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Electronics Telecommunication Engineering Department

A

Mini Project & Seminar Report On

"AUTOMATIC BILLING MACHINE"

Submitted By

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SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT OF
THIRD YEAR MINI PROJECT

Guided By

Prof. M.P. Gajare

ACADEMIC YEAR 2020-21

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CERTIFICATE

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Is the record of bonafide work carried out by them in partial fulfillment of the requirement for the award of the Third Year of Engineering (Electronics and Telecommunication), as prescribed by the Savitribai Phule Pune University in the Academic Year 2020-2021.

This project report has not been earlier submitted to any other Institute or University for the award of any degree or diploma. (12/ sentence case)

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Acknowledgement

It is my great pleasure in expressing sincere and deep gratitude towards my guide **Mr** *M.P.Gajare* **,**Assistant Professor Electronics & Telecommunication Engineering Department for his valuable guidance and constant support throughout this work and help to peruse additional studies in adaptive signal processing and MATLAB(domain of project).

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The motivation factor for this work was the inspiration given by our honorable principal **Dr. P.B.Mane.**

Lastly I am thankful to those who have directly or indirectly supported for our work.

Sign	Sign	Sign
Rishabh Jagtap	*Yash Nandre*	*Shweta Kanakdande*

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Intoduction

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 . 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 . 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

LITERATURE SURVEY

Literature survey shows the idea provided by the papers

1. Paper Title Author Analysis Smart Shopping Cart with Automatic Billing System through RFID and ZigBee1 : 1)Mr.P. Chandrasekar 2)Ms.T. Sangeetha This application creates an automated central bill system for the mall. Customers can pay their bill through credit/debit cards. Zigbee and RFID used for in it.

2. Novel Model for Automating Purchases using Intelligent Cart 2 : 1)Ms. Vrinda 2)Niharika This paper provides an idea of LCD use for offers, discount, and total bill.

3. The RFID Based Smart Shopping Cart3 : 1) Ms. Rupali Sawant 2) Kripa Krishnan 3)Shweta Bhokre 4)Priyanka Bhosale Here a mobile device is used to make the payment of a bill via mobile applications etc.

4. Electronic Shopping Cart For Effective shopping based on RFID4 : 1)Kalyani Dawkhar 2)Shraddha Dhomase 3) Samruddhi Mahabaleshwarkar

5. In this paper, we conclude that the time required for billing in the shopping malls is cut down in self- scanning RFID Based Smart Shopping and Billing : 1)Zeeshan Ali 2) Reena Sonkusare In this paper, more utilization of LCD like removing the atom by cancel button on LCD implemented.

6. Intelligent Shopping Cart: 1)Raju Kumar 2) K. Gopalakrishna 3) K. Ramesha It explains, how to access real time information about the diverse product inside the shopping cart.

Proposed System: 1)Every product in the shop or a mall will have an RFID tag on it .

2) Each Cart will have an RFID reader and Tran receiver implemented on it .

3) There will be a Centralized Server System.

4) After the payment of money, the Cart must get reset. There will be online

payment procedure for billing .

5) If the product is removed, it must get deleted from bill too.

6) There must be an RFID reader at the exit door for anti-theft.

7) Display Product Info, Expiry Date and Better Alternative .

AIM

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 . 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.

OBJECTIVE

We have seen long queues in the supermarket that takes most of the time. While shopping consumers face many problems like worrying that amount of money brought is not sufficient, incomplete information about of the items . Other than this they have to select the best product out of thousands of products. Also, want to revolutionize the entire shopping mechanism in the supermarket and attract number of customers reduce the labor cost . Passive and Active these are the two categories of RFID tags. Passive tags have no battery life, and Active tags have battery life. Through the RFID implementation of mobile technologies and automatic recognition, technologies become easier for smart cart.With the help of wireless networks, RFID makes the conventional retail process fast, transparent and efficient. Shopping is easy but waiting at a billing counter after shopping is risky as we are more vulnerable to the COVID-19 due to the huge amount of rush. This innovative project which will be placed in the shopping trolley itself. Huge amount of rush plus cashiers preparing the bill with a barcode scanner is too time consuming and results in long queues. Hence this system is suitable for use in places such as supermarket , where it can help in reducing crowd and in creating a better shopping experience for its customers.

