AUTO FOOD COUPON TELLER MACHINE

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Abstract - *Auto Food Coupon Teller Machine is a new methodology for placing an order and collecting cash in faster and more efficient way in a cafeteria. The inspiration of the system is from ATM. The system eliminates the long waiting queues and problems regarding hard cash. The system is developed with the objective to not to rely on hard cash and paper coupons instead adopting the digital cash system. In this system we will be using Radio Frequency Identification (RFID) technology along with Graphical User Interface (GUI) and database. The customers will be having RFID tags in the form of their Identity cards using which they can place the orders securely and according to the amount of the money available in the person's virtual account which is linked with the identity card (RFID tags). This system will be installed near the order delivering counter of the cafeteria; we can install more than one system according to the capacity of the cafeteria. This automated system is going to help us to make a SMART cafeteria, go cashless and go green avoiding wastage of paper which are used for generating coupons in the existing system and this will also reduce transaction time of order placement and will avoid crowding near the counter of cafeteria. Also, in the Covid pandemic situation this system might prove helpful to stop the transmission of Coronavirus.*

Key Words: ATM, Digital Cash System, RFID, GUI, SMART Cafeteria, Transaction Time, Order placement, Covid Pandemic.

1.INTRODUCTION

The main objective of this system is to reduce time consumed to place an order in the cafeteria and avoid crowding near the delivering counter of the cafeteria with improved accuracy and efficiency of the order placement and transaction.

In our proposed system, students and employees pay their bills by passive RFID cards which can be provided as identity cards for every individual. Thus, provides improved and organized procedure to place an order for food. The virtual account of every individual is linked to their identity cards (RFID cards) which is managed by canteen administration staff for recharge purpose and many other facilities. This system addresses the problem of handling hard cash and paper coupons. Thus, would help to reduce the chaos near the counter and make the operation more efficiently.

1.1 Motivation

For the initial study, only college canteen is considered. Students and the college staff are the main canteen users on the daily basis. Thus, our main aim is to reduce the problems faced by them and the canteen staff. According to the present scenario, student or the faculty member has to verbally tell the item from the menu card to the person at the canteen counter to place the order. The person then enters the item number from the menu card to generate a coupon for the specific order. Cash payment is the only option for making the payment. Moreover, students are provided with a short break of only 15 minutes. Thus, it creates a lot of chaos and clutter to place and receive the order during those peak periods. The major drawback faced is that the user always needs to carry the cash and the counter authority has to provide change for the amount at any cost. Coupons generated are sometimes handed to wrong student. The coupons get misplaced by the canteen people. Torn cash or damaged cash is one of the major problems. Also, the canteen authority must maintain all the paper coupon records and the cash record personally. Thus, the current system has some major problems that need to be worked on.

1.2 Objective

The basic objective of automation is to reduce the time consumed to do a task and human efforts increasing the accuracy and the efficiency of the system. Considering the drawbacks of the current system, the main objective of our system is to automate the canteen coupon system. This is done to eliminate the use of hard cash so that it eliminates the problem of handling the cash and providing change. Another objective is to reduce the time required to place the order and to eliminate the paper coupon generation. The system also focuses on helping canteen staff to maintain easy records of their accounts.

Also considering the situation of Covid pandemic this system will be very useful. Customers in cafeteria will not have to touch the system while placing an order as in lifts we are using toothpicks to press the buttons same trick we can use to press the buttons on keypad of the system. Since, the transaction is cashless that solves the problem of handling cash and flow of cash in the pandemic situation which will stop transmission of coronavirus.

2. LITERATURE SURVEY

In recent years, radio frequency identification technology has moved into mainstream application that help to speed up the handling of manufactured goods and materials. Hence this technology has proved an important revolutionary factor in the Meal Management system to improve the operations.

