

RFID based Money Transactions for Canteen Automation System

1. Dhvani Kansara, 2. Yukti Bandi

1: Department of Information Technology,

2: Assistant Professor, Electronics and Telecommunications Engineering,
D.J. Sanghvi College of Engineering, Mumbai University

Abstract—We are currently in the midst of a technological and computing revolution that will drastically change our lives and potentially redefine what it means to be human. Automation in many fields has replaced the old school pen and paper and at the same time proved to be more efficient, correct and less cumbersome making our life much easier. Automation can be implemented by an institute to replace hefty tasks. This automation process when applied on an integral part of the working people helps reduce the service time, eliminates queues, there is no burden to provide the exact change to the staff for the order; to name a few benefits on the customer side and on the other hand it provides a reliable way of storing records and keeping the money safe as mostly the payments are made online via virtual money; benefits for the owner as well. We achieve this automation process by using Radio Frequency Identification (RFID) card, an RFID card reader, and hosting the application. Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects using radio waves.

Keywords—RFID reader, RFID tags, e-wallet, web application, security.

I. Introduction

Traditional transactions are based on pen-paper records, cash, manual calculations and manual record keeping of credits which in today's time in an inefficient way to operate a business. Rendering exact changes proves to be an all-time struggle. Also, the existing system lacks data integrity due to the use of books/files to store entries as these may be altered or easily misplaced and there aren't any backups for such cases. The cashless and automated systems in colleges will be able to overcome the disadvantages of the traditional systems and also offer other advantages of automation like total bill amount, total profit/loss of the business, usage of stock, a much safer way to hold the money and as payment method is prepaid there will not be a need to provide exact change to the customers. Also records of past years can be easily stored and compared if needed without any hassle[1]. Hence we have proposed an idea of replacing the currency transactions for canteen in the college with just a scan! Here, cards will be issued to all the students who wish to purchase from the canteen with an initial amount deposited, with just a scan of the card the exact amount will be cut from the respective card. In order to make sure that the card is not misused by a malicious user, we have incorporated an OTP based system checking to authenticate the user. For this we have also developed a "web application" through which students can add items to their carts and perform the virtual money transactions through their respective accounts.

II. Description

A. RFID reader

The RFID RC522 is a RFID reader and writer that is based on the MFRC522 microcontroller. This microcontroller provides its data through the SPI protocol, and works by creating a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags.

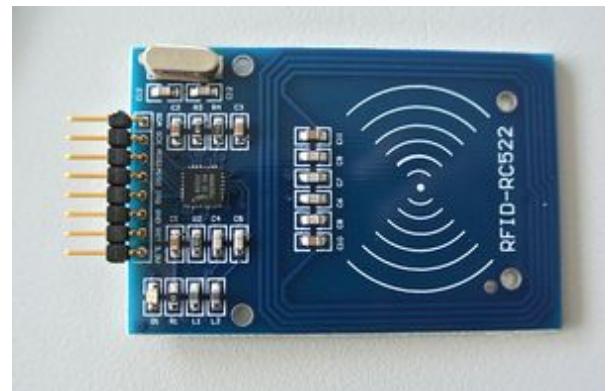


Fig. 1: RFID Reader

B. RFID Tags

The RFID tag is an integrated circuit for storing and processing information that modulates and demodulates a radio-frequency (RF) signals; a means of collecting DC power from the incident reader signal; and an antenna for receiving and transmitting the signal. The RFID tag receives the message and then responds with its identification and other information.

C. Working

RFID is a part of Automatic Identification and Data Capture (AIDC). They can recognize objects, identify data contained within them and enter that directly into the computer systems with least human intervention. It utilizes radio waves to accomplish this. Our RFID system will consist of mainly two components: an RFID tag and an RFID reader. RFID tags contain an integrated circuit and an antenna, which are used to transmit data to the RFID reader. The reader will then convert the radio waves to a usable form of data. A C program is used to recognize each RFID card distinctly. So the information collected after scanning the tags is then transferred to a host computer system, where the data will be stored in a database.

