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IoT Based Smart Trolley for Auto Billing

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Abstract - This paper proposes the development of a Smart Trolley system aimed at enhancing the shopping experience by automating the billing process. The system integrates Raspberry Pi, a low-cost, credit-card-sized computer, and RFID (Radio-Frequency Identification) technology to create an efficient and seamless checkout process for customers in retail environments. The Smart Trolley employs RFID tags attached to products and an RFID reader mounted on the trolley to identify items as they are placed inside. The Raspberry Pi processes the RFID data and maintains a running total of the items in the trolley. Additionally, it communicates with the store's database to retrieve product information and pricing. Through this integration, the Smart Trolley eliminates the need for manual scanning of each item at checkout, reducing waiting times and enhancing overall efficiency. Moreover, the system provides real-time updates on the total bill, allowing customers to track their expenses as they shop. This paper outlines the design, implementation, and testing of the Smart Trolley system, demonstrating its effectiveness in automating the billing process while improving the shopping experience for customers. The proposed system holds promise for revolutionizing retail operations, offering a glimpse into the future of smart, technology-driven shopping solutions.

Key Words: Autobilling, Rasberry Pi, RFID(EM-18), LCD, Smart Shopping, IoT.

1. INTRODUCTION

In the ever-changing world of technology, the Internet of Things (IoT) has emerged as a revolutionary concept that connects physical devices and enables them to communicate, collect information, and perform tasks autonomously. One of the exciting applications of IoT technology is the development of “smart cars” designed to enhance customer experience and improve the checkout process for retailers. The project introduces the concept of IoT-based smart car powered by Arduino to make the store more convenient and efficient while improving the checkout and payment process in store sales. Daily grocery shopping is a time-consuming task that often results in long lines at the checkout.The smart tram project uses the power of the Internet of Things to solve this problem. By integrating sensors, RFID technology and user experience, smart cars can identify products and add them to the shopping cart. It also allows shoppers to view items in their shopping cart, track their spending, and receive instant digital invoices, eliminating manual costs and long wait times.

When used with Arduino microcontrollers, they can be used to increase sales, make it easier for customers, and make retailers work better. By integrating RFID tags, weight sensors, and user interfaces, smart cars can seamlessly perform automated inventory, weighing, and payment processes. The system is also designed to reduce human error in billing and improve inventory management. How it works and the benefits it provides to buyers and sellers. As IoT technology continues to transform many industries, the smart trolley project is a great example of how it can transform business operations and lead to greater connectivity and convenience in the marketplace.

2.Existing System

The system must be reliable when scanning products and resp ond accurately to the business, sending all details to the online database. We have prepared a smart shopping cart that allows customers to view the products in their cart and complete the payment process. Customers must retrieve their cart, then scan their card and proceed to scan the product. If he wants to rem ove items from the cart, he needs to scan again. Orders can be placed after all products have been checked. The customer mu st scan his card in order to withdraw his card. There is also an obligation to check the balance on the card. Customers can vie w payment details online on the store's website. The license ce nter uses key licenses to migrate customers. Only the cardhold er can withdraw from the customer's card, write the details of t he RFID tag, add the customer to the system, send the card to the customer and store the information online. A store that ben efits customers and shoppers in many ways.

3.Methodology

The approach is important to develop an IoT based automatic billing smart cart using Arduino. The project should begin by defining requirements and objectives. Then carefully search and select the hardware and software tools needed to ensure compatibility. The architecture should establish the data flow and communication protocol of the system. Next comes hardware integration, where selected components (such as RFID scanners, load sensors, displays, and IoT modules) are connected to the Arduino board and pretested. Then, using RFID system, the tags are read and the products are identified, and the RFID tags are signed for the products and prices. Integrate load sensors to recognize added and

removed items and adjust items in the cart accordingly. Create IoT connections by configuring IoT modules to connect to selected platforms and write code to send product data to the cloud. Create a backend system to interact with the IoT platform, create an API endpoint for resource storage and billing. Create a database to store product information and pricing. Whether it is a mobile or web application, the user interface is designed, built and connected to the backend for real data analysis. Thorough testing and debugging is crucial to ensure smooth functionality. After successful evaluation, the system is deployed in the desired environment and users are provided with training and support. Maintenance, updates, information security, compatibility, evaluation and feedback are constant considerations for success. Careful planning and testing is important, and working with professionals can help achieve the desired and efficient performance.

