RSET

RAJAGIRI SCHOOL OF
ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Minor Mini Project Report On

Automated Billing System

Submitted in partial fulfillment of the requirements for the award of the degree of

Minor

in

Robotics & Automation

By

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CERTIFICATE

This is to certify that the minor mini project report entitled ***"Automated Billing System"*** *is a bonafide record of the work done by* ***Basil Eldho Joseph(U2103057)***, ***Basil Sabu (U2103059)*** *and* ***Daniel Robin (U2103072)*** *submitted to the Rajagiri School of Engineering & Technology (RSET) (Autonomous) in partial fulfillment of the requirements for the award of the degree of Minor in "Robotics & Automation" during the academic year 2024-2025.*

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It is indeed our pleasure and a moment of satisfaction for us to express our sincere gratitude to our project guide **Ms. Priya S**, Assistant Professor, Department of Applied Electronics and Instrumentation, for her patience and all the priceless advice and wisdom she has shared with us.

Last but not the least, we would like to express our sincere gratitude towards all other teachers and friends for their continuous support and constructive ideas.

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Abstract

In the era of rapid technological advancement, traditional shopping methods are evolving into seamless and efficient processes. This project focuses on an Automated Billing System equipped with an RFID scanner and an automatic billing system to enhance the shopping experience. Key features include RFID scanning and automated billing, designed to provide convenience, efficiency, and heightened customer satisfaction. Supermarkets utilize shopping trolleys to help customers select and store products they intend to purchase. However, the traditional method of placing items into the cart and then proceeding to a checkout counter for billing is highly time-consuming. Our Automated Billing System aims to streamline this process, reducing wait times and improving overall shopping efficiency.

Contents

List of Abbreviations

GSM-Global System for Mobile Communication

RFID-Radio Frequency Identification

LCD-Liquid Crystal Display

UART-Universal Asynchronous Receiver/Transmitter

SIM-Subscriber Identity Module

SMS-Short Message Service

TX-Transmitter

RX-Receiver

GND-Ground

VSS-Source Voltage

VDD-Voltage Input Pin

VEE-Voltage at Common Emitter

IDE-Integrated Development Environment

AT Commands-Attention commands

IC-Integrated Circuit

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Chapter 1

Introduction

An Automated Billing System is an innovative retail solution designed to enhance the shopping experience by integrating advanced technologies to streamline the checkout process. In traditional billing, customers select items and place them in trolleys, then proceed to the billing counter where cashiers prepare bills using barcode readers—a time-consuming process that leads to long queues. This tedious process may soon become obsolete with the introduction of sensors embedded in trolley wheels. The proposed system, intended for use in shopping malls, will feature RFID readers installed in all trolleys. Every product in the mall will be equipped with an RFID tag, enabling automatic item detection and efficient billing.

1.1 Background

An innovative retail solution aims to revolutionize the shopping experience by integrating advanced technologies to streamline the checkout process. Traditionally, customers place items in trolleys and queue at billing counters where cashiers use barcode readers, a time-consuming process leading to long waits.

To eliminate this inefficiency, trolleys will feature embedded sensors and RFID readers. All mall products will have RFID tags, allowing the system to detect items as they are added to the trolley, automatically storing their prices and displaying item details and costs on a local screen. This enables in-trolley billing, eliminating the need for manual checkout.

Additionally, the system incorporates a GSM module for generating printed receipts, enhancing the convenience of automatic billing. This innovative approach aims to optimize the retail experience and reduce checkout delays.

1.2 Problem Definition

In today's fast-paced world, shopping at malls or supermarkets has become a lifesaver for people who value time as a crucial factor. Technological innovations primarily aim to make daily life easier and faster. People select various products and place them in trolleys, then they proceed to the billing counter for payment, where prices encoded in barcode tags are scanned to prepare the bill. This process is time-consuming and often leads to long queues at billing counters.

1.3 Scope and Motivation

System is designed to reduce shopping time by providing a low-cost, user-friendly, and efficient technology for seamless shopping. Key modules include:

Improve convenience: Automatic billing uses technologies like RFID and machine learning to detect items as they are added to carts, eliminating checkout lines. Bills are calculated and charged automatically, saving time and reducing the need for cashiers. Real-time inventory tracking ensures optimal stock levels, enhancing efficiency and customer satisfaction.

Reduce labour cost and wait time: Automatic billing minimizes the need for manual billing and staff, cutting payroll costs. Self-service kiosks and mobile apps enable faster checkouts, reducing wait times. Integration with inventory systems further optimizes operations, improving efficiency and the customer experience.

