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Smart Id Card System using RFID Technology

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Abstract: In the Smart id card system using RFID technology, the system will be based on RFID technology where RFID (Radio Frequency Identification) is a technology with the help of radio waves, data can be transferred from a RFID tag to RFID reader. The system will allow the personnel in charge at a college or university to easily track student money transactions and also allow to make attendance in the easiest manner. The administrator will be able to make reports easily by one simple click. The system includes two major parts: hardware and software. Hardware part consist of an RFID reader and RFID tag. RFID reader is a low frequency reader (125 kHz) which is connected to the computer via USB cable and the RFID tag will be scanned from the reader and the information embedded on the tag will be transferred to the system to allow data manipulation. The system interface is developed using JAVA NetBeans. The system provides multiple functionalities such as managing a student or staff personal information, managing student or staff account transactions, attendance management and producing various reports such as student information reports, account transaction report, attendance reports and user log report.

I. INTRODUCTION

A. What is RFID?

Radio Frequency Identification is a technology that uses radio wave signals to transfer data from RFID tag, through a RFID reader and process the data embedded on the tag to satisfy the need of a specific application. Usually, RFID tags have a small storage that contains an identification of that tag. Information that can be embedded in the tag are unique identification number, location coordinates or particular data a developer will use in the product being produced.

A RFID tag is made of an integrated circuit with an antenna. The tag can allow 2 KB of data.

An RFID reader is used to read data stored on the RFID tag. The reader uses radio waves signals antennas to receive signal from RFID tag. RFID technology work by an RFID reader that sends radio wave signals and the RFID tag receives it, the transmit back signal containing data on that tag and then that data provided by the tag will be transformed into digital information to be received by a computer.

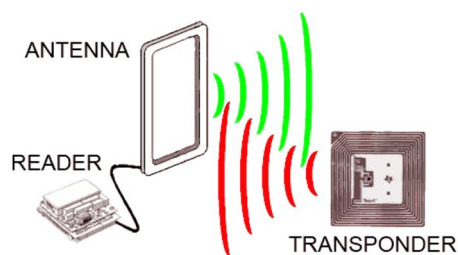


Figure 1

The project is developed to ease the work of student or staff, involves a card containing a RFID given to each student. The smart ID card can be used at many places like office, library and canteen. The amount (balance) in the card can always be refilled with the help of admin. When the RFID card is scanned the balance is deducted from the student's account that is associated with the unique id. The RFID card is scanned with the help of RFID scanner.

The student or staff can use this card in office to pay fine and the amount will be calculated depending on the information stored in database. It can also be used in canteen. Thus, this makes very easy for a student he just needs to carry a portable card which will be very secure. The other functionality of this project is to allow student to do a hostel attendance RFID tags or student USN.

So, for a student or staff to be allowed to use the system, administrator have to register him/her and assign an RFID tag. The tag provided to the student/staff contains unique identification that will be used to identify the student/staff identity.

When a student arrives to an RFID reader and place the tag on the RFID reader, the reader reads the unique ID and check if the ID is present in the system. If the unique ID is not present, system will notify the administrator that the RFID tag is not registered into

the system database. When the system accepts the RFID tag unique ID, administrator can attend the student, can spent student money from account, add student money to account, report the student information, account transactions and attendance reports.

II. LITERATURE SURVEY

In the development process of the system, some reviews were conducted to understand the basic theory, system requirements, hardware requirements, methodologies and technologies that can be used to achieve the objectives of the system. By these reviews that were conducted, we also conducted research on the existing system which gave us the insights about the current system, requirements such as hardware and software requirements in order to develop a system that can be related to the current one but better. So Smart ID Card System using RFID was developed specifically for colleges and universities. The figure below gives some insights about the system.

