A PROJECT REVIEW

On

Smart shopping cart using RFID and NodeMCU

Submitted in partial fulfilment of the Requirements for the award of degree of Bachelor Of Technology

In

Electronics and communication Engineering

By

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RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

(Established through Government of A.P Act of 18 of 2008)

Ongole, Prakasam (Dt.) AP-523225.

CERTIFICATE

This is to certify that the report entitled "**SMART SHOPPING CART USING RFID AND NODEMCU** " submitted by **S.OMKARAM (O180934) P.SRINU(O180920)**, **T.BHARATH REDDY (O180913)**, in partial fulfilment of the requirements for the award of Bachelor of Technology in Electronics and Communication Engineering is a bonafide work carried by them under my supervision and guidance.

Head of the department:	Project internal guide:
Mr.G.BalaNagiReddy	Mr.G.SrinivasaRao.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to Mr.G.SrinivasRao,my project guide for valuable suggestions and keen interest throughout the progress of my course and research.

I am grateful to Mr. G. BalaNagiReddy, HOD of Electronics & Communication Engineering, for providing excellent computing facilities and a congenial atmosphere for progressing with my project.

At the outset, I would like to thank RAJIV GANDHI UNIVERSITY KNOWLEDGE AND TECHNOLOGIES, Dr.A.P.J ABDUL KALAM IIIT ONGOLE for providing all the necessary resources for the successful completion of my course work. At last, but not the least I thank my teammates and other students for their physical and moral support.

With Sincere Regards,

P. Srinu

S. Omkar

T. Bharath reddy

DECLARATION

We herby declare that the project work entitled "SMART SHOPPING CART USING RFID AND NODEMCU " submitted to the Rajiv Gandhi University Of Knowledge Technologies in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology(B.Tech) in Electronics and communication.

Engineering is a record of an original work done by us under guidance of Mr.G.SrinivasaRao, Assistant professor, Dept of Electronics & Communication and this project has been submitted to any other university for the award of any other degree or diploma.

With Sincere Regards,

P. SRINU

S. OMKAR

T. BHARATH REDDY

ABSTRACT

A creative item with societal acknowledgment is the one that will guide the solace, accommodation and effectiveness in regular daily existence. Acquiring and shopping at enormous shopping centres is winding up day by day action in metro urban areas. The Internet of Things (IoT) means taking all the things in the world and connecting all of them to the internet. People buy a variety of products and deposit them in the trolley. After the purchase is completed one need to go to billing counter for the payment which is very time consuming and at times very frustrating. The main objective for designing this prototype is to reduce the human efforts, eliminate the queue and also eliminate the time taken during billing, which makes it easier for customer. The prototype consists of components such as RFID tags which is used for identification of the product, RFID reader which is used for scanning of product when put in the trolley and it display in the LCD Display. Information received from the RFID tags will be stored in the NodeMCU. Instead of WiFi module NodeMCU is used. So at the billing counter the data is sent into the server. Customer just have to go at billing counter and pay the payment. In the present project, an attempt is made to develop and explain the use of Internet of Things (IoT) in Smart shopping cart.

ABBREVIATIONS

USB : Universal serial bus
RFID : Radio-Frequency Identification
NODEMCU : Node micro-controller unit
TX : Transmit
RX : Receive
I/O PORTS : Input/Output ports
LED : Light emitting Diode
RST : Reset and power-dow
GND : Ground
VIN : Input Voltage
RXD : Received data
TXD : Transmit receive data

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Chapter-1

1.INTRODCTION

Now a days world has fast-growing population with a wide range of the demand from a variety of domains. shopper who need to buy different products in supermarkets needs lots of time and restraint in coordinating among them self for successful shopping. We have a solution to this problem by using technologies. In advancement technologies, world is getting automated in a lot of aspects. In this system, we designed reasonable and cost-effective Smart Shopping Cart utilizing IoT innovations. Such a framework is useful in spots such as mall & supermarkets, where it can help in lessening work and in making the best shopping knowledge for the clients. This structure helps in maintaining the easy and comfortable billing process. The shopping processed with two aspects, with predefined list and random shopping. Our proposed system provides the nearest route to shop-up the listed items present in different racks of supermarket. Also, with added feature we have an approach where Cart-to-Cart communication is enabled that allows a shopper to share their shopping list with co-shopper to enable parallel shopping using two or multi cart. That features save time and make shopping easily. With this technology, this system design is also capable of detecting theft by shoplifters. In addition, the Walmart or supermarket management will be able to analyse the shopping behaviour of various customers to arrive at valuable business insights. This system is very helpful and convenient for all retailers. The management system will have the power to detect the rate of sales of all individual products and make the stock available is based on the ongoing shopper requirement.

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Project motivation and purpose

The project motivation of a smart shopping cart using RFID and NodeMCU is to enhance the shopping experience by enabling customers to easily and quickly checkout their items without the need for a cashier. The RFID technology allows for fast and accurate item identification, while the NodeMCU facilitates the automation of the checkout process. This can result in shorter checkout times, improved efficiency, and increased customer satisfaction. Additionally, the smart shopping cart can also provide valuable data for retailers to analyze and optimize their inventory management and sales strategies.

Functions and Features

A smart shopping cart with RFID employs radio frequency identification technology to scan, track and provide payment for items within the cart. With NodeMCU, an open-source hardware platform, this shopping cart can also be equipped with additional functions such as real-time inventory tracking, customer loyalty programs, and route optimization systems. The data collected can be analyzed to provide insights into consumer behavior, where the carts can provide personalized shopping experiences.

Problem statement

The merchandising process is the major part of the supply chain management that promotes the products to the consumers and distributors. Shopping is the activity in which a group of people uniting at one place or purchasing products. There are supermarkets or shopping malls that provide space for people to do shopping where retailers promote their products to the consumer and consumers purchase the product according to quality like ingredients, expire or not and brand of the product, reasonable price, and quantity of the product. This is also known as traditional retailing. Supermarkets are convenient for retail and urban planning. Supermarkets are the most crowded place at the time of the weekend. As most consumers have experienced, the basic steps involved in shopping are making a list, typically with pen and paper or on their mobile phone. They have to spend a lot of time in search of products in the whole supermarket one by one and spend time in long queues to pay bills. The waiting in-queues is negatively affecting on human morale and may cause misunderstandings or conflict amongst people, for instance, when someone breaks the line and stands in front of other people. That is not an ideal development because traditional marketing promotes many local jobs, city life, and urban culture. The supermarket also needs to personalized the inventory according to consumer preferences. Due to that online shopping attracts a large number of consumers that provide products through the internet and web browsers. Consumers can receive the product from specified locations in the meantime by selecting products according to prescribed specifications, ingredients or instructions. Also, there is higher risk of fraud, lack of inspection, item may not work properly or defected, not be the same product as item pictured, transaction from stolen credit card, Phishing in which customer thinks that they purchase product from reputable seller, disruptor in retail industry and not provide the pricing negotiation. Instead of online shopping, people feel more valuable, entertain, enjoy and get the quality product with traditional shopping. In these critical situations, traditional shopping and supermarkets have to reinvent to survive in the current age. Shopping hubs or shopping malls are the places were several small business groups together known as a market.

Chapter-2

Existing Method/Literature history

People have consistently imagined and built up an innovation to help their needs from the start of the humanity. The main reason for these innovations has been limiting errands and making the regular tasks quicker and simple. A task on which people are discovered spending significant measure of time is going for shopping and purchasing the products needed. In olden days we used manual billing using pen and paper then we started using the barcode system but after some years it also started to have issues like LOS (line of sight), increasing queue etc. So, to overcome this issue a concept of smart shopping with RFID technology was proposed

Paper [1] describes the implementation of smart shopping cart using radio frequency identification using the RFID sensors, Arduino microcontroller, Bluetooth module, and Mobile application. Where the mobile is connected to the shopping cart and the application is already installed, the data is shared using the Bluetooth from the arduino microcontroller and the mobile then with the server.

