PIMPRI CHINCHWAD EDUCATION TRUST'S

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE- 411044.

MINI PROJECT REPORT

SMART SHOPPING TROLLEY

Project ID: - C_09

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Abstract

Time is the most valuable thing in today's world, and people prefer those things which require and consume less time. Shopping in supermarkets and malls is a very common thing nowadays specially in the big cities. But we know that, billing of products in the malls is quite difficult. People have to wait in long queues for billing of the items and due to this, it takes much time at the billing counters. Nowadays, there are various evolutions taking place in the world of technology. Looking at these, we came up with the idea of "Smart Shopping Trolley" for the automatic billing in supermarkets. The project consists of RFID readers, Liquid Crystal Display (LCD), push buttons, crystal oscillator, 9V battery for power supply. When the user puts the product in the trolley, then its code will be detected using the RFID reader and name and cost of the product will be displayed on LCD and added to the list. And in case, the user wants to remove anything from the trolley, he will again scan the same RFID tag which will again be detected using RFID reader and the amount of that product will be decremented from the list.

Acknowledgment

Presentation inspiration and motivation have always played a key role in any venture. We express our sincere thanks to Dr. Govind N. Kulkarni, Director, Pimpri Chinchwad College of Engineering, Pune. We pay our deep sense of gratitude to Dr. M.T. Kolte (HOD of Electronics and Telecommunication department, PCCOE) to encourage us to the highest peak and to provide us the opportunity to prepare the project. We feel to acknowledge our indebtedness and deep sense of gratitude to Mr. Ajjay Gaadhe whose valuable guidance and kind supervision given to us throughout the course shaped the present work as it shows. We would also like to express our special gratitude and thanks to other academic faculties of PCCOE for giving us the opportunity to do this project under their guidance and time. Our thanks and appreciation also go to our teachers and colleagues who have willingly helped us out.

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1. INTRODUCTION

1.1 Background

Shopping in supermarkets and malls is a very common thing nowadays specially in the big cities. But we know that, billing of products in the malls is quite difficult. People have to wait in long queues for billing of the items and due to this, it takes much time at the billing counters. And hence the best way to help the people or the customers is to reduce the time on shopping for which one of the possible way is with the help automated billing. For these various technologies are used like Barcode system, QR scanning, etc.

1.2 Problem Statement

To design a Smart Shopping Cart system using RFID tags which can be used in supermarkets for automatic billing and for the ease of customers.

1.3 Objectives

- To develop a customer centric Smart Shopping Cart which will be used to show the total cost of all products and price of the new product added.
- To interface the RFID module with Atmega 328pu.
- To interface a LCD display which will be used to display the cost.

1.4 Brief Application Areas

- Supermarkets
- Wholesale markets
- Grocery stores

2. Literature Survey

2.1 Recent Trends in the Project (Existing System):

In the existing system, they have used the traditional method of barcode scanning. Using the barcode scanner, we need to scan each product and so this method becomes very slow to be scanned. In this process we have no automatic billing system and the customer has wait for the billing process in the long queues. Therefore, using the barcode process billing method is slow. This eventually results in the long queues. To avoid the process, we introduced types of technology is the RFID based billing system.

2.2 Literature Survey:

Sr. No.	Title of Paper	Authors & Publication details	Methodology
1.	Automatic Billing Trolley using RFID and ZigBee with Android Application Rewarding System	International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 5, May 2016	This model the system consists RFID reader and the products in the malls equipped with RFID tags. When a person puts any product in the trolley its code will be detected by RFID reader and the price of the product will be stored in the memory. At the billing counter the total bill data will be transferred to the pc by wireless RF modules.