METHODOLOGY

STEP 1 : Every product has an RFID tag which contains a Unique ID. These ID's are fed in the database assigned to the corresponding products. If there needs to be a purchase done, then that product can be dropped in the cart where the RFID reader reads the tag.

STEP 2 : The information of the product is extracted and displayed on the LCD screen. At the same time billing information is also updated. Upon exit of the aisle, the aisle info is sent to the server along with details of purchase. Server will store the required information in database. These steps are repeated until and unless the shopping button is pressed at the end.

STEP 3 : Once the "Complete" button is pressed there's an option provided to end the shopping with the same products or to delete some of the products from the cart. This all process the customer choice. At the end of shopping, the customer can straight way pay the bill and leave.

STEP 4 : Inventory status of the products is also updated at the end of shopping. Smart carts can be either contact or contact less smart cart. Smart carts can provide personal identification, authentication, data storage, and application processing.

Specification of the system

1.NODE MCU :

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTS: 1
- SPIS: 1
- 12Cs: 1
- Flash Memory: 4 MB SRAM: 64 KB
- Clock Speed: 80 MHz • USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your loT projects

2.RFID Card :

- RFID tags comprise of 3 key components, namely, an inbuilt chip,a substrate and an antenna.
- A general RFID chip is competent of accumulating 96 bits of data but some other chips have a capacity of storing 1000-2000 bits.
- Every RFID card has an unique ID number

3. EM18 Module :

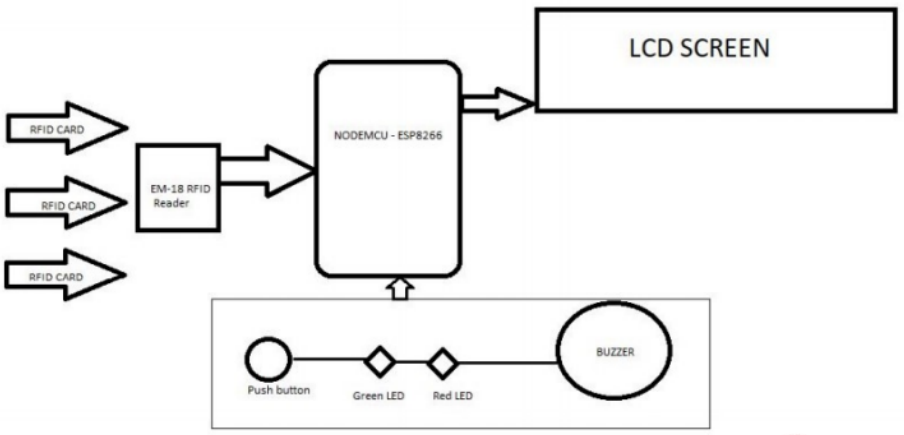
- The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more,depending upon it's power output and the radio frequency used.
- When an RFID tag passes through the electromagnetic zone, it detects readers activation signal.
- Operating Voltage : +4.5V to +5.5V.
- Operating Frequency : 125 KHz

4. LCD Display :

- The 16*2 LCD module has a set of commands each meant for doing a particular job with the display.
- Data pins are D0 - D7, to use pins effectively we are using D4-D7 which are connected to NodeMCU ESP8266.
- LCD display is used in our project to display product name and cost each item.

Block Diagram

Block Diagram:



Block Diagram explanation :

1: When the system is powered up, display the initial data.

2: Scanning of the RFID membership card.

3: 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.

4: 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.

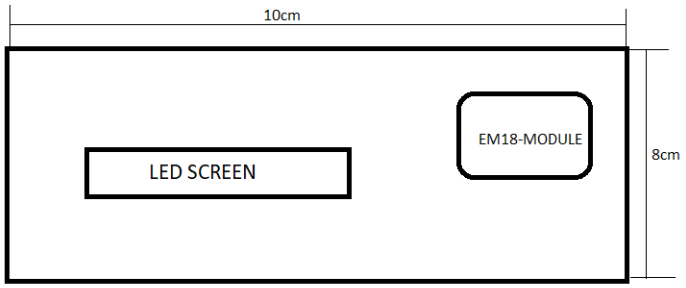
5: If a scanned product is scanned once again then that product is removed from the microcontroller's memory & in the ongoing bill .