Improved transparency: Accurate billing ensures trust through detailed invoices and transparent pricing. Security measures safeguard financial data, while flexible payment options and easy error resolution enhance customer satisfaction. Real-time monitoring and feedback systems help improve processes.

Minimize human error: Automated systems reduce errors with real-time data processing and robust algorithms. Regular audits and AI-powered predictions prevent discrepancies. Integration with inventory and customer systems ensures accuracy, while self-service portals add transparency and trust.

Improve security: Robust encryption, multi-factor authentication, and role-based access controls protect sensitive data. Continuous monitoring, regular audits, and quick response mechanisms enhance system security and build user trust.

1.4 Objectives

The main objectives of this project are:

1. Integrating RFID Reader with Arduino Uno:
   The project integrates an RFID reader with Arduino Uno to track items in the cart for accurate billing.

2. Integrating GSM Module with Arduino Uno:
   A GSM module is added to enable communication with the user's mobile phone, sending SMS notifications and receiving registration data for secure communication.

3. Integrating LCD Display(16x2) with Arduino Uno:
   A 16x2 LCD display is used to show real-time information such as item names, prices, quantities, and total bill, enhancing user interaction.

4. RFID Card detected and item name, price, count, and total amount will be displayed:
   When an RFID card is detected, the system displays the item's name, price, quantity, and total amount for easy tracking of purchases.

5. After pressing the "Finish" option, billing will be done in the cart itself:
   Pressing "Finish" triggers the billing process, calculates the total, sends the bill via SMS, and displays confirmation on the LCD, ensuring quick checkout.

1.5 Challenges

Implementing automatic billing carts with RFID technology and sensors presents challenges, including interference between RFID tags, which can affect accurate detection of items. Items with metal packaging or liquid contents may also pose detection issues. Additionally, the initial investment for hardware and software installation is significant, with ongoing maintenance costs for system upkeep and upgrades.

1.6 Assumptions

The successful implementation of automatic billing carts relies on several assumptions: RFID tags are read reliably without interference, carts have sufficient battery life, and RFID scanners provide full coverage of tagged items. The GSM module is assumed to facilitate reliable communication for real-time updates. Error-handling mechanisms are expected to manage misreads and communication failures, while seamless integration between RFID and GSM components is crucial. Additionally, proper training for users and staff is assumed to ensure smooth and secure operation.

1.7 Societal Relevance/Industrial Relevance

Smart shopping carts, equipped with RFID readers and LCD displays, have significant societal relevance by enhancing the shopping experience. They streamline item scanning, calculate totals, and enable self-checkout, reducing wait times and improving customer satisfaction. Additionally, they can offer personalized promotions based on shopping habits, further enhancing the experience. In the retail industry, smart carts transform operations by automating item scanning, reducing checkout times, and improving customer flow. They also track inventory in real time, providing accurate stock data, helping retailers manage inventory efficiently, and reducing stockouts and overstock.

1.8 Organization of the Report

The report is structured to provide a clear understanding of its objectives and scope in the introduction. Chapter 2 reviews existing literature pertinent to the study, highlighting key findings, methodologies used, and identifying gaps in current knowledge. Chapter 3 details the research methods employed, including how data was collected, analyzed, and any experimental procedures conducted to achieve the study's objectives. Chapter 4 presents and interprets the findings resulting from these methods. Finally, Chapter 5 summarizes the report's key findings and insights, emphasizing the significance of the research and its contributions to the field.

Chapter 2

Literature Survey

2.1 Related Work

Related works [1] on automatic billing systems span various industries. Retail systems like Amazon Go use computer vision and sensor fusion for checkout-free shopping. In telecommunications, real-time billing enhances accuracy and customer satisfaction. Healthcare systems automate billing using electronic health records (EHR), reducing administrative tasks. Smart grid technologies enable real-time utility billing with IoT smart meters. Subscription services like Netflix and Spotify manage recurring payments seamlessly. Blockchain is being explored for secure, transparent billing in supply chains using smart contracts [2]. These advancements showcase the broad impact of automatic billing across sectors.

2.1.1 Utility Billing System

A utility billing system automates billing for services like electricity, water, gas, and waste management by using smart metering to record consumption in real-time. The system generates accurate bills based on this data, applying rates, taxes, and charges, eliminating manual readings and reducing errors. Many systems offer customer portals for viewing consumption, managing accounts, and making payments, while supporting various billing cycles and integrating with CRM and ERP systems. Advanced systems include analytics for usage patterns, demand forecasting, and resource management, improving efficiency and customer satisfaction [3].