2.	Automated Shopping Trolley for Super Market Billing System	International Journal of Computer Applications (0975 – 8887)	This system integrates a raspberry pie embedded chip with two barcode scanners and a battery kit to allow users to self-check out at supermarket.
3.	A model automation of shopping cart to ease queue in mall by using RFID module	SADHANA CHAUDHARI, 2NIKITA MAGAR, 3MAYURI PATIL, 4 SHALINI UBALE, 5PROF.A.R. GAIDHANI ISSN: 2455-2631 © December 2019 IJSDR | Volume 4, Issue 12	In this system we are using RFID tags instead of bar codes, whenever a customer puts a product into a trolley, it will get scan by RFID reader and product price and it will be displayed on the LCD. We are using ZigBee transmitter which is used to transfer the data to the main pc.
4.	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	In this technology, the communication is in between RFID tag and reader, each tag has magnetic strip with specific code and tag is read by RFID Reader module. The automated billing system based on the passive RFID provides suitable solution to the manual billing method in shopping mall.
5.	A model of electronic shopping cart for effective shopping based on RFID	Authors: Kalyani Dawkar, Shraddha Dhomae, Samruddhi Mahabaleshwarkar	This system consists of smart trolley which will have RFID reader, lcd display and Bluetooth module. When the person puts a product in trolley it will scan and the cost, name and expiry date of the product will be displayed

Table 1. Literature Survey

2.3 Summary of Literature Survey

Above reviews proposes the Smart Shopping Cart such as -

1. System is proposed with RFID module and ZigBee.
2. Raspberry Pie with two barcode scanners are used.
3. Using ZigBee module to transfer and store the data in database system.
4. NFC technology is implemented using RFID tags.
5. Bluetooth module is used along with RFID.

Here we propose a system which can be used to sum up the product cost and display the product price.

3. Specification

3.1 Specifications for Power Supply

9V battery is connected to the circuit for power supply and converted into 5V by voltage regulator LM 7805. We can also power the circuit using serial converter.

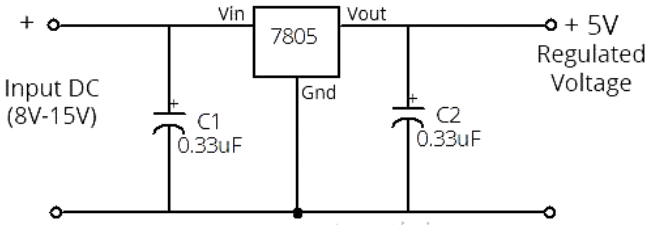

Fig. 1. Circuit diagram for LM7805

3.2 Specifications of Microcontroller

The ATmega328P is a low power, CMOS 8-bit microcontrollers based on the AVR® enhanced RISC architecture. By executing instructions in a single clock cycle, the devices achieve CPU throughput approaching one million instructions per second (MIPS) per megahertz, allowing the system designer to optimize power consumption versus processing speed. The EM-18 RFID Reader module operating at 125kHz is an inexpensive solution for your RFID based application. The Reader module comes with an on-chip antenna and can be powered up with a 5V power supply

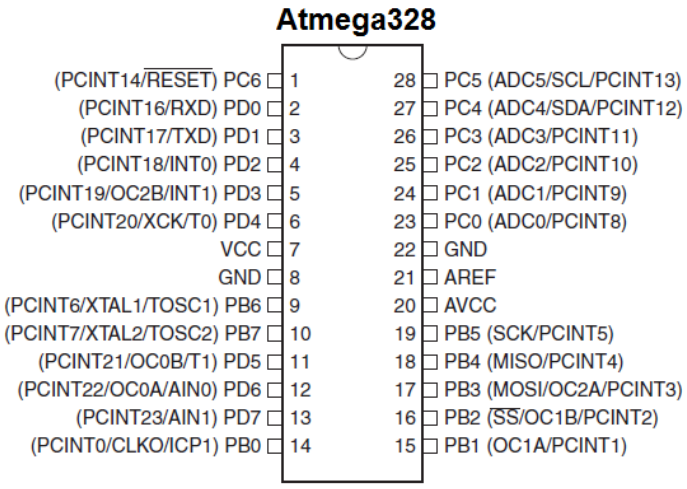

Fig. 2. Pin diagram of ATMEGA 328P

4. Proposed Methodology

4.1 Introduction to the Project

In this project, RFID technology is used. Each item is attached with RFID tag and it is detected using RFID reader and it is attached to a trolley. User purchases different commodities and puts them into trolley, the name and price of which is displayed on LCD screen which is attached with the circuit on the trolley. If one wants to remove some items, he/she have to remove it from the trolley, the RFID reader will again detect the same tag and delete it from the total bill. Thus, customer's time is reduced while shopping.

