NEPAL POLYTECHNIC INSTITUTE

DEPARTMENT OF ENGINEERING

DIPLOMA IN COMPUTER ENGINEERING

A

FINAL REPORT

ON

SMART ID Card System for College Students

for partial fulfillment of Major Project

DCOM 6th semester

SUBMITTED BY:

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November, 2024

DECLARATION

We declare that the work hereby submitted for Diploma in Computer Engineering at Nepal Polytechnic Institute, CTEVT entitled "**SMART ID Card System for College Students**" is our own work. This project work carried out by us under the supervision of Mr. Hari Bhakta Acharya. Due reference has been provided on all supporting literature and resources.

_____

Aashish Mandal, Pankaj Pariyar & Rijan Shrestha

RECOMMENDATION

The undersigned certify that we have read and recommended to the Nepal Polytechnic Institute, CTEVT for acceptance, a project work entitled “SMART ID Card System for College Students”, submitted by Aashish Mandal, Pankaj Pariyar & Rijan Shrestha in partial fulfillment of Major Project for the degree of “**Diploma in Computer Engineering**”.

_____

Supervisor

Mr. Hari Bhakta Acharya

Date: November, 2024.

CERTIFICATE OF APPROVAL

This is to certify that this project work entitled "SMART ID Card System for College Students" submitted by Aashish Mandal, Pankaj Pariyar & Rijan Shrestha is a bonafide project work carried out under our supervision and guidance and fulfilling the nature and standard required for the partial fulfillment of the degree of Diploma in Computer Engineering. The work embodied in this project has not been submitted elsewhere for a degree.

Submitted by:

Aashish Mandal, Pankaj Pariyar & Rijan Shrestha

A project submitted in partial fulfillment of the requirement for the degree of "Diploma in Computer Engineering".

Mr. Hari Bhakta Acharya	_____	_____
Supervisor	Signature	Date
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Nepal Polytechnic Institute, CTEVT

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ABSTRACT

The Student Smart ID Card application is designed to enhance efficiency and convenience in managing official documents, canteen payments, and library transactions in educational institutions. This system enables students to use a single smart card for various functions, including recharging for canteen bills and managing book transactions and fines. In an era where reliable identification systems are crucial, smart ID cards provide a comprehensive solution for student identification and access management.

This proposal reviews the evolution and implementation of smart card technology, from early patents in 1969 to current applications. It highlights the integration of smart cards with RFID technology for attendance tracking and showcases systems that use RFID tags and readers to streamline processes and enhance security. Smart cards offer secure storage of student information, cashless payments, and seamless integration with campus services. They also combine RFID with web-based technologies, fingerprint verification, and GSM modules to improve attendance management and prevent identity theft. The adoption of smart ID cards simplifies administrative processes and enhances the overall student experience, creating a more integrated and user-friendly campus environment.

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LIST OF ABBREVIATION

CSS	Cascading Style Sheet
DCOM	Diploma in Computer Engineering
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
LCD	Liquid Crystal Display
RFID	Radio-Frequency Identification
SD	Secure Digital
UI	User Interface
UML	Unified Modeling Language
XAMPP	Apache Http Server MySQL Database PHP and Perl

CHAPTER ONE

INTRODUCTION

1.1. Background and State of Problem:

Student Smart ID Card application helps student to manage official documents management, canteen bill payments, library management in college, schools and educational institutes. It also helps students to pay their canteen bills just by using their Smart Card which can be recharged through admin and can also be used in Library for book managements and fine payment by student on late return of book. [1] Now-a-days with rapid growth of population, people need to be identified and it is now a must for every organization from a company to a large country to have the Identity card (ID) for the every people. Therefore, now for every educational institute an ID card for a student is compulsory. ID card is said to be the summary of any student indeed. It is highly essential for an educational institute to provide ID card to each and every student of it. ID card is generally considered to be the summary of a student's information. [2]

