Visvesvaraya Technological University
Jnana Sangama, Belagavi

A PROJECT REPORT ON

Smart Shopping Cart System

Submitted by

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BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

Under the Guidance of

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PES INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Approved by AICTE, New Delhi, Affiliated to VTU, Belagavi, ISO 9001 Certified)

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July 23, 2022

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CERTIFICATE

Certified that the project work entitled **"Smart Shopping Cart System"** carried out by Mehantha M (4PM18CS047), Priyanka CS (4PM18CS066), Savina Gowda (4PM18CS085) and Tarun S (4PM18CS107), a bonafide student of PESITM, Shivamogga in partial fulfillment for the award of Bachelor of Engineering in Computer Science & Engineering of the Visvesvaraya Technological University, Belagavi during the year 2021-22. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

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Project Guide	HOD, CSE	Principal, PESITM

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Department of Computer Science & Engineering

DECLARATION

We, Mehantha M (4PM18CS047), Priyanka CS (4PM18CS066), Savina Gowda (4PM18CS095) and Tarun S (4PM18CS107) students of 8^{th} semester B.E. in Computer Science & Engineering, PESITM, Shivamogga hereby declare that the final year B.E. major project report entitled **Smart Shopping Cart System** which is being submitted to the **PESITM, Shivamogga** during the year 2021-22 is a record of an original work done by us under the supervise of Mr. Puneeth B H, Asst. Prof., Dept. of CSE, PESITM, Shivamogga. This Project work is submitted in partial fulfilment of the requirements for the award of the Degree of **Bachelor of Engineering** in **Computer Science and Engineering**. The material contained in this report has not been submitted to any University or Institution for the award of any degree.

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Place: PESITM, Shivamogga.
Date: July 23, 2022

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Abstract

In the modern, technologically advanced world most shoppers must wait in line to do their food shopping because it takes a while. When weekend or other promotional bargains are advertised, a sizable crowd will congregate in the supermarket, where barcode-based billing procedures necessitate lengthy lineups from shoppers. In the supermarket, the products are similarly challenging to find. In this sense, a smart shopping cart powered by the Internet of Things (IoT) is recommended in order to bypass the checkout line. Utilizing the mobile application, the customer can instantly alter the shopping list. After receiving information about wireless purchases, the server automatically generates billing. This test version's objective is to do away with time-consuming purchasing processes and poor service issues.

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Chapter 1

Introduction

1.1 Introduction to IoT

The term "Internet of Things" (IoT) refers to a network of connected, web-connected things that may gather and transmit data across great distances without the intervention of a human. When anything is connected to the web, it suggests that it has the ability to send, receive, or both. The ability to send and receive data is what makes something "Smart."
Our system will want to predict customer interest based on previous purchasing data from customers, and with the help of IoT, our system will want to keep track of every item purchased and want to provide item information and important details on a customer's mobile device.[1-4].

1.2 Introduction to Project

A shopping center is where individuals get their everyday necessities going from food items, clothing, electrical appliances, and so forth time clients have issues in regards to the deficient data about the item marked down and misuse of pointless time at the charging counters. Now and then clients deal with issues in regards to fragmented data about the item and holding up at the charging counters. Henceforth improvement is needed in the conventional charging framework to work on the nature of looking for clients. With this framework, the client will have data about the cost of each examined thing and the absolute cost of the thing. This will save the time needed in shopping centers. A cell phone with an android application is utilized here. The filtered items are consequently charged in the android application, accordingly essentially diminishing turnaround time.

Fast and simple payment of bills in the supermarket is one of the fantasies which each customer envisions of. so we will propose a "SMART SHOPPING CART" here we will utilize an RFID sensor. The main target of IoT is to screen individual items and the environment wirelessly. This introduces electronic tags connected with individual items. At the point when these tags become within the scope of the reader, it reads the stored data of the object wirelessly which is known as RFID innovation. RFID assumes a vital part in the utilization of IoT. It comprises three parts, for example, RFID tags connected to the object that contains personality or information about an item, RFID Reader reads the tags. The significant utilization of RFID innovation is to follow the item.

Chapter 2

Electronic Components

2.1 RFID Reader :

The RFID reader is utilized to accumulate data from the RFID tag which is utilize to follow individual items radio waves are utilized to move information from tag to reader[5].

Figure 2.1: RIFD reader

2.2 RFID tag :

Figure 2.2: RFID tag

To identify the tags affixed to the goods, radio-frequency identification (RFID) uses electromagnetic waves. The data stored by RFID is kept. It is used to identify, keep track of, and communicate with objects and people. Smart labels called RFIDs are able to record a variety of data, including serial numbers..

2.3 Arduino uno microcontroller :

Arduino Uno is a Microcontroller board named Arduino Uno because of the ATmega328 series regulator. You can handle your board on how to treat sending a bunch of guidelines to the microcontroller on the board. It collaborates with the software developers and designers in a coordinated advancement environment that makes it easy to complete a variety of duties. Composing, integrating, and transmitting code to the microcontroller, for example[6].

Figure 2.3: Arduino uno microcontrollerm

2.4 Bluetooth module :

Bluetooth module HC-06 is intended for building up short-range remote information correspondence between two microcontrollers or frameworks. The module chips away at Bluetooth 2.0 correspondence convention and it can go about as a slave gadget. This is the least expensive technique for remote information transmission and is more adaptable contrasted with different strategies and it even can send records at an accelerated to 2.1Mb/s[7].

Figure 2.4: Bluetooth module

2.5 LCD display :

Today's most popular LCDs on the market are 1 Line, 2 Line, or 4 Line LCDs with just 1 regulator and support for up to 80 characters. LCDs supporting more characters than 80 characters use 2 HD44780 regulators. Typically, LCDs with one regulator have 14 pins, while LCDs with two regulators have 16 pins. (two pins are extra in both for backdrop illumination LED associations).

Figure 2.5: LCD display

2.6 QR scanner :

It is possible to store a lot of information with QR codes. In any case, the client can rapidly access data by scanning a QR code, regardless of how much information they may contain. Because so many objects have implicit QR readers, it is common practise to use QR codes to track information about goods in a production network. They are also commonly used in showcasing and marketing initiatives.[8].

Figure 2.6: QR scanner

Chapter 3

Literature Survey

It was reported in [9] how well the automated trolley system built on the Internet of Things performed. The RFID module is used to facilitate shopping in the mall's structural structure. When the item is put in the trolley, the RFID reader will begin reading the RFID tags that are connected to the item. The name, price, and total bill for the returned item will be shown on an LCD in the trolley, and the total bill will be forwarded to the cashier's desk via the Xampp server.

The writers of paper[10] develop a solution for an automatic billing system in shopping centres. By using the smart trolley, this idea seeks to shorten the time spent at the mall. The products in this system proposal are billed using RFID technology, which is then integrated with an Arduino microcontroller. The type of ARDUINO used in this project hasn't been fully described. The admin portal was constructed using Visual Basic software, while the Java programming language was used to create the GUI for their system. The RFID reader scans the item when it is placed in the cart, and a bill is then generated.