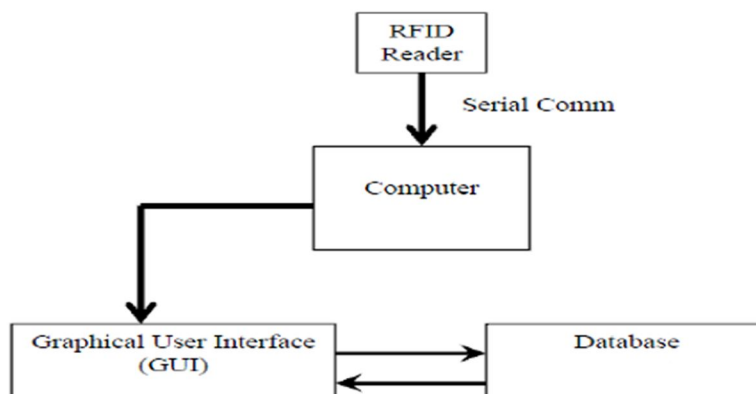


Figure 2 Block Diagram

In general, it is said that the underlying foundations of the well-known radio-repetition innovation test can be followed in World War II. The Germans, the Japanese, the Americans and the British used all the radars that had been discovered in 1935 by the Scottish physicist Sir Robert Alexander Watson-Watt to warn them to move to airplanes when they were still miles away. The problem was that there was no real way to recognize which planes had a place with the enemy and which pilots of a country were returning from a mission.

The search and disclosure of radio frequency identification (RFID) began decisively in the 1970s. RFID is generally used to transmit and obtain data wirelessly. Readers and RFID tags transmit through a separation using radio waves. There is a considerable amount of points of interest in the RFID framework, incorporated in its value, estimate, memory limit and capacity. Advances in radar and RF matching frames continued in the 1960s. Labels based on electronic elements, which are still used today in the cluster, have a 1-bit label. The bit is enabled or disabled. In case someone pays for the thing, the part dies, and a man can leave the store. In any case, if the person does not pay and tries to leave the store, the people who look at the ticket identify the label and issue a warning. The primary RFID licenses allowed Mario W. Cardullo to obtain the main US patent. UU For a dynamic RFID tag with rewritable memory on January 23, 1973.

Subsequently, organizations created a low repetition framework (125 kHz). highlighting smaller transponders. A glass transponder could be infused under the skin of the cattle. This framework is still used as part of the cows in the world today. The low repetition transponders were also placed on cards and used to control the entry of structures. Currently, 13.56 MHz RFID frames are used for control, payment frames (Versatile Speed Pass) and contactless smart cards. They are also used as a hostile tool for car theft. A user in the guide section examines the separate RFID tag in the plastic housing around the key. In case you do not receive the identification number, it is modified to search, the car will not start [5].

In the mid-1990s, IBM engineers created and patented an ultra-high frequency (UHF) RFID frame. UHF offers a longer reproduction extension (up to 20 feet in good condition) and a faster information exchange. IBM made some first drivers with the Wal-Store, but it never popularized this innovation. When it continued to encounter monetary problems in the mid-1990s, IBM sold its licenses to Intermec, a provider of scanners. Intermec's RFID frames have been introduced in a variety of applications, from the distribution center to the culture. Be that as it may, innovation was costly at that time due to the low volume of offers and the lack of open and universal guidelines.

III. PROBLEM DEFINITION

This project is developed to ease the work of students. A unique card that is assigned to the student called "Smart ID Card". This Smart Card is useful for the student in places like library, canteen and office. The main motive is to avoid direct cash payments at various places in college with a Smart Card Compact Solution, the new way of debiting money. Also making sure the attendance is done smoothly and reports are generated whenever needed.

IV. OBJECTIVES

A. *The project will be the Solution Which Involves the Following Objectives*

- 1) It involves a RFID card which is given to each student.
- 2) This smart card can be used at many places like office, library and canteen.
- 3) The amount in the card can always be refilled with the help of admin.
- 4) When the smart card is scanned the balance is deducted from the student's account that is associated with the RFID tag.
- 5) E wallet to allow a student or staff member to pay any college dues using RFID tag.
- 6) Student can be able to make attendance easily.

