Spectre(Smart Personalized Electromagnetic Card to Recognize Entry)

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Abstract— Marking attendance in colleges is generally a tedious effort on account of the increasing number of admissions. The process of attendance involves passing a sheet with the column for signature or a roll call at the end of the lecture. In the first scenario, the student may not receive the sheet and in the second may not be heard to the teacher. Also, the library system mainly consists of manual entry of book id by the librarian. Here the management of issued books becomes restricted. Lastly, colleges offer canteen services where physical money or coupons are used to buy the food item. Ticket printing and money handling is difficult to manage, leaving room for human error. In this paper, we propose a Smart Personalized Electromagnetic Card i.e. the NFC card which can be used to mark the attendance, issue a book and buy food items by a simple tap on the NFC enabled phone.

Key words: NFC technology, NFC mobile application attendance system, canteen system, library system

I. INTRODUCTION

The attendance system in the present scenario is very tedious and inclined towards manual submission and prone to human error. It also tends to be problematic and time consuming for the staff to constantly enter data from the sheet, to the register and then finally to an excel sheet for the monthly average. This process has many drawbacks and the marking of attendance itself is unnecessarily tedious. Attendance is an important factor in a student's academic years since it decides whether the student is eligible to sit for the final papers. Other systems like the library usually have redundant requirements for identification and bare minimum features regarding the registration, overdue payment work managed by the librarian. The usual norm of paying with physical money at the canteen is less effective since the virtual wallet concept could easily be introduced that can make payment even easier and optimized. We can considered several technologies like biometric, RFID, NFC, Barcode etc. which can be used to eliminate the drawbacks of all three systems.

Barcode	Biometrics	RFID	NFC
Scans the barcode (set of adjacent bars) where the light is absorbed by the black colour and reflected by the white portion. The light reflected to the sensor gets converted into binary digits of 1's and 0's.	Organic matter i.e. fingerprint, retina etc. are scanned and cross checked with a copy present in the database to see if it matches.	Radio waves transfer data between the RFID tag and the reader, which are tuned to the same frequency.	Communication is activated by touching two NFC enabled devices together, or bringing them into close range to send and receive or exchange data.
	Uses laser scanning technology. Reader forms include hand-held, hands-free, scan engine etc.	Devices include fingerprint readers, facial recognition systems, hand geometry systems, voice verification systems, and signature verification systems.	Three types of tags i.e. active, semi and passive.	Types of tags:- Type1-read/write Type 2-write once Type 3-write only(smaller memory capacity than type 2)
	User friendly, quick turnaround time, inexpensive.	Extremely secure, minimum scope for fraud, eliminate ID misplacement and other related problems.	Three types of tags i.e. active, semi and passive.	Types of tags:- Type1-read/write Type 2-write once Type 3-write only(smaller memory capacity than type 2)
	User friendly, quick turnaround time, inexpensive.	Extremely secure, minimum scope for fraud, eliminate ID misplacement and other related problems.	Can scan multiple tags simultaneously, tough and long lasting tags, long read range.	NFC technology availability in phones reducing extra hardware requirements, cheap NFC tags, ease of use, portability.
	Non reusable, scanner is damage prone	Very expensive, can make mistakes with dryness of the fingers.	Expensive reader, tag collision reader collision, tags are specific.	Low data transfer rate, works only in short ranges.

Table 1.

In this project we propose a web and android application based attendance system using Near Field

Communication (NFC) technology. NFC is a new, short range, high frequency, low bandwidth, and wireless communication technology. NFC communication is activated by touching two NFC enabled devices together, or bringing them into close range. The range is usually few centimeters, and it operates at the frequency of 13.56 MHz. The maximum data transfer rate is 424kbit/s. NFC is based on Radio frequency Identification (RFID) thus its communication involves initiator and a target, the initiator actively generates a Radio Frequency (RF) field that can be used as a signal to power a passive target. The initiator (active) has its own internal power that can be used to power the ICs that generate the outgoing signal; while the target (passive) has only ICs with no internal power, which makes it to be in different forms like tags, stickers or cards [1].

NFC support three modes of operation they are: reader/writer mode, card emulation mode, and peer to peer mode. The communication in reader/writer mode is between NFC device and a tag in which device either read from a tag or write to a tag. Peer-to-Peer mode involves exchange of data between two NFC devices. While in card emulation mode the NFC device acts as a tag which will appear to an NFC reader as a contact-less smart card. [2].

