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An NFC – Enabled Mobile Application for Student Attendance

Sakshi Tiwari¹, Pradnya Sabale², Rasika Mahalle³, Shraddha Kate⁴, Prof. Gunjan. V. Ukalkar⁵

Student, Department of Computer Engineering, Padmabhooshan Vasantdada Patil Institute of Technology, Pune,
Maharashtra, India¹

Student, Department of Computer Engineering, Padmabhooshan Vasantdada Patil Institute of Technology, Pune,
Maharashtra, India²

Student, Department of Computer Engineering, Padmabhooshan Vasantdada Patil Institute of Technology, Pune,
Maharashtra, India³

Student, Department of Computer Engineering, Padmabhooshan Vasantdada Patil Institute of Technology, Pune,
Maharashtra, India⁴

Project Guide, Department of Computer Engineering, Padmabhooshan Vasantdada Patil Institute of Technology, Pune,
Maharashtra, India⁵

ABSTRACT: Abstract—Due to the increasing number of students, taking attendance in educational institutions has become increasingly difficult, especially at larger colleges and universities. Teachers often call names and record them in paper. The reality that students have to interrupt the presentation for the purpose to record their attendance as well as register for absent fellow students is one of the many issues associated with this strategy. Through the use of near field communication (NFC) technology, the smart attendance solution proposed in this study streamlines the attendance process by enabling students to tap their student identity (ID) card on an NFC reader. Inexpensive, efficient, and simple to maintain is the method. Time is saved and tension is reduced by automating student attendance. The NFC technology takes an average of 3.5 seconds, whereas the traditional method takes 16 seconds to collect a student's attendance.

KEY WORDS: NFC, MOBILE APPLICATIONS, STUDENT ATTENDANCE, AND MOBILE DEVICES

I. INTRODUCTION

In the context of human nature, technology is getting increasingly sophisticated and widespread. ICT has introduced innovation to numerous industries, but especially in the field of higher education. Furthermore, as attendance has an immediate impact on students' academic performance, monitoring every student's attendance at an educational institution has become more crucial in recent decades. In addition, there are a few limitations to the conventional method of maintaining record of students' attendance. For example, students must sign a paper that is subsequently transmitted to the system when the lecturer distributes the manual attendance list. The system requires manual input, which takes time, effort, and is prone to error. In addition, when lecturers distribute the paper attendance record to the class. Whether an institution is an educational setting or a working office, attendance is a fundamental component. Still, a few educational institutions take attendance using the old-fashioned way (register, paper sheet, attendance sheet). These approaches have several drawbacks, including the constant need for time investment and the potential for fraud, such as when a friend of an absentee marks a fictitious attendance. Automating the process can reduce, if not completely eliminate, the problems and obstacles related to the current university attendance registration routine. This research suggests an NFC-enabled desktop-based attendance system. An attendance system is used in businesses, educational institutions, and other Developing a mobile environment NFC-based student attendance system is the goal of this project. The most effective and safest method for students to sign attendance in class would be provided by this. Attendance at literature class is presented in the following sections. The NFC-related literature review is presented in the ensuing parts.

II. BACKGROUND

The technique known as Near Field Communication (NFC) enables for the hands-free transfer of data across inadequate boundaries, usually between 5 and 10 cm. This newer generation of RFID technology integrates a smart card interface and reader into a single standalone unit. Information acknowledgment, verification, and communication can be achieved using this as a contactless system. In addition, this technology offers far stronger security and more adaptability in data integration as compared to the conventional approach. The application of cryptographic techniques in NFC facilitates this type of encrypted communication. This inspired multiple tech companies to support NFC in their payment systems as a whole. It follows that there would be no security compromise while adopting NFC as the attendance system's approach. Since magnetic field induction is used to initiate communication, no prior setup is necessary for this type of communication between the devices. When in card emulator mode, the NFC-capable device acts as a real card that recognizes user input. enables a credit or debit card to be swapped out for an NFC-capable device. You rely on the NFC-enabled devices to complete the transaction rather than a credit or debit card. Other card-type applications are also included in this mode, including identity cards, hotel passcards, credit cards, ticketing, access control, and any other card-related responsibilities you may think of. Users are able to interact with many information sources and save brief information on the computer for later use by utilizing the Read/Write mode. Users can interact with intelligent advertising and get coupons using this kind of communication tool. With the appropriate NFC-capable computer, it is also feasible to contribute data to these intelligent information sources. Furthermore, the peer-to-peer mode allows users to share data between devices that support NFC. Two NFC-capable PCs are connected by it. NFC's peer-to-peer mode can be used when users share information with other smartphone users or construct an ad hoc network to work collaboratively on projects. While in this mode, NFC functions as if a person had an encrypted network in their pocket that they could use anywhere, worry-free. The different ways that NFC functions are displayed in Fig 2.1