Most of the previously proposed RFID based Meal management includes dedicated machines to handle the operation of order placement in the cafeteria. The system proposed in reference [1] leverage an architecture consisting of RFID reader, microcontroller and PC interface. When the RFID tag gets detected by the RFID reader/writer module, then the microcontroller identifies whether the person is a valid user or not using installed data. Thus, the user can access his/her account and get facility of ordering food one can collect it very easily. With the help of wireless transceiver, signal is sent to the cafeteria kitchen system for preparing the ordered food[1].

The system proposed in [2] involves use of RFID technology along with the 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 the 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[2].

The system proposed in [3] involves use of the web and windows based intelligent system using web technologies, biometric and Radio Frequency Identification technologies (RFID) to strengthen an Academic Management System (AMS) in a campus for monitoring and improving academic performance of teachers and students. A campus mobile phone application will allow guardians to monitor student's movement history at campus, e-payments and food choices at canteen, class attendance, exam attendance and academic performance on daily basis. Mobile application for students will allow students to view their class schedules, teacher appointments, e-payment statement, warnings or announcements, locate their exam halls and search for classrooms[3].

In research carried out by Syed Abdul Rehman Khan in their paper "Usage of RFID technology in supply chain: Benefits and challenges", author investigated the efficiency and effectiveness of SCM with using the technology of RFID. We have been examined that appropriate business processes affected through the technology of RFID. In restaurant waiters keep the record of customer's orders and then order goes to the kitchen for preparation. Total amount of bill is calculated by cashier. When number of customer increases then the workload on the waiters increase due to this order misplaces can take place. Hence overall service quality may be degrading. Therefore, by using enhanced technology we can replace the older way of taking order by pen and paper. Advanced technology like touch screen menu display and IOT has been adopted in this system. The tendency of this system is to rise dining table service[4].

3. METHODOLOGY OF USE

The system consists of microcontroller ARDUINO-UNO, which is interfaced with RFID scanner and LCD modules. RFID scanner is used to read the passive RFID tags. The information fetch by the RFID scanner is then sent to Arduino. The Arduino compares the tag number with the one stored in its memory. If the tag number is present in the memory, then the information corresponding to the tag number is retrieved. The retrieved information of the student, i.e. his/her name and balance in the card is displayed on the LCD. Then input is taken from the student with the help of keys present on the LCD shield i.e. the items to be ordered along with the quantity are taken as input, accordingly the amount is deducted from the balance that is present with the student and the updated balance (after deduction) is displayed.

The order placed by the student is sent to the canteen user interface via ethernet cable. The user interface is created using MATLAB. The canteen user interface displays the order number, customer name, items and corresponding quantity. When the order is placed, the information previously stated is displayed along with an "Order Placed" tab at the bottom. Another interface present

shows which order is ready. When an order is ready to be served, the canteen worker presses the "Order Placed" tab. When that is done, the information of the customer is cleared for the next information to be received. This is done simultaneously for many customers. The information of the ready order is sent to another user interface which displays it to the customer that his/her order is ready.

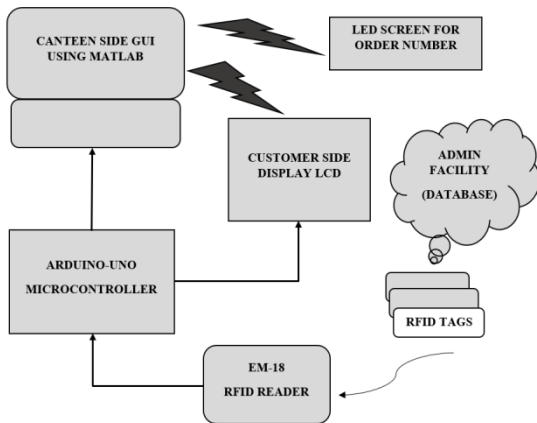The Figure 1 shows the block diagram of the proposed system:

Figure-1: Block Diagram of the System

3.1 Selection of components

- In our system we are going to use RFID tags and RFID reader EM-18. The basic reasons to select those RFID tags are we can scan RFID tags multiple times, a RFID reader can scan a tag as long as it is within frequency range, and it does not have any line of sight limitations. The alternate solution such as barcoding require the reader to be close to the barcode before it can "detect" it to scan it. RFID systems can automatically pick up tag ID's from a distance and sometimes through the obstacles also[5].
- We will be using Arduino Uno as our microcontroller because it is a single board microcontroller designed to make applications, interactive controls or environments easily adaptive. The basic advantages of Arduino Uno are it is inexpensive (Costs $ 3-6), it comes under open source and extensible hardware, it provided cross-platform for operation and it is easy to learn for beginners. The other microcontrollers can also be used for the application of our system (Ex.: Raspberry Pie, Arduino NANO, etc.).
- We have use MATLAB to create a Graphical User Interface (GUI) on canteen side but we can use any open source software to create GUI for system application.
- We will be using LCD shield on the customer side because we are preparing a prototype, but we can

use screen touch display or TFT display for system application. Similarly, on canteen side in our prototype we are using Laptop screen to display order placement, but we can use separate screen touch display for system application even we can interface one more display to show that order is ready for serving purpose this will complete the loop of system application from user to canteen to user.

3.2 Flowchart of the System
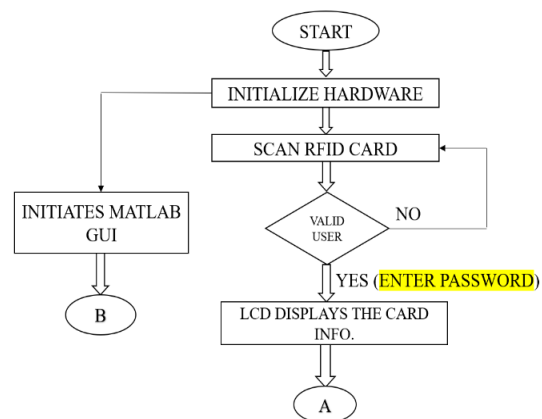
The following figures introduces the flow of the system:

Figure-2a: First phase of the System

In the first phase of the system the hardware is initialized or powered up. Once the system is initiated properly the customer needs to swipe the RFID tag to the RFID reader after which it goes for authentication with the database. If the user is valid the system will ask to enter the password after which the system will display the related information on the LCD display.

In the second phase of the system the user selects the required food items from the menu card by entering the corresponding item code in the system along with the quantity. Then the system will generate the total amount which needs to be deducted from the card after the approval from customer. Once the amount is deducted the order will be sent to canteen staff for the preparation and the user will be updated by the new balance in the account and the order number generated once the order is ready to serve the order number will be displayed on the LED screen once the canteen staff press the 'ORDER PLACED' tab.
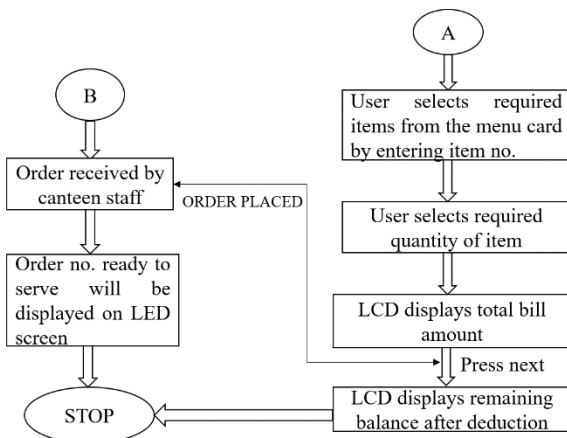
Figure-2b: Second phase of the System

4. RESULTS

We will be discussing the output of the system with respect to the different conditions, which will give the brief idea about the working of the system. Basically, we will be discussing the following conditions for the system working:

1. Use of Valid Card.
2. Use of low balance card.
3. Use of invalid card.

4.1 System Output

As soon as we start the system, the system will display the welcome message on the screen (LCD) as "WELCOME TO CUMMINS CANTEEN". Then the user needs to press the next button (Right button on keyboard) and the system will ask the user to swipe the card as shown and then user will enter the password provided to him to enter the loop of order placement further.

