

# Smart Shopping Cart with Automated Billing System

**A smart cart for the smart world; providing a convenient and reliable shopping process**

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**Abstract**— Technology has changed so much, so is the rate of people of all ages who are attracted to electronic gadgets. In many industries, electronic devices such as smart card readers, barcodes, and RFID scanners are increasingly used. Supermarkets also need these kinds of gadgets. Currently, every person in the mall purchases the product placed in the trolley. Upon purchase, the person will have to stand in a queue for billing. In the billing process, an employee scans each product's barcode and bills it to the final [5]. This process can take a lot of time and it can be even worse on holidays, special offers or weekends. To overcome this, a smart way to shop in malls has been developed. Each product has an RFID tag instead of a barcode. The Smart Trolley features an RFID reader, LCD module. When a person places any product on the trolley, it is scanned and the product's cost, name, and expiration date are displayed. The total cost will be added to the final check out bill. The bill is stored in the microcontroller's memory. Once the purchase is complete, the purchase details are sent to the customer through the GSM module. Arduino IDE software tool is used for programming and Proteus software is used to check simulation results before hardware implementation.

**Keywords**—RFID Tag, RFID Reader, LCD Module, GSM Module, Arduino IDE Software Tool, and Proteus Simulation Software.

## I. INTRODUCTION

Shopping is easy, but waiting at the bill counter can be very boring & laborious. Rush plus cashiers who prepare a bill with a barcode scanner take longer & have longer-lasting results [14]. This innovative project includes an automated billing system that can be placed in a shopping trolley. This automated payment system includes an RFID reader controlled by Arduino instead of the traditional barcode readers [11]. A unique membership card is provided to every customer where all the personal details & the account balance details of the customer are stored. The shoppers can deposit cash in counters before shopping, balance & other details will be updated whenever the shopper deposits cash at the billing counter. so, whenever the shopper goes shopping, he/she has to scan the special membership card against the RFID reader attached to the cart. Therefore, all the required personal details will be transferred to the microcontroller's memory. Then a welcome text with account balance details is displayed on the LCD screen. Now the system will be ready to start scanning

the products. Any product, he/she has to scan it against the RFID reader & then has to get it into the cart. All the product details are displayed on the LCD along with the price of the product. As the shopper goes on adding products, every product is detected by the module & therefore the price will increase accordingly. In case if the shopper changes his/her mind & doesn't want any product added into the trolley, he/she can remove it by scanning the same product once again against the reader & the price added will be deducted automatically. A buzzer is used to verify whether the membership card/product scanning is successful or not. Buzzer beeps once the product scanning is successful. At the end of shopping, the shopper has to scan the membership card, when done the final bill details will be displayed on the LCD screen. The bill amount will be deducted from the membership card & the remaining balance amount will be displayed. Immediately after the bill is paid an SMS is sent to the prescribed member's mobile phone via GSM module. Hence this technique is an appropriate method to be used in places like supermarkets. This will help in reducing manpower & helps in making a better shopping experience for customers.