This paper describes our works in developing an NFC supported attendance, library and canteen system. The arrangement in this paper is as follows: Section II presents the purpose of our project. The working of each module is explained in Section III. Section IV states the technologies used for the project. Lastly the conclusion and future scope is described in section V.

II. PURPOSE OF OUR PROJECT

- The purpose of the Website is to manage attendance, library and canteen system records.
- The Android Application accepts values from the NFC card and updates the database displayed on the website.
- The login provisions will be provided to the teachers, librarians and canteen managers for the android application while the website will only be accessible to the college administrator to maximize security.
- It will automate the system, reduce human involvement and manual errors.

III. WORKING OF SPECTRE

A. Attendance System

In this system, the student has an id number stored in his NFC card which points at his or her information in the database. An android app is installed onto the teachers phone. The teacher must login in with provided user id and password. Now all the student has to do is tap his card onto the teachers mobile to mark his attendance. The marking is immediately inserted in the database and visible in the website. The website allows the admin to view any students attendance as well as add, edit or delete a student from the database altogether. He also can add, edit or delete teachers in the database. When the email id of the teacher is submitted along with his or her details, a random password is generated that allows the teacher to login into the app.
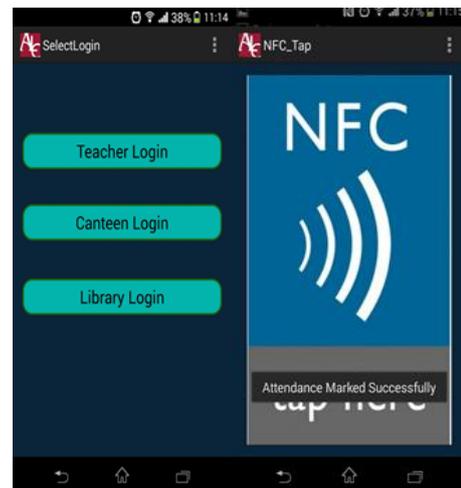

Fig. 1, 2: Login page of application and NFC screen visible after marking attendance

B. Canteen System

In this system, the student will contact the administrator to enter some amount into his account. However, the amount will not be stored onto the card but rather in the database. The canteen manager will login and the student will tap his card on the phone. The canteen manager will fill in the amount and description of food item and click on "make payment" button. The amount will automatically be deduced from the students account. In case of insufficient balance, an error message will be displayed and the student will not be able to purchase before refilling his account. The admin will be able to view all the transactions made during the day on the website.

Fig. 3, 4: Details page and NFC page after successful transaction

C. Library System

In this system the librarian logs into his account with the designated user name and password. When the student taps his or her card onto the phone, the librarian tyoes in the book name click on the button which issues it under the particular student. The librarian can also view the list of books previously issued by the student along with the date or return. Another plus feature is that the fine for overdue books is directly deduced from the student account. The admin can also view the fines of the students yet to be paid on the website.
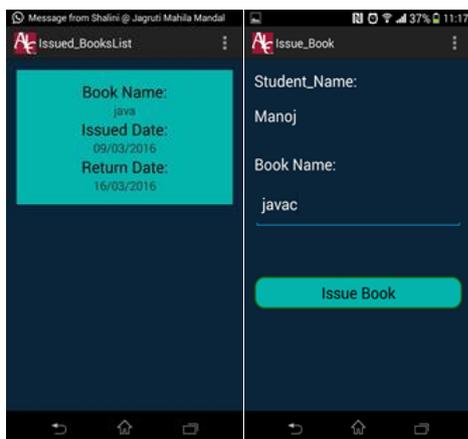
Fig. 5, 6: Details page and list of books issued under the
student name

IV. TECHNOLOGIES USED

– Visual Studio 2010
– MS SQL Server 2008
– SDK for Android 4.0
– Eclipse

V. CONCLUSION AND FUTURE SCOPE

In conclusion, this paper has put forth an efficient and cost effective way to manage all three systems in a college which generally are quite tedious in their working and management. The authority of editing and managing students as well as teachers has been given to the admins of the college in order to maintain a single stream of control. The automated process makes attendance marking and tallying very easy and saves time. The canteen process ensures the usability of "virtual wallet" to make transaction easier. Lastly the library system is optimized in terms of all its management activities. One card is used all three sections, thus saving college resources for other scopes.

The future scope of this project can be expanded upto universities with dormitory and campus travelling services where the same card could be used for identification and payment purposes. Also, it could be applicable for apartment entry, shops local libraries etc.

REFERENCES

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