2.1.2 Telecommunication Billing System

Telecommunication billing systems manage and automate billing for telecom services such as voice, data, SMS, and value-added services. These systems track customer usage in

real-time, calculating charges based on service consumption. They support various billing models, including prepaid, postpaid, and hybrid plans. Real-time billing ensures accurate charges and reduces errors, improving customer satisfaction. Telecom billing systems also manage subscriptions, generate invoices, process payments, and handle disputes [4].

2.1.3 Healthcare Billing System

Healthcare billing systems ensure that healthcare providers receive payment for services through a structured process, starting with patient registration and insurance verification. Medical coding assigns standardized codes to diagnoses and procedures, which are entered into the billing system for claims generation. These claims are submitted to insurance companies for reimbursement, with adjudication determining payment amounts. Payments are recorded during the payment posting phase [5].

2.2 Summary and Gaps Identified

Here's the shortened version with Overleaf commands intact:

The automatic billing system uses RFID scanning and GSM communication to automate transactions in applications like toll collection and inventory management. RFID scanners identify tagged items or vehicles, while the GSM module enables real-time data transfer for billing without human intervention. [6]

A smart shopping cart integrates technologies like sensors, RFID tags, and GSM to enhance the shopping experience. It automatically scans and totals items, offers product recommendations, and facilitates easy checkout without cashier lines. As technology advances, these carts will become more sophisticated, benefiting both consumers and retailers. They improve efficiency, track inventory in real-time, reduce theft, and provide data analytics for personalized marketing. However, challenges such as high initial costs, technical limitations, customer adoption, privacy concerns, and operational issues remain. Some identified challenges are:

1. **High Initial Investment and Maintenance Costs:** The technology required for smart shopping carts, including sensors, GSM module, RFID tags, and integrated payment systems, represents a significant financial investment for retailers.

2. **Technical Limitations and Reliability:** The accuracy of item scanning and recognition can be an issue. Misreads or failure to detect items properly can lead to customer frustration and potential loss of revenue.Poor Wi-Fi coverage in certain areas of the store can disrupt the cart's functionality, leading to an inconsistent shopping experience.

3. **Customer Adoption and Usability:** Customers who are not tech-savvy might struggle to use smart shopping carts, especially older adults or those unfamiliar with digital interfaces.Moreover Shoppers accustomed to traditional shopping methods may resist adopting new technology.

4. **Privacy and Data Security Concerns:** Smart shopping carts collect a wealth of data on customer behavior, preferences, and purchase history. While this data is valuable for retailers, it raises privacy concerns among consumers who may be wary of how their information is used and stored.[7]

5. **Operational Challenges:** Smart shopping carts require a reliable power source. Managing the battery life and ensuring carts are charged and ready for use is a logistical challenge for retailers. Given their advanced technology, smart carts may be more susceptible to damage compared to traditional carts. [8]

6. **Environmental Considerations:** The increased use of electronics in smart carts raises concerns about electronic waste and sustainability.[9]

Chapter 3

Methodology

This chapter outlines the methodology for designing and developing the water quality monitoring buoy. It covers hardware selection, sensor integration, software development, and system testing, providing insight into the technical approach and decision-making process behind the final product.

3.1 Hardware Selection

Choosing the right hardware components is very important for the purpose functioning of the device.The following hardware was chosen based on the needs of the buoy

3.1.1 Arduino UNO

The Arduino Uno, based on the ATmega328P microcontroller, can be used to create a smart shopping cart by integrating various sensors and modules. It features 14 digital I/O pins, 6 analog inputs, and operates at 5V with a clock speed of 16 MHz. The Arduino can interface with an RFID scanner to read item codes, enabling real-time tracking and data collection for the cart. An LCD display, connected via I2C, shows item names, prices, and the total cost, providing immediate feedback. For communication, the Arduino can integrate with a GSM module to send an electronic receipt and notifications to the customer's mobile phone, reducing paper waste. The system processes RFID data to retrieve product information, calculates the total bill, and updates it as items are scanned. This setup ensures accurate billing, transparency, and an enhanced shopping experience by displaying the running total and promotional messages.

Figure 3.1: Arduino uno

3.1.2 RFID Tag

RFID technology integrated into smart trolleys with automatic billing systems has significantly improved the shopping experience by enhancing convenience and efficiency. Items in the store are tagged with RFID labels storing key details such as name, price, and specifications. The smart trolley, equipped with an RFID reader typically integrated into the handle, automatically scans the tags as items are added to the cart. This eliminates the need for manual input, providing a smoother, faster shopping experience. By automating item identification and billing in real-time, RFID-enabled trolleys streamline checkout, reduce waiting times, and improve customer satisfaction in retail environments [10].

