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An Image Based Authentication System Using NFC Technology

Tojy Thomas* and K.Vadivukkarasi**

ABSTRACT

In today's world, people looking for speed and efficiency to reduce the time required for work and performance of a system. In most of the colleges students attendance is one of important factor, because it should required to evaluate student's attendance while giving them final grade.. Some colleges use paper sheet for student attendance and after that fill all this information in college server. This all are time consuming process and student give the proxies of their friends even they absent. Hence we are proposing a system called an image based authentication system using Near Field Communication (NFC) and Global System for Mobile Communication (GSM) technology. This will help in monitoring student's attendance fast and thereby reducing the time for taking attendance by tutor. Also students get information when the attendance is updated and thereby avoiding the loss of attendance due to some faults.

Index Terms: *NFC technology,* attendance, embedded camera, Raspberry Pi.

1. INTRODUCTION

In the most of the time staff takes the attendance by calling out the names of the students and then marking on the attendance sheet or pass the attendance sheet to students and asking the students to sign on it. Both practices have their own drawbacks. In first case if strength of students is more, checking this entire student by name and surname might take about several minutes. In second case if student is absent then friends of absent students may write down their name and surnames. Both methods have its own disadvantages when it comes to taking attendance. To overcome all these issues we use NFC tag into service. Each tag has a unique ID, and tags are given to students when they registered in college. When the student enter the class room and move these tag on NFC reader device, NFC readers program will read these tags and identify whether the students is valid or invalid. If it is valid, then embedded camera will capture the face of particular student and send all the data to college server and the validation program in the sever will check the data for validation, if valid data is found then program will mark the attendance and send a message to the authorized mobile no informing that attendance is loaded, otherwise mark student is absent. If the tag is matching and face is not matching with the data in the tag, then message send to the mobile no indicating some unauthorized person is using the tag. All these done with one system no manual working is needed. This paper is organized as follows. Section 2 describe about the NFC technology we are using in this system. Section 3describes the design and implementation and section 4 conclude the paper.

2. RELATED WORK

2.1. RFID

RFID, which stands for Radio Frequency Identification, is an automatic identification technology used for retrieving from or storing data on to RFID Tags without any physical contact [1]. Main concept behind the RFID based attendance system is to take the students attendance in a college or university. An

* Department of Electronics and Communication Engineering, SRM University, Chennai, India.

RFID system primarily comprises of RFID Tags, RFID Reader, Middleware and a Backend database. RFID Tags are uniquely and universally identified by an identification sequence, governed by the rubrics of EPC global Tag Data Standard[2]. A tag can either be passively activated by an RFID reader or it can actively transmit RF signals to the reader [2]. The RFID reader, through its antenna, reads the information stored on these tags when it's in its vicinity. The reader, whose effective range is based on its operational frequency, is designed to operate at a certain frequency. The operational frequency of the reader ranges from 125 KHz – 2.4 GHz.

2.2. Biometric Identification

Fingerprint identification is one of the most well known and common biometric identification systems. Because of their uniqueness & consistency over time, fingerprints have been used for identification over many years, more recently becoming automated due to advancement in computing capabilities. So, here the fingerprint identification technique was used for maintaining the attendance record. The record of the fingerprints of various students was maintained in a database. The communication between the PC and Module was done wirelessly over Bluetooth. Students are supposed to enroll their fingerprint at the beginning of the semester for a particular course. During the class the fingerprint module would be passed among the students to mark their attendance.

3. NEAR FIELD COMMUNICATION

NFC[3], or near-field communication[4], is a new technology having number of advantageous. It is a wireless communication technology based on the technology of Radio Frequency Identification (RFID), which uses magnetic field induction to enable communication between electronic devices[5]. One of the key elements of NFC, near field communications technology is the ability for NFC enabled devices to be able to be touched onto passive NFC tags. This facility of NFC technology is a key enabler for many applications. The stored data on the NFC tag may contain any form of data, but common applications are for storing URLs from where the NFC device may find further information. The NFC tag is a passive device with no power of its own. Accordingly when one is used, the users touch an NFC enabled device onto the tag. A small amount of power is taken by the NFC tag from the reader/ writer to power the tag electronics. After getting power tag is then ready to transfer information to the reader/writer.

