RFID Based Canteen Cashier System

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Abstract The system involves use of RFID technology along with GUI and database. This system is made with the objective to not rely on hard cash transactions or handling paper coupons for a month anymore, instead opt for digital money concept which could be well structured and stored in database. The beholder on tapping his/her RFID passive tag on RFID reader (EM-18) and entering correct password would be allowed to enter the system, wherein the menu of Canteen would be displayed. On selecting eatables via touchscreen the respective amount would be deducted from customer's balance and new amount would be updated in database for further transactions. If customer wants to keep track of his/her monthly consumption of eatables from canteen then he/she can log in into their account with their unique ID provided and password (customer editable). If customer is out of money then he/she can get their account recharged from Administration Staff. The Administration Staff of the system would have highest level privileges like he/she could add/delete users, also add/delete administration in charge and would have information of every user on system. This system addresses the problem of handling coupons for months and reduce crowd in canteen counter. This system would also help the customer in keeping track of his eatables he/she did eat in past.

Keywords — Arduino, RFID tag, EM-18, TFT display, Touchscreen, Visual Basic.

I. INTRODUCTION

The advancement in technology has greatly influenced the business transactions. The adoption of digital technology has led to automation in the hospitality industry. Business in hospitality industry such as restaurants can be improved with the help of digital systems. This system aims to automate the food ordering process by incorporating the use of RFID tags as unique identity of the user and Visual basics as the database where the information of user will be stored. This system is made with the objective to not rely on hard cash transactions or handling paper coupons for a month anymore, instead opt for digital money concept which could be well structured and stored in database. The beholder on tapping his/her RFID passive tag on RFID reader (EM-18) and entering correct password would be allowed to enter the system, wherein the menu of Canteen would be displayed. On selecting eatables via touchscreen the respective amount would be deducted from customer's balance and new amount

would be updated in database for further transactions. If customer wants to keep track of his/her monthly consumption of eatables from canteen then he/she can log in through user login page with their unique ID provided and password (customer editable). If customer is out of money then he/she can get their account recharged from Administration Staff. The Administration Staff of the system would have highest level privileges like he/she could add/delete the users, also add/delete administration in charge and would have information of every user on system. The system does also consist of a touchscreen display at user side, so that it can be easily accessible by user to order by simply touching the display screen. This system addresses the problem of handling coupons for months and reduce crowd in canteen counter. This project would help the customer in keeping track of his eatables he/she did eat in past.

II. REVISED WORK

RFID (Radio Frequency Identification) is a method of identifying unique items using radio waves. Typical RFID systems are made up of three components: readers

(interrogators), antennas and tags (transponders) that carry the data on a microchip [1]. There are various types of microcontroller available like 8051, Atmel's AT89S52 that can be programmed using C or assembly language [2]-[3]. RFID is habitually presented as replacement for barcode system, and the technology has much greater potential such as individual serial numbers for each item and these numbers are examine at some distance. RFID is a technology being adopted in security, business and medical applications [9]. Different types of RFID readers and tags are available in market; each type has its own significance. The RFID tags and reader can be active and passive and their range varies depending on their operating frequencies [10]. There may be similar projects before, on temperature monitoring system using Wireless Sensor Networks (WSN), which were built on PIC micro-controllers or ATMEGA micro-controllers and had used zigbee for wireless communication. Use of such microcontrollers increases the complexity of programming plus the use of zigbee increases the cost of system effectively [4]-[7]. XAMPP and WAMP provide ease to create a database using PHP and MySQL but it becomes very difficult to access data from database using Arduino or any other microcontroller. To overcome this problem Visual Basic Scripting language is used to integrate hard and database and to provide user interface on PC [5]. All the wireless communication takes place via RF signal. Due to this there is a lot of interference between transmitter and the receiver and data transmitted would not be retrieved at the receiving end plus there could be a time lag between transmitted data and the received data [6]. Security privacy is the major concern in any of the cashless system. RFID Tags are miniaturized wireless radio devices that store information about their corresponding subject. Due to the inherent weaknesses of underlying wireless radio communication, RFID systems are plagued with a wide variety of security and privacy threats [8]. To make the project user friendly a resistive touchscreen display is provided. The 4-wire Resistive Touch Screen display consists of a conductive bottom layer of either glass or film and a conductive topmost film layer, separated by extremely small, transparent spacer dots. A voltage is applied across the conductive surface. Any type of probe can be used to apply pressure against the top film will activate the screen [11].