In this paper[12], they put forth a method in which each item would have a scanning tag read it as it was added to the trolley. Along with the product's details, the expiration date is also made available for viewing. The most thorough and transparent system has a distinct ID associated with each product, and as soon as the reader reads the product, it automatically generates the information about the products on the screen. The product ID and its details are kept in the micro-controller memory.When the data about the items is presented on the LCD panel, the GSM/GPRS module transmits the bill to the system computer. According to testing, the cart can accurately and flawlessly read the information when the item is added to or withdrawn from the trolley.The signal is limited by the cart's metal exterior.

a very high degree that only the items in the cart are being read when the reader is inside the cart. This effectively demonstrates that the product is a smart trolley that won't be unintentionally destroyed or read by another cart nearby.

[13] On paper The RFID reader in this project can read the merchandise, and the LCD screen displays all of the product's information. They chose this particular article because they enhanced an existing system with several new features. As of right now, the item can be scanned by an RFID reader, and its totality is shown on an LCD screen. Since they added some additional highlights to the current framework, this document has been portrayed. n the current system, a product's name and weight are clearly visible; nevertheless, if a task requires that a product's weight be somewhat different from its put-away weight, a signal will then beep. The customer will either hear a buzzing sound or receive a text notification via the GSM module if any unlawful tasks are being carried out. Customers are alerted of unlawful behaviour via the LED system.

Paper[14] describes the designed smart shopping trolley that used the RFID technology to fetch the information of products already present in the database and also provides an automated billing system using RFID and Zigbee communication. A localization algorithm(Fast map algorithm) is used to find the particular product location. Each product will have an RFID tag and contain a unique identification number, product details like nutritive contains expiry date, etc. Each cart has a PID(Product Identification Device) specifically containing a micro-controller, LCD, an RFID reader, Keypad, Buzzer, IR add sensor, IR remote sensor, RF transceiver module. The power supply of 12V is used as the input voltage for different components used in the system.16*4 LCD will display the information when the RFID reader reads the products in the cart.IR add sensor is used to add the price when we add the product to the cart and IR remote sensor is used to deduct the price of theproduct when we remove it from the cart.

A shopping cart is created by Paper[15] utilising an NFC reader, OLED, buttons, Bluetooth transceiver/ESP8266, and microcontroller. The shopping list is transferred from the product to the basket via the NFC protocol in this situation. It offers data transfer via peer-to-peer connectivity. The ESP8266 wifi module is used to create a connection between hardware parts so that data may be sent and received. We can use the wifi module to store the data in a firebase-like database.The client and this technology are connected by OLED. It provides information to the user about

the item in the cart as well as the overall cost. The microcontroller utilised in this project is an Arduino UNO R3, which is used to examine the data in the tag and update accordingly.

Paper[16] The construction of a shopping cart was created by the authors, who largely used mobile phone applications and a weighted sensor system made up of a load cell module connected to a load cell amplifier HX711 module. Following transmission to the ESP8266 NodeMCU through the Wi-Fi network, the combined weight of the products in the shopping basket is recorded in the cloud servers. After being scanned by the RFID reader, the product's information is shown.

In Paper[17], a smart shopping cart implementation is described using an RFID code system, an automatic lock system, an EEPROM, a Zigbee module, an IR coupling, an HC-12, and a Cartesian system. The product is read by the RFID reader attached to the cart when it is placed inside the trolley, and the information is then shown on the LCD Display. The data is sent to the billing counter and stored in EEPROM. It will be firmly fastened to the object, and if someone takes it outside the mall without having it scanned, the security alarm will sound at the door. Additionally, the LCD displays the item's entire price.

According to this paper[18], the customer is exempt from having to wait in line to pay his bill after making a purchase. Additionally, the trolley will perform the function of a smart trolley by scanning the item with an RFID reader and sending the information about the product and the total bill to the central system. It takes up the customer's time and boosts client happiness.

According to this paper[19], the shopping cart includes hardware elements such an Arduino Mega 2560 microcontroller, an RFID reader, an ultrasonic sensor, an auto-calibrating sensor, a motor driver, and a 12V acid battery. RFID. After the reader reads the product's tag, the information is recorded in the Arduino Mega 2560 microcontroller and subsequently communicated via Bluetooth to the user's smartphone. In order to find items, ultrasonic sensors are utilised. The shopping cart is assisted by a motor driver, whose movement is managed by a smartphone.

According to this paper[20], the RFID tag linked to the shopping cart aids in identifying shoppers who are present in the market. In this case, a smartphone serves as a barcode scanner. When a product is scanned by a smartphone, its description is

delivered to an audio file that is played on an LCD screen built inside a smart trolley. After the consumer has finished his shopping, he must click the trolley's button to send the entire bill to the computer using NRF24L01.

They presented an architecture in this paper[21] for passive RFID product tracking. The author thinks that enterprises will only participate in IoT networks through involving users. Additionally, they put out a business plan with a global tracking system for products that would allow consumers to profit from recycling efforts. The producer includes its identification in the product code on the RFID label linked to the product, even in the suggested platform.Only the printed RFID identity must be understood by the service operating in the RFID reader in order to call the appropriate manufacturer service method. additionally outlined the costs and advantages based on the positions.

They described how a trolley is outfitted with an RFID reader and LCD screen in their paper[22]. When a product is placed in a trolley, it automatically scans the barcode, and the item name and price are displayed on the LCD. Through the Zigbee module, a product's billing or related data will be sent to the central billing unit. This article compares barcode with RFID technology and shows that RFID has increased productivity across a wide range of industries. Standardized tags have a low unit price and can be customised to fit certain objects or packaging. They utilised Python on the Rasberry Pi to connect to this RFID reader. The tags used in this project only have one side that can be detected, so they are circularly connected to prevent non-detection. when a single shopping cart containing a unique item is used for the evaluation.

They have developed a central automated billing system for supermarkets and malls in this paper[23]. Credit/debit cards are used to pay the bill after the purchase. Here, an 8-microcontroller was utilised to read the 8-bit data from the RFID reader. They have used AT89S52, but as AT89S52 lacks an integrated 12C protocol, the programmer must create a separate Embedded C programme to send and receive data using EEPROM. Utilizing microcontroller and microprocessors with built-in 12C protocol characteristics will help you overcome this.

They discussed a monitoring system in a shopping lab and examined the shoppers' behaviour in this paper[24]. They have created and tested a working prototype based on person tracking, tracking for various shoppers, and face localization. They

have also tested the motion detection and trajectory analysis modules.

In this essay[25], the modern, forward-thinking product helps with convenience, effectiveness, and comfort in daily living. They have talked about the novel idea of "ELEC- TRONICS SHOPPING." The major objective is to provide a technology-oriented, low-cost service to help customers with everyday shopping by minimising their time spent looking for products.

They present a solution in this paper[26] for all grocery shoppers who struggle with the issue of having to wait in a long line for final billing. It is easy to use and doesn't require assistance. The shopping cart in this instance was created with automated charging. This project will save down on billing time and is simple and commercial.
In this paper[27], they mainly focus for the blind people and they have 1. an RFID and smart phone-based indoor navigation system and 2. a mobile QR-code based product recognizer. As an important note that although the chosen scenario was a shopping mall, the platform easily adapted to any other self-service shopping scenario.