Paper [2]" Intelligent shopping cart using BOLT based on IOT". IOT kit consists of barcode scanner, LCD display, Bolt ESP8266. The broad clarification of its process is, when consumer takes an item and put inside the trolley, that time barcode scanner scans the item barcode and value as well as gain to show into the digital display panel. Later than consumer concluded their purchasing and the bill is sent to the counter section.

Paper [3] "Smart Trolley with Instant Billing to Ease Queues at Shopping Malls using ARM7 LPC2148. This is based on arm7 microcontroller fitted with an LCD and RFID scanner and a wireless technology called zigbee. The LCD used is a 16x2 and zigbee modules make the wireless network to work even at long distance due to its wide range, the RFID scanner scans the product's unique code and its price. And it gets displayed on the LCD screen. So, after costumer has finished with the shopping, he/she has to visit the counter and pay the bill as displayed on the LCD screen fitted on the trolley

Paper [4] EM-18 RFID scanner module has been used. It uses a RFID reader which will read 125 kHz tags. So, it will be known as a low frequency RFID reader. The RFID Readers here used are big tags with range of 125KHZ which can be detected by EM-18 Module. It shows

the real time billing and you can even delete the item you don't want by pressing the delete button. In this author has used ARDUINO Uno which one of the cheapest and most efficient models in the market. It contains everything required to support the microcontroller merely connect it to a laptop (or applicable wall power adapter) with a USB cable or power it with an AC-to-DC adapter or battery to get started. Once the item is scanned it will start billing and you can remove the item if you want.

Paper [5] Framework is utilized to ease lines in shopping centre by utilizing RFID module. The RFID reader will peruse the RFID Tag set on the item when the item falls in the trolley. In the event that, the client needs to expel any item then he should expel that item from the trolley. The LCD will show the subtitles of the expelled item like name, cost and the absolute bill and with the help of Xampp server the bill will be send to the cashier

Paper [6] describes the implementation of a Smart Shopping Cart using ZigBee networks. The reliable and cost-efficient system design also ensures detection of deception. Thus, the smart system attracts both the buyers and sellers and ZigBee acts like Xampp server but is more reliable.

Paper [7] Automation of shopping cart using RFID module and ZIGBEE module, in this system, RFID tags are used instead of barcodes. These RFID tags will be on the product. When the customer takes a product and places it in the trolley, the trolley will contain an RFID reader which will sense the RFID tag which is present on the product. Thus displays the product price on the LCD display. Like this, the process continues. Along with it, comes a ZIGBEE transmitter in the trolley, which transfers data to the main computer. The ZIGBEE receiver is placed near the main computer which receives the data from transmitter.

FUTURE SCOPE

The smart shopping trolley has a high beneficiary future aspect. the project can be modified for better performance in several categories.

The trolley can communicate with the cloud platform and mention the activity it is performing, like moving to the stack, or stooped due to the presence of an obstacle. this will enable the administrative staff knows about the function of the trolley. the trolley can be modified so that it can detect obstacles and behave with the presence of obstacles without disturbing them.

The smart shopping trolley can be equipped with RFID sensors so that the trolley can be tracked more efficiently by the administrative staff. RFID sensors and tags can be used to detect the product chosen by the customer. this will help to analyze the shopping activities of customers and gather data about people thoughts on various products. RFID sensors will also enable the trolley to calculate the bill itself. this will save customers time from standing in the queue while checking out.Furthermore, the trolley can be controlled from the dashboard by the administrative staff by using two-way communication of the cloud platform. In this project only one-way communication, which means the dashboard could receive information from the sensors through ESP8266

APPLICATIONS OF THE PROJECT:

A smart shopping cart using RFID and NodeMCU can be used to provide a variety of applications including:

1. Inventory Management: By attaching RFID labels to products, the shopping cart can track inventory levels and alert store employees when products are running low.
2. Contactless Payment: RFID technology can be used to facilitate contactless payment, allowing customers to make payments without physically touching a terminal.
3. Dynamic Pricing: The shopping cart can adjust prices in real-time based on customer behaviour, such as marking down items that are in high demand.
4. Navigation: By integrating GPS technology into the cart, customers can navigate the store more easily and find products more quickly.

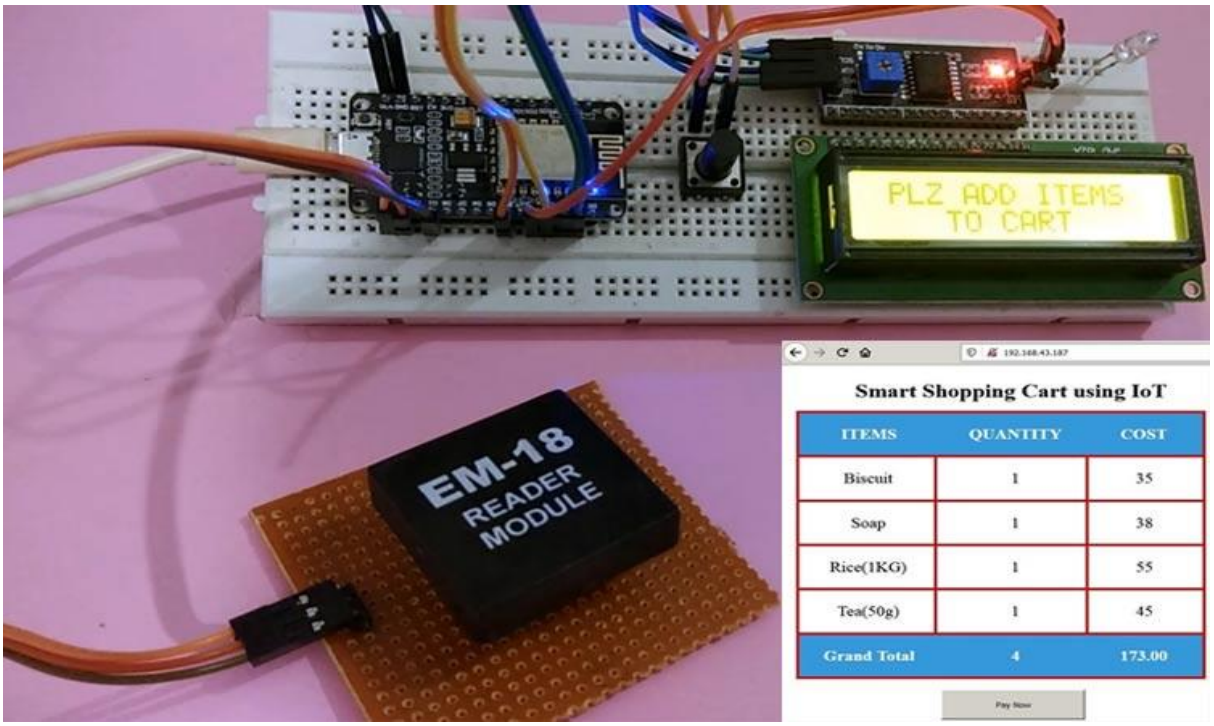
Chapter-3

PROPOSED SYSTEM

SYSTEM INTRODUCTION

Today's world have a fast growing population with a wide range of demand from a variety of domains. Customers who need to purchase different products in Walmart or supermarkets needs lots of time and patience in coordinating among them self for successful shopping. We need to address this problem by efficiently using our technologies. In the advancement of technologies, the world is getting automated in many aspects. In this Paper, we depict reasonable and cost-effective Smart Shopping Cart utilizing IoT (Internet of Things) innovations. Such a framework is appropriate for use in spots such as Walmart & supermarkets, where it can help in lessening work and in making a superior shopping knowledge for the clients. Rather than influencing the clients to sit tight in a long line for looking at their shopped things, this framework helps in mechanizing the easy and comfortable billing process. The shopping is processed with two aspects, with a predefined list and random shopping. Our proposed system provides the nearest route to pick-up the listed items present in different racks of the Walmart. Also, with the added feature we have an approach where Cart-to-Cart communication is enabled that allows a customer to share their shopping list with co-shopper to enable parallel shopping using two or more carts. These features save time and make shopping easy. Along with these abilities, this system design is also capable of detecting theft by shoplifters. In addition, the Walmart or supermarket management will be able to analyze the shopping behaviors of various customers to arrive at valuable business insights. These will be very beneficial for the retail stores. Accordingly, the management team will have the ability to predict the rate of sales of all individual products and make the stock available is based on the ongoing customer requirements. Overall, this system will ensure that the customers will have the best shopping experience and very often, they visit the Walmart for the shop.