Figure 3.2: RFID Tag

3.1.3 RFID Reader

Integrating an RFID reader into a smart shopping cart for an automatic billing system greatly enhances the shopping experience. The RFID reader is embedded within the cart, often in the handle or a dedicated scanning area, ensuring easy access and usability. Each product in the store is equipped with an RFID tag containing unique identifiers and pricing information. As items are placed in the cart, the RFID reader automatically scans the tags, capturing the data swiftly and accurately. This process uses the UART protocol for real-time data transmission between the RFID reader and the billing system. By automating the scanning and billing, RFID-enabled smart carts streamline the checkout process, reduce wait times, and improve overall customer satisfaction.

Figure 3.3: RFID Reader

3.1.4 GSM MODULE (SIM 900)

Integrating a GSM (Global System for Mobile Communications) module into a smart shopping cart with an automatic billing system enhances communication and introduces valuable functionalities. The GSM module enables the cart to transmit data wirelessly over cellular networks, allowing communication with external systems like billing servers and inventory databases from anywhere within the store. This ensures real-time updates to the billing system as items are added or removed. Additionally, the GSM module al-

lows remote monitoring by store staff, providing real-time status updates on cart locations, usage, and contents. Using the UART protocol, Arduino microcontrollers send AT commands to the GSM module for operation, ensuring smooth integration and efficient data exchange. The GSM module improves operational efficiency, enhances customer service through real-time updates, and optimizes inventory management in retail environments [11].

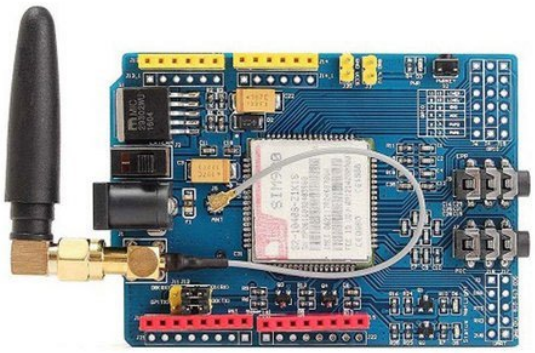

Figure 3.4: GSM MODULE(SIM900)

3.1.5 LCD Display (16x2)

Integrating an LCD (Liquid Crystal Display) into a smart shopping cart with an automatic billing system enhances the shopping experience by displaying a list of items, their prices, and quantities. This allows customers to track purchases in real-time and ensures accurate billing before checkout. The total cost updates dynamically as items are added or removed, helping customers manage their budgets. The LCD can also provide detailed product information, such as descriptions, nutritional facts, allergen warnings, and reviews, aiding informed decision-making. Communicating with the Arduino microcontroller using parallel four-wire mode, the LCD ensures seamless integration, boosting convenience, engagement, and satisfaction [12].

3.1.6 Power Supply

In a smart shopping cart with an automatic billing system, a reliable power supply is crucial for uninterrupted operation. The cart typically uses a built-in rechargeable battery or a mains power connection to supply energy to components such as the RFID reader, LCD display, communication modules, and billing system. The total power required for this project is 12V, ensuring that all systems function efficiently during the shopping process.[13]

3.1.7 Push Button

Push buttons in a smart shopping cart with an automatic billing system enhance user interaction by allowing manual item addition, quantity adjustments, and price checks. These buttons simplify tasks like starting scanning, applying discounts, and generating invoices. With tactile feedback, they improve the user experience, making transactions smoother and more efficient.

Chapter 4

Results

When a customer adds a product with an RFID tag to the shopping cart, the RFID scanner captures the item details, which are then processed by the microcontroller to generate and update the bill. The updated bill is displayed on both the LCD screen and the web server, allowing the customer to view and verify the products added. Customers can also remove items from the cart by using a push button, which prompts the system to scan and remove the selected product from the bill.

4.1 System Initialization and Registration Overview

The initial phase involves setting up the GSM module, RFID reader, LCD display, and user interaction switches. Successful initialization ensures smooth system operation. The GSM module was initialized with previous SMS messages cleared, and the system accurately received and displayed the registered phone number. If the registration keyword was missing, failure messages were shown. The LCD displayed clear messages throughout the process, ensuring effective user communication.

