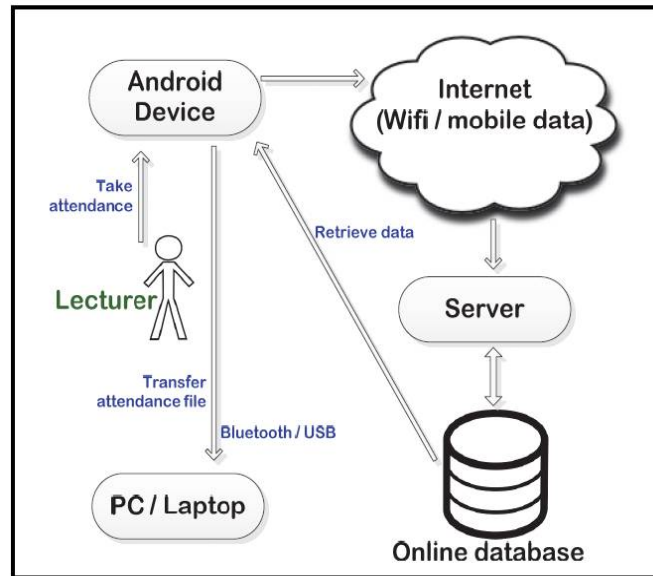


Fig 2.4. Android Based Attendance Management System

In recording student attendance, conventional methods are still adopted in some institutions, where the instructors call out the student names one by one or by taking signature from each student to determine their presence. Nowadays, better methods are also employed, i.e. by relying on a system to record the attendance of students in semi-auto manner, e.g. RFID or biometrics-based systems. Such systems are absolutely excellent as a solution to existing problems, but one obvious drawback is the additional cost of hardware and maintenance.

Hence, it was author's target to develop an attendance system that will require minimal hardware cost, setup and maintenance. i.e. by having the application to run on the instructor's existing Android mobile device. Besides that, to prevent data loss, an online database will be used especially to store the recorded student's attendance. The system was successfully developed by following the client-server framework. A complete design of the system was created first, followed by the actual implementation of the system both on the server and Android device. The development was finalized with the system testing on the overall system.

III. PROPOSED SYSTEM

3.1 System architecture of proposed system

The proposed system is on Android smart phone-based system which a staff member will take a image of students and upload their attendance in the system. The below figure is described the proposed system architecture.

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Vol. 6, Issue 5, May 2018

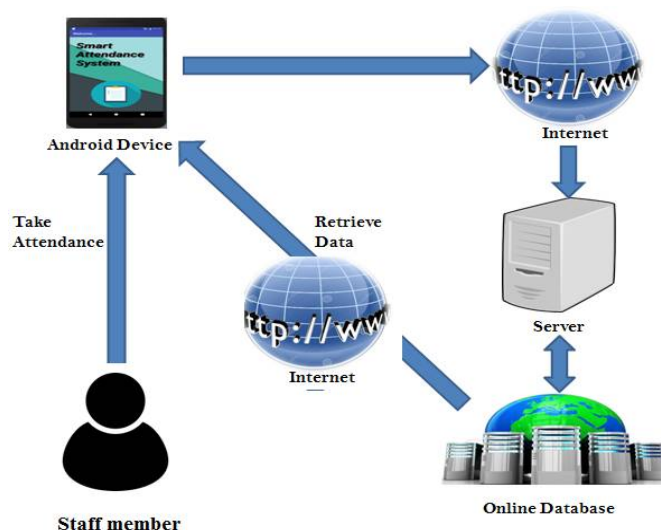


Fig 3.1. Architecture of Proposed System

The system we are proposing in this system aims to address the issues of capturing student's attendance in class through the use of an Android-based attendance management application. In which a staff member has authority to capture the images of students in the classroom. Android devices are normally small, light and portable, which allows them to be used anywhere and at any time with ease. Admin has authority to register teachers. And can view all the activity of teachers such as teacher's lectures conducted. When staff member will take an image of students and provided to admin. Admin has authority to update their attendance to the database. Teachers has authority to register students.