In more technological terms, NFC defines how the two products communicate among them. NFC is short range wireless RFID technology[6] (1-4cm. realistically, 10cm. theoretically) which uses low speeds (106-414 kbps) and allows two devices to automatically start communicating when they are close to one another. NFC uses passive targets with no batteries and random devices that are not powered, so called tags or stickers, sometimes aka transponders or labels. NFC Tags are essentially "targets" that "want" to be touched by NFC devices. These Tags can contain information, applications or services[7].NFC technologies are now a day's used for payment, contactless bank card become more common now a day's and a NFC phone can act like a contactless bank card.

The important components of this system are: - NFC reader (Raspberry Pi), Student id_tag (NFC tag). The Raspberry Pi, features a powerful ARM processor, a 3D graphics processor capable of generating high-definition video, 512 Megabytes of RAM, and a SD memory card connector for our files[6].

Raspberry here will act as an reader device. The Reader device will be placed at every classroom. This attendance system can be used in college, university, by using NFC in android/ linux OS based Raspberry Pi device. For avoiding misuse or an unauthorized attendance this system is embedded with a facial Authorization camera which would recognize face of a particular student.

Figure 1: NFC technology applications.

4. DESIGN AND IMPLEMENTATION

This paper introduce a system with one server to which all individual NFC module device are connected, so all data will be saved in the NFC reader module device and send to the database on server, to match the data on the NFC tag and facial authorization.NFC reader module in each class can read the student NFC id tag and embedded camera in the device can take the photo of the student to prevent the unauthorized attendance marking

The hardware required for the image based authentication system using NFC technology for monitoring Attendance is Raspberry PI, a NFC reader module, no of NFC tag and a camera module. This makes it low cost system and a user friendly application.