In this paper[28], In this project, they have done a safe smart shopping system that uses RFID technology, Zig-bee technology that is utilized in adlibbing shopping encounters by making it smart and coordinating security highlights into the system simultaneously.

In this paper[29], They have provided an initial demonstration of feasibility and acceptability to users of several aspects of a new approach to intelligent location-aware shopping guidance. In this project, the aspect of the shopping guide that could be tested in the present study passed their tests fairly well, and the improvements that proved desirable can be realized without much difficulty. But the goal of deploying the system in a real shopping situation raises some issues that were not (fully) addressed in the present study.

They have given a preliminary demonstration of the viability and acceptability to users of several features of a new method for intelligent location-aware shopping recommendations in this paper[29]. The shopping guide's component that could be tested in this project passed its tests reasonably well, and the improvements that were found to be desirable can be implemented without too much trouble. However, the intention to use the system in a real-world shopping scenario creates various problems

that were (completely) not addressed in the current study.

In this paper[30], They have proposed an accurate method of shopping prediction. They have used the XGBoost algorithm, which is a machine learning algorithm,to predict the shops where customers are currently located. They evaluated their method on a dataset composed of real customers transaction records in shopping malls, and the results showed that their method is useful in that task. Additionally, they need to verify the generalization of their method on different datasets.
In this paper[31], They have designed it useful to reduce the billing time and standing queues at the bill counter in shopping markets. The system also ensures that all the products placed in the cart are being scanned and added up for billing.

In this paper[32], RFID based shopping cart is a new way of shopping and avoiding long queues. The object would be tagged with a unique reader tag, which will be identified by the RFID reader attached to the trolley as the object is added to the cart. As the scanning is done the cost of the product will automatically be displayed on the screen attached to the cart.

In this paper[33], This smart shopping mart has the facility of automatic billing. The customer at on-time shopping needs to just drop the product in the cart and the RFID reader here calculates the amount of their bill. The customer can now spend according to their wallet.

In this paper[34], To avoid the long queue, they proposed a smart trolley system for automatic billing using Zigbee and RFID. RFID is used to identify each product in a shopping mall and display it on the LCD screen. Zigbee supports to transfer of the total amount to customers.

Chapter 4

Problem Statement and Objectives

4.1 Problem Statement

Design and implement IoT in shopping and provide a detailed bill of the products present in the trolley using RFID technology.

4.2 Objectives :

- Implement a system to display the product details present in the trolley on the trolley LCD screen and in web application.
- Implement a system that should fetch the details of the rack number in order to track the product in the shopping mall and Display the shortest path.
- Generating the total bill and generating the QR code for security purposes at the exit gate.

Chapter 5

Architecture

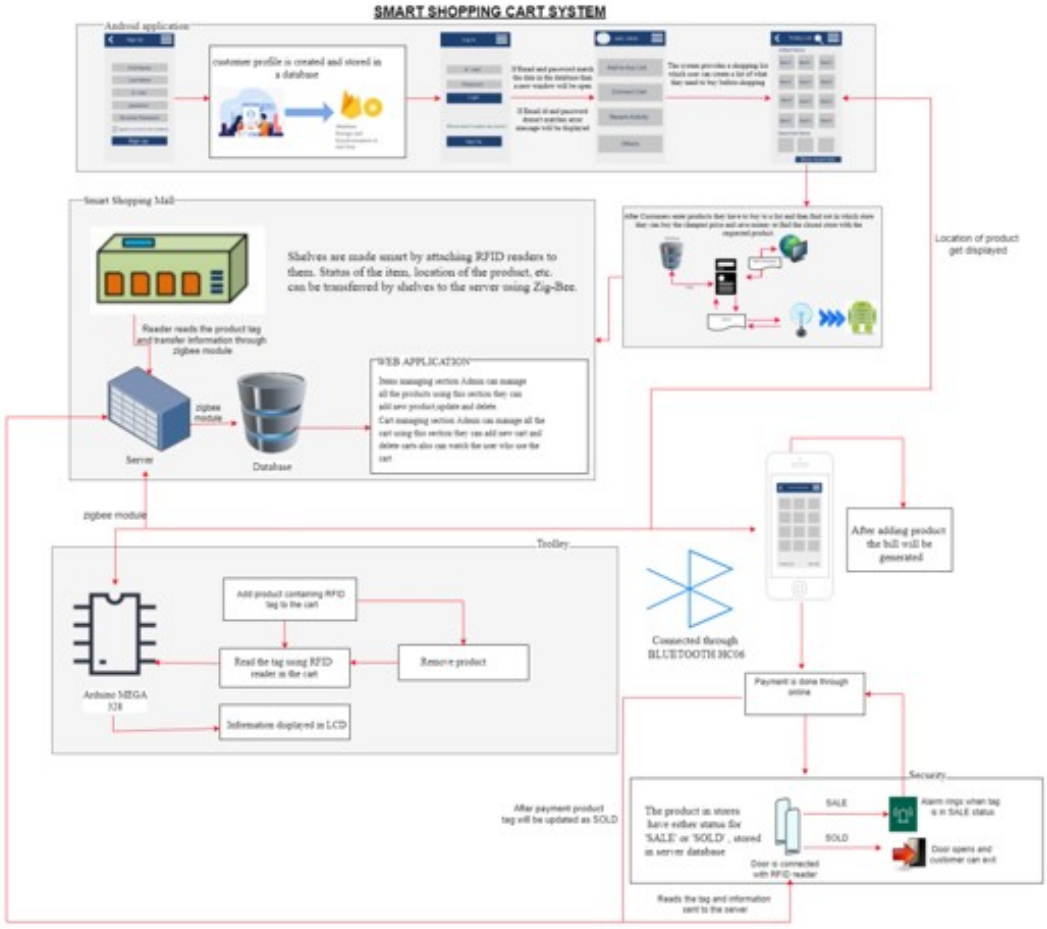

Figure 5.1: Architecture of Smart Shopping Cart Systrm

Initially, the customer login to the application and choose the shopping mall he wishes to visit to purchase the items[35-37]. once the shopping mall is selected the application will provide the list of items available in the shopping mall. the customer

will select the items he wishes to buy from the list and then the application will provide the shortest route to reach the shopping mall. Based on the customer's mobile location the centralized server will get to know about the customer reached the shopping mall or not. once the customer reaches the shopping mall, inside the mall shelves are made smart by attaching an RFID reader to the shelves that will help to find a product location.. once the customer reaches the first product location then the application will sort the product list again based on the current location of the customer inside a shopping mall. Once the customer reaches the product location he will add the product to the trolley containing the RFID reader each product will have an RFID tag, the RFID reader will read the product tag and send a request to the centralized server to fetch details of the product and details will be displayed on an LCD screen attached to the trolley parallelly using Bluetooth module the product details will be updated in the mobile application along with a price. Once all the products are added, the mobile application will display the list of items in the trolley along with price details and the total cost of all the items to pay the bill can be done by using unified payment interface ex: google pay, phone pay, etc. [38-39]. If in case if the customer wants to remove any items from the trolley he/she needs to make an RFID reader read the tag of that particular item, which will send a request to the server to delete the item and it will provide a delete option in the mobile application to remove and the list is updated along with the cost. the product in stores has either status as SALE or SOLD stored in a database server. if any product is in sale status then a QR code will not generate an alarm will ring if all the products are in sold status then a QR code will generate and the customer can leave the mall[40].