BLOCK DIAGRAM



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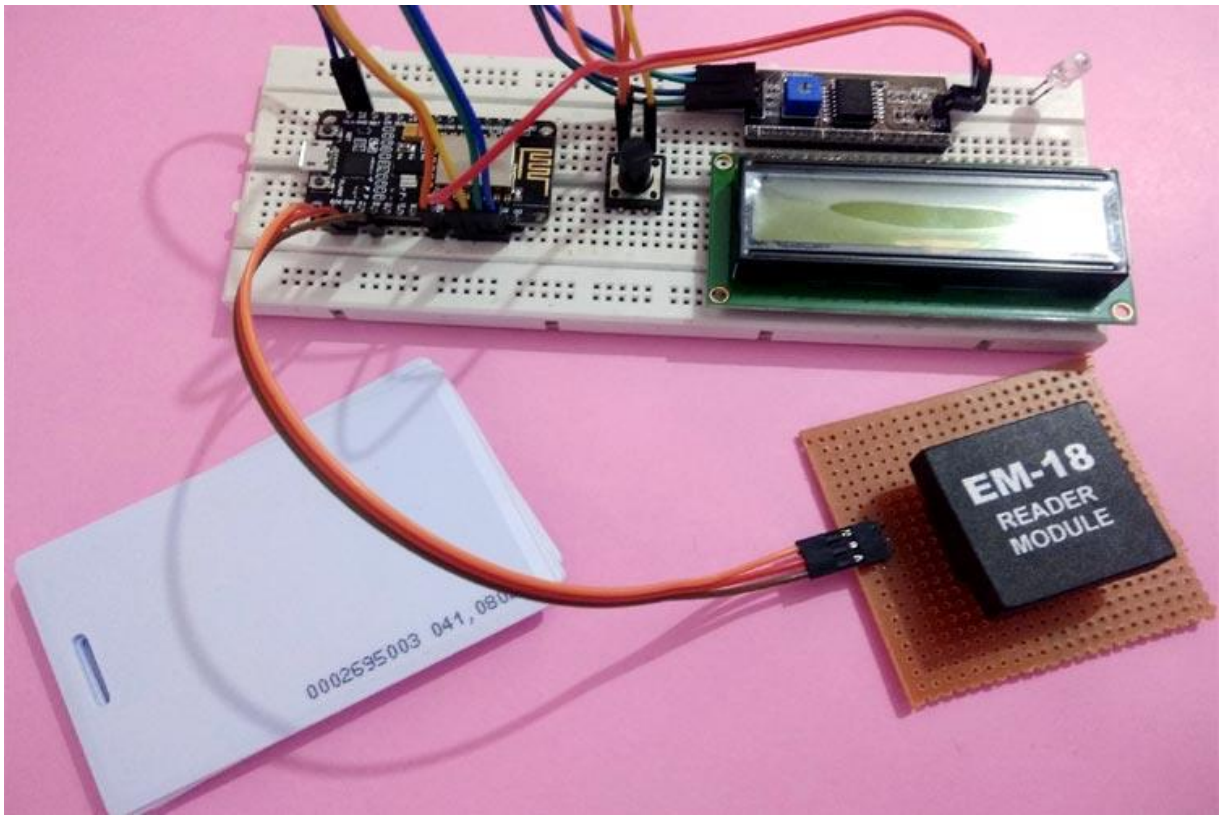


HARDWARE COMPONENTS

ESP8266 NodeMCU :

It can be used as a standalone device, or as a UART to Wi-Fi adaptor to allow other microcontrollers to connect to a Wi-Fi network. For example, you can connect an ESP8266 to an Arduino to add Wi-Fi capabilities to your Arduino board. The most practical application is using it as a standalone device.

With the ESP8266, you can control inputs and outputs as you would do with an Arduino, but with Wi-Fi capabilities. This means you can bring your projects online, which is great for home automation and internet of things applications. Why is the ESP8266 so popular? Mainly for the following reasons

Low-cost: you can get ESP8266 boards starting at $3 (or less) depending on the model.

Low-power: the ESP8266 consumes very little power when compared with other microcontrollers and can even go into deep sleep mode to consume less power;

Wi-Fi: the ESP8266 can generate its own Wi-Fi network (access point) or connect to other Wi-Fi networks (station) to get access to the internet. This means the ESP8266 can access online services to make HTTP requests or save data to the cloud, for example. It can also act as a web server so that you can access it using a web browser and be able to control and monitor your boards remotely.

Here's a short list of what you can do with an ESP8266:

- Create a web server to control outputs;
- Create a web server to display sensor readings;
- Send HTTP requests;
- Control outputs, read inputs, and set interrupts;
- Datalogging projects;
- Communicate with third-party services;
- Create web applications;
- Send emails, notifications, post tweets, etc.

- And much more.

The Hardware

Processor: L106 32-bit RISC microprocessor core based on the Tensilica Diamond Standard 106Micro running at 80 or 160 MHz

Memory:

32 KiB instruction RAM

32 KiB instruction cache RAM

80 KiB user-data RAM

16 KiB ETS system-data RAM

External QSPI flash: up to 16 MiB is supported (512 KiB to 4 MiB typically included)

IEEE 802.11 b/g/n Wi-Fi

Integrated TR switch, balun, LNA, power amplifier, and matching network

WEP or WPA/WPA2 authentication, or open networks

17 GPIO pins

Serial Peripheral Interface Bus (SPI)

I²C (software implementation)

I²S interfaces with DMA (sharing pins with GPIO)

UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2

10-bit ADC (successive approximation ADC)

Fig - ESP8266 NodeMCU

The ESP8266 peripherals include:

17 GPIOs (usually not all GPIOs are accessible on the ESP8266 development boards)
SPI

I2C (implemented on software)

I2S interfaces with DMA

UART

10-bit ADC

Different ESP8266 GPIOs have specific features, so you must choose the pins for your projects wisely. Otherwise, you may end up getting unexpected results.

USB- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.

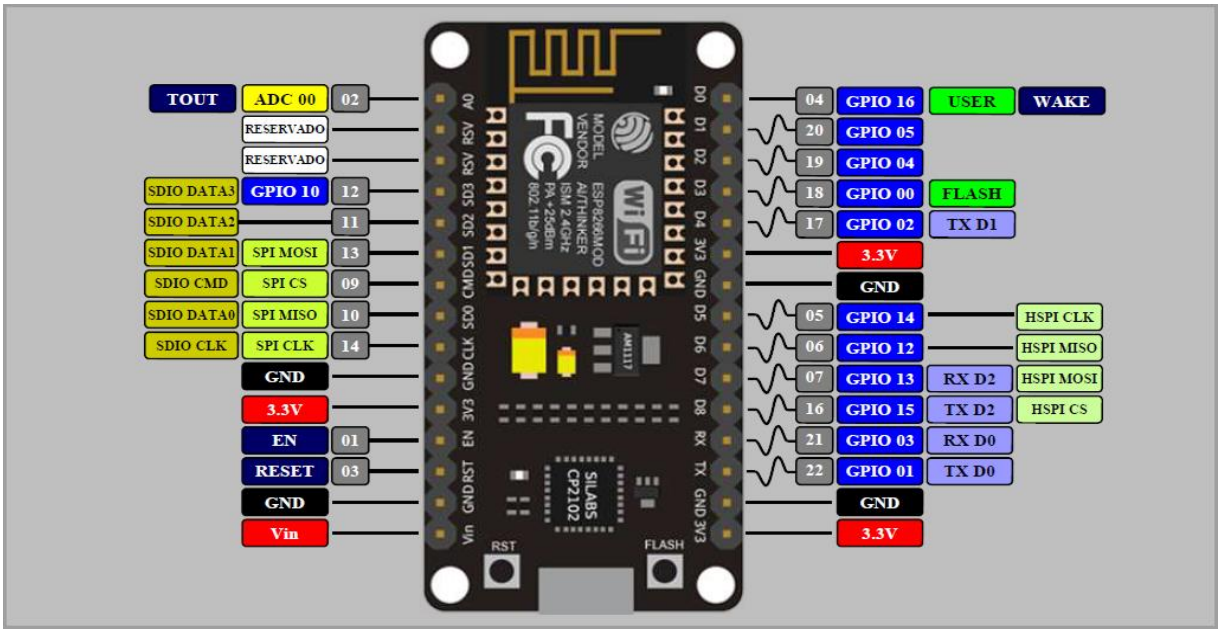
Crystal Oscillator- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.