## II. BLOCK DIAGRAM

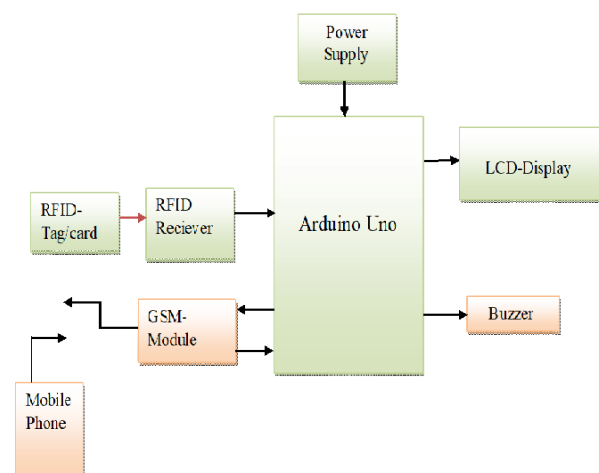


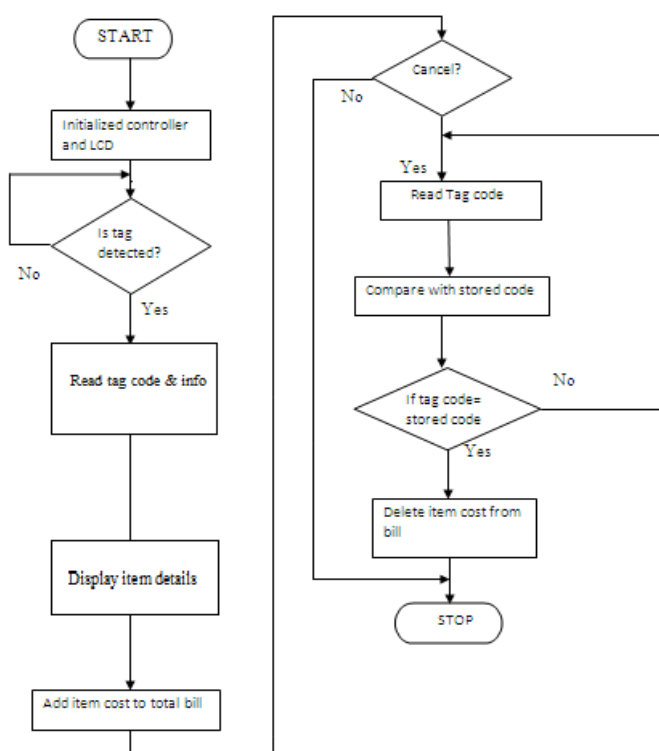
Fig.1: Complete System Block Diagram

The block diagram consists of 8 components in total where 6 of them will be embedded-attached to the shopping cart. Arduino UNO ATmega328 microcontroller is interfaced with various modules [12] i.e. RFID reader-RC522 SPI, LCD panel 20x4, buzzer, 9V battery, RFID card, GSM module-GSM SIM 900 and a mobile phone is required for receiving SMS.

### III. WORKING

As shown in the above block diagram, the Arduino is interfaced with all the remaining components. Once the microcontroller is powered up with the use of a 9v battery it is initialized and set to the basic settings, now the system is ready to proceed which means the RFID card and the tag can be scanned. Then the RFID card or tag is scanned the RFID reader fetches all the details from the scanned card or tag, and if the scanning process is successful the product details will be transferred to the microcontroller's memory and then will be transferred to the LCD module to be displayed on the LCD screen. Here the RFID module uses the SPI communication technique to transfer or to retrieve the data from the RFID card or tag [4]. After the shopping is completed the entire bill details will be displayed on the LCD screen, each card or tag acts as a product, where the product details are pre early set or dumped into the card. When the bill amount is paid, the shopping details will be sent via the sim900 gsm module to the prescribed customer's mobile number. The entire working process is implemented by the software called Arduino IDE. The Proteus simulation software is used to check the simulation results before the hardware implementations [10] [16].

### IV. SYSTEM FLOW DIAGRAM



### Step 1: Start

**Step 2:** When the system is powered up, display the initial data.

**Step 3:** Scanning of the RFID membership card.

**Step 4:** If the membership card scan is successful fetch all the personal details & display it on the LCD. If not, scan the membership card once again. Loop repeats until the scanning process is successful.

**Step 5:** Now the product scanning process is ready. If the scanned product code is detected, display all the product details on the LCD screen. If not, the product has to be scanned until it gets detected. This process applies to each & every product.

**Step 6:** If a scanned product is scanned once again then that product is removed from the microcontroller's memory & in the ongoing bill [13].

**Step 7:** Finally, to end the shopping, the shopper has to scan the Membership card. If the card is successfully scanned, then the complete bill summary is displayed on the LCD.

**Step 8:** Immediately after the bill amount is deducted from the card, an SMS is sent to the prescribed shopper's mobile phone via a GSM module regarding the shopping details [8].

**Step 9:** Stop.

**Step 10:** Repeat the entire process if another membership card is scanned & detected.

### V. RESULTS

#### 1. Simulation Results:

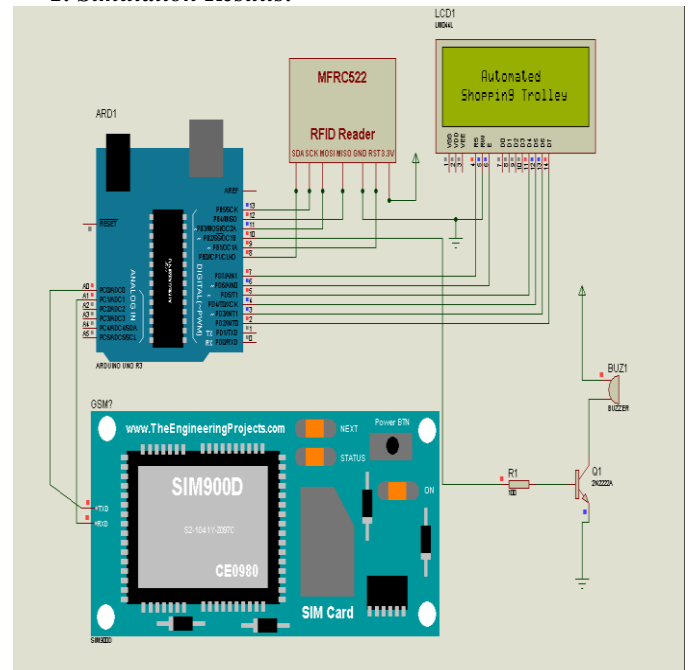


Fig.3: Complete circuit design and Simulation results.