4.2 Explanation of Block Diagram , Methods Implemented

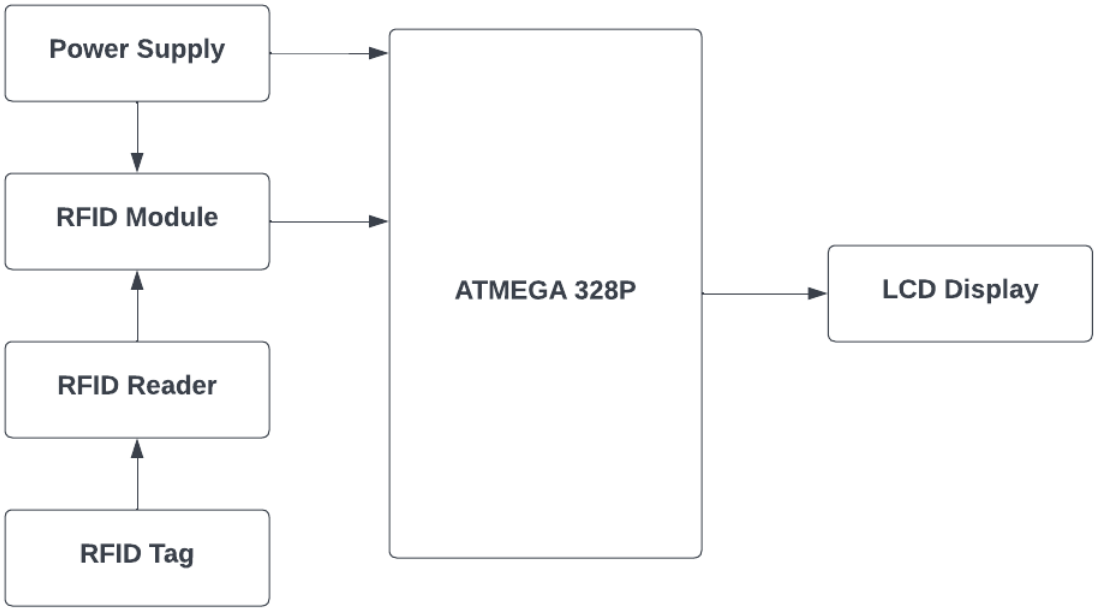

Fig. 3. Block diagram of system

The Smart Shopping Cart System consists of Power Supply, RFID reader, RFID Tags, Atmega328pu and LCD Display.

Power Supply - A power supply is an electrical device that supplies electric power to an electrical load. The main purpose of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

RFID Reader Module - A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. Here EM-18 reader module is used. It can read multiple RFID tags at a time.

RFID Tags- RFID tags are made out of three pieces: a microchip (an integrated circuit which stores and processes information and modulates and demodulates radio-frequency (RF) signals), an antenna for receiving and transmitting the signal and a substrate. The tag information is stored in a non-volatile memory. Each product is attached with a RFID tag. The tag will provide information about the product such as its name, cost ,etc.

ATmega 328PU- ATmega328PU is a high performance yet low power consumption 8-bit AVR microcontroller. It has advanced RISC architecture. It can commonly be found as a processor in Arduino boards such as Arduino Fio and Arduino Uno. ATmega 328p is the main IC in our project.

LCD Display - A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. The LCD will display the bill. The display is connected to I/O port of microcontroller.