Data Flow Diagram (DFD) :

Below is a simplified Data Flow Diagram (DFD) illustrating the flow of data and processes for the mentioned system functions:

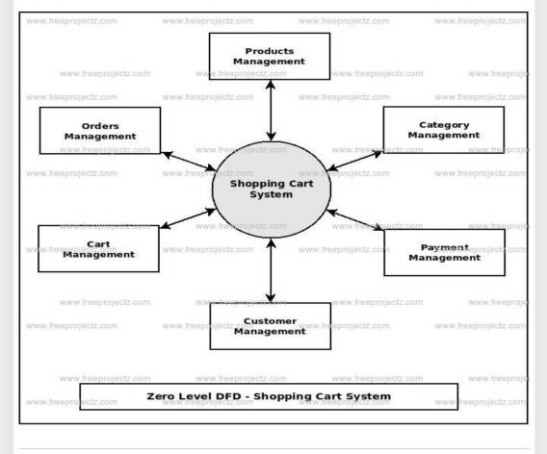


Fig 1. DFD 0

Data Flow Diagram DFD 1

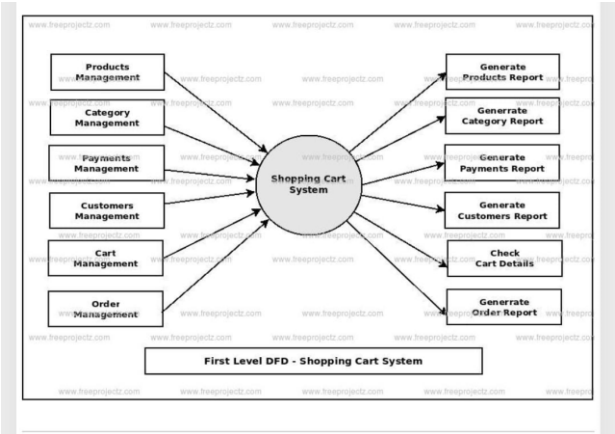


Fig 2.DFD 1

3.Data Flow Diagram DFD 2

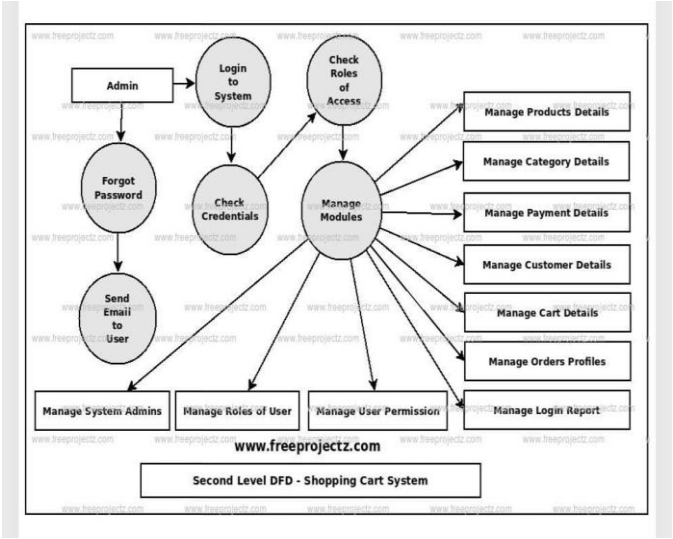


Fig 3.DFD 2

5. Block Diagram

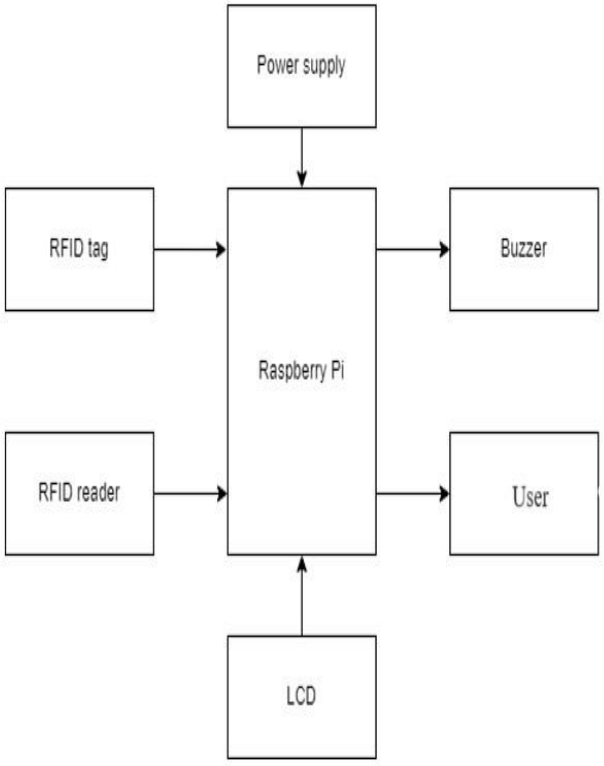


Fig.4 Block Diagram

Block Diagram consist of raspberry pi, which contains RFID tags ,reader mmodule,buzzer,LCD also the user who interacts with GUI.