V. HARDWARE AND SOFTWARE USED

A. *Hardware tools*

- 1) *Rfid reader*: This will be used to read data from RFID tag/card.



Figure 3 RFID Card Reader

- 2) *RFID Tag*: This tag/card will contain a unique serial number that will be read by the scanner connected to the computer.



Figure 4 RFID Tag/Card

B. *Software tools*

- 1) *NetBeans*: This software will be used to develop the desktop Java application for the administrator used to load money, update information, store documents.
- 2) *Android Studio*: This tool will be used to develop an android app for the user which is used in retrieving Balance, account transactions and document.
- 3) *MySQL Server*: This will be used for creating the Database to store students related information.
- 4) *PHP*: This tool will be used to ease the communication between android app and the server containing the database.

VI. METHODOLOGY AND SYSTEM DESIGN

The advancement philosophies of the framework are used to control and supervise the programming configuration process, and also to organize and improve the entire framework improvement process. It also helps to institutionalize the process of advancement and generation by showing the exercises to be carried out and the strategies to be used. In this exploration, the demonstrated procedure that was used was the direct consecutive model, also called great life cycle or cascade screen. LSM is an orderly way to deal with improved programming that starts at the frame level and progressions through revision, schemata, coding, testing and support.

The integrated database stores all the data recorded during the enrollment time period. Use the web to accept data entered by the customer using the line registration recorder. It has two notable classifications: the linked monetary classification and the natural monetary classification. The database was created using the Prophet database and with Java Server Faces as a structure. All interfaces were created using the Java programming dialect.

The recognizable registration and confirmation module is responsible for validating the personality of the liners. The stage in which the format of the brilliant card is combined with the live distribution taken. The coordinated result verifies the personality of the smart card transporter. This period of the identification and registration control module does not depend on the focal database but takes all the data from the smart card, which guarantees coordinated coordination results quickly. This module confirms the client before accessing the integrated database and one of the modules. The session initiation module provides access to confirmed and approved clients based on their rates and enrollment limitations.

The frame configuration step is structured around the different frame modules. The phase exercises of the plan ensure that all parties exhibit durable and sonic properties, that is, that they function independently and reliably in the meantime, with highly planned interfaces. Figure 1 delineates the engineering of the framework created from this exploration.