Chapter 6

Methodology

- Customer logins to the application [41]
- Customer adds the products to the cart containing RFID Reader
- RFID reads the products and information will be passed on to the microcontroller [42]
- Microcontroller the compare it with the data stored in it and display on the web application.
- Customer pays the bill through phone pay or googles pay etc. . .
- Generating the total bill and unique QR Code.
- Customer leaves the shopping mall.

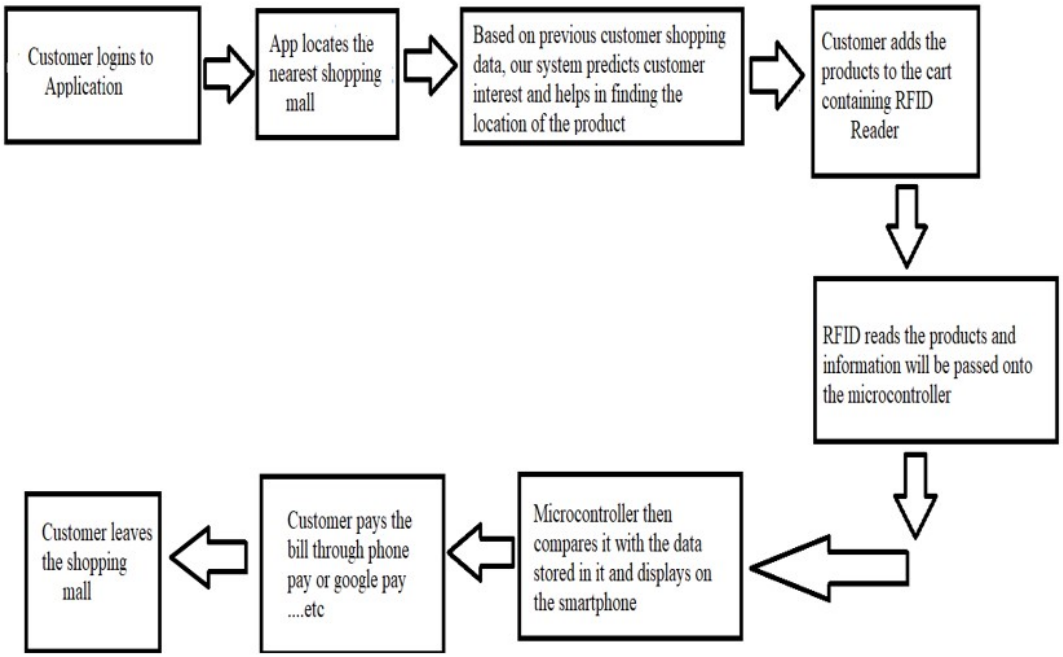

Figure 6.1: Workflow of Smart Shopping System

Chapter 7

Requirements and IDE

7.1 Requirements :

- NodeMCU
- EM-18 RFID reader
- RFID cards (5)
- 16x2 LCD Display
- Buttons, Led, Buzzer
- Arduino IDE for Coding (Software)
- Female to Female Jumpers

7.1.1 NodeMCU

The NodeMCU which works on IoT platform it is available in low cost. It also include frimware which runs on ESP8266 Wi-Fi and hardware based on ESP-12 module.

Figure 7.1: NodeMCU

7.1.2 EM-18 RFID reader :

EM-18 RFID reader is one of the normally utilized RFID readers to read 125KHz labels. It includes minimal expense, low power utilization, little structure factor, and is not difficult to utilize. The module emanates 125KHz through its loops and when a 125KHz inactive RFID tag is brought into this field it will get stimulated from this field.

Figure 7.2: RFID Reader

7.1.3 RFID cards :

These lables work on the RFID. These labels are controlled by electromagnetic acceptance from attractive fields delivered close to the reader.

Figure 7.3: RFID Tag

7.1.4 16x2 LCD display :

Figure 7.4: 16*2 LCD Display

LDC display is utilized to show the items added to the cart and to show the aggregate sum of the items inside the cart.

7.1.5 Push buttons,LED,Buzzers :

Figure 7.5: Push button

7.1.6 Female to Female jumpers:

Jumper wires are little wire channels that can be utilized to associate parts with one another on breadboards or somewhere else. The female and female tops of this item, with plastic heads, can give a more straightforward association without the need for soldering.

Figure 7.6: jumpers

7.2 Features:

The features of the system are as follows:
1. The system has a user-friendly UI.
2. It is cost efficient
3. Easy to implement in malls and shops.
4. Billing in shops gets easier.
5. User can keep tabs on his expenses along with the list of items in cart.

7.3 Description of the Project:

An RFID card is attached to every product shelf in the mall and the reader system is attached to the trolley. At the time of purchase, the tag attached to the product is scanned by the reader. Each tag has a unique EPC (Electronic Product Code). Based on the EPC received by the NodeMCU, the information of the product is displayed on the LCD along with the updated cost. This information is also sent to a webpage hosted on the local server with the help of the IP address provided at the start with the help of the WiFi module. If the customer wants to remove the added product, the product should be scanned again while pressing the 'Delete' push button on the system. Then the cost and the quantity of the corresponding product will be deducted from the bill. Along with the display of addition and deduction of products on the LCD screen it can also be seen on the webpage at the given IP address. A special checkout card is required to show the Net total on the LCD screen which is available at the billing counter for payment. After billing, the system can be reset for a new transaction by using the 'Reset' button mounted on the scanner system.