4.3 Selection Criteria for each Block

i) We have used Atmega328pu as it is easily available, cheap, small size 8-bit microcontroller which works on 5V power supply and basically ideal for any type of small as well major projects and you can use Arduino ide to program it which makes it easy to implement than 8051 and Pic microcontroller.

ii) EM 18 RFID module which works on 125Khz operating frequency, it is more than efficient for any mini project.

4.4 Flowchart and Algorithm

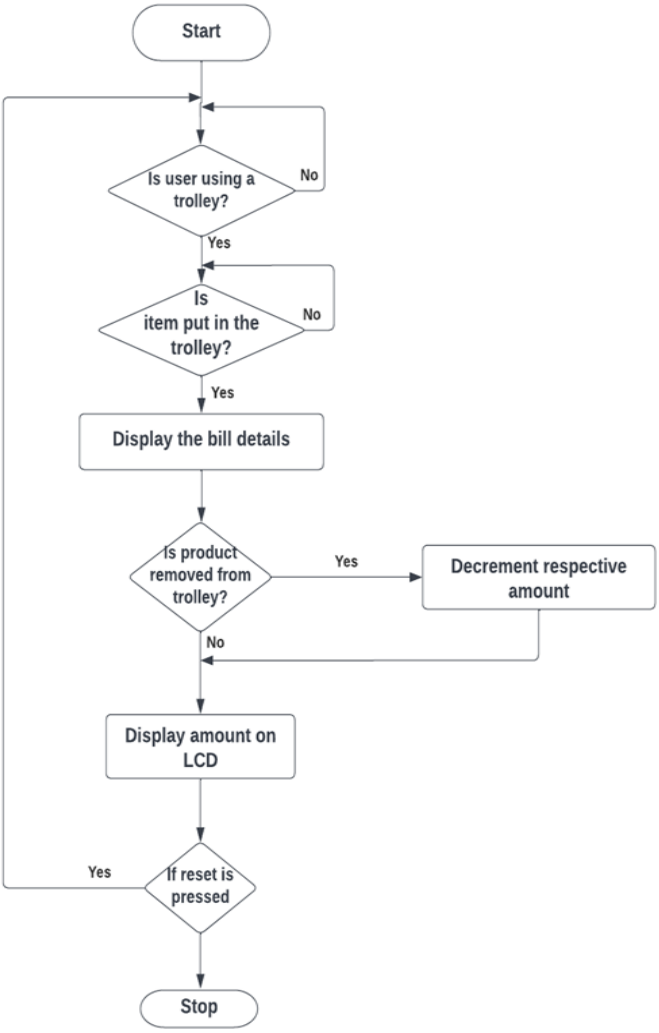

Fig. 4. Flowchart of System

Algorithm for the working of the system is given as -

1. Power is supplied to the system.
2. Greetings message is shown.
3. Put product in the cart.
4. EM 18 scans the data.
5. Price of the product is displayed.
6. Name of the product is displayed.
7. Total bill is displayed.
8. System gets powered off when disconnected from the power supply.