3.2. Modules and Working of Proposed System



Fig 3.2. Face Recognition and Detection

The proposed attendance system mainly consists of Four phases; Image acquisition, Face Detection, Feature Extraction, Face Recognition. The working of the system is depicted as follows:

1. Image Acquisition

The system consists of a camera that captures the images of the classroom and sends it to the image pre-processing. Then that image is sends for face detection.

2. Face Detection

This process separates the facial area from the rest of the background image. The faces which are stored in the database.



International Journal of Innovative Research in Computer and Communication Engineering

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Website: www.ijircce.com

Vol. 6, Issue 5, May 2018

3. Feature Extraction

Feature extraction is done for distinguishing faces of different student. In this system, eyes, nose and mouth are extracted. Feature extraction is helpful in face detection and recognition.

4. Face Recognition

The face image is then compared with the stored image. If the face image is matched with the stored image then the face is recognized. Then for that particular student the attendance is recorded.

IV. MATHEMATICAL MODEL

Set theory of the proposed system:

$$S = \{I, P, O\}$$

I= Input to the System.

P= Processing of System.

O= Output of the System.

$$I = \{i_1, i_2, i_3, i_4\}$$

i_0 = Staff Registration and Login Credentials

i_1 = Student Face registration.

i_2 = Classroom Snap from Android Camera.

i_3 = Face Detection from input samples.

i_4 = Date and Time of attendance.

$$P = \{p_1, p_2, p_3, p_4\}$$

p_0 = Registering staff (teachers).

p_1 = Registering face samples of students with details.

p_2 = Recognition of faces from the input classroom image.

p_3 = Attendance marking for detected faces.

$$O = \{o_0, o_1, o_2\}$$

o_0 = Detected faces of the present students.

o_1 = Attendance Marked for detected faces.

o_2 = Staff wise attendance records.

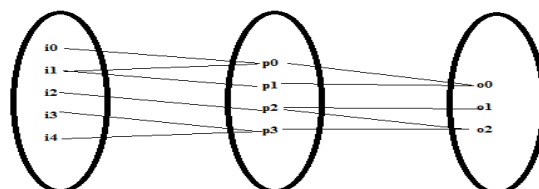


Fig 4: Venn diagram for Mathematical Model of System

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 5, May 2018

V. RESULTS OF SYSTEM

Results of system which is shown in figure step by step.



Fig 5.1 Add Student

In Fig 5.1 shows that the how to add student in database.

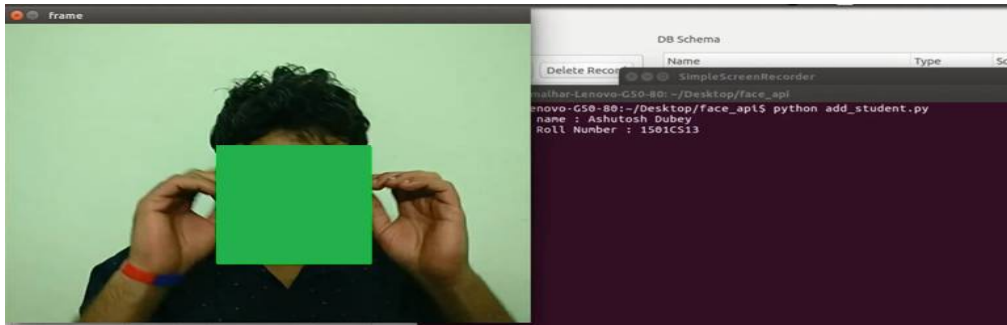


Fig 5.2 Add face

In fig. 5.2 shows how to add face of student in database.

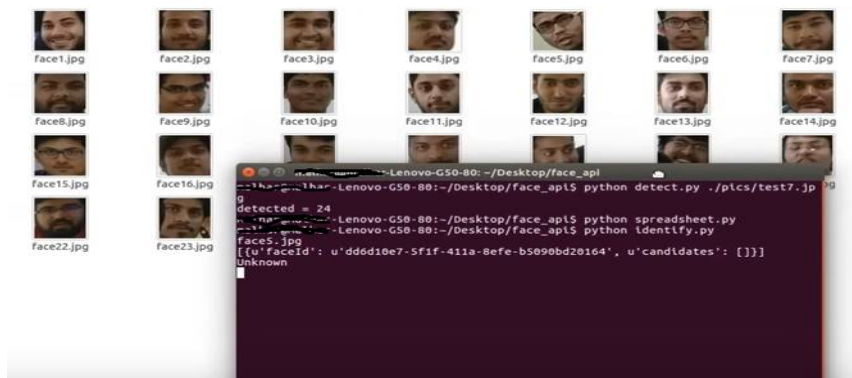


Fig. 5.3 Cropped faces

In fig.5.3 shows cropped faces after adding it in database.