Voltage Regulator- The voltage regulator converts the input voltage to 5V.

GND- Ground pins. The ground pin acts as a pin with zero voltage.

Vin- It is the input voltage.

Analog Pins- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.



16*2 Alphanumeric LCD

Fig - 16*2 Alphanumeric LCD

HOW FIRE SENSOR WORKING

Wanna add an interface to your project? Use the 16x2 standard alphanumeric LCD display, they are extremely common and is a fast way to have your project show status messages.

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Command register stores various commands given to the display. Data register stores data to be displayed. The process of controlling the display involves putting the data that form the image of what you want to display into the data registers, then putting instructions in the instruction register. In your arduino project Liquid Crystal Library simplifies this for you so you don't need to know the low-level instructions. Contrast of the display can be adjusted by adjusting the potentiometer to be connected across VEE pin

I2C module for 16*2 LCD :

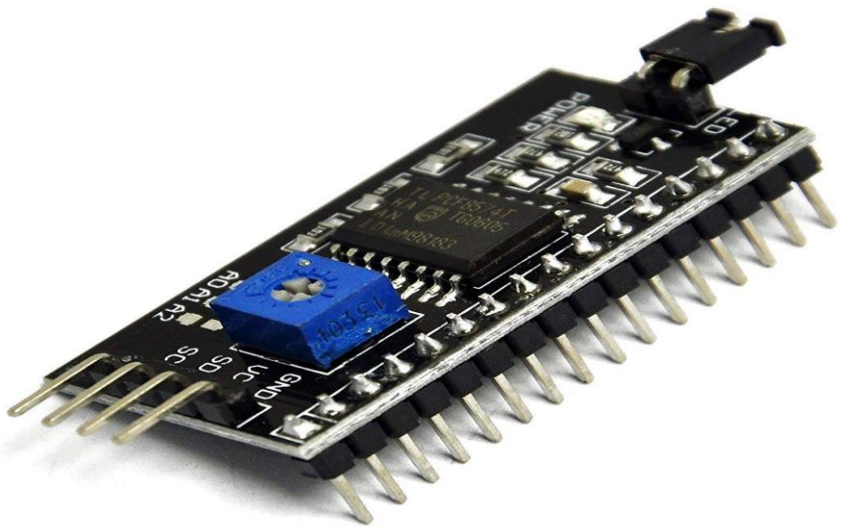


Fig- I2C module for 16*2 LCD

I2C Module has a inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display.

These modules are currently supplied with a default I2C address of either 0x27 or 0x3F. To determine which version you have check the black I2C adaptor board on the underside of the module. If there a 3 sets of pads labelled A0, A1, & A2 then the default address will be 0x3F. If there are no pads the default address will be 0x27.

The module has a contrast adjustment pot on the underside of the display. This may require adjusting for the screen to display text correctly.

FEATURES AND SPECIFICATIONS

Features:-

Operating Voltage: 5V
Backlight and Contrast is adjusted by potentiometer
Serial I2C control of LCD display using PCF8574
Come with 2 IIC interface, which can be connected by Dupont Line or IIC dedicated cable
Compatible for 16x2 LCD
This is another great IIC/I2C/TWI/SPI Serial Interface
With this I2C interface module, you will be able to realize data display via only 2 wires.

Working.

I2C Module for 16×2 (1602) Character LCD.

The I2C Module for 16×2 (1602) Character LCD is an essential component in modern electronics, simplifying the interface between microcontrollers and liquid crystal displays.

The I2C Module serves as a bridge between the 16×2 character LCD and the microcontroller.

Instead of using numerous GPIO pins for data and control signals. Designed to work seamlessly with 16×2 (1602) character LCDs, and ensuring compatibility and ease of integration into various projects.

In conventional setups, a 16×2 character because LCD requires at least 6 GPIO pins for data and control. The I2C module dramatically reduces this number to just 2 pins.

The reduction in wiring complexity because enhances the flexibility of the overall system, allowing for easier modifications and expansions.

The reduced number of wires results in a neater and more organized circuit design, especially in projects with space constraints.

I2C ensures efficient and fast data transfer between the microcontroller and the LCD, improving the system's overall performance.

The I2C Module for 16×2 Character LCD finds applications in a wide range but of electronic projects, including:

Used in various embedded systems where a compact and efficient but display solution is required.

Integrated into IoT devices where and minimizing because wiring but complexity is essential for compact designs.

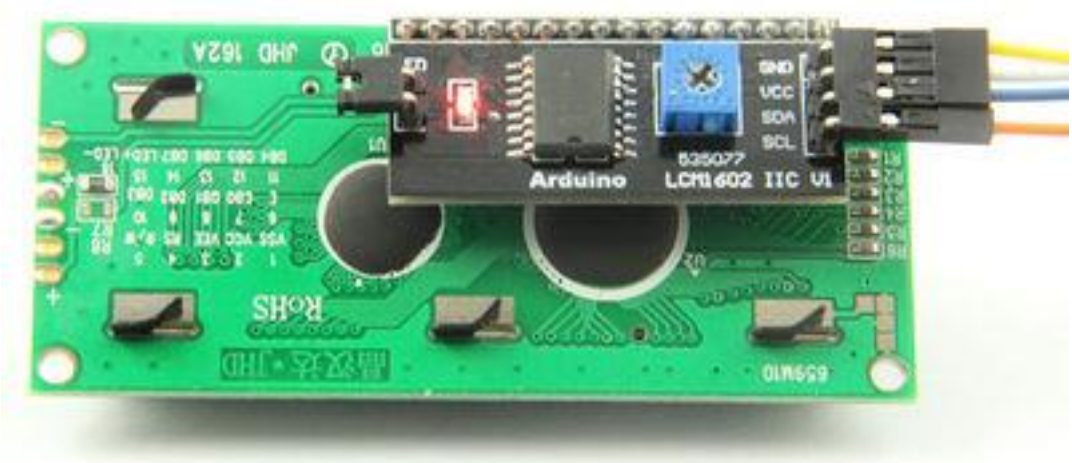
Widely used in prototyping and development so projects but to simplify so connections and focus on programming logic.

Employed in educational contexts to teach students about I2C communication and LCD interfacing techniques.

Its efficient communication, reduced wiring, and compatibility make it a popular choice in modern electronics design..

Advantages

I2C is a widely used communication protocol for microcontrollers, allowing for fast and efficient data transfer between devices. A 16x2 LCD module, also known as a 1602 character LCD, is a type of display that is commonly used in DIY projects and other applications. When used together, the advantages of I2C and a 16x2 LCD module in a smart shopping cart include minimal wiring requirements, easy integration with other components such as microcontrollers and sensors, and clear and easy-to-read text for informing customers of product information. Additionally, the modular design of a shopping cart allows for easy customization and testing of different features.