5 Design and Implementation

5.1 Circuit Diagram :

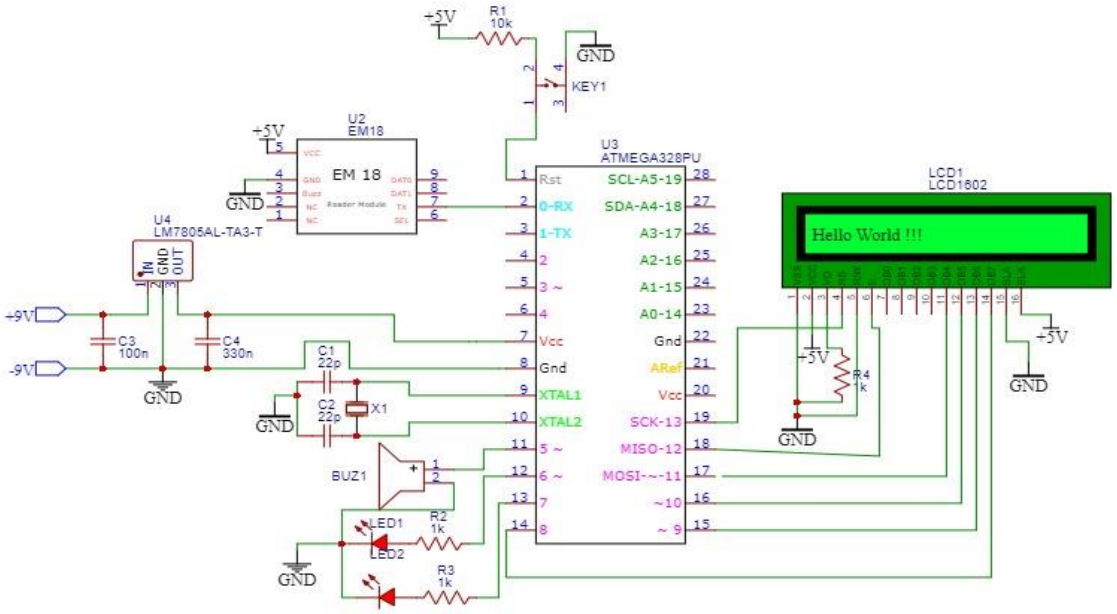

Fig. 5. Circuit Diagram of system

EM 18 is powered using the pin 7 (VCC) of ATMEGA 328p. LCD display is connected to the controller IC. Circuit is powered using 9V battery. LM 7805 is used to reduce the voltage to 5V.