Hardware:

Fig Raspberry Pi

Raspberry Pi (/ paɪ /) is a series of small single-board computers (SBCs) developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom.

Fig. Reader Module

EM18 RFID Reader is a module which reads the ID information stored in **RFID TAGS**. This ID information is unique for every TAG which cannot be copied.

6.Architecture

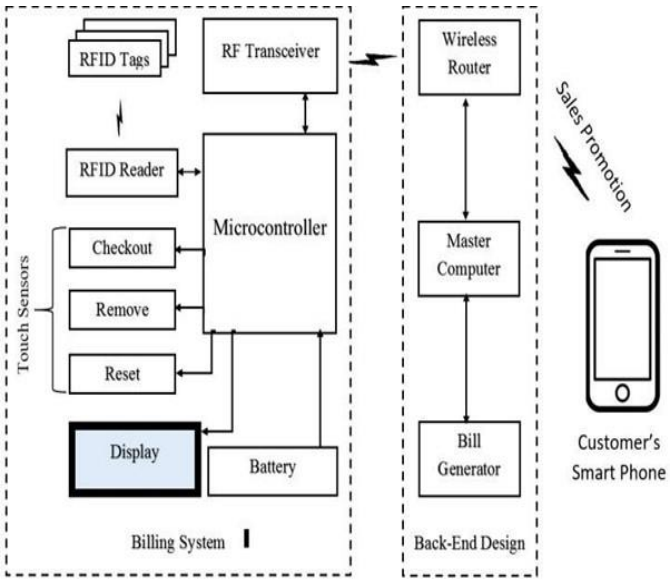


Fig. System Architecture

1. **Reader**: This device reads RFID tags attached to items placed in the trolley.
2. **RFID Tags**: These are attached to each item in the store and contain unique identifiers.
3. **Raspberry Pi**: The Raspberry Pi receives the RFID tag information from the reader.
4. **Actuators**: Motors or other actuators controlled by the Raspberry Pi can move the trolley autonomously or assist the user.
5. **Communication Module**: A communication module (e.g., Wi-Fi or Bluetooth) enables the trolley to communicate with other devices, such as smartphones or a central server.
6. **User Interface**: A display and input device (e.g., touchscreen or buttons) allows the user to interact with the trolley and view information.