Jumper Wires

These are male to female jumper wires used in connecting the female header pin of any development board to other development boards having a male connector. They are simple wires that have connector pins at each end allowing them to be used to connect two points to each other. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.40 strip Male to female jumper wire each cable length about 20cm or 8-inch

Fig JUMPPER WIRES

circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity

4 pin Tactile switch :

Fig - 4 pin tactile switch

Tactile Push Button Switch 4 Pin 6x6x5mm is widely used as a standard input “buttons” on electronic projects. These work best when you mount it on PCB but can also be used on a solderless breadboard for temporary connections in prototypes. The pins are normally open (disconnected) and when the button is pressed they are momentarily closed and complete the circuit.

This tactile switch also offers reliable dome contact technology and strong tactile feedback, with multiple operating forces to choose from. Applications include telecommunications, consumer electronics, audio/visual, medical devices, testing/instrumentation, and computer/peripherals.

Features :

- Through-hole design.
- Shaft Shape: Round
- The long life of 300,000 cycles realized despite the high operating force
- Used in the fields of electronic products, household appliances and more.
- This light touch switch is waterproof, prevent oil, anti-pollution, anti-static interference.
- High precision mechanism design offers acute operation and long service life.
- Compact and lightweight, easy to carry and dismantling.
- Good electrical conductivity.

EM18 RFID Reader :

It is used to read unique ID from RFID tags. Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the microcontroller or PC. RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position

Basically, RFID systems categorized as active and passive based on how they are powered and their range.

1. Active RFID system

Active RFID tags have their own transmitter and power source (Mostly battery operated). They operate at 455 MHz, 2.45 GHz, or 5.8 GHz, and they typically have a read range of 60 feet to 300 feet (20 meters to 100 meters).

2. Passive RFID system

Passive RFID tags do not have a transmitter, they simply reflect energy (radio waves) back coming from the RFID reader antenna. They operate in Low frequency (~125 kHz) as well as High frequency (~13 MHz) band and have limited read range of up to ~1m.

There are two modes of coupling for communication used in RFID as,

Inductive coupling, in which RFID reader emits magnetic field and whenever RFID tags enters the magnetic field which creates energy response from RFID tags and is detected by RFID reader. As the magnetic field drops sharply with distance, it is used for short distance applications.

Capacitive coupling, where reader emits electromagnetic waves and whenever that waves encounters RFID tags, RFID tag reflects signal containing information of ID.

Working :

RFID Reader has transceiver which generates a radio signal and transmits it through antenna. This signal itself is in the form of energy which is used to activate and power the tag.

When RFID tag comes in range of signal transmitted by the reader, transponder in the tag is hit by this signal. A tag draws power from the electromagnetic field created by reader. Then, the transponder converts that radio signal into the usable power. After getting power, transponder sends all the information it has stored in it, such as unique ID to the RFID reader in the form of RF signal. Then, RFID reader puts this unique ID data in the form of byte on serial Tx (transmit) pin. This data can be used or accessed by PC or microcontroller serially using UART communication.

EM18 is a RFID reader which is used to read RFID tags of frequency 125 kHz.

After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins.

EM18 RFID reader reads the data from RFID tags which contains stored ID which is of 12 bytes.

EM18 RFID reader doesn't require line-of-sight. Also, it has identification range which is short i.e. in few centimeters

RFID reader EM-18 features:

- Serial RS232/TTL output

- Operating Frequency is 125KHz.
- Range is 5-8 cm.

Specification of RFID EM18

- Operating frequency: 125kHz
- Operating voltage: DC 5V
- Supply current: <50mA
- Read distance: up to 100mm (depending on the tag used)
- Interface: UART (TTL level)
- Dimensions: 40mm x 40mm x 16mm
- Communication protocol: UART
- Baud rate: 9600, 8, N,

Advantages :

1. The EM18 RFID reader is a type of RFID (Radio-Frequency Identification) reader that offers several advantages for various applications. Some of the key advantages of EM18 RFID readers include:
2. Cost-Effective: EM18 RFID readers are relatively affordable, making them a cost-effective choice for many applications, especially when compared to more advanced RFID reader options.
3. Low Power Consumption: EM18 RFID readers typically have low power consumption, making them suitable for battery-powered or low-power applications. This is particularly important for applications where power efficiency is a consideration
4. Easy to Use: EM18 RFID readers are straightforward to set up and use. They often have a simple interface, making them accessible to users with varying levels of technical expertise
5. Reliable Performance: These readers provide reliable RFID reading capabilities, ensuring consistent and accurate identification of RFID tags. They are suitable for applications where accuracy is critical.
6. High Frequency Support: EM18 RFID readers often support a higher RFID operating frequency, such as 125 kHz, which is commonly used for access control, inventory management, and identification applications.

7. Durability: Some EM18 RFID readers are built to withstand various environmental conditions and can be used in both indoor and outdoor settings. Their rugged construction makes them suitable for challenging environments.
8. Integration Options: EM18 RFID readers can be integrated with a variety of microcontrollers, development boards, and other devices, allowing for customization and versatility in different applications.
9. Read Range: EM18 RFID readers typically offer a reasonable read range, allowing them to read RFID tags from a few inches to several feet away, depending on the specific model and environmental conditions
10. Wide Range of Applications: EM18 RFID readers can be used in various applications, including access control systems, inventory management, asset tracking, attendance systems, library management, and more.