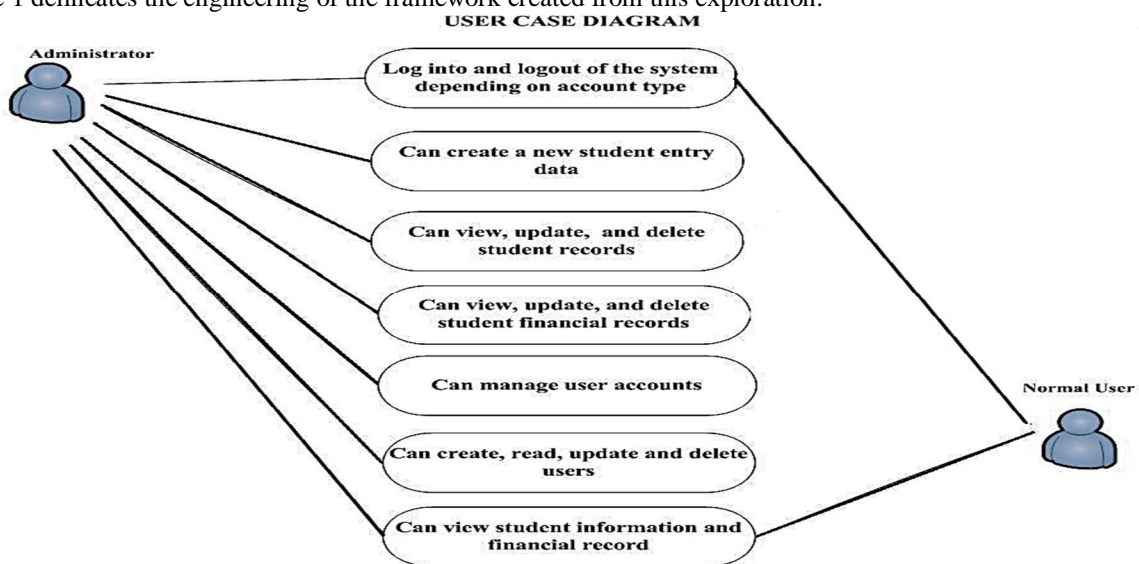


Figure 5 use case diagram for the system.

The sensitive flow in the frame engineering demonstrates an interconnection of the frame and Web segments. Shows the collected database and the background frame in which the server application is presented. Different devices, for example, were work stations, are associated with the database through the Web. The PCs are presented as clients, or final frameworks, to access all the modules / framework interfaces according to their registration fees. smart card readers and the associated backend framework, and customers through USB associations.

When another person is expected to enlist, the manager (an employee in the confirmations work place) uses the subcompany and stores all the basic data in the database. The distinctive proof and confirmation process is used appropriately to verify the monetary record of the subsection to the subject of the section of the examination room. The actual confirmation step is completed when the liner floats the smart card in the device within a short distance.

VII. FUTURE SCOPE AND LIMITATIONS

A. Future Scope

The system can be improved in the future to give much more functionalities which haven't been included:

- 1) Include new High range RFID to allow a collective Class attendance.
- 2) Install new RFID based embedded systems that don't need the manpower and computer to operate where each embedded system will have a specific function to execute.
- 3) Access actual bank account to load money into student/staff accounts.

B. Limitations

- 1) Carrying money in a pocket is a critical risk while travelling from public transport. The wallet might get lost.
- 2) No proper track of transactions and there are more chances of losing or misplacing the data.
- 3) Money transaction report of every student is generated.
- 4) Attendance reports are done manually by the warden.
- 5) Time spend by the student when searching for his/her name on the attendance sheet.
- 6) Students can make mistakes or purposely sign on another student's name.
- 7) Student and even the campus can't keep track of money transaction in the college.
- 8) Attendance sheet/book may be misplaced

VIII. PROPOSED SYSTEM

The Smart ID Card System is made of two different modules:

Each part performs specific functionalities but they also interact with each other to achieve the common goal of the system. So, Administrator panel is used by admin to manage student, student accounts, attendance, and generate report of different transactions done. Student panel/App is used to view student transactions, change student account information such as number, email, picture.

A. Administrator Panel

This panel is the main part of the system where almost all transactions happen. This panel consist of three main models:

- 1) Registration Model
- 2) E-Wallet Account Model
- 3) Report Model
- 4) Attendance Model

Now all these models happen only when a user has administrator privileges.

- 1) *Registration Model:* This model allows administrator to register a new student/staff into the database, create their account information, and student/staff login credentials and making sure that the student/staff is well notified of this information by email. All these student's/staff's information will be stored in the database for further access in the system. When the administrator adds a student/staff, he must add some important information about the student such as USN, First Name, Last name, Date of Birth, Email, phone number. Now doing so, the system will automatically create student/staff E-Wallet Account and login credentials referencing their USN as the main focus. After that the student/staff will be sent an email notification of the new credentials such as E-Wallet Account information along with Login credentials of the mobile app to view and edit his/her profile, set new password, view account transactions and contact administrator for any query.
- 2) *E-Wallet Account Model:* This model allows the administrator to add money to a student/staff account and also allows the student/staff to spend money in different areas in the college such as canteen and library. So, the student/staff will approach the admin for him to add money to his/her account using the provided RFID card given to him/her. Now after the money has been added to his/her account, the student/staff can now do some transactions by going to the provided locations on the campus and scan his/her RFID card and allow the reduction of money to his/her account. All these transactions such as adding money to account, spending money will be notified via student/staff email as soon as the transaction is completed. Also, these transactions done by student/staff can be tracked using the android app developed along with the system.
- 3) *Report Model:* This model allows the administrator to generate automatic real time reports of the student/staff information needed such as his/her profile information, E-Wallet account transactions and attendance done throughout time. This report can be printed or sent to the particular person in need for it. Reports that can be generated are student/staff information, account transactions, attendance.
- 4) *Attendance Model:* This model allows the administrator to manage attendance procedures according to college rules and regulations. The student will attend by scanning his/her RFID card on the RFID card reader on the provided location for doing attendance. Administrator will be present to allow a smooth attendance process. After the student makes attendance, the information will be stored in the database for future reference such as making reports. Attendance information can also be viewed in the android app developed along with the system.