Smart cards streamline processes like attendance tracking and access to campus facilities. Without them, colleges may rely on manual methods, which are time-consuming and prone to errors. [3] Smart cards can integrate seamlessly with various systems, such as library management, dining services, and transportation. This integration simplifies processes and enhances user convenience. Without smart cards, integration becomes more challenging, and students might need multiple IDs or systems to access different services [4] Smart cards can securely store and manage data, such as student information, financial transactions, and access logs. Without them, there is a greater risk of data breaches and mishandling of sensitive information. Manual systems are less efficient and secure, making it difficult to maintain data integrity and privacy. Smart cards often function as digital wallets, allowing students to make cashless payments on campus. This system not only adds convenience but also improves financial tracking for the institution. Without smart cards, managing financial transactions can become cumbersome, potentially leading to errors and inefficiencies. [5] Students can use smart cards for cashless payments in cafeterias, bookstores, vending machines, and other campus locations. This system not only adds convenience but also reduces the need for carrying cash, making transactions safer and

quicker. The adoption of smart cards reduces the need for paper-based processes, such as issuing physical tickets or passes, contributing to a more sustainable and eco-friendly campus environment [6]

Smart card technology has been in existence for more than three decades. The first smart card patents were filed in February 1969 by two German engineers, Jurgen Dethloff and Helmut Grottrupp [7]. One year later, Kunitaka Arimura of the Arimura Technology Institute in Japan filed for a smart card patent [8]In May, 1971, Paul Castrucci of IBM filed for and received an American patent entitled Information Card. However, the term smart card was not used until 1980 when it was coined by Roy Bright, a French publicist. Roland Moreno is credited with launching the smart card industry as it is known today. Moreno, a French journalist, filed 47 smart card-related patent applications in 11 countries and founded the French company Innovation [7]. Moreno demonstrated the capability of installing integrated circuits on a piece of plastic the size of a credit card and launched the chip card industry. Moreno's early chip-equipped cards were known as memory cards. Early memory cards were based on EEPROM (electrically erasable programmable read-only memory) and featured fixed digital circuits [9]. The early applications of memory cards included healthcare identification cards and telephone payment cards. Smart cards are more secure than magnetic strip cards and were first adopted by the French banking association to combat credit card fraud. Motorola Semiconductor, working with the French computer company Bull HN Information Systems designed the first smart card microchip for the French banking industry [10]. According to Flohr (1998), the first real smart card was a two-chip microcontroller-based card. Subsequently, Motorola unveiled a single-chip microcontroller-based smart card [9]. Since 1988, with the smart card infrastructure in place, the French banking association witnessed a tenfold drop in credit card. In 1998, the fraud rate was reported to be 0.018%, down from 0.18% in 1988 (Bull and Cartes Bancaires salute 10 years, 1999). During this same period, the number of transactions nearly tripled, from 1.2 billion in 1988 to 3.1 billion in 1998 [11].

1.2. Objectives:

- To develop a Student College Smart Card system for management of library streamlining administrative process and enhancing convenience for students and staffs.

CHAPTER TWO

LITERATURE REVIEW

A. A. O. et al have implemented a system called RFID Based Automatic Attendance systems. This attendance system software has been developed using VB.net and database (Microsoft Access). Each student has RFID tag attached with their Student ID card. There is a serial connection amid computer and RFID reader also has been maintained for connection between RFID and the computer system. The RFID reader is placed at the lecture hall door. Whenever students enter the lecture hall RFID reader read the RFID tag and it store the all information (Entry time, Name, etc.) of students into database via serial connection and maintain the system. Here admin of this system can view all documents using the software interface by retrieving information from database without any difficulties not like traditional system. [12]

Implemented an attendance system with the combination of RFID and Web-Based system. This system uses a RFID tag and reader for getting students "attendance and read particular student. Then this reader connects with Arduino microcontroller which passes the RFID reader response to web server by using Arduino shield, finally the attendance of students can be stored in web server by using PHP and MySQL. The admin of the system can view all students" documents by login to this particular Web based application and also can view the student's details using LCD displays. [13]. Found a system that, RFID and Pose Invariant Face Verification for automatic attendance system. This system works under two-factor verifications. In the first step, students need to use RFID tag which is read by RFID reader. If the first step is succeeded then it moves to second step of verification, if not, student becomes under unrecognized category. The second step is Face verification, if the face match with particular RFID tag, then it marks attendance into database. Missing the above both readings, the system identifies the fraud students. This two-factor automatic system reduces the misuse of identity theft for the purpose of getting attendance. [14]