HARDWARE DESIGN

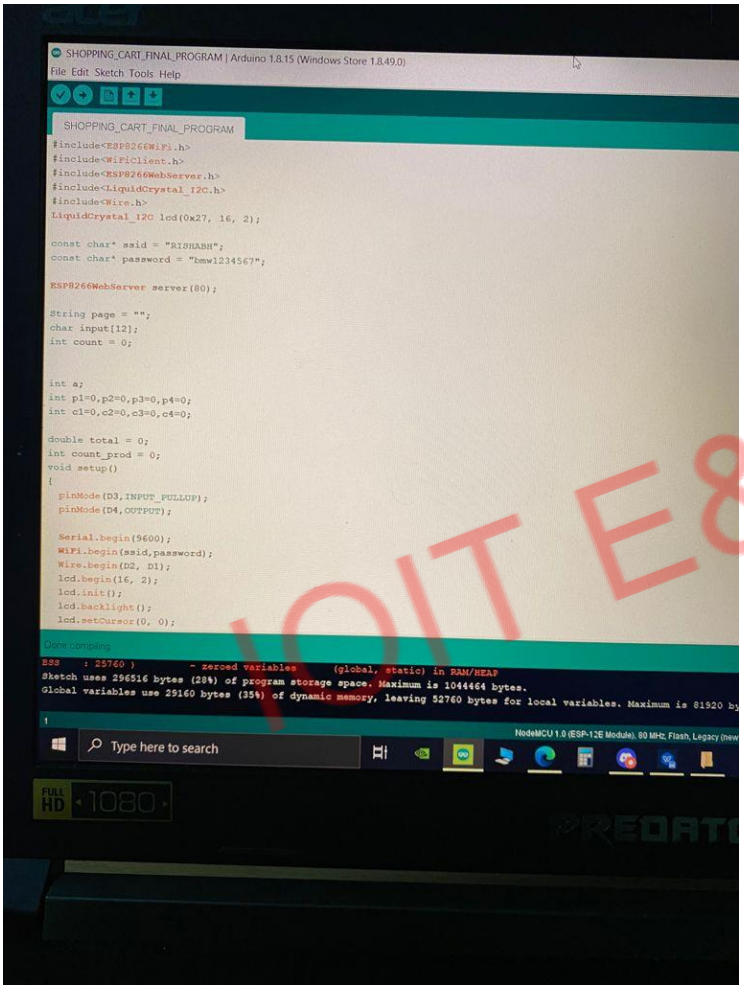
Size : 8 * 10 cm

Weight : 150gm

Fibre Encloser diagram :

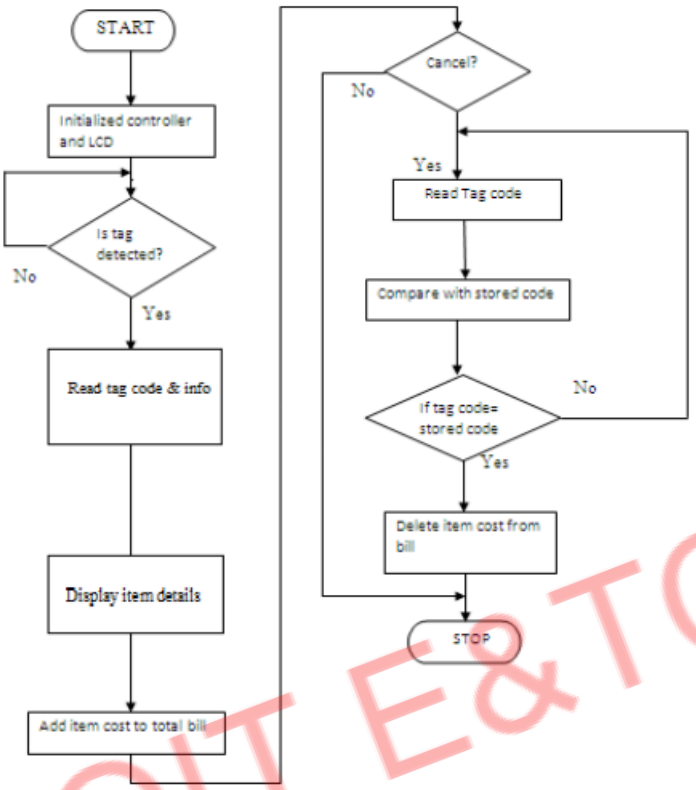


Simulation Software :