B. Student/Staff Panel/App

Using the android app, at first the student/staff will be prompted with login before accessing the app. The login credentials are provided automatically when a student/staff is registered in the database through the administrator panel/system.

The student/staff app can allow him/her to change their profile information. Also, it will be used to track account transactions along with attendance. Student/Staff app consist of these 3 models:

- 1) *Profile Information Model*: This model will allow the student/staff to view and edit his/her profile. To do so just navigate to profile page and you can view your profile information such as name, date of birth, email id, contact number, and picture. From here you can edit your information that will be automatically updated in the database. Also, user can change his/her password.
- 2) *Transaction Model*: This model will allow the user to view his/her transaction history of how his/her money was spent, timestamp, purpose. And allow to view how and when money was added into his/her account. By navigating to Credited page you will be able to view money that was credited into your account and its timestamp for easy tracking. By navigating to Debited page user will be able to view how his/her money was spent with appropriate timestamp and purpose it was spent on. Also, on the Balance page user will be able to view his/her remaining balance in the account.
- 3) *Attendance Model*: This model will allow user to view attendance history. By navigating to attendance page, user will be able to view his/her attendance history.

C. Backend/Database

Now that we have given you the insight of our system, one question remains that is how data is manipulated and saved?

Using Database as a structured way to save data, from the software system designed using Java language in NetBeans tool, we use a Java-MySQL Connector library to allow the communication between the software and the MySQL DBMS which holds the database used in the software.

Tables involved in our database are:

- 1) *Student table*: holds the student information such as USN, first name, last name, date of birth, department, semester, RFID tag id, email, phone number.
- 2) *Staff table*: hold information such as registration number, first name, last name, date of birth, department, RFID tag id, email, phone number.
- 3) *Account table*: holds all student and staff account number.
- 4) *Login table*: holds all student and staff login credentials.
- 5) *Attendance table*: holds all student attendance report.
- 6) *Debited table*: holds all account spent money and purpose. It holds information such as transaction id, account number, date, time, amount spent, purpose.
- 7) *Credited table*: holds all account added money, timestamp. It holds information such as transaction id, account number, date, time amount added.
- 8) *Log table*: holds all activities done by the administrator such as registering a student/staff, adding money to accounts, spending money in the account, attendance.