Figure-3a: Welcome display of the system

Figure-3b: System asking user to swipe the card on the card reader

4.2 Test Cases to Validate the Performance of the System

**(Note:** The below figures are just for reference how the system will give output for every step.**)**

-   **Use of Valid Card:**

Once the user swipes the card the system firstly authenticates the user ID by crosschecking it with its database. Once the card is authenticated system displays the message of user name and the balance available in the card on the screen (LCD) as shown:

Figure-4 : System displaying the information of the card

After this the user need to press the next button and will have to insert the item no. that he wants by referring the canteen menu card and then will need to enter the quantity as shown:
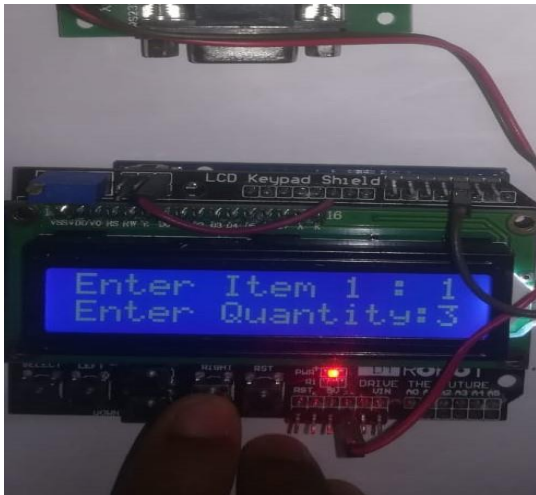
**Figure-5:** User selecting items and their quantity

The user can select different items by pressing the next button for this system prototype we have given the feasibility to place 3 different items at a time. But this can be change according to the user and canteen demand.

The next step will be the placement of order with the bill amount as shown:

Figure-6: System displaying Bill Amount and placement of order

In the next step the system will deduct the bill amount from available amount and then at last will display the Updated Balance before exiting the order transaction.
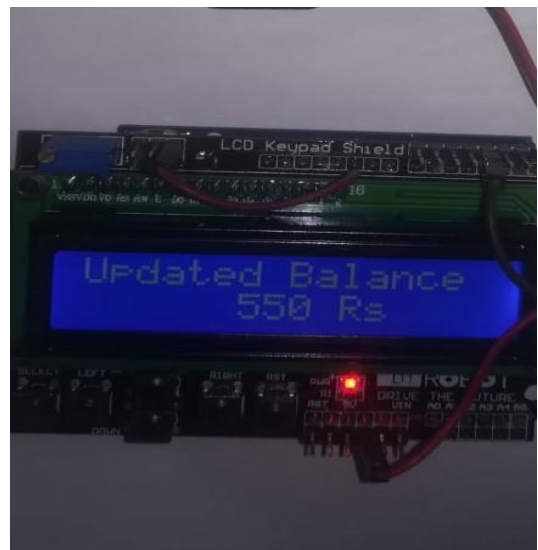

Figure-7: System displaying Updated balance after deducting the bill amount

After placing the order, the canteen staff will get a notification on their screen for which we have used MATLAB to create a GUI. The order placed by user are displayed on GUI shown.
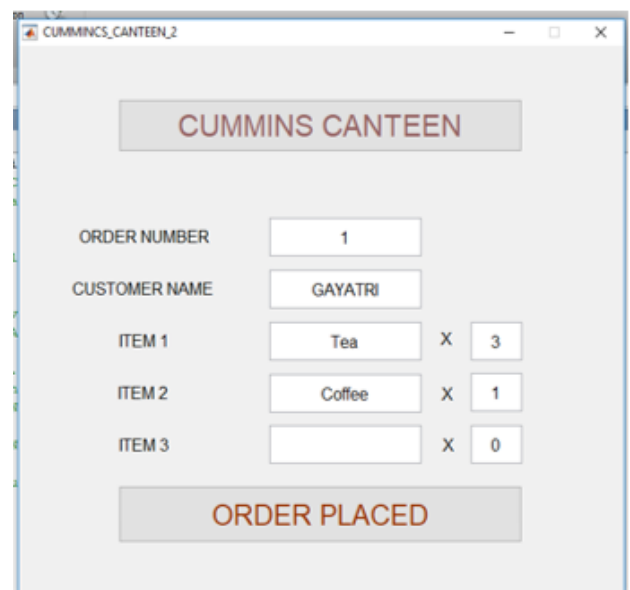
Figure-8: Canteen Side Graphical User Interface (MATLAB)