7.4 Circuit Diagram :

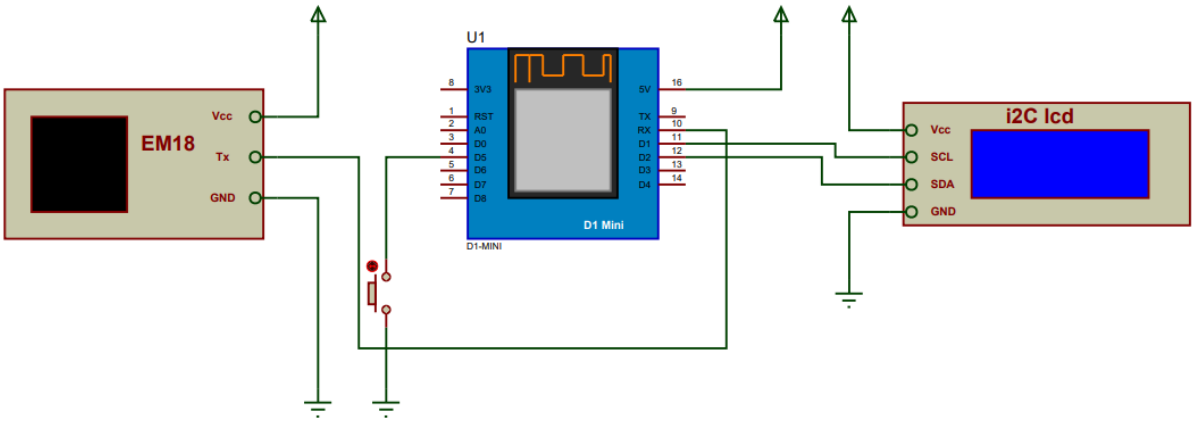

Figure 7.7: Circuit Diagram of Smart Shopping System

7.5 Code Snippets:

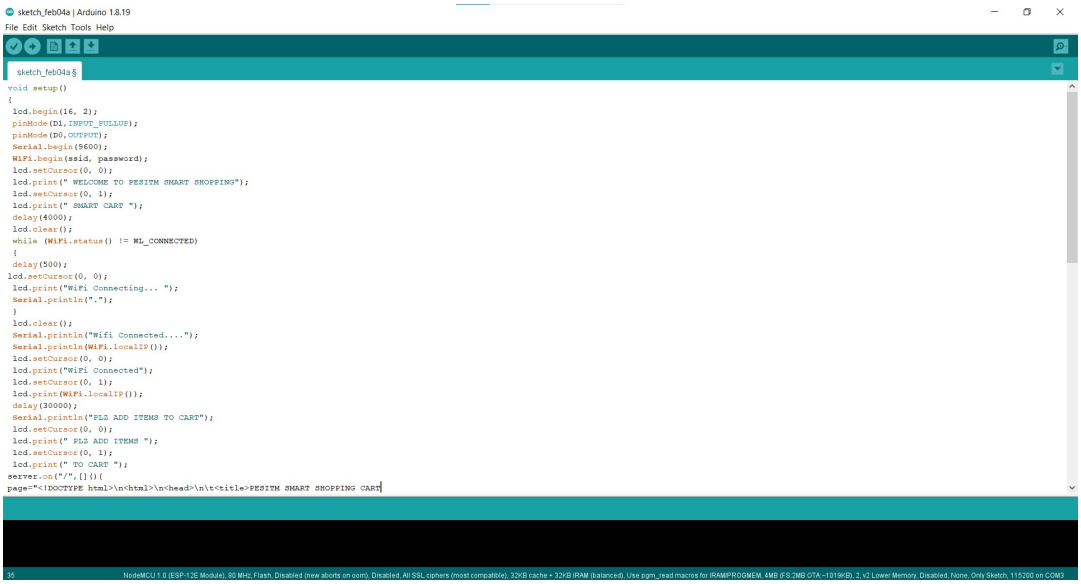

Figure 7.8: Aurdino IDE

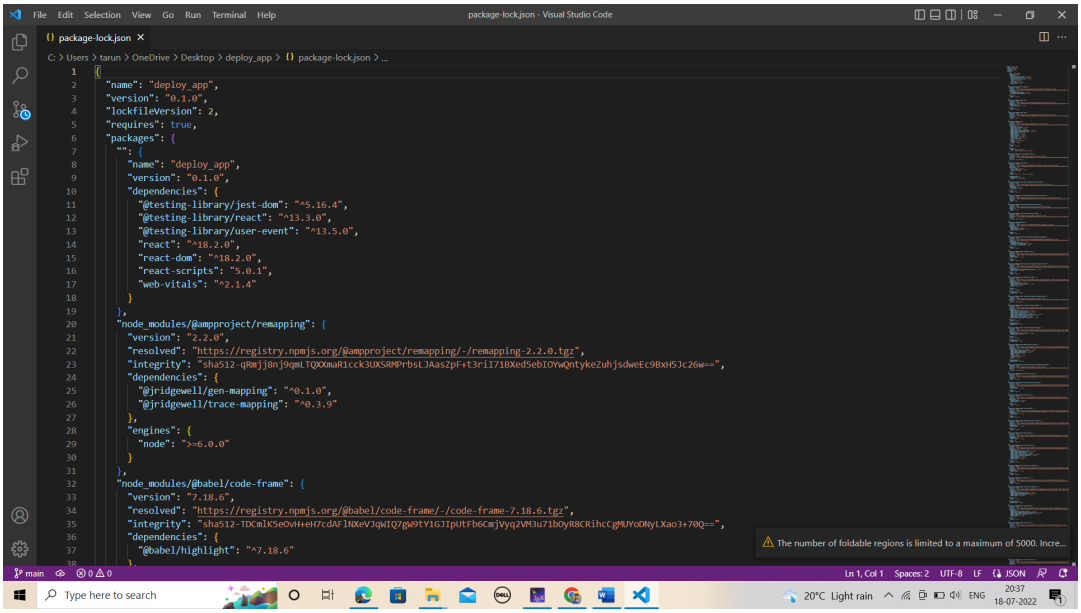

Figure 7.9: Visual Studio Code

Chapter 8

Objectives with its Result Analysis

8.1 Implement a system to display the product details on web application and LCD in the trolley of products present in the trolley.

Every product in the mall has an RFID tag, and the reader is attached to the cart. The reader scans the tag attached to the product at the time of purchase. Each tag has its own EPC(Electonic product code). The information about the product is presented on the LCD, along with the updated cost, based on the EPC received by the Node MCU. With the help of an HC-12 transmitter on the trolley and an HC-12 receiver on the PC, this data is likewise relayed to the central PC. The product should be scanned again if the consumer wants to remove the added product. The charge will then be reduced by the cost of the matching product. The cart has a push button to signal the end of the shopping.

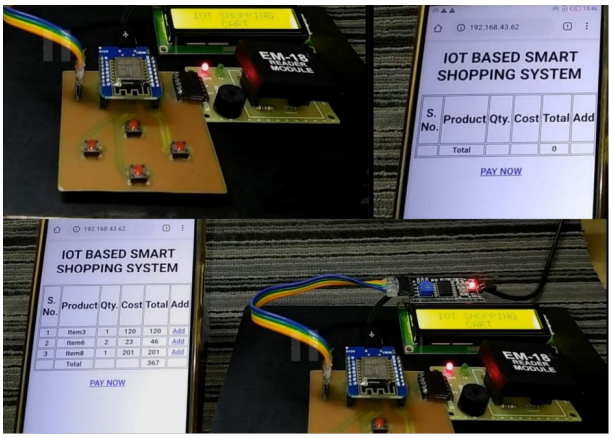

Figure 8.1: Objective 1 Result

8.1.1 Result Analysis of Objective 1

Products	Time taken(sec)
Product 1	2
Product 2	1
Product 3	3
Product 4	1
Product 5	4
Product 6	2

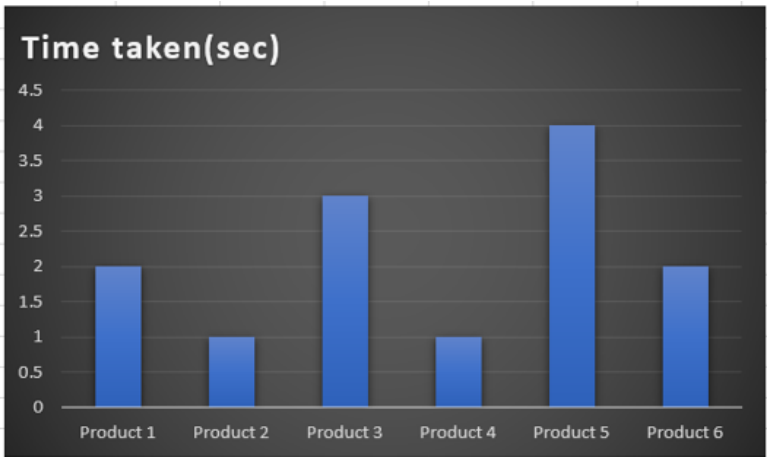

Figure 8.2: Detection Rate for adding the products to the trolley

Products	Time taken(sec)
Product 1	1
Product 2	2
Product 3	1
Product 4	3
Product 5	1
Product 6	2