Arduino Based Smart RFID Security and Attendance System with Audio Acknowledgement" is developed by Yashi Mishra et al. SD card module with RFID tag which carry different voice codes is used in this system. The tag ID and code of the voice greeting stored in SD card module. While a student enters the class room door, his / her

RFID tag is being read. If the ID of the tag matched with stored data in the SD card, then particular person needs to use the voice greeting, if it is matched then the door will be opened and the attendance will store in excel sheet. Student can view the attendance detail using the LCD placed in Arduino. Here Arduino working as microcontroller to connect LCD, RFID reader, SD card module and so on. This system is also working as two-factor verification process. Moreover, this system is very simple schematics than other system because of very simple components and design. Also, here we get fast response with accuracy [15]. Had been created a prototype system called Microcontroller Based Attendance System Using RFID and GSM. This system consists three at Mega16 microcontroller placed in between RFID reader, GSM modem and computer. Each microcontroller has its own purpose. The system starts whenever a teacher used his/her RFID tag to enter the class room and students will enter the class room by swapping their tag within five minutes. RFID reader reads RFID tag and sends the signal to first microcontroller which analyses the signal of RFID reader and opens class room door using IR signal which is influenced by a motor. The signal is temporarily stored in microcontroller, when teacher finishes his / her class he /she must swap the RFID tag again to the reader and system decides automatically that the class is over. Thus, microcontroller passes the temporary stored signal to computer database as attendance. In case of absent of student, the signal passes to GSM modem and it will send the message to parents of the students who were not at the class. If any students go out before teacher use finishing RFID tag which doesn't count the status (present) of the students. This system itself added advanced and reliable security features. Thus, students are not able to cheat the administration and parents. [16]

Proposed a system that working with RFID and GSM. Here they have used microcontroller (LPC) as an intermediate amid GSM module and RFID. Whenever students enter the classroom, they need to use their tag which read by RFID reader and it send to the present signal to GSM module. If the ID of the tag does not match with database it considered as unauthorized access. If it is okay then GSM module send massage administration and parents [17]. Proposed a system that web based attendance using four-tier architecture by using RFID and Biometrics. In this system student's and teacher's RFID unique code will store into the database. A RFID reader and fingerprint device are placed at the door of the classroom. When students enter classroom, they need to use the RFID tag which read by reader and verifies identify by comparing with database whether the tag matches or not.

Second level verification will be allowed if and only if first level is succeeded. Verification with fingerprint is the second step of the system and if the student's finger print matches with database, then the attendance will be marked and stored into database, if not there is no attendance for students. The fingerprint verification only active in span of ten minutes including five minutes before the schedule and after the schedule of class starting time. If anyone late then it denies to provide attendance to particular student but students can stay at the lectures and learn. Finally, SMS will send to the student's parents about inform particular student's presence. This system is time oriented. [18]

Developed a prototype for attendance management system with the placement of a greater number of RFID readers placed in room and there is a server application maintains via a laptop. The reader and laptop or PC connected with the help of wireless router or LAN connection. When a person enters the room, he / she needs to use the RFID tag which reads by RFID reader and passes the attendance to the server through wireless or LAN connection. Since many RFID readers are placed, more than one person can get the attendance simultaneously and get the higher efficiency than traditional method [19]. Also, suggested a system that working with RFID and Telegram Messenger Application. In this system students are needed to meet the teachers for tapping of RFID tags. If it is matched with tag stored in the database, then it sends to the attendance to the principal in the form of excel as well as it sends a message to the specific student's parent via Telegram messenger. [20]

CHAPTER THREE

METHODOLOGY

The below flowchart figure provided outlines the login process for the smart card system, which ensures secure access for students. The flowchart begins at the "Screen," where the login interface is displayed. The next step involves the user scanning their student card, which triggers the system to verify the student's identity.