The order which one is placed before can be viewed even after the second different order is being placed as shown.
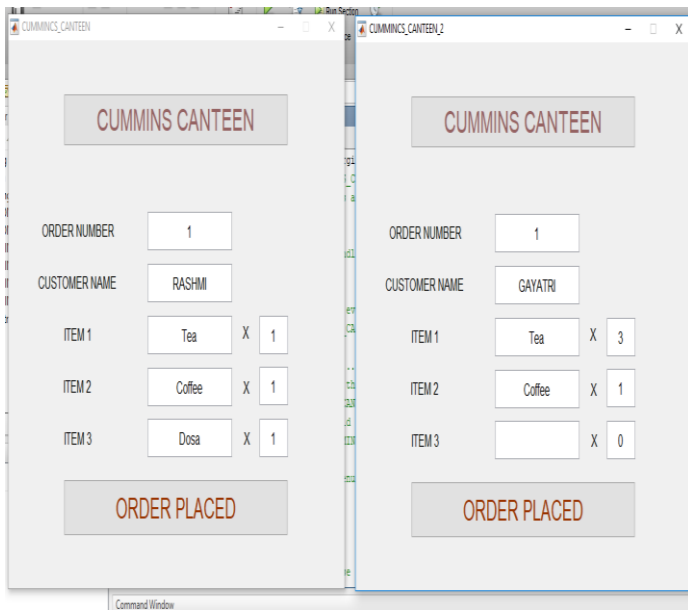
Figure-9: MATLAB GUI for placement of two orders on a canteen side

- **Use of Low Balance Card:**

Once the user swipes the card and the card is authenticated and user enters into further order transaction procedure if the bill amount is more than the available balance then the system will indicate the bill amount followed by the message of low balance and further order transaction cannot be able to proceed as shown:

Figure-10: System showing the card has low balance to proceed further

For a card with low balance customers can go to administration department of the canteen where they can recharge their cards. There will be a canteen staff who will be the in charge of the admin department of canteen and will be responsible for the recharge of cards. Even we can provide the facility of Master Card for the outside visitors like outside visitors can recharge their Master Card according to their need of the order. So, this will also solve the problem for visitors.

Administration Facility: On the administration side there will be a in charge who will carry out the activities like updating menu card, change of password, blocking and recharging the account of the user. For visitors the admin will recharge and issue the card to the visitor which will be a Master card containing the balance and indicating visitor card on the display.

- **Use of Invalid Card:**

After swiping the card if system fails to detect or to authenticate the card then the system will display the message to use valid card as shown:

Figure-11: System asking to use valid card for further order transaction

5. CONCLUSIONS

The system thus uses RFID tags to carry out transactions in the cafeteria. Every customer from the same institute or organization will be provided RFID tags which can be used as identity card as well. After swiping the card and on detection of the valid card, the customer will be able to place the order.

The customer can recharge their respective account balance through the admin facility provided in the area or in the future the same facility can be provided by mobile application for the individual. The system uses radio frequency waves to detect valid and invalid users. Thus, it overcomes the issues related to traditional canteen

management system by providing scalable and reliable canteen ordering. It helps in reducing the time required to place the order and handling the coupon.

6. FUTURE SCOPE

Currently the system hardware is chosen considering a prototype of the system. Thus, there is no huge database to consider, but analogous system which can handle large databases can be created using Python, SQL etc. As the budget increases, so will the graphical user interface look can be modified. It can include pictures of the food items and can be aesthetically improved . The system can also be used to track the quantity of the ingredients required daily. Thus, helping in efficient inventory.

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