Chapter-4

SOFTWARE DESIGN

```
#include <ESP8266WiFi.h>

#include <WiFiClient.h>

#include <ESP8266WebServer.h>

#include <LiquidCrystal_I2C.h>

#include <Wire.h>

#include <SPI.h>

#include <MFRC522.h>


LiquidCrystal_I2C lcd(0x27, 16, 2);

constexpr uint8_t RST_PIN = 0;     // Configurable, see typical pin layout above

constexpr uint8_t SS_PIN = 2;

//MFRC522 rfid(SS_PIN, RST_PIN);


MFRC522 rfid(SS_PIN, RST_PIN);// Create instance of MFRC522

MFRC522::MIFARE_Key key;


const char* ssid = "omkar";     // Replace with your network SSID

const char* password = "123321123"; // Replace with your network password


//const char* WIFINAME = "omkar";

//const char* PASS = "123321123";
```

```
ESP8266WebServer server(80);


String page = "";
char cardUID[12]; // Array to store the card UID
int uidLength = 0; // Length of the UID


const int BUTTON_PIN = D0;
int a;
int p1=0,p2=0,p3=0,p4=0;
int c1=0,c2=0,c3=0,c4=0;


double total = 0;
int count_prod = 0;


void setup() {
  Serial.begin(115200);
  SPI.begin(); // Init SPI bus
  rfid.PCD_Init(); // Init MFRC522
  pinMode(BUTTON_PIN, INPUT_PULLUP);
  pinMode(D8, OUTPUT);
  //SPI.begin(); // Init SPI bus
 // mfrc522.PCD_Init(); // Init MFRC522
```

```
// 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      ");

 delay(2000);

 lcd.clear();

 while (WiFi.status() != WL_CONNECTED)
 {
   delay(500);
 lcd.setCursor(0, 0);
 lcd.print("WiFi Connecting...  ");
 }
 Serial.print(WiFi.localIP());
 lcd.setCursor(0, 0);
 lcd.print("WiFi Connected");
```

```
  lcd.setCursor(0, 1);

  lcd.print(WiFi.localIP());

  delay(1000);



  lcd.setCursor(0, 0);

  lcd.print(" PLZ ADD ITEMS     ");

  lcd.setCursor(0, 1);

  lcd.print("    TO CART         ");



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)+"</t
d><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>";
```

```
  // Add JavaScript to refresh the page every 2 seconds
  page += "<script>setTimeout(function(){ window.location.reload(true); }, 2000);</script>";

  server.send(200, "text/html", page);
});

  server.begin();
}
void loop()
{
  int a=digitalRead(BUTTON_PIN);
  if (rfid.PICC_IsNewCardPresent() && rfid.PICC_ReadCardSerial()) {

    uidLength = rfid.uid.size;

    // Store the UID in the cardUID array
    for (int i = 0; i < uidLength; i++) {
      cardUID[i] = rfid.uid.uidByte[i];
    }

    if (uidLength == 4)
    {

  MFRC522::PICC_Type piccType = rfid.PICC_GetType(rfid.uid.sak);
```

```
// Check is the PICC of Classic MIFARE type
if (piccType != MFRC522::PICC_TYPE_MIFARE_MINI &&
  piccType != MFRC522::PICC_TYPE_MIFARE_1K &&
  piccType != MFRC522::PICC_TYPE_MIFARE_4K)
  {
  Serial.println(F("Your tag is not of type MIFARE Classic."));
  return;
}

String strID = "";
for (byte i = 0; i < 4; i++) {
  strID +=
  (rfid.uid.uidByte[i] < 0x10 ? "0" : "") +
  String(rfid.uid.uidByte[i], HEX) +
  (i!=3 ? ":" : "");
}
strID.toUpperCase();

Serial.print("Tap card key: ");
Serial.println(strID);
    if ((strID.indexOf("14:33:1E:85") >= 0) && (a == 1))
    //if ((strID.indexOf("36:48:63:32") >= 0) && (a == 1))
```

```
//if ((strncmp(input, "A105821B", 8) == 0) && (a == 1))
{
  Serial.println(a);
  lcd.setCursor(0, 0);
  lcd.print("Biscuit Added      ");
  lcd.setCursor(0, 1);
  lcd.print("Price(Rs):35.00     ");
  p1++;
  digitalWrite(D8,HIGH);
  delay(2000);
  total = total + 35.00;
  count_prod++;
  digitalWrite(D8,LOW);
  lcd.clear();
}
else if ((strID.indexOf("14:33:1E:85") >= 0) && (a == 0))
//else if ((strncmp(input, " 14 33 1E 85", 12) == 0))
{ Serial.println(a);
  if(p1>0)
  {

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Biscuit Removed!!!       ");
```

```
  digitalWrite(D8,HIGH);
  delay(2000);
  p1--;
  total = total - 35.00;
  count_prod--;
  lcd.clear();
  digitalWrite(D8,LOW);
  }
  else
  {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Not in cart!!!       ");
  digitalWrite(D8,HIGH);
  delay(2000);
  digitalWrite(D8,LOW);
  lcd.clear();
  }
 }
 else if ((strID.indexOf("A3:52:1F:FB") >= 0) && (a == 1))
// else if ((strID.indexOf("36:48:63:32") >= 0) && (a == 1))
 {
  lcd.setCursor(0, 0);
  lcd.print("Soap Added         ");
```

```
  lcd.setCursor(0, 1);
  lcd.print("Price(Rs):38.00        ");
  total = total + 38.00;
  digitalWrite(D8,HIGH);
  delay(2000);
  p2++;
  count_prod++;
  digitalWrite(D8,LOW);
  lcd.clear();
 }
 else if ((strID.indexOf("A3:52:1F:FB") >= 0) && (a == 0))
 {
   if(p2>0)
  {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Soap Removed!!!       ");
  digitalWrite(D8,HIGH);
  delay(2000);
  p2--;
  total = total - 38.00;
  count_prod--;
  lcd.clear();
  digitalWrite(D8,LOW);
```

```
  }
  else
  {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Not in cart!!!       ");
  digitalWrite(D8,HIGH);
  delay(2000);
  lcd.clear();
  digitalWrite(D8,LOW);
  }
}
else if ((strID.indexOf("E5:E7:1D:85") >= 0) && (a == 1))
{
  lcd.setCursor(0, 0);
  lcd.print("Rice(1KG) Added      ");
  lcd.setCursor(0, 1);
  lcd.print("Price(Rs):55.00      ");
  total = total + 55.00;
  digitalWrite(D8,HIGH);
  delay(2000);
  count_prod++;
  p3++;
  lcd.clear();
```

```
 digitalWrite(D8,LOW);
}
else if ((strID.indexOf("E5:E7:1D:85") >= 0) && (a==0))
{
 if(p3>0)
 {
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("Rice(1KG) Removed!!!       ");
 digitalWrite(D8,HIGH);
 delay(2000);
 total = total - 55.00;
 p3--;
 count_prod--;
 lcd.clear();
 digitalWrite(D8,LOW);
 }
 else
 {
 lcd.clear();
 lcd.setCursor(0, 0);
 lcd.print("Not in cart!!!       ");
 digitalWrite(D8,HIGH);
 delay(2000);
```

```
  lcd.clear();
  digitalWrite(D8,LOW);
  }
}
else if ((strID.indexOf("36:48:63:32") >= 0) && (a == 1))
{
  lcd.setCursor(0, 0);
  lcd.print("Tea(50g) Added          ");
  lcd.setCursor(0, 1);
  lcd.print("Price(Rs):45.00       ");
  total = total + 45.00;
  count_prod++;
  digitalWrite(D8,HIGH);
  p4++;
  delay(2000);
  lcd.clear();
  digitalWrite(D8,LOW);
}
else if ((strID.indexOf("36:48:63:32") >= 0) && (a == 0))
{
  if(p4>0)
  {
  lcd.clear();
  total = total - 45.00;
```

```
  lcd.setCursor(0, 0);
  count_prod--;
  p4--;
  lcd.print("Tea(50g) Removed!!!       ");
  digitalWrite(D8,HIGH);
  delay(2000);
  lcd.clear();
  digitalWrite(D8,LOW);
  }
  else
  {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Not in cart!!!       ");
  digitalWrite(D8,HIGH);
  delay(2000);
  lcd.clear();
  digitalWrite(D8,LOW);
  }
}
else if (strID.indexOf("23:8A:5C:DD") >= 0)
{
  lcd.clear();
  lcd.setCursor(0, 0);
```

```
   lcd.print("Total Prod:");
   lcd.setCursor(11, 0);
   lcd.print(count_prod);
   lcd.setCursor(0, 1);
   lcd.print("Price:");
   lcd.setCursor(6, 1);
   lcd.print(total);

   digitalWrite(D8,HIGH);
   delay(2000);

   lcd.clear();
   digitalWrite(D5,LOW);
   lcd.setCursor(0, 0);
   lcd.print("   Thank you       ");
   lcd.setCursor(0, 1);
   lcd.print("  for Shopping       ");
   digitalWrite(D8,LOW);
  }

}

c1=p1*35.00;
c2=p2*38.00;
```

```
   c3=p3*55.00;
   c4=p4*45.00;
   }


server.handleClient();
//delay(2000); // Delay for 2 seconds
  rfid.PICC_HaltA();
  rfid.PCD_StopCrypto1();


}
```