Software Design

Flowchart :



Algorithm / Code explanation :

After the successful completion of the hardware setup, now it's time to program NodeMCU. Complete code for this RFID based smart trolley project along with the video is given at the end of this tutorial. The stepwise description of the code is given below :

Start the code by including all the required library files in the code like ESP8266WiFi.h for ESP8266 board, LiquidCrystal_I2C.h for LCD, Wire.h for SPI communication, etc.

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <LiquidCrystal_I2C.h>
#include<Wire.h>
```

Then create the ESP8266WebServer class object with the name server and default port number 80.

```
ESP8266WebServer server (80);
```


Now, declare the network credentials- i.e. SSID and password. It is required to connect the NodeMCU to the internet.

```
const char* ssid = "admin";
const char* password = "12345678";
```

For using the I2C module for 16*2 Alphanumeric LCD, configure it using the LiquidCrystal_I2C class. Here we have to pass the address, row, and column number which are 0x27, 16, and 2 respectively in our case.

```
LiquidCrystal_I2C lcd(0x27, 16, 2);
```

Inside setup (), declare all the input pins and output pins. Then print a welcome message on the LCD which will be displayed during the initialization of the project.

```
pinMode(D3,INPUT_PULLUP);
pinMode(D4,OUTPUT);
Serial.begin(9600);
WiFi.begin(ssid, password);
Wire.begin(D2, D1);
lcd.begin(16, 2);
lcd.init();
lcd.backlight();
lcd.setCursor(0, 0);
lcd.print("   WELCOME TO      ");
lcd.setCursor(0, 1);
lcd.print("   SMART CART      ");
```


Then, to connect NodeMCU to the internet, call WiFi.begin and pass network SSID and password as its arguments. Check for the successful network connection using WiFi.status() and after a successful connection, print a message on LCD with IP address.

```
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED)
{
  delay(500);
  lcd.setCursor(0, 0);
  lcd.print("WiFi connecting...          ");
}
lcd.setCursor(0, 0);
lcd.print("WiFi connected          ");
lcd.setCursor(0, 1);
```

```
 lcd.print(WiFi.localIP());
 delay(1500);
```

In the next step, an HTML page is created as shown below, which has an HTML table to show the product details and billing information in the cart. The HTML page is stored in a string variable so that it can be sent back on client request using a server.send() function.

```
server.on("/", []()
 {
   page = "<html><head><title>E Cart using IoT</title></head><style type=\"text/css\">";
   page += "table{border-collapse: collapse;}th {background-color:  #3498db ;color: white;}table,td {border: 4px solid black;font-size: x-large;";
   page += "text-align:center;border-style: groove;border-color: rgb(255,0,0);}</style><body><center>
   page += "<h1>Smart Shopping Cart using IoT</h1><br><br><table style=\"width: 1200px;height: 450px;\"><tr>";
   page += "<th>ITEMS</th><th>QUANTITY</th><th>COST</th></tr><tr><td>Biscuit</td><td>"+String(p1)+"</td><td>"+String(c1)+"</td></tr>";
   page += "<tr><td>Soap</td><td>"+String(p2)+"</td><td>"+String(c2)+"</td></tr><tr><td>Rice(1KG)</td><td>"+String(p3)+"</td><td>"+String(c3)+"</td>";
   page += "</tr><tr><td>Tea(50g)</td><td>"+String(p4)+"</td><td>"+String(c4)+"</td></tr><tr><th>Grand Total</th><th>"+String(count_prod)+"</th><th>"+String(total)+"</th>";
   page += "</tr></table><br><input type=\"button\" name=\"Pay Now\" value=\"Pay Now\" style=\"width: 200px;height: 50px\"></center></body></html>";
   page += "<meta http-equiv=\"refresh\" content=\"2\">";
   server.send(200, "text/html", page);
 });
 server.begin();
```

Inside loop(), the digital pin where the push button is connected is read using digitalRead() and stored in an integer variable. Here we are using a button to remove a product from the cart.