International Journal of Innovative Research in Computer and Communication Engineering

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Vol. 6, Issue 5, May 2018

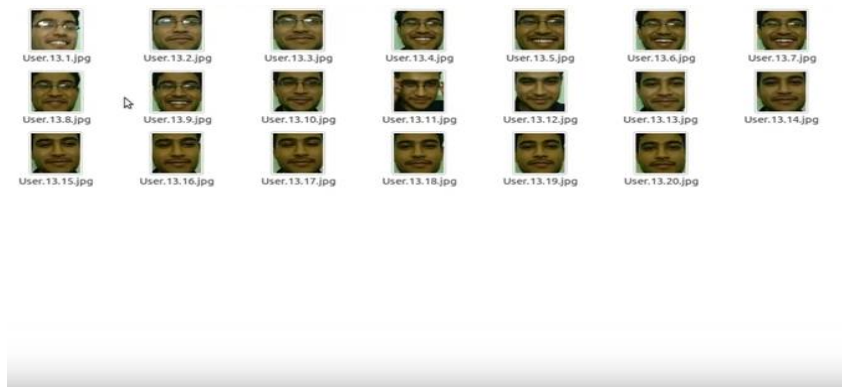


Fig 5.4 Face Dataset Created

In fig. 5.4 face created shown in snapshot.

```
malhar@malhar-Lenovo-G50-80:~/Desktop/face_api$ python create_person.py user13
({'personId': u'a15b02d5-2014-4423-bc84-b0182c99f7d7'})
Person ID successfully added to the database
malhar@malhar-Lenovo-G50-80:~/Desktop/face_api$ python add_person_faces.py user13
3
User.13.9.jpg
({'persistedFaceId': u'8587ec29-f8a0-4f96-a1a5-1975f684232c'})
User.13.18.jpg
({'persistedFaceId': u'2ad0be5a-aeec-409e-81c4-9d70a21c2bda'})
User.13.15.jpg
({'persistedFaceId': u'b3ba418e-210c-43ad-8584-42d97a5d4ea9'})
User.13.16.jpg
({'persistedFaceId': u'482bc984-8dc4-4e6f-87a6-49fa5df823dd'})
User.13.17.jpg
({'persistedFaceId': u'6d310d4c-02ba-401a-b317-95d08a6ba40a'})
User.13.14.jpg
({'persistedFaceId': u'a7fb9850-11f0-42ee-afc9-71e1f2034d3c'})
User.13.2.jpg
({'persistedFaceId': u'a1c420a4-4425-402a-9e72-24f5d802f7cc'})
User.13.6.jpg
({'persistedFaceId': u'2a890312-020e-4302-8255-e19390f9ecd0'})
User.13.20.jpg
({'persistedFaceId': u'3b9f710d-c042-49e2-a50c-18bc27969b1d'})
```

Fig 5.5 Face Registered Count and Names

In fig.5.5 Face registered count and name shows in table which is allocate in database.

```
malhar@malhar-Lenovo-G50-80:~/Desktop/face_api$ python spreadsheet.py
g
detected = 24
malhar@malhar-Lenovo-G50-80:~/Desktop/face_api$ python identify.py
face5.jpg
[{'faceId': u'dd6d10e7-5f1f-411a-8efe-b5090bd20164', u'candidates': []}]
Unknown
face19.jpg
[{'faceId': u'9b090d79-cb20-48e1-8b6c-817fac60b3d9', u'candidates': [{'personI
d': u'a0dc3748-383f-402a-92ed-678bf646578d', u'confidence': 0.68669}]]
Ajay Deshmukh recognized
face17.jpg
[{'faceId': u'79648a1a-e303-426f-9f3c-419927f7f0a1', u'candidates': [{'personI
d': u'b226ae87-a2f5-498d-b32e-6c6c1f8814e9', u'confidence': 0.73543}]]
Ashish Raj recognized
face3.jpg
[{'faceId': u'a56932c3-8310-4bc0-a38e-825aef07df22', u'candidates': [{'personI
d': u'3f1e9fbf-783a-4972-8fe1-5e214ca67415', u'confidence': 0.77486}]]
Arinjaya Khare recognized
```