Results

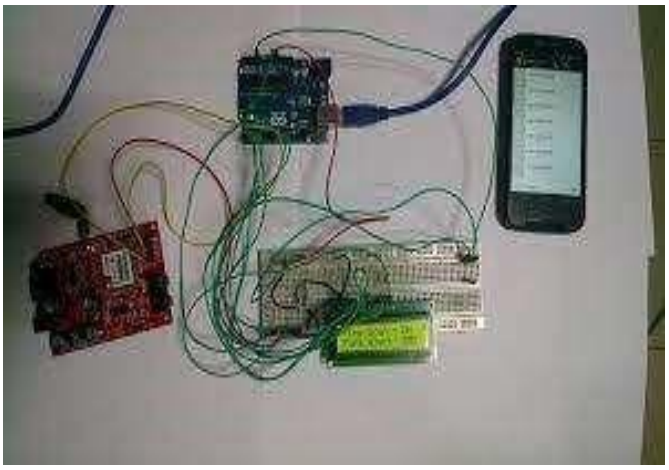
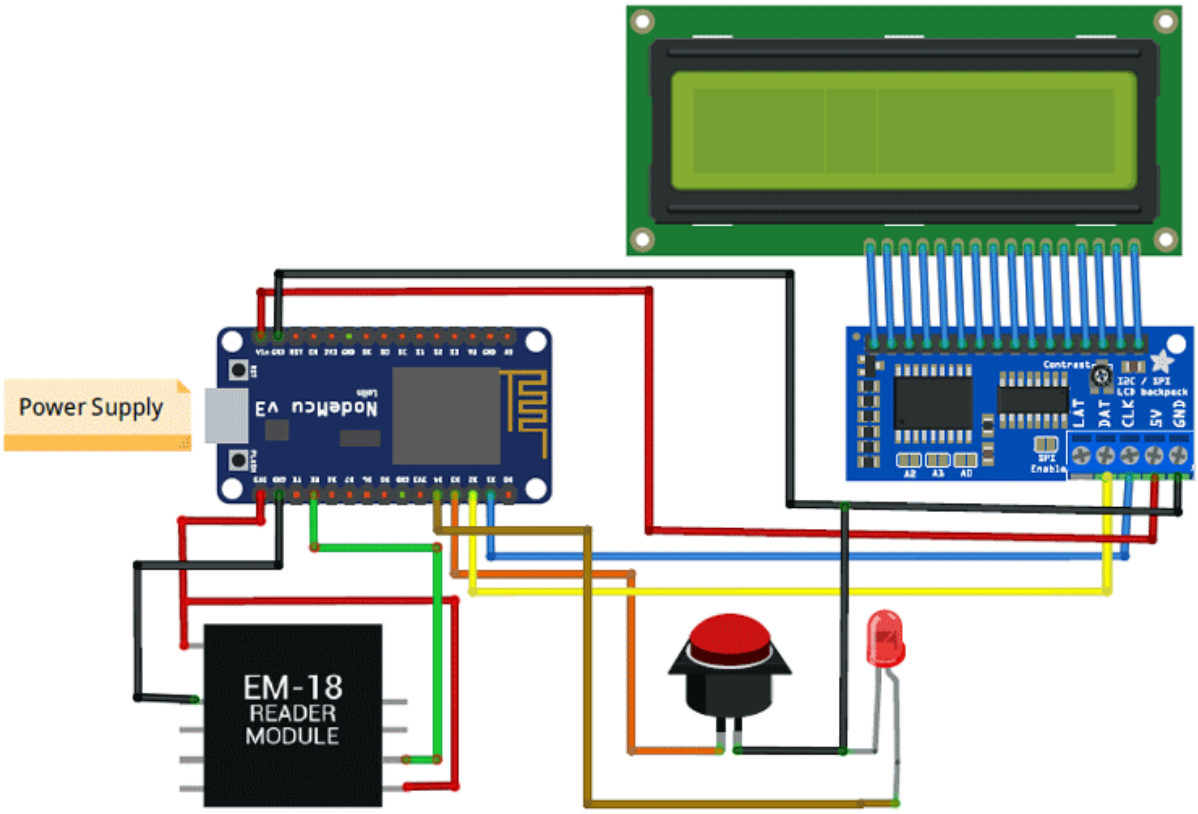
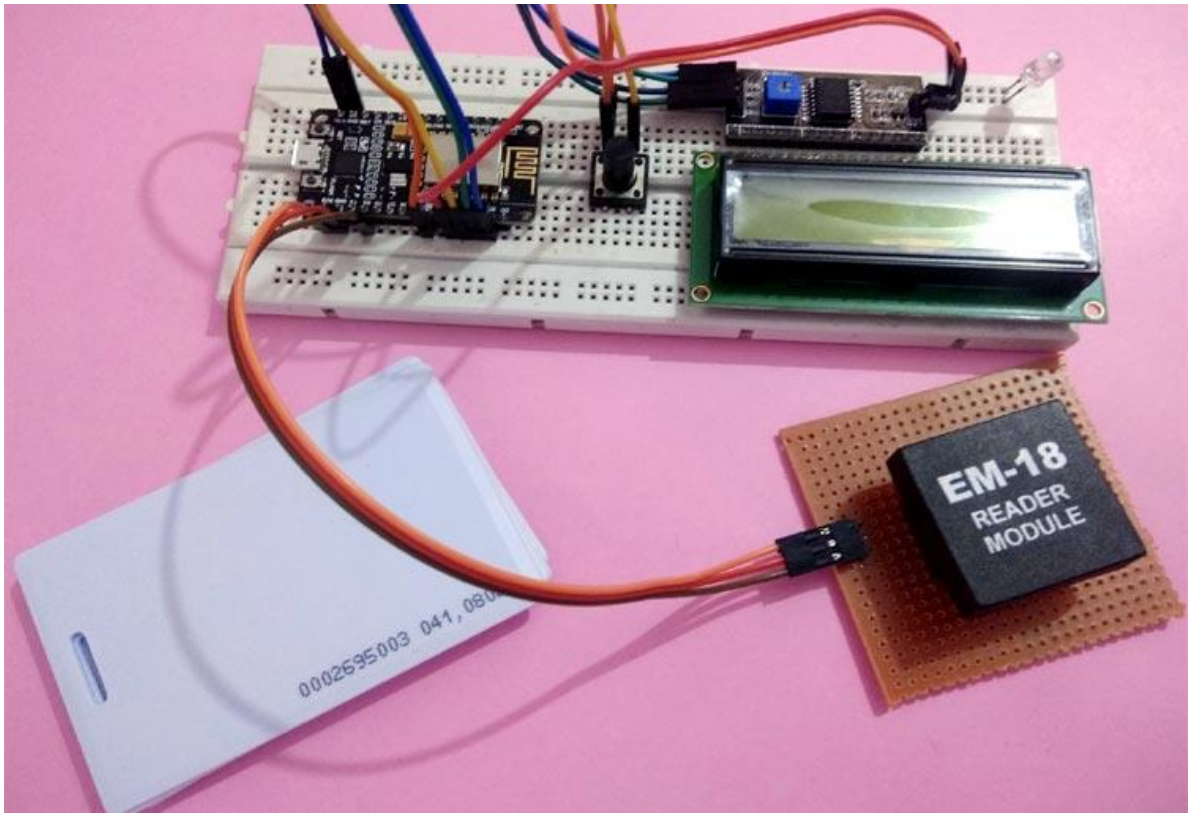


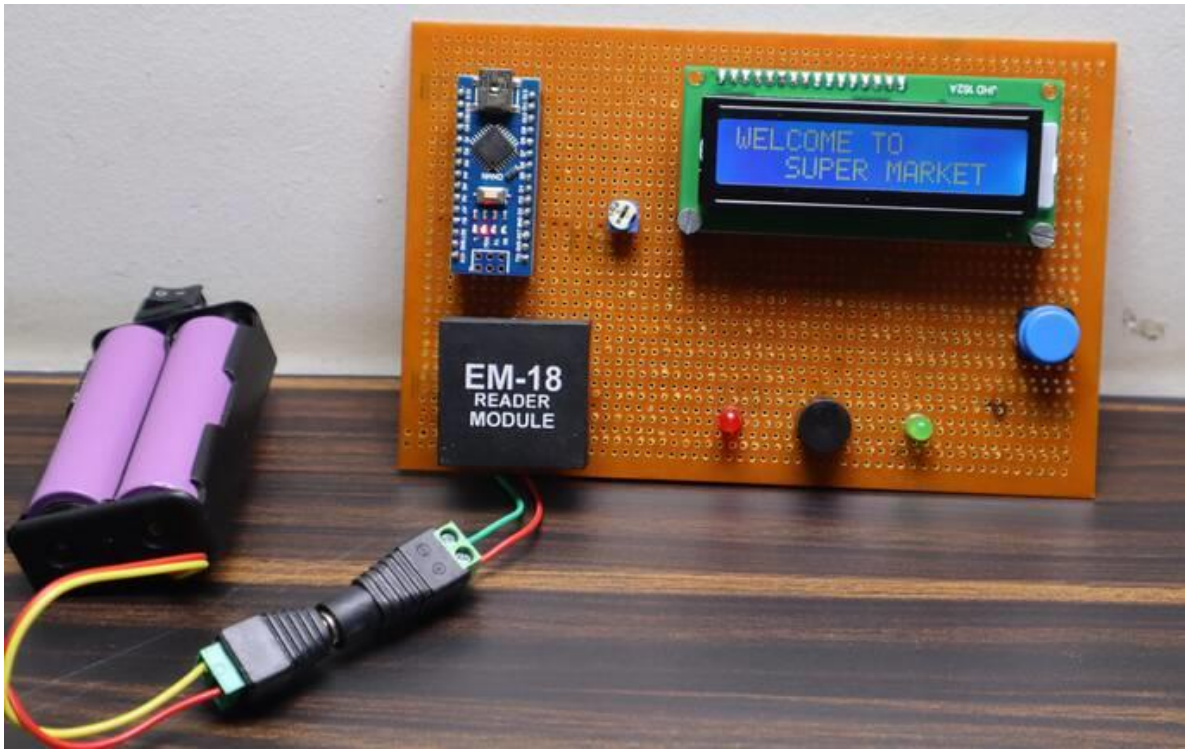
Fig.1

The Fig-1 represents the overview of the project and how the hard-ware components are connected to each other.it is the outlay of the project of how every component is connected to each other