5.2 PCB Schematic:

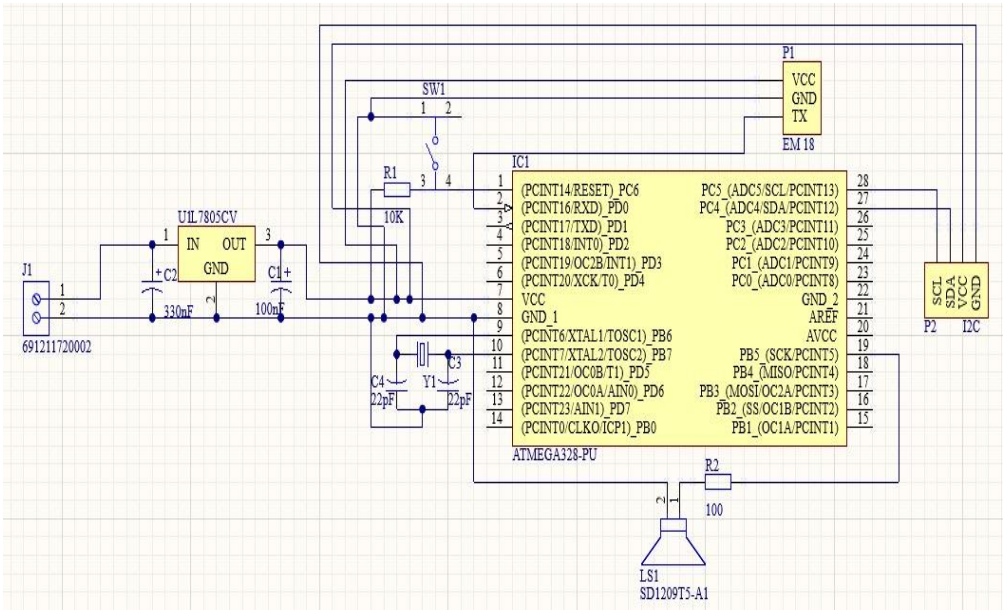

Fig. 6. PCB Schematic

5.3 Layout of PCB

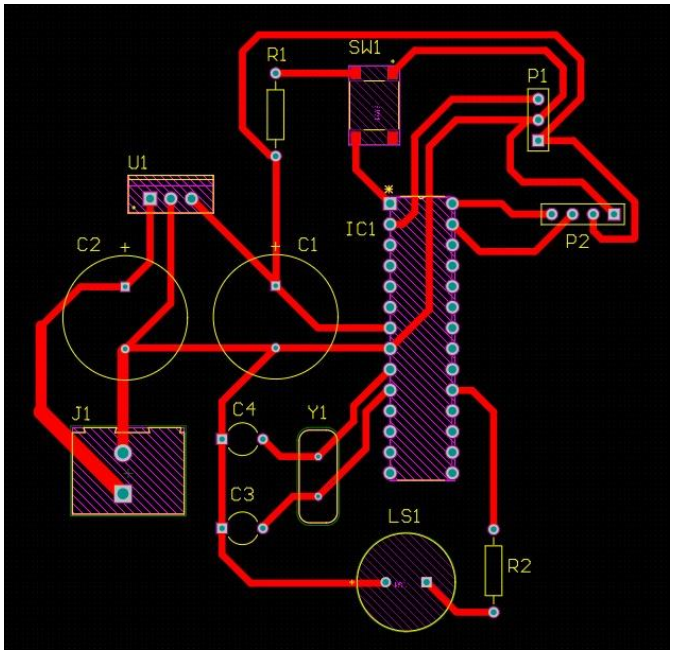

Fig. 7. PCB Layout made on Altium

PCB is designed on the Altium software. First when we open Altium, create a new project. After creating the project add a schematic design template. In this template add the required components from the manufacturer part search window. After adding all the components do the required connection of all the components. Fig 6 shows the Schematic of PCB of system. After finishing the circuit design in the tools menu annotate all the components. Then add a PCB template in the project. Save all the files. Next in the design menu do update PCB. After doing so, the components will be placed on the PCB template. Place the components according to the placement pattern of the designer. Route the tracks of components. Use both Top and Bottom side if tracks cannot be routed. Fig 7 shows the routed PCB and its final design. After routing is done, add the ground plane.

5.4 Snapshots of Implementation.

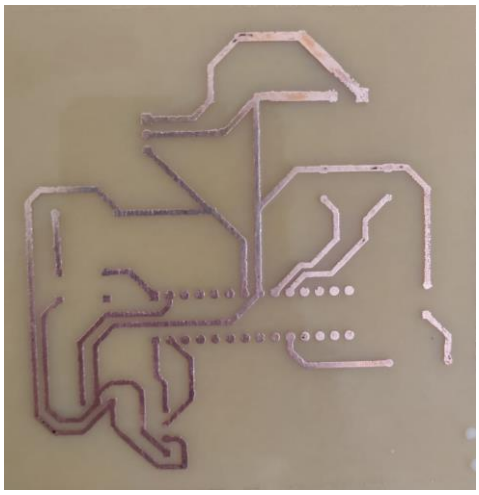

Fig. 8. Implementation of PCB Making

After all the process of PCB designing is done print the design with actual size on photo paper using laser jet printer. Attach this printed paper to copper clad without any air gap and heat it for about 30 mins. After 30 mins due to heat the printed portion on paper will be pasted on copper clad. Then put this printed copper clad in Itching solution ($FeCl_3$). This will remove the unwanted copper on the copper clad. Thus, the PCB is manufactured. Fig 8 shows the final PCB. After this soldering of components is done.

6. Results

Simulation Results :

6.1 Simulation Software tool Introduction - Proteus

The Proteus is an electronic circuit design software which includes a schematic capture, simulation and PCB (Printed Circuit Board) Layout modules. You can do simulation of microcontrollers by putting hex file generated by particular IDE.

6.2 Simulation Software Tool Features;

- Schematic Capture.
- Microcontroller Simulation.
- Design and drawing different circuits.

6.3 Simulation Software Tool Procedure used for Project:

Initially, the code for the simulation is written in the Arduino IDE.
Then hex file of the code is created.
The circuit is drawn & designed in the proteus software.
The hex file is attached to the microcontroller and the we run the simulation.