```
int a=digitalRead(D3);
```

Now in the below code, the unique 12 digit codes of the RFID tags are decoded and stored in an array. Then the elements of the array will be matched with the Stored Tag numbers in the memory, to get the product details.

```
count = 0;
  while (Serial.available() && count < 12)
  {
   input[count] = Serial.read();
   count++;
   delay(5);
  }
```


Here, we compare the received array with the stored tag codes, if the button is not pressed and the code matches, then the below condition is executed and the product is added in the shopping cart. The same information will be displayed on LCD. The below code increase the product numbers in the cart and add the price in total cart value.

```
if ((strncmp(input, "0800291F5866", 12) == 0) && (a == 1))
    {
      lcd.setCursor(0, 0);
      lcd.print("Biscuit Added       ");
      lcd.setCursor(0, 1);
      lcd.print("Price(Rs):35.00      ");
```

```
    pl++;
    digitalWrite(D4,HIGH);
    delay(2000);
    total = total + 35.00;
    count_prod++;
    digitalWrite(D4,LOW);
    lcd.clear();
   }
```

Now the below condition will be executed when the button is pressed, and the RFID tag codes are matched with the stored array. This means we have to remove this product from the cart and subtract the product price from the total cart value.


```
else if ((strncmp(input, "0B00291F5B66", 12) == 0) && (a == 0))
   {
    if(pl>0)
    {
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Biscuit Removed!!!        ");
    digitalWrite(D4,HIGH);
    delay(2000);
    pl--;
    total = total - 35.00;
    count_prod--;
    lcd.clear();
    digitalWrite(D4,LOW);
    }
    else
    {
```

```
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("Not in cart!!!        ");
      digitalWrite(D4,HIGH);
      delay(2000);
      digitalWrite(D4,LOW);
      lcd.clear();
      }
    }
```

Finally, the individual costs of the products are calculated as follows. Here some random cost values are chosen which you can be changed as per choice.

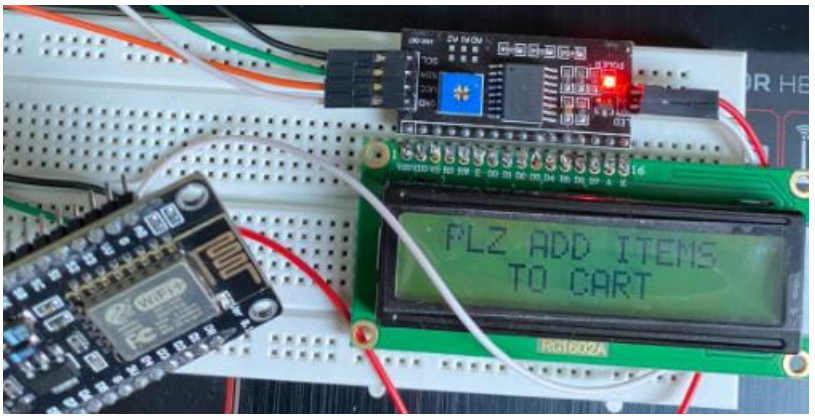
```
  c1=p1*35.00;
  c2=p2*38.00;
  c3=p3*55.00;
  c4=p4*45.00;
```

In the end, call server.handleClient() to handle new requests and check them.