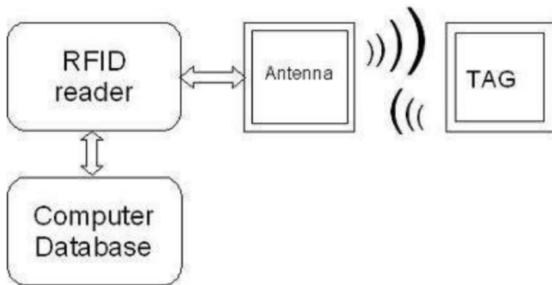


Fig. 2: Working of RFID Reader

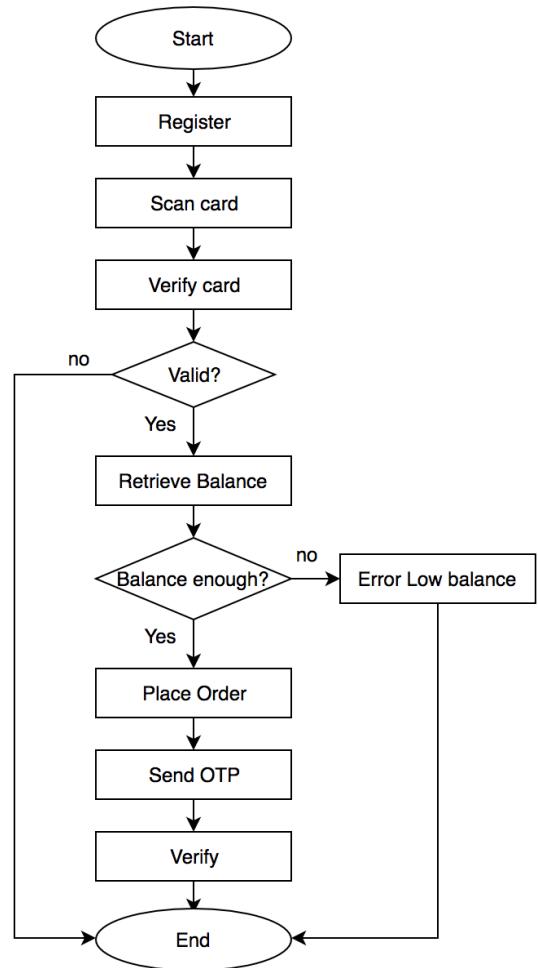
and analyzed for usage. So in this way, the card of the student will be scanned, the amount to be deducted will be entered by the owner, an authentication notification will go to the student's account in the web application and after the successful verification the amount will be deducted from the student's card by making changes in the database. The updated values for a user after their purchase will be sent as a SMS to respective user.

III. Methodology

In this project the administrative person of the canteen will give a RFID card to the user each having a unique RFID number. The user will pay cash to the owner to recharge this RFID card. User can recharge this card depending upon their own requirements or purchases. User can recharge the card for minimum amount of Rs.150 to the maximum amount of Rs.2000. Along with the card, the students have to register their account on the web application, which will have their mobile numbers and passwords.

Initially, the records until now should be uploaded onto the database. Once the system is setup, the customers must register themselves to the manager by providing his mobile number. The entry will hold the mobile number, RFID card number, initial balance, the type of customer. After the card is issued monetary transactions can be started. To place an order the customer must provide his card to the controller who scans the card and checks if the customer has enough balance for his order, if the balance is sufficient then the order is placed and the amount of order is deducted from his balance. The updated balance is instantly reflected. To make the system secure, we have added a distinguishing feature. When a customer places his/her order, they will receive an OTP on their registered mobile number, ensuring if there was a legitimate request made by them, if the user received OTP matches with the OTP generated by the computer then successful deduction of the amount is done. The manager is the authorized person who also manages the data that is entered in the database related to all aspects. He can update or change the contents of the menu, its prices, add offers to menu or other offers if any to lure customers and also the monthly costing is added by him. After the deduction, an SMS is sent to the respective user about his current transaction along with a notice of the available amount in his account.

IV. Flow Chart



V. Implementation

For software implementation, the webApp provides a user interface displaying the canteen food items in the menu, location, contact and page to register/login.