IX. SOFTWARE AND APP DESIGN

A. Software Design

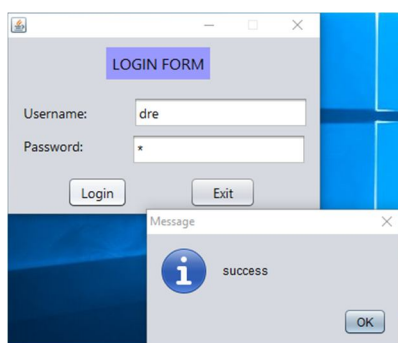


Figure 5 Login

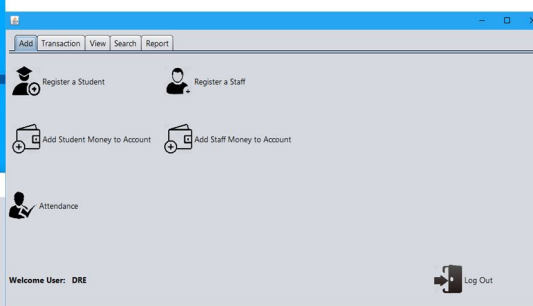


Figure 6 Main Menu

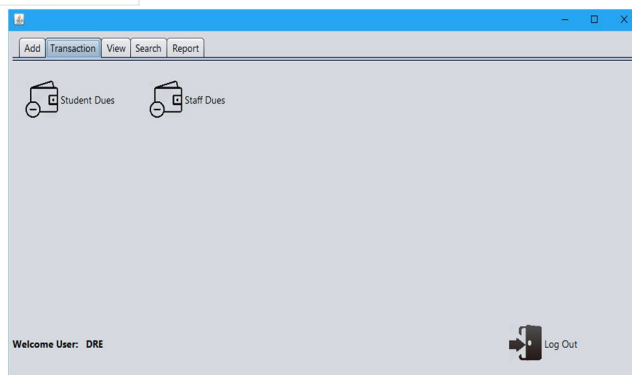


Figure 7 Main Menu

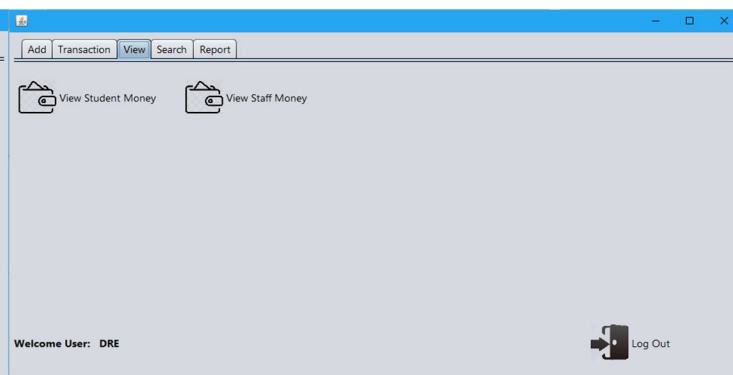


Figure 8 Main Menu

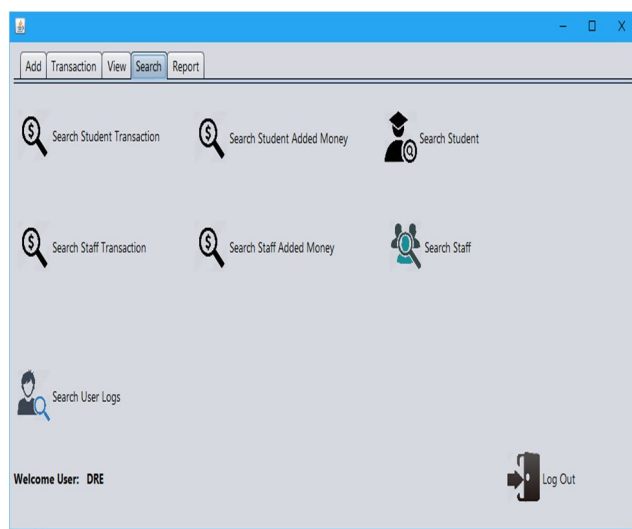


Figure 9 Main Menu

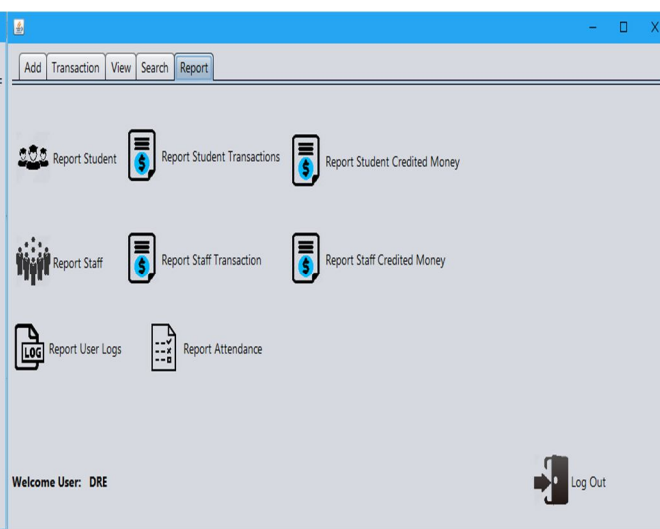


Figure 10 Main Menu

B. App Design

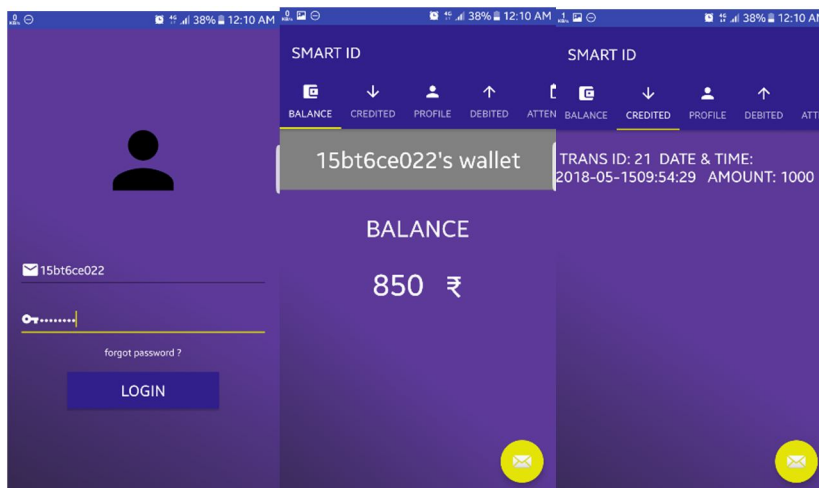


Figure 11 Login page

Figure 12 Balance page

Figure 13 Credited page

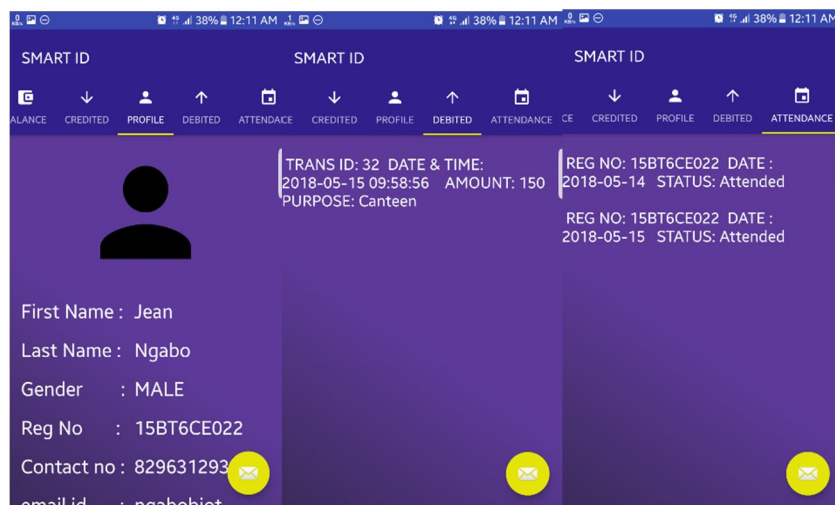


Figure 14 Profile page

Figure 15 Debited page

Figure 16 Attendance page

X. CONCLUSIONS

The Smart ID Card System is intended to be used in colleges and universities. The Smart ID Card System will ease the work of the student/staff by helping to track money transactions spent around the campus at a given time, also keep track of the attendance reports. Also, it will allow the administrator around the campus to keep track at all times student needs around campus and improve all these services that is needed on a daily basis. Again, the system will provide a way for a student to do hostel attendance in order, smooth and clean and will provide different reports at just one simple click.

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