6.4 Simulated Results:

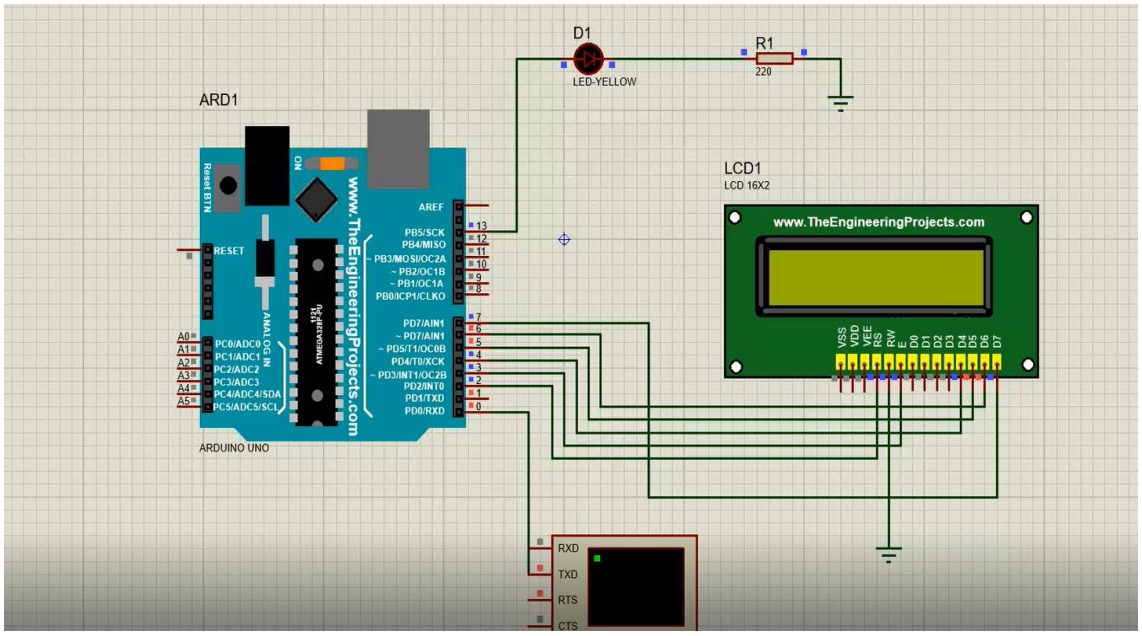

Fig. 9.1. Simulation of system on Proteus software (Powering up the circuit).