```
server.handleClient();
```

TEST RESULTS

LCD Display :

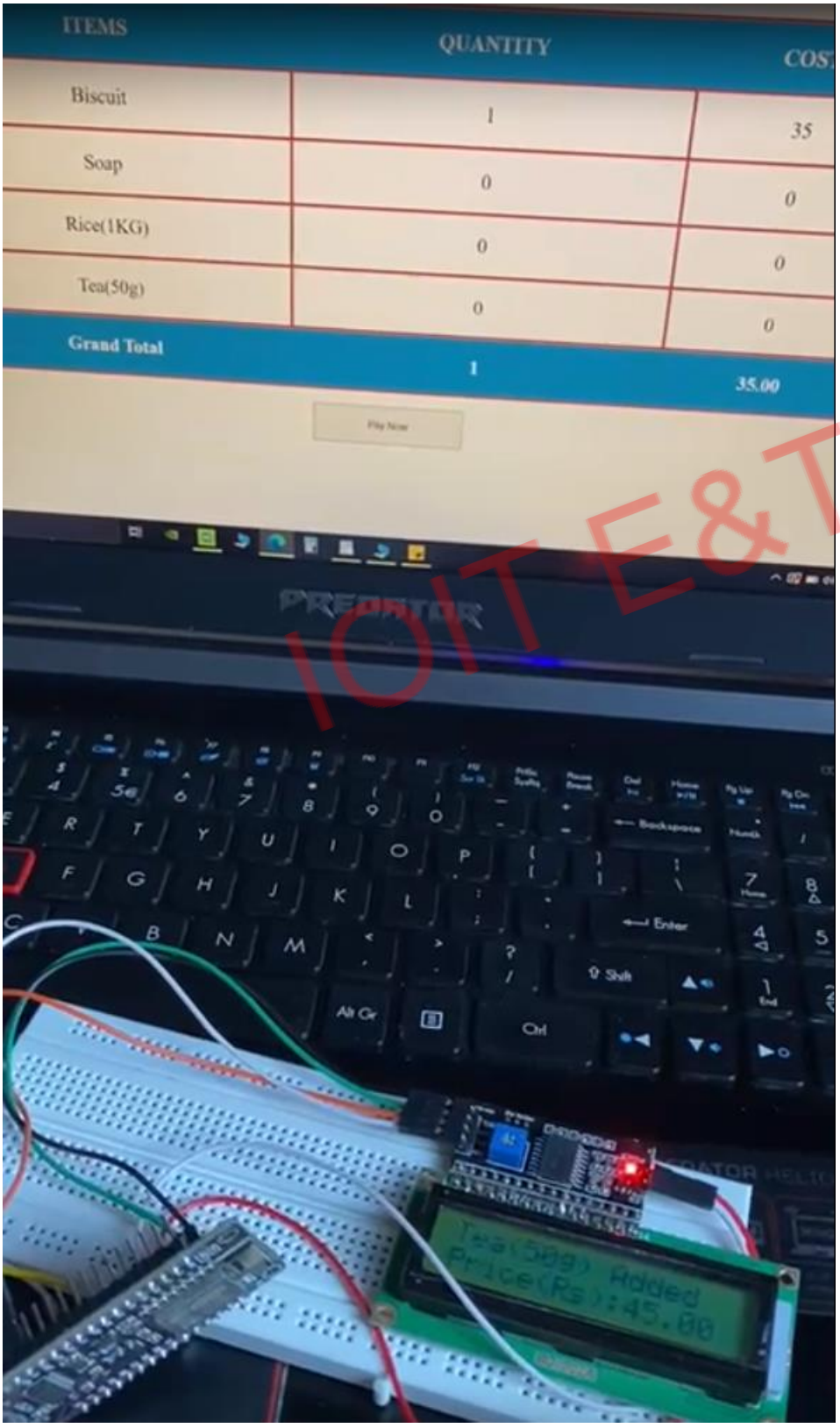


Web Pages :

Smart Shopping Cart using IoT

ITEMS	QUANTITY	COST
Biscuit	1	35
Soap	1	38
Rice(1KG)	1	55
Tea(50g)	1	45
Grand Total	**4**	**173.00**

Pay Now


ITEMS
QUANTITY
COST
Biscuit
1
35
Soap
0
0
Rice(1KG)
0
0
Tea(50g)
0
0
Grand Total
1
35.00
Pay Now
PREDATOR
Backspace
Enter
Shift
Alt Gr
Ctrl
Tea(50g) Added
Price(Rs):45.00

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 . This innovative project idea can be used is 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 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

Future Scope :

- This system can be also implemented using LI-FI, NFC & other communication systems
- This system can be advanced by using Beacon Module instead of RFID Module & including a Load sensor is also a helpful implementation
- 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
- 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.

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