4.2 Item Identification and Billing

The system utilizes RFID technology to identify items like Milk, Egg, Oil, and Soap by reading unique RFID codes. It successfully detects RFID swipes and records data in the RFIDData array, displaying item names, prices, and updated totals on the LCD. Users can adjust item quantities using the Up, Down, Ok, and Done switches, with real-time updates on the display. The Up switch increases quantities, the Down switch decreases them, the Ok switch confirms the changes, and the Done switch triggers the billing process, sending the final bill via SMS. The system provides a smooth and responsive user experience.

4.2.1 Final Billing and SMS Confirmation

Once shopping is completed, the system calculates the total bill based on item quantities and prices. The GSM module sends an SMS with detailed billing information to the registered phone number, while the LCD confirms successful transmission. This process ensures a reliable and efficient conclusion to the shopping experience.

Figure 4.1: LCD Display(16x2)

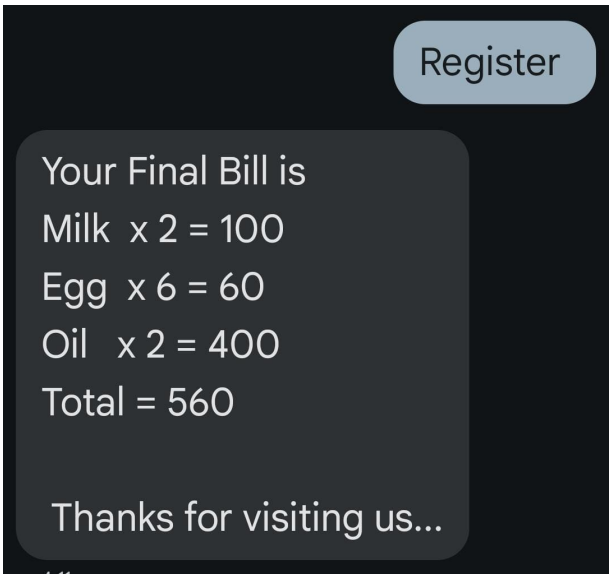

Figure 4.2: Final Bill

Chapter 5

Conclusions

The RFID and GSM-based smart shopping cart system showed strong functionality, effectively initializing components such as the GSM module, RFID reader, and LCD display. It identified items via RFID, displayed real-time details, and updated quantities and bills. User-friendly switches allowed easy adjustments, and the billing process was initiated with the Done switch, sending detailed bills via SMS. The system's ability to calculate accurate bills and send prompt confirmations demonstrated its effectiveness. In the future, advanced features like theft prevention, automated movement, and seamless payment systems will further revolutionize the shopping experience by enhancing security, automation, and efficiency.

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Appendix A: Presentation

Automated Billing System

Mini Project Final Presentation

Presented by:

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Guided by: Ms. Priya S

Outline

1. **Introduction**
2. **Motivation**
3. **Objectives**
4. **System Block Diagram**
5. **Methodology**
6. **Results**
7. **Work Plan**
8. **Conclusion**
9. **References**

Introduction

In the era of rapid technological advancement traditional shopping are evolving into seamless, efficient process.

This project is based on a smart shopping cart with RFID scanner and automatic billing system to make shopping experience more convenient and efficient.

Main features:

- RFID scanner
- Automatic billing

Motivation

1. Make shopping more convenient
2. Reduce labour cost and wait of customers
3. Proper utilisation of customer’s money
4. Minimize human error in billing
5. Ensure security

Objectives

Designing a Smart Shopping Cart with automatic billing system:

1. Integrating RFID Reader with Arduino Uno
2. Integrating GSM Module with Arduino Uno
3. Integrating LCD Display(16x2) with Arduino Uno
4. RFID Card detected and item name, price, count and total price will be displayed.
5. After pressing the “Finish” option, billing will be done in the cart itself.