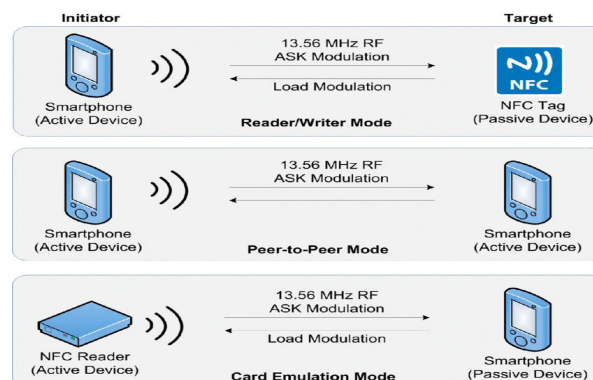


Fig. 2.1. The various methods NFC operate

While Bluetooth, Radio Frequency Identification (RFID), and WiFi are additional forms of communication that can be employed, they are not as economical and power-efficient as NFC. The table below compares and demonstrates the specifications of each module. Table 1 lists all of their features, user requirements, and connectivity options. The NFC connectivity range, as can be seen above, is the least of all that allows the user to have safe connectivity with the shortest setup time amongst the others. Then, since NFC connections are made quickly, there is no need for a lengthy line to form, which provides both the educator and the students with an important benefit in terms of transferring information between applications. Using NFC is also an easy and quick way to utilize it. Furthermore, manufacturers have decreased the initial expenses of obtaining NFC

Specification	NFC	RFID	Bluetooth
Maximum Coverage Range	10cm	3meter	100meter
Frequency of operation	13.56MHz	varies	2.4GHz
Communication	2-way	1-way	2-way
Data rate	106,212,424Kbps	varies	22Mbps
Applications	credit card related payments, e-ticket booking	EZ-Pass, tracking items	communication between phone and peripherals

Table 2.1. Comparison of connectivity types

Smart cards by integrating NFC into the majority of their Android smartphones as part of their payment system in recent years. Then, since NFC connections are made quickly, there is no need for a lengthy line to form, which provides both the educator and the students with an important benefit in terms of transferring information between applications. Using NFC is also an easy and quick way to utilize it. Furthermore, manufacturers have decreased the initial expenses of obtaining NFC smart cards by integrating NFC into the majority of their Android smartphones as part of their payment system in recent years.

III. LITERATURE SURVEY

Students may demonstrate their own work by taking a friend's test. Traditionally, attendance has been monitored manually, which can be time-consuming and interfere with instruction. To build an NFC-based system, two essential components are required: an NFC reader/writer and a tag. Under NFC, there are standard correspondence and information sharing conventions that rely on Radio Frequency Identification (RFID). The overall environment for teaching and learning is likely to be impacted by the integration of NFC innovation in student attendance systems. The NFC-based attendance system's objective is to make use of the two things that students should always have with them: This study reviews previous studies conducted for various reasons related to an updated attendance system. We have a systematic writing audit to identify all current qualitative proof relevant to this stage in order to achieve this level-headedness. This test can broaden the range of data regarding how NFC is used or received in educational institutions, particularly when it comes to managing attendance or participants in a program or session.

3.1 Related Computerized Attendance Systems

A typical type of time and attendance system that is more accurate in estimating and monitoring student time is the barcode system. The automation of recent manual finance or attendance errors is eliminated by barcode innovation. As a result, the system tracks student attendance consistently and correctly. Additionally, the setup costs of the system are negligible when contrasted with the expense of financing or attendance problems. It is simple to use the barcode technology. All students receives a barcode-equipped ID or card. Entering and leaving the premises requires exchanging the ID/card on the time clock. The study of measurable organic properties is known as biometrics. Biometrics, as used in computer security, describes verification techniques that depend on genuine, measurable attributes that can be independently confirmed. There are several biometric identification techniques, such as vein, voice, hand, and voice analysis.

The watch data can be downloaded by the director or overseer, who can then utilize it to keep track of and amend time and attendance records [22]. A product's UPC, or unique 12-digit number, is used in retail to identify both the product and the merchant. keep track of your time and attendance. A merchandise's UPC, its unique 12-digit number, can be utilized in retail for recognizing both the product and the merchant. The item's barcode and the Universal Product Code (UPC) are shown next to each other. An item's UPC is constant continuously. The merchant's EIN appears in the first six numbers. All of the merchant's products will have identical UPCs with the first six digits. It's identified by the next five numbers. Last is the check digit. This helps to confirm the item's UPC. An estimate is made when a UPC is scanned. If the determined digit differs from the check digit, the PC detects a serious problem with the UPC. A barcode with its generic item code (UPC) is displayed in Figure 3.1.