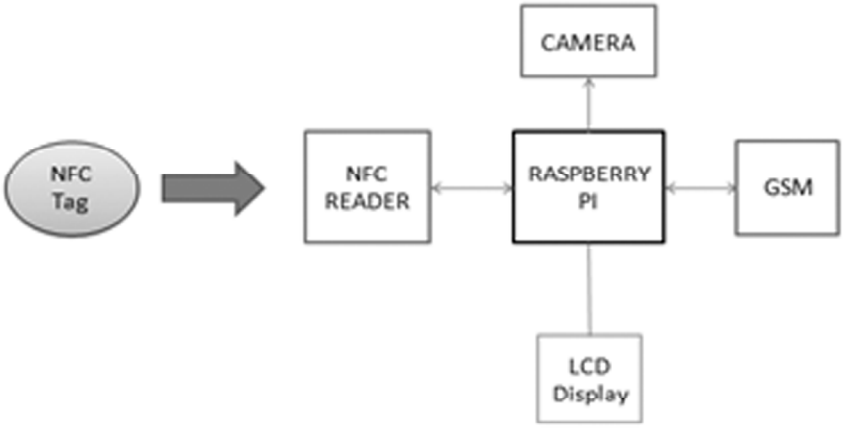


Figure 2: NFC enabled system block diagram

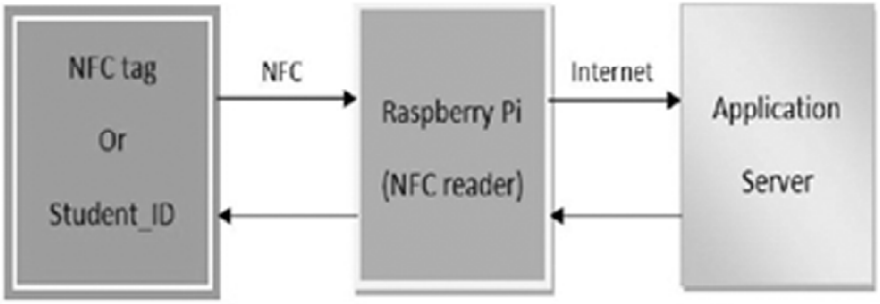


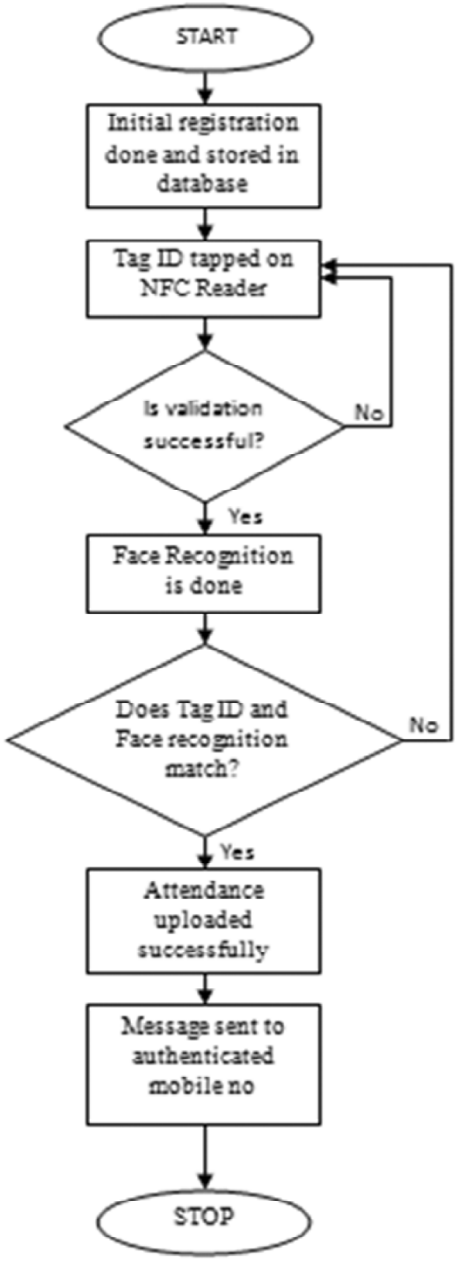
Figure 3: NFC enabled system design

4.1. Algorithm

Initially the details of the students should enter in to the database from the registration department. Details of N number of students can be saved in the database.

1. The student taps his Tag id on NFC reader module.
2. The Tag id gets validated.
3. After successful validation of the Tag id then Face recognition of that particular student takes place.
4. Else, if validation unsuccessful then that student is not registered in the department or the facial recognition of the student has failed.
5. If both Tag id and Facial Authorization are successful then attendance is marked on the database.
6. A message is also send to the authorized mobile no indicating that attendance is loaded.
7. Stop

4.2. Flowchart



4.3. Coding

4.3.1. ADMIN

1. Student creation: The admin is responsible for creating entries for the students. During the registration process, the important details related to them are entered and creates their login credentials in the system. The admin is responsible for performing the function like creation of different student in the application.
2. Face Training: The image of the student will be uploaded by the admin to the face training module which will be stored for detection purposes. This is done by using Open cv software. In this we are using Principle Component Analysis (PCA) technique employed with Eigen face algorithm. The disadvantage in PCA is overcome by Haar Cascade Classifier.

4.3.2. Attendance Loading

1. Verification: The student needs to place his NFC tag near the reader module. The application retrieves the information saved in the tag and verifies the student.
2. Face Detection: The student image will be captured and send to the detection module based on which a response of valid and invalid will be received by the module and display on screen.
3. Attendance Marking: On successful validation of the student, the application marks the attendance of the student.
4. Notification: On successful marking of attendance a short message service is send to authenticated mobile indicating attendance is marked.

4.4. GSM Modem Interface

It is almost equivalent to a mobile communication system. Using transmission and reception pins, a modem can receive and send the messages with Raspberry pi . Insert a SIM card in to the GSM modem and make the suitable connections. Power up the GSM module and wait for few seconds for SIM initialization. Modem control is done through AT commands, so suitable commands should be transmitted to the modem for each purpose and the modem will respond to these commands by transmitting suitable messages