Fig 2 represents that which code is dumped to the board




EM-18
READER
MODULE


WELCOME TO
SUPER MARKET
EM-18
READER
MODULE

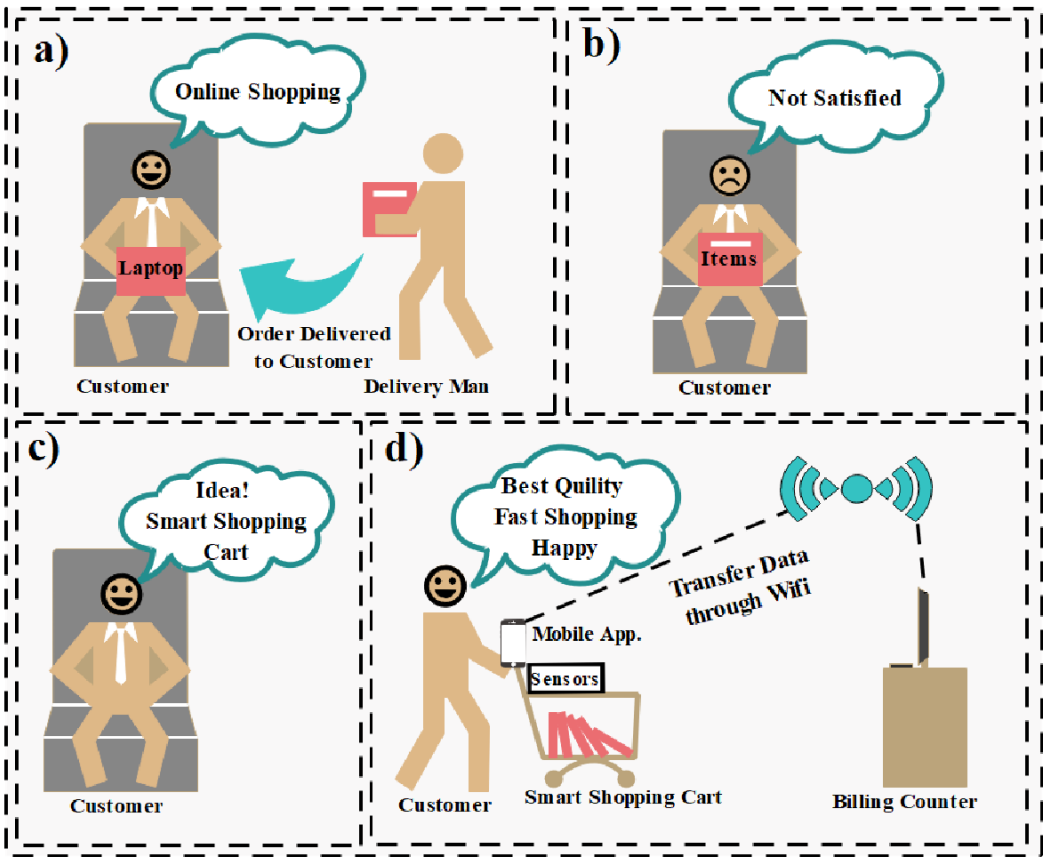
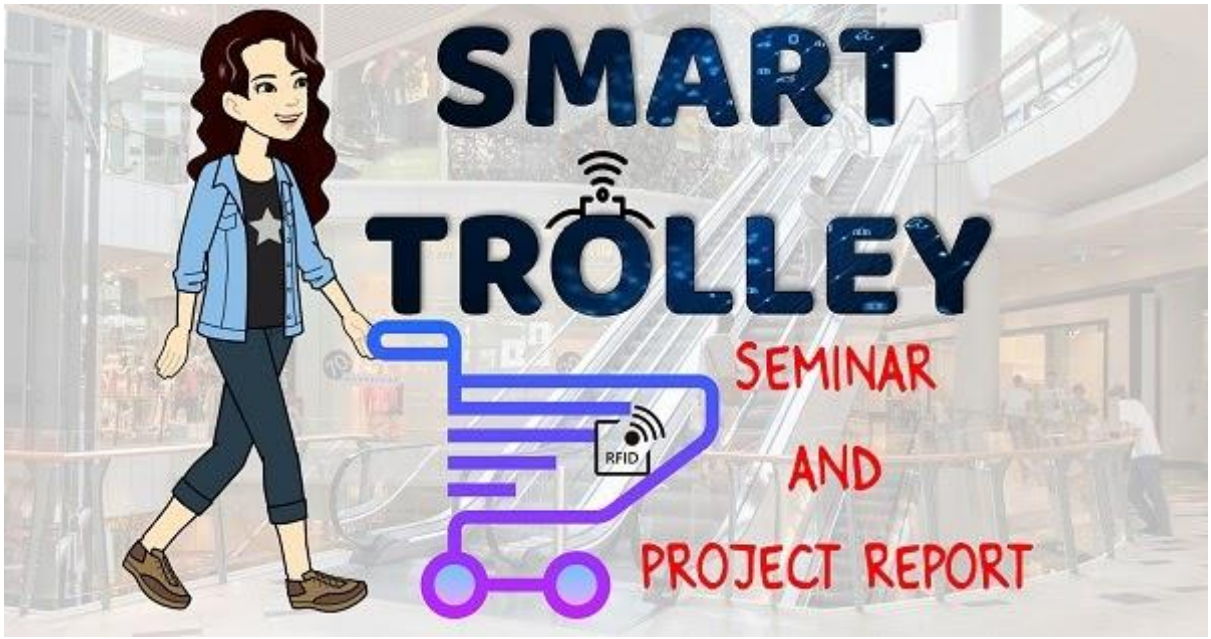


FIGURE 1. Proposed smart shopping cart over online shopping.



RESULT:

An RFID (Radio Frequency Identification) smart shopping cart project involves embedding RFID technology in a shopping cart, allowing it to be tracked and monitored as it moves through a store. This project can be implemented using NodeMCU, an open-source microcontroller platform. The project result is a shopping cart that can be easily tracked and monitored, helping store owners and employees keep track of inventory and improve the overall shopping experience for customers.

Conclusion :

In this project RFID used as security access for the object which there by increases the observation performance. this implementation begins with an automated central billing system in shopping malls and supermarkets. With this, customer no longer have to wait near counter for payment of bills because of their purchased product information getting transferred to central billing unit. This speed up the billing process and makes it much easier. In addition to this ability, the mechanism also assures identification of cases of the inspired by cheater customer which makes the system more reliable and attractive to both shopper as well as seller. This will take the shopping experience toa whole a new level.

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REFENCE

https://youtu.be/xgP_565UEK8?si=AcmO7W1xKUkYVFB9https://iotdesignpro.com/projects/iot-based-smart-shopping-cart-using-rfid-and-nodemcu
https://www.electronicscomp.com/i2c-module-16x2-lcd-india