Fig3.1 Barcode (source: Google)

3.2 Biometric Attendance System

In biometrics, verifiable organic characteristics are studied. Biometrics refers to verification techniques in PC security that rely on measurable real attributes that can be verified as a result. Voice, vein, hand calculation, retina, and so on are some examples of biometric identification schemes. The computer uses one of these biometric identification schemes to determine who you are and grant your exceptional level of access based on your personality. Biometric innovation is used for verification representatives under this method. This method has the unique benefit of being quick and easy to use during the entire cycle. The elimination of the current costs associated with obtaining student cards is one of the additional advantages. The damage, loss, and theft of cards, as well as the continuous need for card support and reclamation, are ongoing costs associated with the other card-using system (attractive stripe and barcode systems).



Fig3.2 computerized biometric attendance system (source: Google.)

3.3 Magnetic Strip Attendance System

For the magnetic stripe attendance method, information is encoded on the student card's magnetic stripe. When the card is swiped through the machine, the magnetic stripe data is recorded by the student time clock. This method scans one card at a time and requires direct contact with the reader. Figure 3 shows an image of a card with a magnetic stripe implanted.



Fig 3.3 Card with magnetic stripe card reader (source: Google)

3.4 NFC Vs Bluetooth

The basic difference between NFC and Bluetooth—and the reason it only works close-by—is that NFC devices can be active or passive, whereas Bluetooth devices must all be active. NFC devices send data packets to other NFC devices via radio frequencies, much like Bluetooth has been doing for years. Bluetooth devices can transfer far bigger packets of data in the megabyte range, as opposed to the kilobyte range for NFC, and they can be placed much farther apart (depending on the signal strength, Bluetooth can be accurate up to dozens of feet away).

3.5 NFC Vs Other Wireless Information Transfer Technologies

A comparison is made between near-field communication and other wireless information transfer technologies. The test was designed to show how valuable NFC is. Among the most important discoveries of the 20th century was this one. Infrared (IR) and wireless communication technologies as Zig Bee, Bluetooth, and RFID are certainly important components of modern registering administrations [13]. With a minimum information transfer rate of 424 kilobits/sec, NFC is a short-range radio frequency protocol of communication that uses 13.56 MHz frequencies. When the devices that are NFC capable are within 5 cm of one another, NFC communication begins. Because of its quick transmission time, NFC communication is said to be more secure than other communication technologies in this assignment.

IV. METHODOLOGY

1. Requirements Analysis

Determine essential features such as real-time attendance tracking, reporting, and user management.

2. System Design

Decide on a client-server architecture where mobile devices act as clients and a central server stores attendance data.

3. NFC Tag Creation

Generate unique NFC tags for each user or event. These tags can contain user IDs or event information.

4. Mobile Application Development

Develop a mobile application compatible with major platforms (Android, iOS). Implement NFC reading capabilities in the app to scan tags. Design an intuitive UI for users to view attendance, notifications, and reports.

5. Backend Development

Establish a server to handle requests and store data. Create APIs for mobile apps to communicate with the server (e.g., to submit attendance data).

6. Integration

Ensure the mobile app can send attendance data to the server after scanning NFC tags.

7. Testing

Test all features of the mobile app and backend for bugs. Ensure that NFC reading and writing work as intended. Involve end-users to test the system and provide feedback.

8. Deployment

Deploy the application to app stores and make the backend live.

9. Maintenance and Support

Keep an eye out for any problems with the system's performance. Constantly enhance the system in response to user input and technical developments.

10. Reporting and Analytics

Implement tools for analyzing attendance data and generating reports.

V. CONCLUSION AND RECOMMENDATION

While there are a number of efficient methods for tracking student attendance, NFC is being used more and more in conjunction with biometric technology for security reasons. One of the main benefits of RFID systems is their non-contact, non-line-of-sight capabilities. This study can therefore be very helpful and used to a real-time application of an attendance monitoring system in a mobile setting, which makes traditional methods of recording attendance easier to manage, less time-consuming, and less burdensome.

The approach in this study has greatly improved attendance and eliminated time-consuming attendance procedures like calling out names or utilizing paper, according to the findings. An additional benefit is that the attendance information is stored in a real-time database. However, the study's limitations include the following: the program only supports one Android platform; user interfaces might be improved by include additional elements; and professors could be granted more authority to filter out course details. Future work will add further functionality to the program, like enabling multilingual support, sending students notifications for classes, and employing an NFC-based mobile application as a student ID (or digital card).

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