In this project, it is only possible to show the complete interfacing & simulation run for the LCD module. RFID & GSM modules simulation can't be shown because the input to these modules is to be given manually i.e. RFID cards scanning is manually done & after the scanning is completed then the GSM module gets to work & sends a message to the customer's mobile phone.

## 2. Hardware Results:

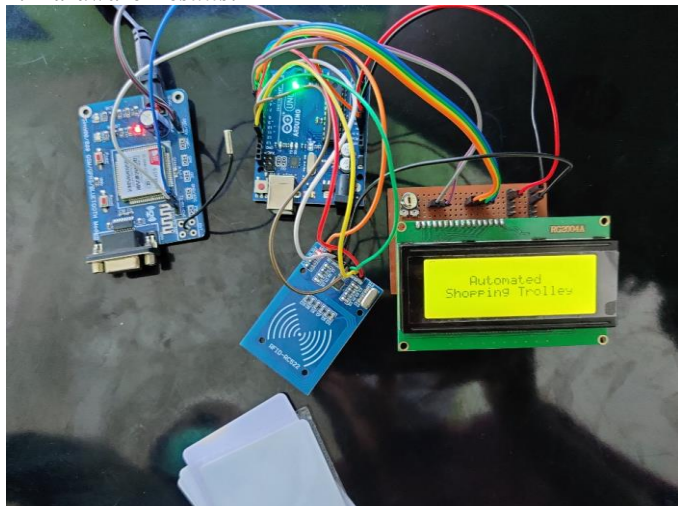


Figure.5: Text displaying once the system is powered up and initialized.

Once the system is powered up & initialized a text is displayed saying “Automated Shopping trolley”. This means the system is ready for scanning products. Now the shopper has to scan the membership card.



Figure.6: Personal details being displayed on LCD.

Once the membership card is scanned by the shopper all the personal details will be transferred & displayed on the LCD for the shopper's verification.

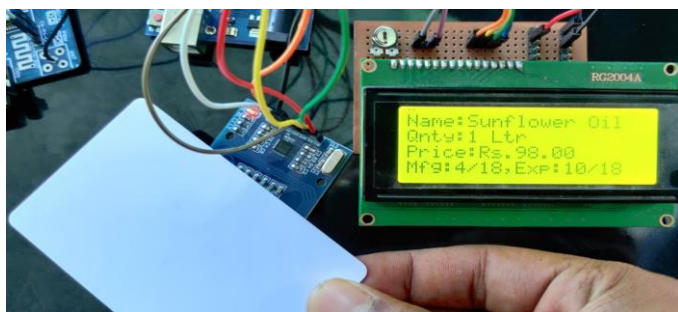


Fig.7: Item details being displayed if the scanning is successful.

Now after the membership card is scanned successfully the system is ready to scan products. When a product is scanned all its details will be fetched by MC & displayed on the LCD screen including name, quantity, price as well as the manufacturing & expiry dates.



Figure.8: Final bill summary being displayed

When the shopping is completed if the shopper scans the membership card, shopping ends & all the bill details will be shown on the LCD screen. It displays the final bill amount: the amount balance which was present before shopping & balance amount remaining after the shopping bill is paid.

## VI. DRAWBACKS

1. The Final cross-check of the bill along with the purchased products may be required.
2. The Shopper must get a shopping cart even if he/she wants to purchase a single product from the stores. This may become inconvenient.
3. As it is an electronic smart cart, maintenance and battery replacements must be made regularly.
4. For small scale supermarkets and stores, this technique may be not so cost-efficient.

## VII. FUTURE SCOPE

- This system can be also implemented using LI-FI, NFC & other communication systems [1][9].
- This system can be advanced by using Beacon Module instead of RFID Module & including a Load sensor is also a helpful implementation [6][7].
- In addition to the product details, nutrition facts of the eatables can be added.
- Automatic track detection & movement of the cart can be implemented by using various sensor technologies [3].
- Shopping budget limit can be set; when the limit exceeds buzzer should beep indicating this.
- Providing an option to the shoppers to priorly create a shopping list.
- The same system can be used in various places.

## VI. CONCLUSION

The progression in science & technology development is an unstoppable process. Now & then evolution changing technologies are being invented. We can't imagine the upcoming future in which technology may occupy each & every place [2]. This innovative project idea can be used in places like shopping complexes, supermarkets & malls to purchase the products. Here RFID card is used to securely access every product in shopping places. If a product is scanned & put into the cart, all the required details of the product will be displayed on the LCD screen. Therefore, an RFID tag/card is used for accessing the products. hence this project will help in improving the security & also the shopping

time can be reduced. It also provides an enjoyable & user-friendly shopping experience to the customers.

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