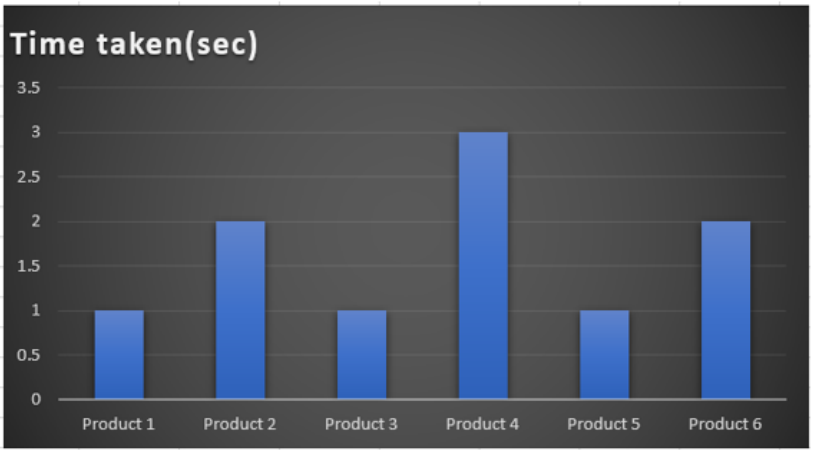

Figure 8.3: Detection Rate of removing the products to the trolley

8.2 Implement a system that should fetch the details of the rack number in order to track the product in the shopping mall and Display the shortest path.

Creating an inventory database using python flask. Our platform offers shoppers personalized shopping mall experiences, allowing them to create a product list and discover products they want to buy every time they go shopping. The admin page allows the admin to add, or remove the product information and based on the customer product list it will show the shortest path to the product based on the location of the product present in the shopping mall by using A Star Search Algorithm.