III. PROBLEM STATEMENT

The traditional food ordering system is entirely a manual process which involves customers to stand in a long queue, wait for the canteen person to listen to the order, handle coupons given for a month use and facing problem of exact change money. Though this system is simple; but it may involve errors while noting down as well as making

calculations. Even sometimes it is difficult to interpret handwriting of the person jotting down order. To overcome these limitations in manual system, we have made a system to automate food ordering process. By using RFID technology with arduino and touchscreen, the ordering system is made more efficient and can help canteen manager to avoid human error and enhance business development. Also the database created using Visual Basics enables customer to keep check on eatables he/she did buy from canteen.

IV. METHODOLOGY

The system consists of the microcontroller (Arduino Mega), which is interfaced with input and output modules. The controller acts as an intermediate medium between both of them. Hence the controller acts as control unit. The input module is nothing but the touch screen sensor which is placed on TFT display to have graphical image display, which takes the input from the user and provides same to the microcontroller. The controller also takes the responsibility to display the menu items on the touch screen. The data of user from touch screen mounted on Arduino is sent via wireless RF transceiver module CC2500, which gets stored in database, developed using Visual Basics. The user, if wants to recharge his/her account or get him/her registered, would have to go to Canteen Admin and get things done. Also user can keep track of ordered eatables he/she did and view them by logging into their respective account. The RFID reader module used is a Low Frequency (LF) active module and tags with the users are passive. When the tag comes in vicinity of active RFID reader module, the radio waves are encountered by the passive RFID tag; the coiled antenna within the tag forms a magnetic field. The tags draws power from it, this energizes the circuit in the tag. The tag then send the information encoded in tag's memory. The block diagram is shown in Fig.1.
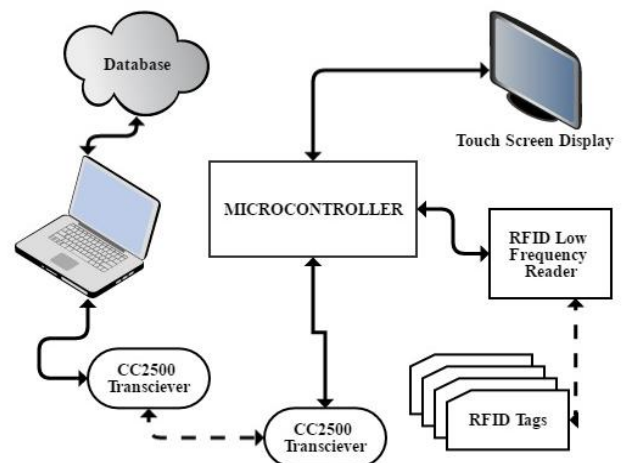