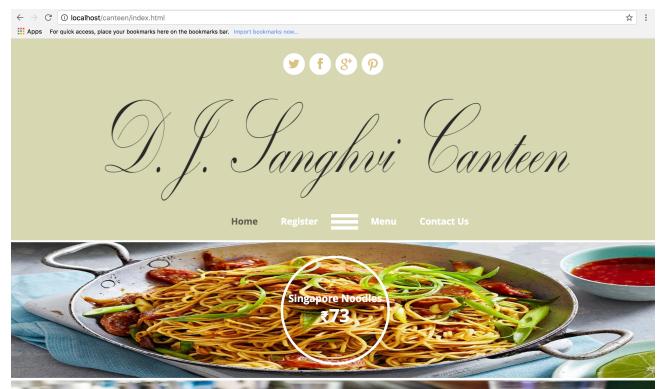


Fig. 3: Website display

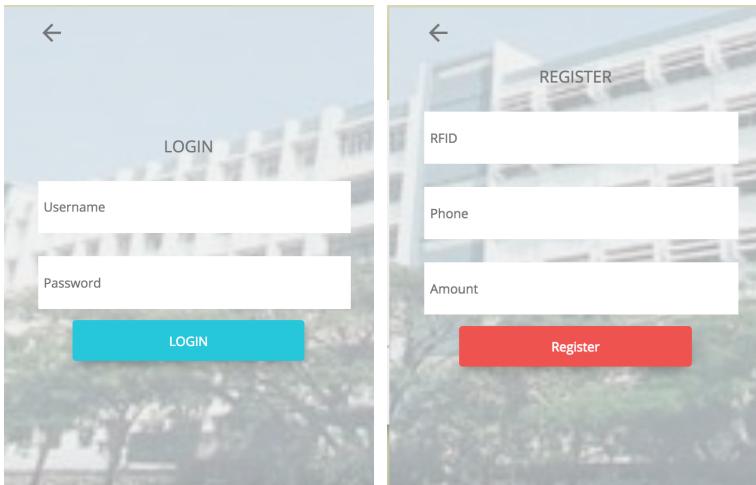


Fig. 4: Register student and admin login page

The register form asks for a user's mobile number and initial amount to be deposited.

For the hardware implementation, the tag is read by the RFID reader. The tag consists of magnet which generates magnetic fields this magnetic field is read the card number is sent to database. The appropriate mobile number is selected and an SMS is sent on that number, the user is verified for his authenticity.

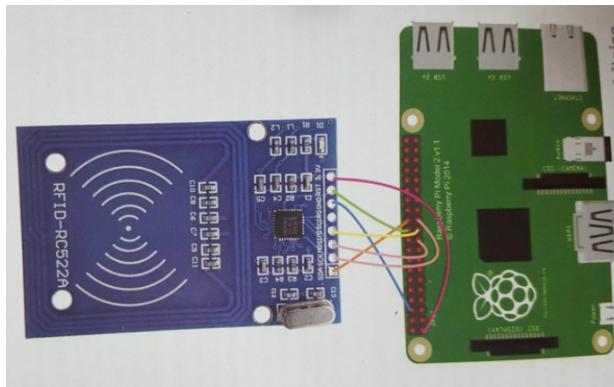


Fig. 5: Circuit implementation

Admin performs action after logging in with valid admin username and password.

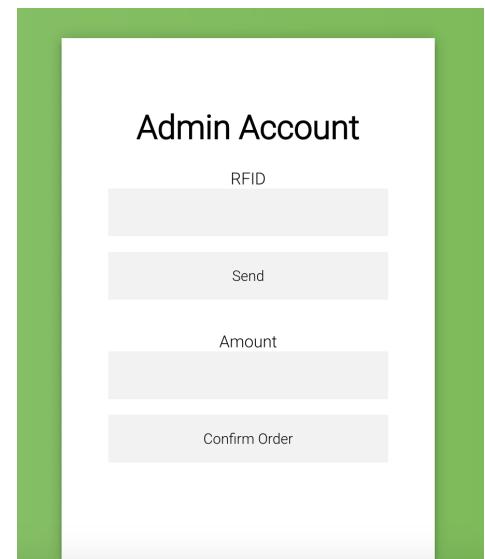


Fig. 5: Admin operations during a transaction

The random OTP will be automatically generated by the website and the same OTP will be sent to the respective RFID's Mobile number for verification.

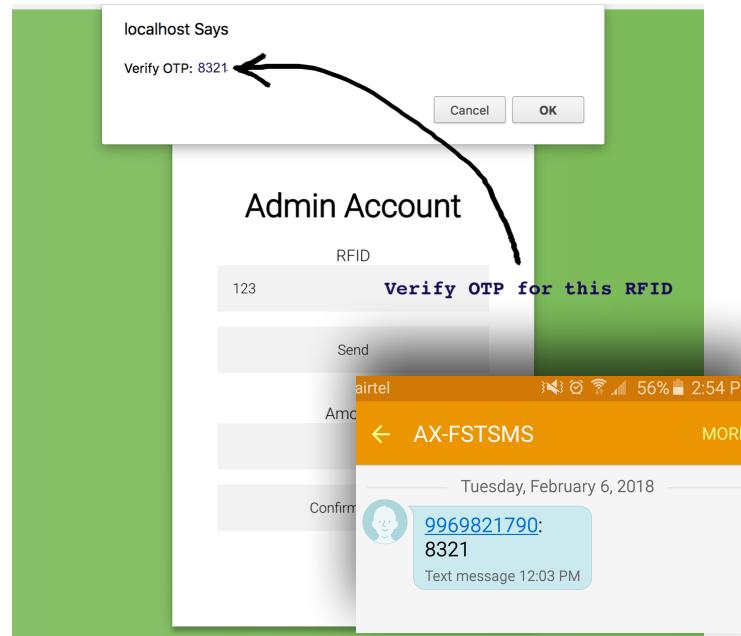


Fig. 6: Verify OTP

VI. Applications

1. The project can be expanded to college xerox centers for easy payments.
2. It can also be used to make library late receipts payments.

VII. Future scope

1. Adding personalized user's accounts on the WebApp with all their transactions history.
2. Personal add to cart feature for each user.
3. Giving information about the availability of a product to the user at any given time and place.

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