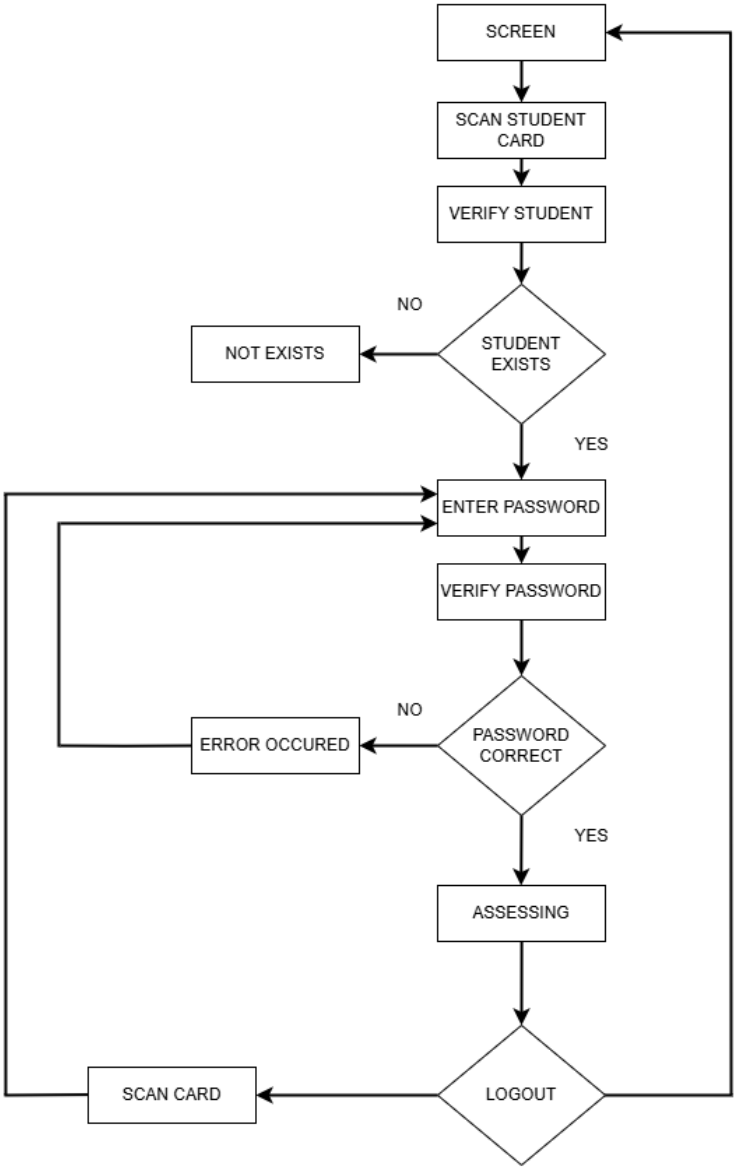

Fig 3.1: Flowchart of processing of system

If the student exists in the database, the process proceeds to the password entry stage. The user is prompted to enter their password, which is then verified by the system. If the password is correct, the user is granted access to the system. If the password is incorrect, an error message is displayed, and the user is prompted to re-enter their password.

Once access is granted, the user can perform various action within the system. The flowchart also includes a logout option, allowing users to securely end their session and return to the initial scan card step. This login process ensures that only authorized users can access the system, protecting sensitive student information and maintaining the integrity of the smart card's multiple functions.

By implementing such a detailed and secure login procedure, the smart card system enhances both the user experience and the overall security of college operations. The methodology for developing this system will involve careful planning, design, and testing to ensure that all functional and non-functional requirements are met, providing a robust and reliable solution for student management.

The proposed project, titled "Smart ID Card for Students", aims to develop a versatile and multipurpose smart card system to enhance the efficiency and convenience of student activities within educational institutions. The smart card will integrate various functionalities, including access control, library management, cashless transactions, and attendance tracking, into a single, unified platform. This integration will streamline administrative processes, improve security, and offer students a seamless and user-friendly experience.

The smart card system will utilize advanced RFID (Radio Frequency Identification) technology to facilitate quick and secure transactions. Each student will be issued a personalized smart card embedded with a unique identifier linked to their academic and personal information. The card can be used to access college facilities, borrow library materials, make payments at the canteen, and record attendance in classrooms. By consolidating these functions, the smart card will reduce the need for multiple identification methods and enhance overall campus security.