Fig 5.6 Face recognized

In fig 5.6 face recognized process is shown.



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Vol. 6, Issue 5, May 2018

	A	B	C
12	1501CS17	Ayush Sharma	
13	1501CS19	Chirag Wadhwa	
14	1501CS20	Chandradev	1
15	1501CS21	Deepak Verma	1
16	1501CS22	Himanshu P	1
17	1501CS26	Kshiti Jauhal	1
18	1501CS27	Malhar Kulkarni	1
19	1501CS29	Moolchand	1
20	1501CS30	Nabeel Qadir	1
21	1501CS31	Solomon	1
22	1501CS32	Rushikesh Pedgaonkar	
23	1501CS34	Pranav Muthurajan	1
24	1501CS35	Praveen Singh	1
25	1501CS36	Raghav Jindal	1
26	1501CS37	Rijul Dhir	1
27	1501CS38	Sahansh Singh	
28	1501CS40	Sahil Sharma	1
29	1501CS44	Suvom Das	
30	1501CS45	Arbaaz Qureshi	1
31	1501CS50	Vijay Kumar	
32	1501CS52	Shashwat Tripathi	1
33	1501CS53	Tarun Garg	1
34	1501CS56	Abhijit Roy	1
35			

Fig 5.7 Attendance Marked output

In fig 5.7 final output is shown which is come in table format.

VI. APPLICATIONS

- The proposed can be used in educational institutes.
- It can be used in corporate world like in banks, IT firms wherein arrival time plays a vital role.

VII. CONCLUSION

Thus, the survey on smart attendance system depicts the use of various software based or hardware based, barcode based or RFID based, biometric based or face recognition-based techniques which have few advantages as well as few shortcomings. Many of the existing systems in the literature proposed the system requires additional hardware requirement for achieving the desired results. So, to overcome, this above framework is the better and reliable solution from every perspective of time and security. In this way we have accomplished to add to a reliable and effective participation framework to distinguish faces in classroom and recognize the faces accurately to mark the attendance.

Thus, there is a need of an efficient system which will not only save the attendance marking time but will save paper and give efficiency as well.

ACKNOWLEDGEMENT

All faith and honor to our HOD for his grace and inspiration. We would like to thank all my Friends and Family members they were always been there to support us. We sincerely thank to our Department Head, Project coordinator, our project guide and all other staff members to give us the guidelines for this paper.



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BIOGRAPHY



Prof. AmolSawant, received BE degree from solapurUniversity and ME from Pune University. His done his researching Data Mining with best paper award and currently associated with Keystone School of Engineering as Assistant Professor having 10 years of teaching Experience and expertise in C, C++,and Data structure, Databases, Data Mining and CloudComputing.



Miss. ArtiDongare, pursuing in the Keystone School of Engineering, pune. She have received the Diploma from the Department of IT from JayvantraoSvant Polytechnic, pune in 2015. Her research interests include Database (MySQL), programming languages (i.e. c, c++, java, python, Android),DataMining,Testing.



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ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

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Miss. Pooja Tekawade, pursuing in the Keystone School of Engineering, pune. She received the 12th from R.R.Shine,Jr.College in 2014. Her research interests include Database (MySql), programming languages (i.e. c, c++, java, python, Android),Website Development.



Mr. Amitsingh Thakur, pursuing in the Keystone School of Engineering, pune. He have received the Diploma from the Department of Electronic from S.R.G.S. Institute of Technology, Hadapsar Pune in 2015. His research interests include Database (MySql), programming languages (i.e. c, c++, java, python, Android),CyberScurity, Data Mining .