System Block Diagram

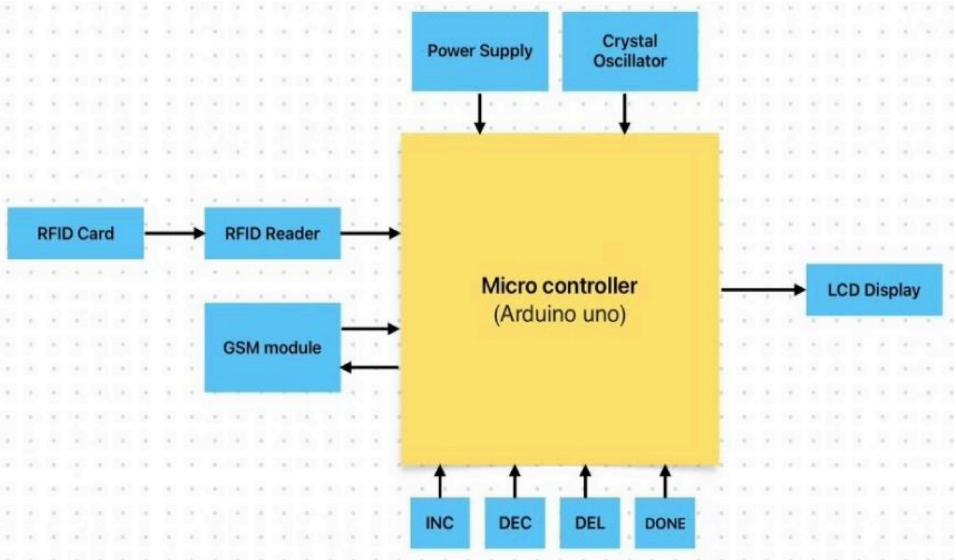

Figure 1: Block Diagram

Methodology

Arduino UNO:

- Chip: ATmega328P chip is used, operates on 5 V
- RFID reader: to detect the items being purchased
- Data Processing : With sensor input total bill is being calculated

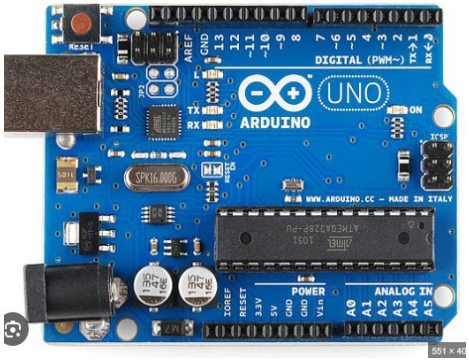

Figure 2: Arduino UNO

Methodology

- Display Output: Drive LCD display to show items being scanned and total bill amount to customer
- Communication: Communicates using GSM module and produce a receipt which is sent to the registered mobile number

RFID READER:

EM-18 RFID Module:Communicate using UART (universal asynchronous receiver transmitter)protocol
Connections:

- Power supply
- Tx to Rx of Arduino UNO
- Code: Read data from EM-18 Module
- Testing : Detect the Tag

Methodology

RFID TAG

Consists of two components: chip and coil

Figure 3: RFID Module

Figure 4 :RFID Tag

Methodology

GSM MODULE (SIM 900):

- Sends SMS from GSM Module to mobile
- Communicate with Arduino using UART protocol
- interaction between GSM Module and Arduino is bidirectional
- Arduino sends AT commands to GSM
- GSM receives commands from Arduino

Connections:

- Power supply
- RX to pin 10 of Arduino uno
- TX to pin 9 of Arduino uno

Methodology

Figure 6: GSM Module

Methodology

LCD DISPLAY (16X2):

Parallel four wire mode communication used.

Three configuration:

1. Register Select : Data and instructions are hold.
2. Read/Write : Connected to ground which makes write enable.
3. Enable Pin: Display to write data

Connections:

- VSS- GND
- VCC-5V
- VEE-Contrast Control
- LED A- connected to 5V

Methodology

Digital pins:

- D4-5th pin of Arduino UNO
- D5-4th pin of Arduino UNO
- D6-3rd pin of Arduino UNO
- D7-2nd pin of Arduino UNO

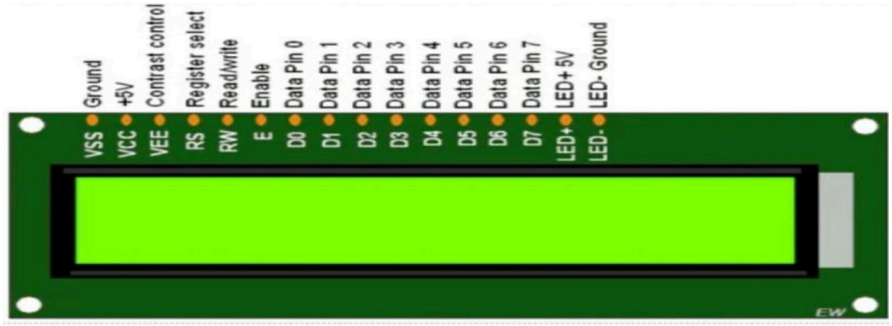

Figure 7: LCD

Methodology

POWER SUPPLY:

- Total Power used-12V
- 7805 Regulator IC

Figure 8: Power Adapter

Methodology

PUSH BUTTON:

Figure 9: Push Button

Uses a push pull resistor

- Pressed -Active Low
- Released -Active High
- ADD- A0 Pin of Arduino UNO
- DELETE- A1 Pin of Arduino UNO
- OK -A2 Pin of Arduino UNO
- FINISH-A3 Pin of Arduino UNO