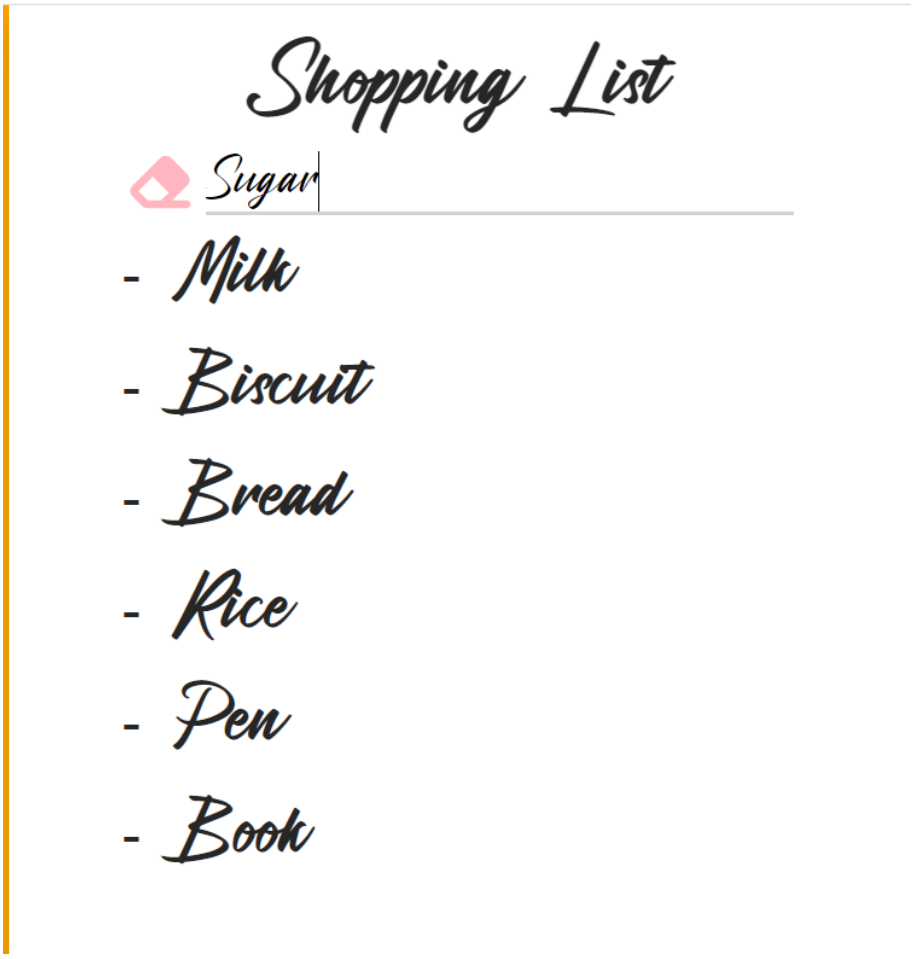

Figure 8.4: creating a product list

Figure 8.5: Inventory Management

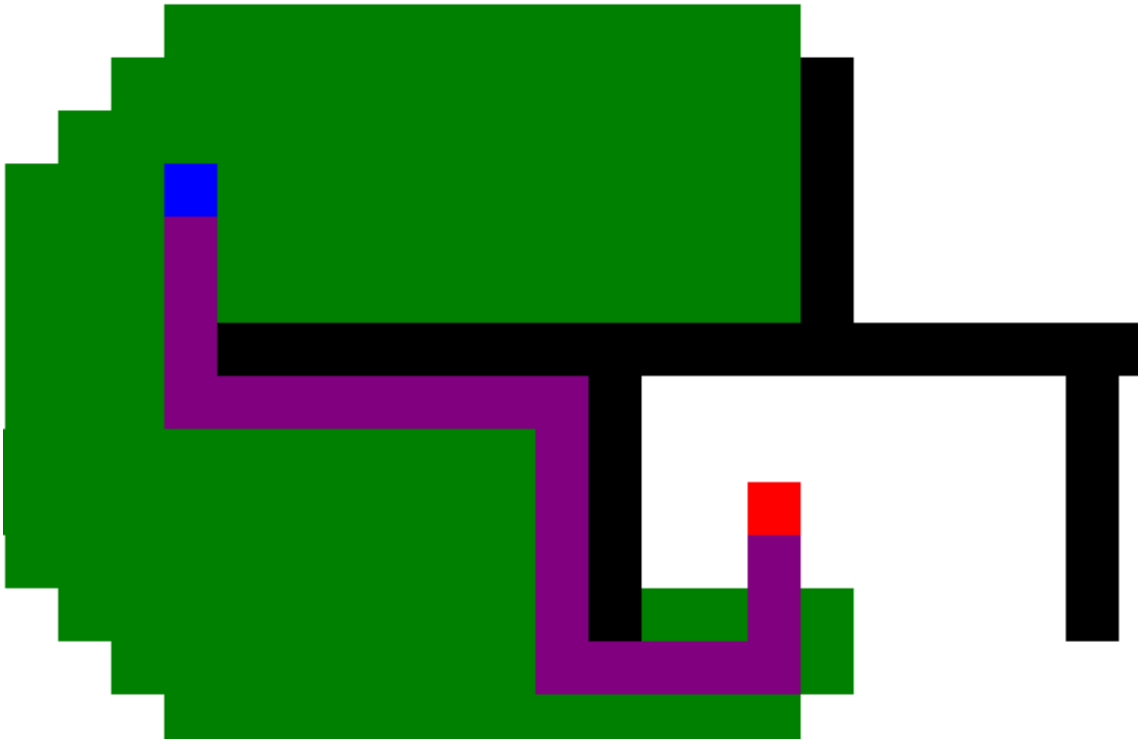

Figure 8.6: A Star Shortest Pathfinding Visualization

8.2.1 Result Analysis of Objective 2

Products	Destination time taken
Product 1	1
Product 2	2
Product 3	1.5
Product 4	3
Product 5	2.5
Product 6	1.5

Figure 8.7: Time taken to find the product in shopping mall using shortest distance

8.3 Generating the total bill and generating the QR code for security purposes at the exit gate.

Calculating the overall total of the product bill ,on the bases of the product bill QR code is generated and based on product present in the trolley it will calculate the total amount and it will be displayed on LCD display screen as well as in the web application. Thereafter it will validate the products details and gives the total bill and generates the unique QR Code.

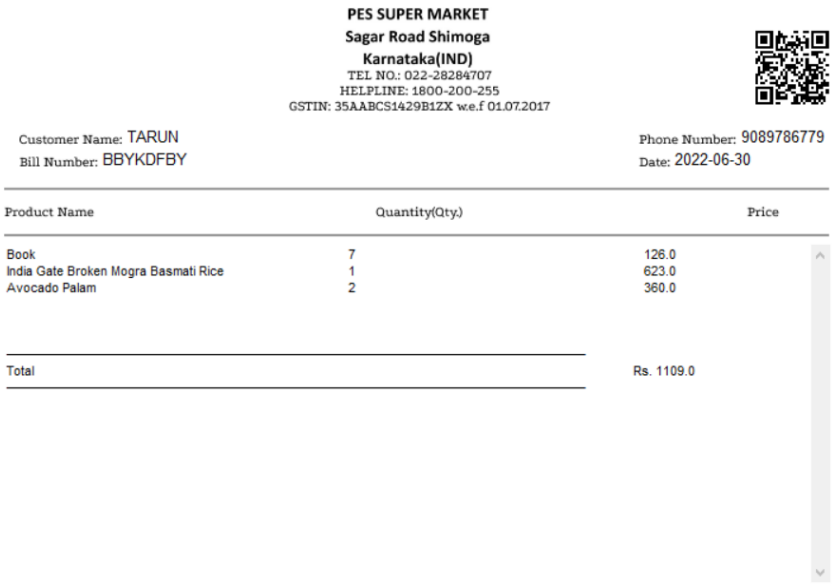

Figure 8.8: Total Amount with Bill and Unipue QR Code Generation

Chapter 9

Summary

IoT and machine learning are combined to create a smart shopping basket. Customers at the shopping centre use this application to expedite the purchasing process of any goods. The labour in shopping centres is reduced because to this application. RFID is used in this project[50] as a secure entryway for the object that enhances observation performance. The automated central billing that is used in supermarkets and shopping malls is the first step in this execution. With this, customers will no longer need to wait in line at a charging station, and the cycle will be simpler. Their purchased item data will be transferred to the central billing unit for bill payment, and the purchase's instalment will be completed via a single payment interface.

Chapter 10

Profile

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Bibliography

[1] IoT-based Smart Shopping Cart Using Radio Frequency Identification.IEEE Access 2016. MOBEEN SHAHROZ1, MUHAMMAD FAHEEM MUSHTAQ2, MAQSOOD AHMAD 1, SALEEM ULLAH1, ARIF MEHMOOD3, AND GYU SANG CHOI 4.

[2] Automated Shopping Trolley for Billing System. FIRST June 2017 volume 4. Mrs. D. M. Yewale, Akshata Ujalambkar, Utkarsha kate, Priyanka shendkar.

[3] IoT Application on Smart and Secure Shopping System using RFID, Zig-Bee, and Gossamer Protoco.IJET volume 4 issue3 may-June 2018. 1Purva S. Puranik1 , Parikshit N. Mahalle2.

[4] Customer buying Prediction Using Machine-Learning Techniques: A Survey IRJET volume5 issue10 Oct 2018. Mr. Shrey Harsh Baderiya1, Prof. Pramila M. Chawan2.

[5] A Survey on Smart Trolley System Based on Android Application IJSRSET volume4 issue4 march 2018. Prarthana Bhandarkar, Chanchal Tomar, Divyani Kasewar, Prof. Ansar Sheikh.

[6] A Survey Paper on Smart Trolley Using RFID Technology.IJFGCN volume13 2020 1Ashutosh Walimbe, 2Vikrant Pagnis, 3Akshit Alva, 4ASidhesh Balapure, 5Madhuri Karnik.

[7] Smart Trolley using Smart Phone and Arduino.JEES 2017 Harpreet Singh Bedi*, Nikhil Goyal, Sunil Kumar, and Avinash Gupta

[8] A Smart Trolley System using RFID.IJRESM volume2 issue4 april 2019 Amruta Pokale1 , Kajal Pilane2 , Prakash D. Kshirsagar3.

[9] Priyanka S. Sahara, Anup Gade, Jayant Rohankar A Review on automated Billing for Smart Shopping System Using IOT International Informational engineering technology association

[10] Sarika S. Pandey, Soumya R. Gupta, Meenaz M. Shaikh, Komal M. Rawat, Prof. Pravin Jangid, Prof. Ragini Mishra Smart Cart Using Arduino and RFID Volume: 05 Issue: 03 — Mar-2018