In this project of DCOM the “Smart ID Card for College Students” will be designed by the programming languages as PHP, HTML, JavaScript, CSS, My SQL, C, C++ etc. and will use server as XAMPP. As the website will consist of linked databases and it will use dynamic UI that enhances the look and feel of the user.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1. Result:

The Smart ID Card system for college students was successfully designed, developed, and implemented with the following key functionalities:

1. **RFID Card Integration**:
    - Students can use RFID cards for identification, borrowing library books, paying dues, and cashless transactions in the canteen.
    - The system accurately retrieves and displays student details when an RFID card is scanned.
2. **Library Management**:
    - The system allows the library manager to manage book records, including adding, updating, and tracking borrowed books.
    - Student book borrowing history and outstanding dues are automatically maintained.
    - Students can view their dues and history after scanning their RFID card.
3. **Canteen Management**:
    - The canteen manager can manage food item menus, track student purchases, and process payments through the RFID card.
    - Students can pay for food using their RFID card balance, which is updated in real time.
4. **Admin Dashboard**:
    - The admin has complete control over the system, including managing student records, viewing data from both library and canteen systems, and updating RFID card balances.
    - A centralized dashboard integrates all facilities for efficient management.
5. **Database and System Security**:
    - A robust database ensures secure and reliable storage of student, library, and canteen data.

- The system validates inputs and restricts access based on user roles to ensure security and prevent unauthorized actions.

6. **User-Friendly Interface**:
   - The system features a clean, responsive interface with a blue-shaded theme for consistency.
   - Sidebars for navigation ensure that users can easily access relevant sections.

4.2. Discussion:

The implementation of the Smart ID Card system demonstrated the feasibility of integrating RFID technology into college administration systems. The following points were observed during the development and testing phase:

1. **System Efficiency**:
   - The system improved operational efficiency by reducing manual tasks like keeping physical records of borrowed books or tracking dues.
   - It significantly reduced transaction time in the library and canteen, benefiting both students and staff.
2. **Scalability**:
   - The modular structure of the system allows easy scalability. New functionalities, such as hostel or transport management, can be added in the future.
   - The database design supports the addition of new students, books, or menu items without significant changes.
3. **Challenges**:
   - **Hardware Compatibility**: Configuring the RFID module and ensuring proper connectivity with the database posed initial challenges, which were resolved through testing and debugging.
   - **User Role Management**: Designing a system with separate interfaces and restricted access for admin, library manager, and canteen manager required careful planning.
   - **Real-Time Updates**: Synchronizing real-time updates in card balances and transaction records required optimizing the database queries.

4. **User Feedback**:
    - Students and staff found the system intuitive and user-friendly.
    - The ability to view dues and transaction history was particularly appreciated, as it provided transparency.

CHAPTER FIVE

CONCLUSION AND FUTURE WORK

The Smart ID Card system for college students was successfully developed and implemented to streamline multiple administrative functions within the college. The project achieved its primary objectives, including the integration of RFID technology for identification and cashless transactions, and the development of dedicated dashboards for the admin, library manager, and canteen manager.

The system demonstrated its potential to improve efficiency and transparency by:

- Reducing manual efforts in managing student records, library operations, and canteen transactions.
- Enabling students to conveniently pay dues and track their transaction history in real time.
- Providing a centralized and secure database for all operations, ensuring data integrity and security.

While the project successfully met its objectives, several potential enhancements can be considered to make the system more comprehensive and versatile:

1. **Integration with College Attendance System**:
    - The RFID card could be used for marking attendance in classes or exams, providing an all-in-one solution for student tracking.
2. **Hostel and Transport Management**:
    - Extending the system to manage hostel accommodations and transport services using the RFID card.
3. **Mobile Application Development**:
    - A companion mobile application could be developed for students to check their balances, dues, and transaction history remotely.

4. **Enhanced Security Features**:
    - Implementing biometric authentication alongside RFID for higher security.
    - Adding encryption to database records to safeguard sensitive data.
5. **Data Analytics and Reporting**:
    - Introducing analytics to provide insights into library usage, canteen sales, and overall system performance.
    - Automated generation of monthly or annual reports for admin and management.
6. **Offline Functionality**:
    - Enabling the system to function without an active internet connection and synchronize data once connectivity is restored.
7. **Multi-Institution Adaptability**:
    - Adapting the system for use across multiple colleges with centralized control for broader implementation.

By addressing these areas, the system can evolve into a comprehensive and indispensable tool for college administration, enhancing both operational efficiency and user experience.

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