Fig.1 Block Diagram of Proposed System

V. FLOWCHART

The Fig. 2 shows user side flowchart. When user comes in canteen, he/she taps RFID tag on reader; if user is authorized then he/she is welcomed and confronted with menu for selecting eatables. After selection of eatables and on entering valid password the amount against bought eatables is checked with the amount stored on database of the user. If user has sufficient balance then amount is deducted and order is placed else user is requested to refill his/her amount from Admin. If the user wants to check past transactions made, then he/she can login with their unique email ID and password. If email ID and password entered is correct, then the user can view balance and past transactions. The users are provided with the provision, wherein they can change their password. The same password changed by the user will be used to in canteen for placing the final order as well as at time of logging into their for checking past transactions.
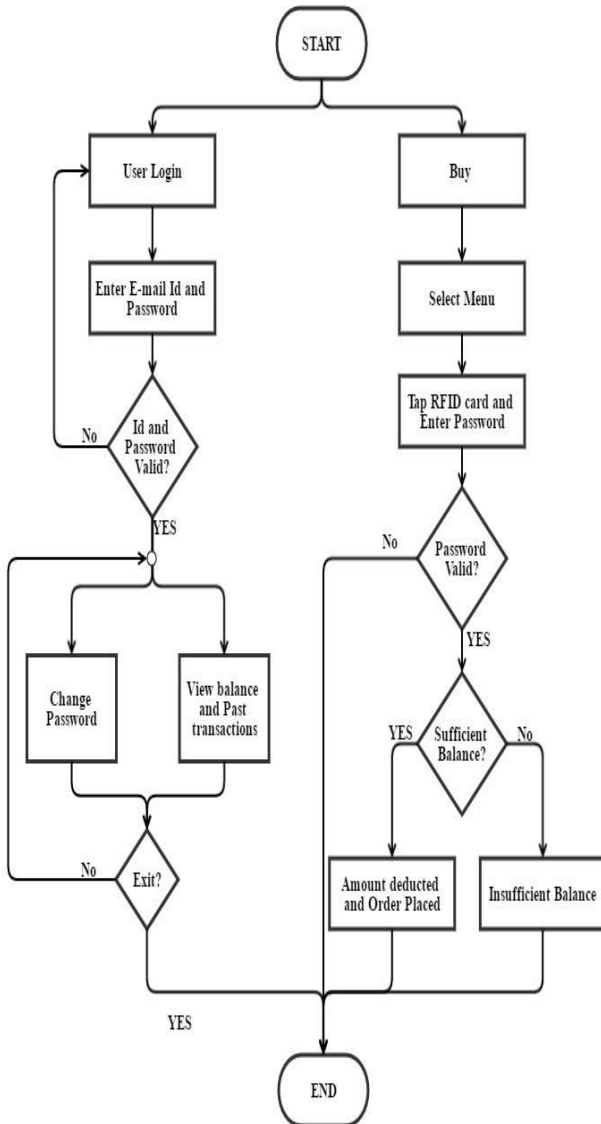
The Fig. 3 is Admin side Flowchart. Initially the system starts with a page pertaining both User and Admin Login. If Admin enters valid Admin Username and password then he/she is allowed enter into the system, where an Admin could either do recharge for a user, update the menu of the canteen or refill balance of user. After doing any of the above three process, the Admin is returned back to the page where he/she could again register, update or refill balance of other user.
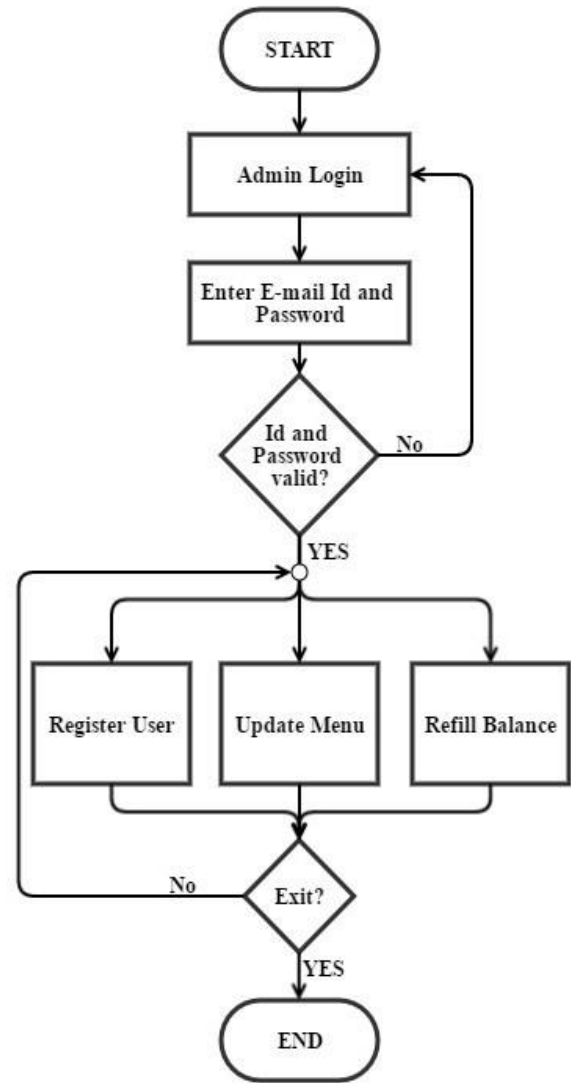

Fig.3 Admin Side Flowchart

Fig.2 User Side Flowchart

VI. RESULT

The Fig. 4 shows the assembled hardware at the user side. It consists of a 3.5" touchscreen mounted on Arduino Mega, EM-18 RFID Reader Module, Wireless Transceiver CC2500 and RFID tags which will be with the users.
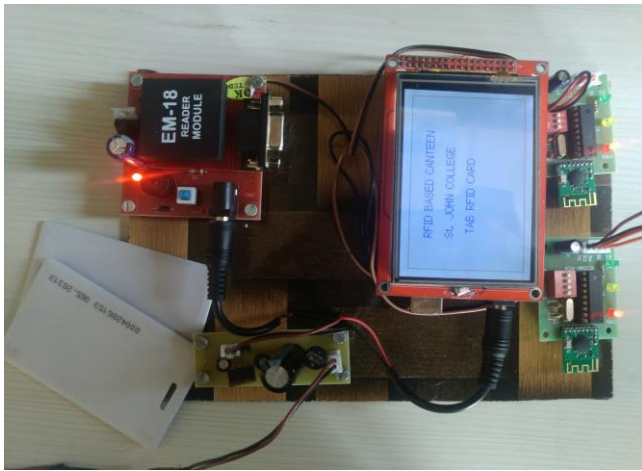
Fig. 4 Assembled Hardware at User Side

The user coming to canteen for placing orders will have to tap the tag on EM-18 (RFID Reader Module). After which the user will be checked in the background whether he/she is a registered user or not. If the user is registered then he/she will be displayed with the Menu (Fig. 5) containing eatables with their price.