[11] Vaishali Rane, Krutik Shah, Kaushal Vyas, Sahil Shah, Nishant Upadhyay

Smart Trolley Using RFID Volume: 06 Issue: 01 — Jan 2019
[12] Pritha N, Sahana S, Selvin Stephy N, Shiny Rose S, Annamalai S Smart Trolley System for Automated Billing using RFID and IoT International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 04 — Apr-2018
[13] Manikandan T, Mohammed Aejaz M. A, Nithin Krishna N. M, Mohan Kumar A. P, Manigandan R RFID based Advanced Shopping Trolley for Super Market Journal of Chemical and Pharmaceutical Sciences
[14] Prasiddhi K, Dhanashri H.Gawali Innovative Shopping Cart For Smart Cities 2017 2nd IEEE International Conference On Recent Trends in Electronics Information and Communication Technology(RTEICT), May 19-20,2017, India
[15] D.Mohanapriya, R.Mohamed Anas, P.Nandini, N.M.Deepika Design and Implementation of Smart Basket Cart using Near Field Communication Indian Journal of Emerging Electronics in Computer Communications vol.5, Issue 1(2018): Page.778-785 ISSN:2393-8366
[16] Sakorn Mekruksavanich Design and Implementation of Smart Shopping Basket Based on IoT Technology
[17] Ria Singh and Satyam Verma,Ms. Kriti RFID and IR based Smart Shopping Mart Management System International Conference on advances in computing, Communication Control, and networking (ICACCCN2018)
[18] P.T Sivagurunathan, P.Seema*,M.Shalini*, R.Sindhu* SMART SHOPPING TROLLEY USING RFID International Journal of Pura and Applied Mathematics Volume 118 No. 20 2018,3783-3786
[19] Cheng Siong Lim, Michael Loong Peng Tan, Kumerasan A. Danapalasingamm, Chee Wei Tan Automatic Human Guided Shopping Trolley with Smart Shopping System March 2015
[20] Harpreet Singh Bedi, Nikhil Goyal, Sunil Kumar, and Avinash Gupta: Smart Trolley using Smart Phone and Arduino 2017
[21] Felix Jesus Villanueva, David Villa, Francisco Moya, Maria Jose Santofimia, Juan Carlos Lopez Internet of Things architecture for an RFID-based product tracking business model 2012 and IEEE
[22] Nemaliddene Sai Megan: Design and Implementation of a Smart Shopping Cart by RFID Technology May 2018
[23] Mr.P. Chandrasekar, Ms.T. SangeethaSmart Shopping Cart with Automatic Billing System through RFID and ZigBee 2014
[24] Mirela Papa, Leon Rathkrantz, Zhenke Yang, and Pascal Wiggers Analysis of Shopping Behavior based on Surveillance System 2015

[25] Electronic Shopping using Barcode Scanner MR Mane, NG Amane, SD Patil International Research Journal of Engineering and Technology(IRJET)
[26] Mrs. D. M. Yewale, Akshata Ujalambkar, Utkarsha Kate, Priyanka Shendkar "Automated Shopping Trolley for Billing System" International Journal for Innovative Research in Science in Science and Technology—Volume 4—Issue 1—June 2017
[27] 'Indoor Navigation and Product Recognition for Blind People Assisted Shopping' Diego Lopez-de-Ipina, Tania Lorido, and Unai Lopez Deusto Institute of Technology
[28] IoT Application on Secure Smart System, Shaikh Faizan Hussain, V. V. Yerigeri International Research Journal of Engineering and Technology (IRJET)
[29] 'Location-Aware Shopping Assistance: Evaluation of a Decision-Theoretic Approach ' Thorsten Bohnenberger, Anthony Jameson, Antonio Krieger, and Andreas Butz Department of Computer Science, Saarland University
[30] Machine-Learning-Based User Position Prediction and Behavior Analysis for Location Services Haiyang Jiang, Mingshu He, Yuanyuan Xi, and Jianqiu Zeng
[31] Electronic Smart Cart with Billing Assistance in Super Market R Priya, NA. Swetha Shri, G Krishnakumar, S Kaliappan, P Jeyabharathi, Sri Ranganathar Institute of Engineering and Technology, Coimbatore—IRE Journels— Volume 3 Issue 10
[32] DESIGN OF AN INTELLIGENT SHOPPING BASKET USING IOT Kumerasan A. Danapalasingamm, Anthony Jameson,IEEE ,2017
[33] RFID and IR based Smart Shopping Mart Management System,Krutik Shah, Kaushal Vyas, Sahil Shah,IEEE ,2018
[34] Design and Implementation of the Smart Shopping Basket Based on IOT Technology, Chanchal Tomar, Divyani Kasewar, IEEE, 2019
[35] DESIGN OF AN INTELLIGENT SHOPPING BASKET USING IOT, Kajal Pilane2 , Prakash D. Kshirsagar3, IEEE, 2017
[36] IoT Application on Secure Smart Shopping System, Ruinian Li, Tinyi Song, Nicholas Capurson, Jiguo Yu, Jason Couture, and Xiuzhen Cheng, IEEE,2017
[37] SMART SHOPPING APPLICATION USING ANDROID STUDIO AND UNITY, Sanjeev Gautham, Piyush Gawali, Anish Gulati, Manjeet Khanna, Tushan Belawat, Journal of Science and Technology, Volume 06, Special Issue 0, August 2021
[38] Design and Implementation of the smart shopping Basket Based on IOT Technology, Sakorn Mekruksavanich
[39] Smart Shopping Cart with Automatic Billing System through RFID

and Zigbee, Ms.T.Sangeetha,ISBN Mr.P.Chandrasekar, No.978-1-47999-3834-6/14/31.00,2014,IEEE
[40] Innovative Shopping Cart for Smart Cities, Prasiddi K, Dhanashri H Gawali, IEEE, May 19-20,2017
[41] A Survey Paper on Smart Trolley Using RFID Technology, Ashutosh Walimbe, Vikranth Pagnis, Akshit Alva, ASidhesh Balapure, Madhuri Karnik, vol.13, No.2s(2020)
[42] Bluetooth Tracking of Humans in an Indoor Environment: An Application to Shopping Mall Visits, Dieter Oosterlinck, Dries F. Benoit, Philippe Baecke, Nico Van de, October 24, 2016
[43] Design and Implementation of an Android Application for Smart Shopping, Rajesh Kannan Megalingam, Suraj Vishnu, Swathi Sekhar, Vishnu Sasikumar, Sreekumar S and Thejas R Nair, IEEE, April 4-6,2019
[44] Smart Cart with Automatic billing, Product Information, Product Recommendation Using RFID and Zigbee With Anti-Theft, Ankush Yewatkar, Faiz Inamdar, Raj Singh, Ayushya, Amol Bandal, ELSEVIER,2016
[45] High-Security System for Smart Shopping using IoT with RFID Tag, Goddndnla Aruna Kumari, Guduru Mallikarjuna, 3 K.Nagalatha, Volume 7, Issue 8, August/2018
[46] IoT Application on Smart and Secure Shopping System using RFID, Zig-Bee and Gossamer Protocol, International Research Group-IJET JOURNAL, Volume 4 Issue 3, May-June 2018
[47] SMART BILLING SYSTEM FOR SHOPPING AUTOMATION USING IOT, B.Radhika, V. Tajkiran, JES, Vol 10, Issue 11, Nov/2019 ISSN NO:03777-9254
[48] Smart Trolley using Smart Phone and Arduino, Harpreet Singh Bedi, Nikhil Goyal, Sunil Kumar, and Avinash Gupta, Journal of Electrical and Electronic Systems, Volume 6, Issue2,1000223
[49] Smart Trolley for a Smart Shopping, Renjini, Saleh Musallam Al Harthi, Ahmad Abdullah Awadh Koofan, Aida Khamis Ahmed A1 Raiisi, IJERCSE, Vol 5, Issue 5, May 2018
[50] SMART SHOPPING TROLLEY USING RFID, P.T. Sivagurunathan, P. Seema, M.Shalini, R.Sindhu, International Journal of Pure and Applied Mathematics, Volume 118 No. 20 2018,3783-3786