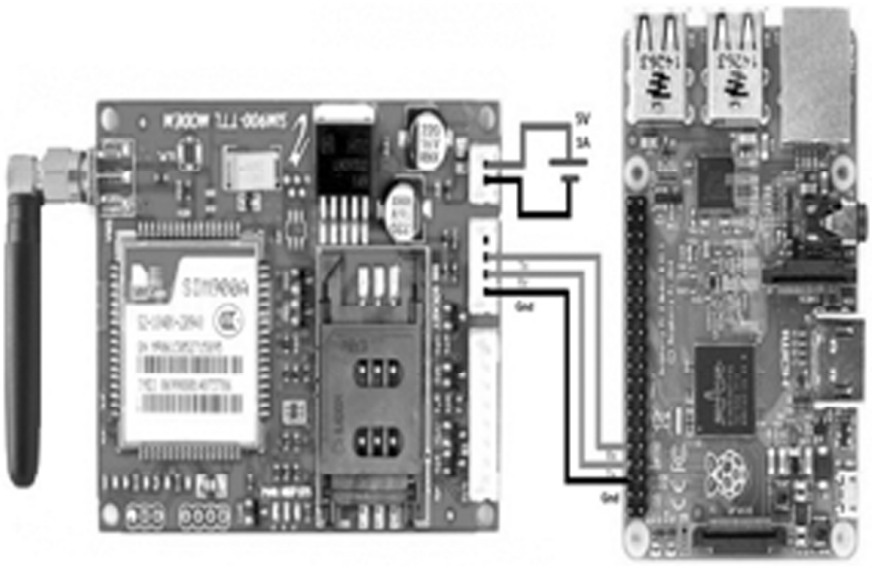


Figure 4: GSM interface with Raspberry pi

4.5. Working

The proposed system can implement in simple and cost effective way. The user should be initially registered at the registration department and then provided with a unique Tag id;then the user will tap the NFC tag on the NFC reader module in the class. Raspberry Pi is a platform which makes the implementation easy and the raspberry pi is connected to an NFC module. When the tag is tapped on the NFC reader server will connect to database, when the connection is achieved, facial authorization through camera will take place and a connection to server database take place. Then it will check for validation; if validation succeeds, attendance will be marked and conformation message with details of time, subject and date will be sent to registered user mobile number..Attendance will be marked if both NFC tag action is valid and camera authentication is valid. If validation fails it means that a particular id_tag for which the validation failed was not registered initially or misuse of any other student's id_tag took place. Administration has power to generate reports and edit student information. The main aspect for an academic improvement is attendance.

5. CONCLUSION

Real time monitoring of attendance without of any wastage of time is developed. The paper shows how the system based on NFC technology can be used to monitor student's attendance without the problem of proxy. One of the important advantage is that the parents can consult about the academic progress of the of the student without calling the respective teacher. The tag which provide by colleges that have been employed for this system are NFC tag, and algorithm used are stable and provide reliable outcomes. Moreover, this algorithm has secured important data that we have stored on these tags Our study clearly defined the benefits of currently developed NFC applications by classifying them into NFC operating modes. For

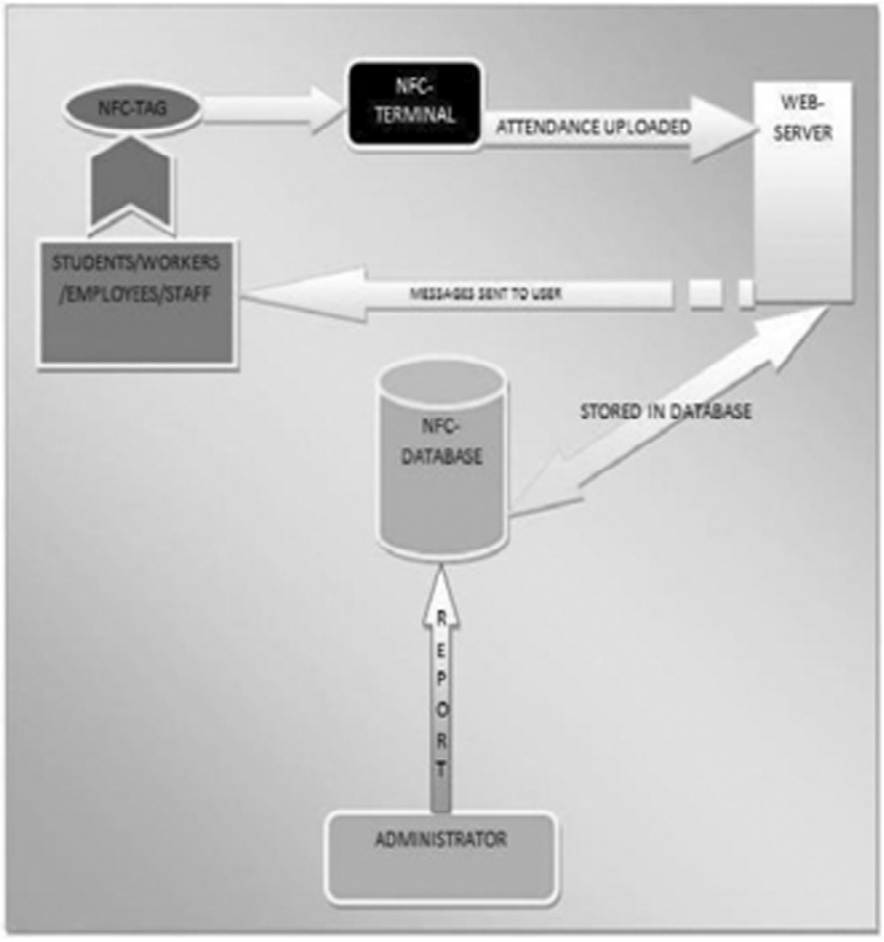


Figure 5: Implementation of the system

future developments of NFC- based application it will guide to believe that underlying each operating modes benefit by analyzing already develop application.

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