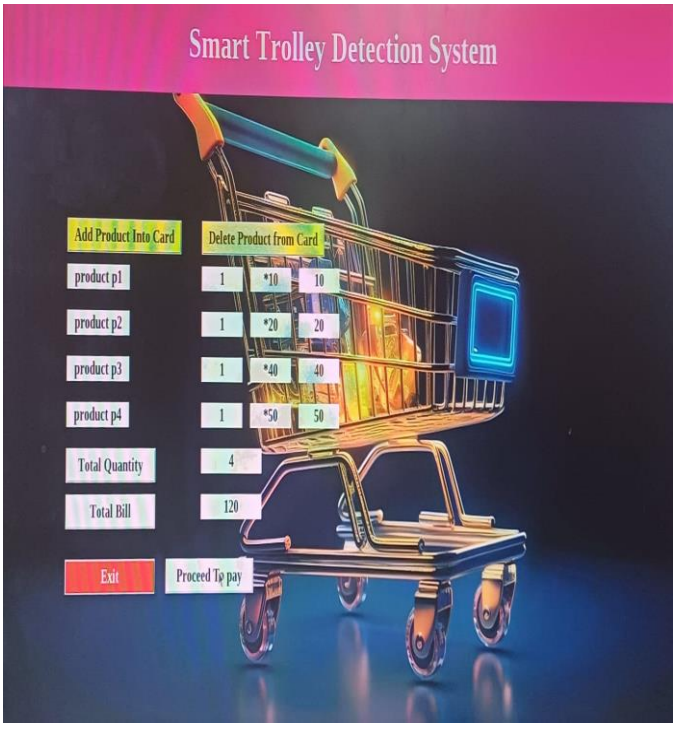
Fig.Actual Circuit Diagram

7.Results

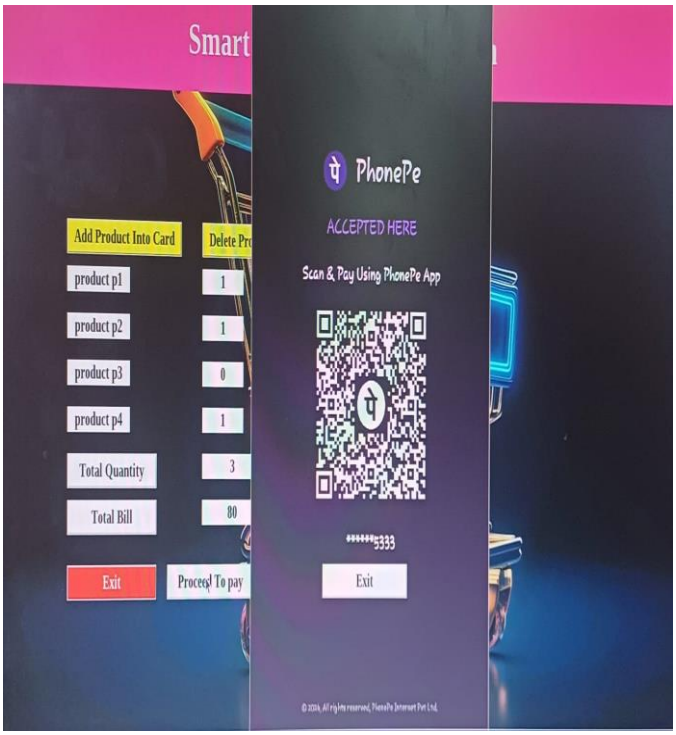
Simple GUI:

Deleted the product 3:

Added product in the cart:

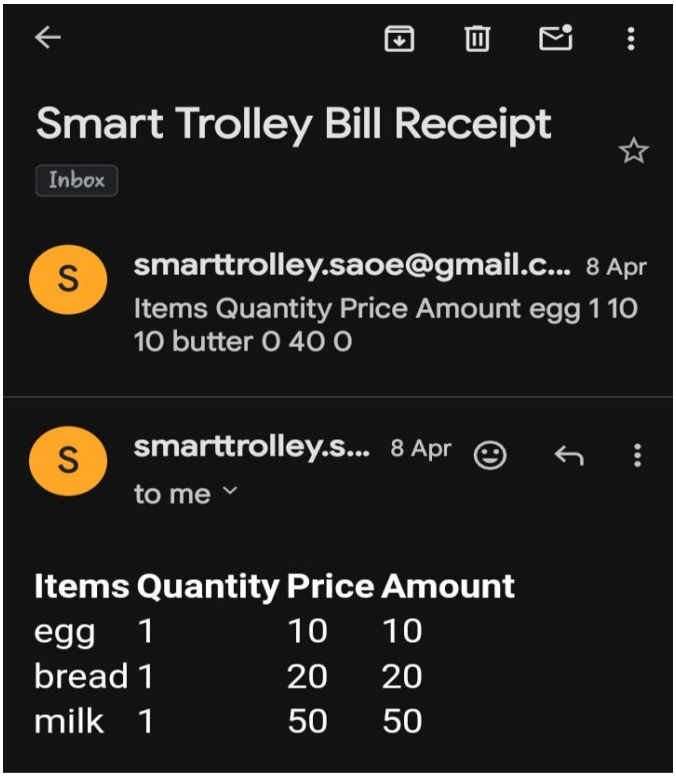


Proceed to payment:



Bill processing:

Invoice sent to the customer's MAIL address:



8.S/W Requirements

2.Python IDLE

9.H/W Requirements

1.Rasberry Pi
2.WiFi Module
3.Display Screen

10.CONCLUSIONS

Smart shopping carts are becoming the new trend in superma rkets. This system makes it easier for customers to shop. The main motivation of the current system and plan is to reduce th e customer's time, avoid wasting more time on delivery and en sure that the customer knows the correct price at the time of purchase. The system also reduces sales staff at the cash regist er. We can apply ESP8266 bolt in this cart as it can be used to monitor your system more easily than other IoT devices. Bolt is a popular IoT platform. Bolt does not use any transmission or equipment when sending data to other devices on the WiFi network. This basket system makes **customer service** more ef ficient and increases customer satisfaction.

11.REFERENCES

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