Fig. 5 Menu display on Touchscreen

The user can select multiple eatables and can also double the quantity of eatables by just touching "+" option on the screen (Fig. 5) also the quantity can be reduced by touching "-" option. After choosing any eatable product, the user needs to press "ODR" (order) option and then select other eatables. If user is done with ordering the eatables then he/she can touch on "FINAL" option to place the order. Before final placement of order the registered user is asked to enter his/her password (Fig. 6).

Fig. 6 Password Screen for Confirming Order & Amount Deduction

After entering correct password the amount against the placed order is compared with the amount in the database of the user in the background. If user has sufficient amount then order is placed, the placed order amount is deducted the amount stored in user's database and the new amount of the user after deduction is stored in user's database.
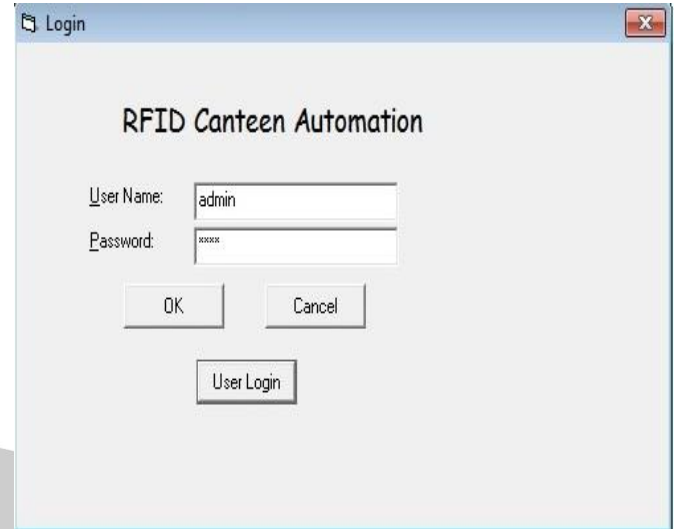

Fig. 7 Login Page for User and Admin

The Fig. 7 depicts the login page for User as well as Admin. For Admin Login, the admin can directly enter the correct user name and password and then click on OK. For User Login user needs to click on User Login option and enter the correct email ID and password. If login details are wrong then the user/admin will not allowed to access the system.
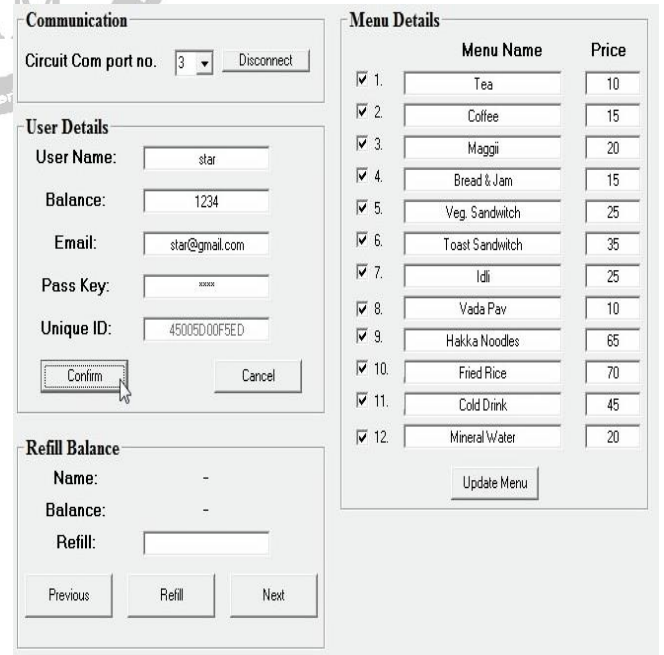

Fig. 8 Screen after Admin Login

The Fig. 8 shows the admin page once the admin has successfully logged into the system. The admin can add or register new user, update menu and their prices and refill the balance of already registered users. For synchronizing between Visual Basic database in computer and hardware connected with Arduino Mega the wireless transceiver CC2500 is used. At computer side the one CC2500 module is connected to a USB port pertaining COM port 3 and therefore in Fig. 14, the Circuit COM port no. "3" is displayed.