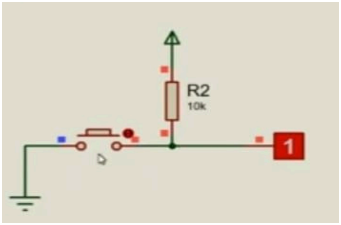

Figure 10:Pull Up

Methodology

WIRING DIAGRAM:

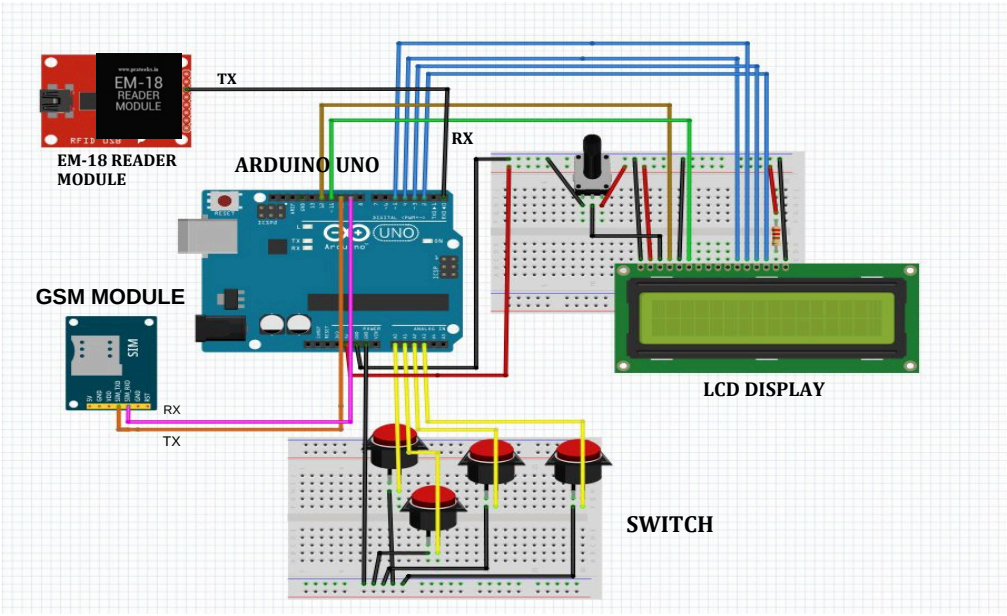

Figure 11:Wiring Diagram

Methodology

Algorithm:

1. Include the necessary header file.
2. Initialization of GSM and RFID module,LCD display and pin modes for switches.
3. Data Initialization of RFID codes and prices for items (Milk, Egg, Oil, Soap) and initializes an array to store the quantity of each item in the cart.
4. loop() Function:
    a. Checks if registration is done or not.

Methodology

b. If not done,it calls Functions:
    i. WaitForRegistration(): Initializes GSM module, deletes existing SMS, waits for incoming SMS, and stores its content.
    ii. FindRegistedNumber(): Searches SMS for a keyword. If found, extracts registered number and displays it. If not found, displays registration failure message.

Methodology

c. If registration is done, it calls the function:

i. WaitForRfidSwipe()Function: Waits for an RFID swipe and reads the RFID data into the `RFIDData` array.

ii. IdentifyScannedItem()Function: Identifies the scanned RFID item (Milk, Egg, Oil, Soap) and displays its name and price on the first line of the LCD screen. Displays the quantity of the scanned item and the total bill on the second line of the LCD screen.

Figure 12: LCD display

Methodology

iii. DisplyAndCount() Function:

- Enters a loop to continuously check the state of switches for user interaction.
- Increments the quantity of the selected item if the Up switch is pressed.
- Decrements the quantity of the selected item if the Down switch is pressed (if quantity is greater than 0).
- Breaks out of the loop if the Ok switch is pressed.
- Sends the bill as an SMS if the Done switch is pressed.

Methodology

5. WaitforGSMRes() Function :
   - Waits for GSM module response by continuously checking for available data on the serial port.
6. GSMSendSMS() Function:
   - Clears the LCD screen and displays "Sending Bill to" followed by the registered phone number.
   - Calculates the total bill based on the quantity of items in the cart and their respective prices.
   - Sends the SMS containing the final bill and item details to the registered phone number.
   - Displays a confirmation message on the LCD screen.
7. End of algorithm

Methodology

Code to find RFID Tag Number:

rfidtagread.ino

```
1   void setup() {
2     Serial.begin(9600);
3
4   }
5
6   void loop() {
7   if(Serial.available())
8   {
9     Serial.print((char)Serial.read());
10  }
11
12  }
```

Results

Observerved RFID Tag Number

1. RFID_1= "3C00AE61887B" //Milk
2. RFID_2 = "3C00AE7B739A" //Egg
3. RFID_3= "3C00AF71799B" //Oil
4. RFID_4= "3C00AF352284" //Soap

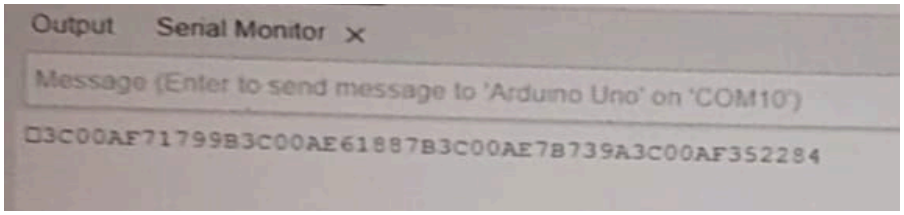

Figure 13:Serial Monitor (RFID Tag Number)

Results

Completed the circuit connection (Figure 14)

Code Status:

1. Wait for registration
2. Find registered number
3. Wait for rfid swipe
4. Identify scanned item
5. Display and count
6. GSM Send SMS

Results

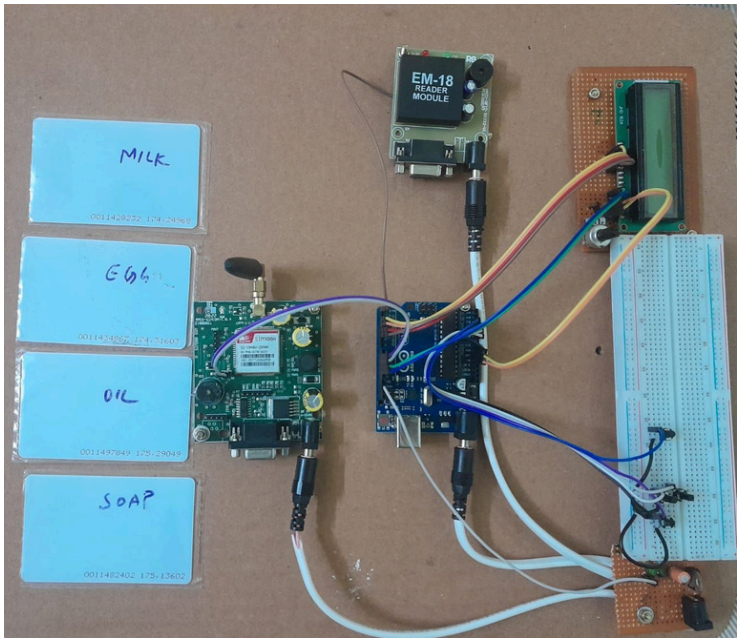

Figure 14:Circuit

Work Plan

	October	November 1st-2nd week	November 3rd-4th week	December
Literature review and components finalization				
Integration of RFID Reader EM-18,GSM Module, LCD Display with Arduino Uno was done separately				
Completion of Circuit Connection				
Completion of Coding				
Report writing				

Conclusion

- An automatic smart shopping cart with RFID scanner and automatic billing system is prepared.
- Main features:
  a. RFID scanner
  b. Automatic billing capabilities

- Future scope:
  a. Theft prevention by automatically closing the cart.
  b. Automated moving cart to follow the customer.
  c. Automatic paying system will be incorporated.

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Thank You

Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To evolve into a centre of academic excellence, developing professionals in the field of electronics and instrumentation to excel in academia and industry.

Department Mission

Facilitate comprehensive knowledge transfer with latest theoretical and practical concepts, developing good relationship with industrial, academic and research institutions thereby moulding competent professionals with social commitment.

Programme Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team work: Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Course Outcomes (CO)

Course Outcome 1: Students will be able to practice acquired knowledge within the selected area of technology for project development.

Course Outcome 2: Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.

Course Outcome 3: Reproduce, improve and refine technical aspects for engineering projects.

Course Outcome 4: Work as a team in development of technical projects.

Course Outcome 5: Communicate and report effectively project related activities and findings

Appendix C: CO-PO Mapping

CO - PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	3	3	3					3	3		3
CO.2	3			3				3	3	3	3	
CO.3	3	3	3	3	3					3		
CO.4					3			3	3	3		1
CO.5	3	3	3	3	2			3		3	3	1