Fig. 9 User Login and Welcome message

The Fig. 9 shows the user login section. The user has to enter the correct details (email id and password) for login. If wrong details are entered then the user is asked to enter the correct details and a message box showing "Invalid Login Details" appears on screen. If the details are correct then "Welcome (username)" pops up on the screen. The user is now redirected to user page where he/she can change password and view the past transaction details.

Fig. 10 View Past Transaction

After successful login the user can access his/her account and can change the password and view transaction details. The Fig. 10 shows the past transaction records of on one user along with date, time and amount. The user can see all the transaction records just by clicking on "previous" and "Next" buttons. The user can change his/her password by entering old pin and then the new pin. The password will updated only if the old pin is correct and once the password is updated the "Pin Changed" message box pops up on the screen (Fig. 11) and now the user can again login with the new password.
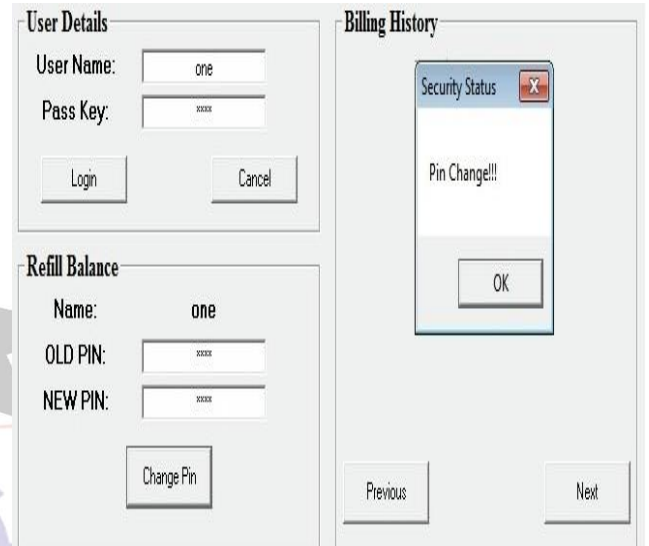

Fig. 11 User Editable Pin.

VII.   FUTURE SCOPE AND CONCLUSION

This project takes the order from the customer and lets him/her pay the bill without any human intervention. By making the selection of microcontroller with large memory size depending upon the application and ROM size of the processor there is a great scope of advancement in this project. We can add graphic images by using SD card and a display with higher dimensions. With the help of Internet of Things (IoT), we can easily place the order just by sitting at home. Also we can implement our project in libraries, where each book will have an RFID passive sticker and details of books issued by the student will be updated in database which will be accessible to both student and librarian. And by implementing a GSM module with database, students will be reminded as on to what date the issued book should be returned back or reissued. By making use of Ultra range RFID technology and IoT, we can implement our this project in toll plazas for deducting money directly from driver's registered bank account against unique RFID tag, which would also not lead to long queues near toll and would also help in keeping track of all vehicles for investigation purpose.
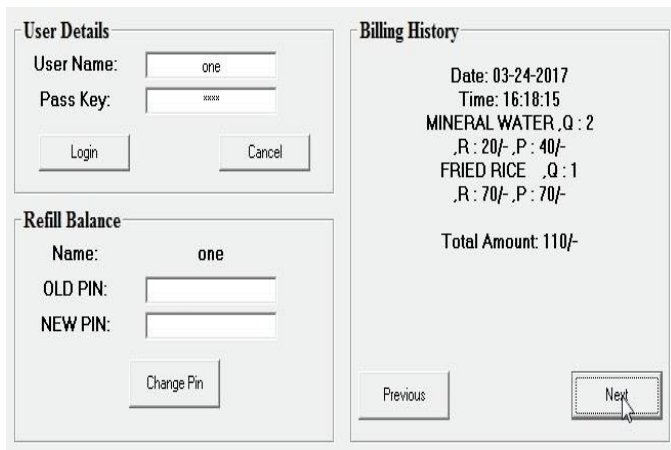
Now a days due to advancement of technology people are accustomed with touch screen interface. It is easily accessible by user to navigate by simply touching the display screen. With slight modification in this project, this system can be widely used at different public places like at hospitals, public transport, college libraries, theatres etc. The system allows us a faster and more convenient access to the world. This system is convenient, effective and easy thereby improving the performance of canteen's staff. This system allows user to make transaction by using the RFID tags given to them. This saves time and problems of carrying exact change and coupons. The users can see the past transaction records and can recharge their account whenever required from canteen Admin. The unique ID and password (user editable) provided to user make system authentic and secure. Only the authorized person will do the recharge and can add or remove users which further add on to security level. And for making system more user friendly we have incorporated a touchscreen at user's side for ordering eatables. It would lead to increased revenues; give the customer a better insight into the kind of food they wish to have given them a great touch experienced.

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