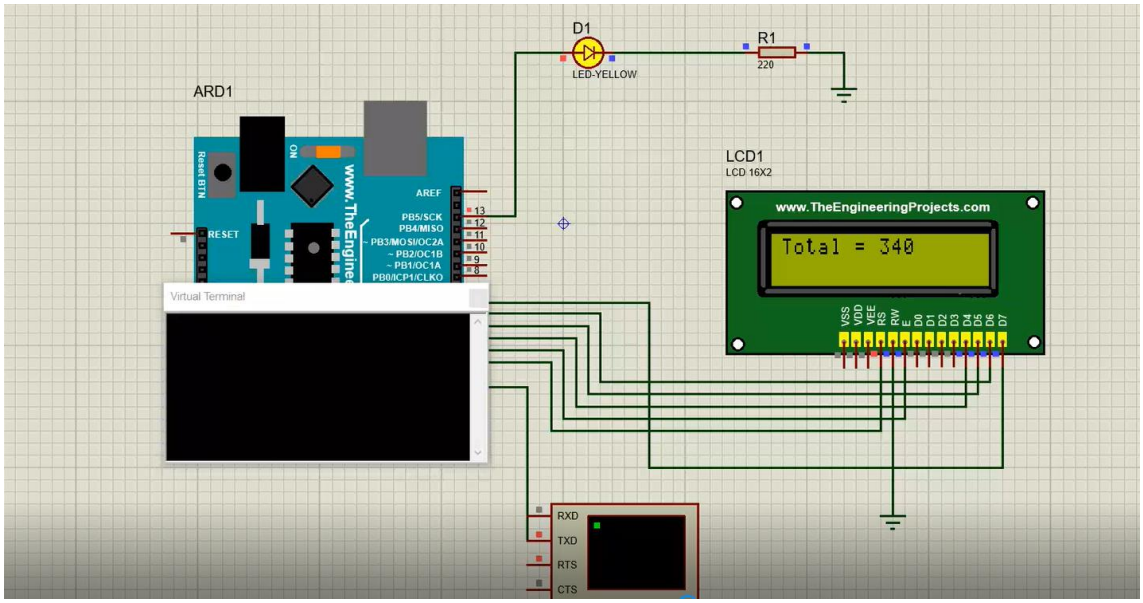

Fig. 9.2. Simulation of system on Proteus software (Displaying the total bill).

Simulation is done on the Proteus software.
Arduino UNO board is used in the circuit for simulating the system.
LCD display is used to show the name of the product added, Price of the product and Total bill.

Hardware Results :

6.5 Full Hardware Results:

The below PCB circuit will be attached to the shopping trolley and whenever the user puts the product in the trolley, then its code will be detected using the RFID reader and name and cost of the product will be displayed on LCD and added to the list. And in case, the user wants to remove anything from the trolley, he will again scan the same RFID tag which will again be detected using RFID reader and the amount of that product will be decremented from the list.

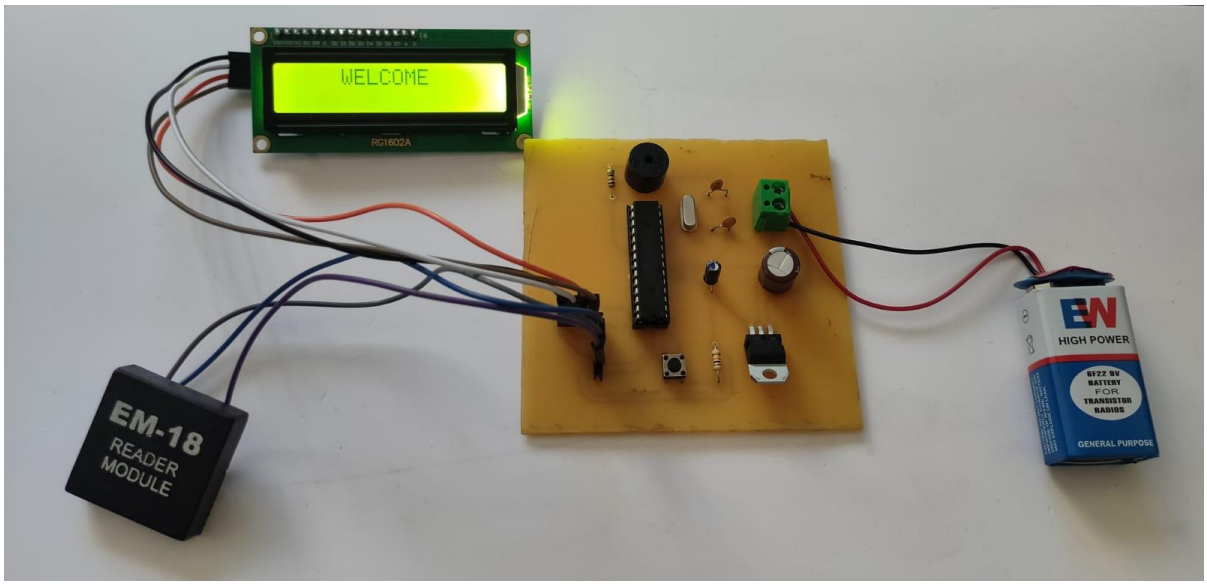

Fig. 7.1. Hardware implementation using PCB and EM 18

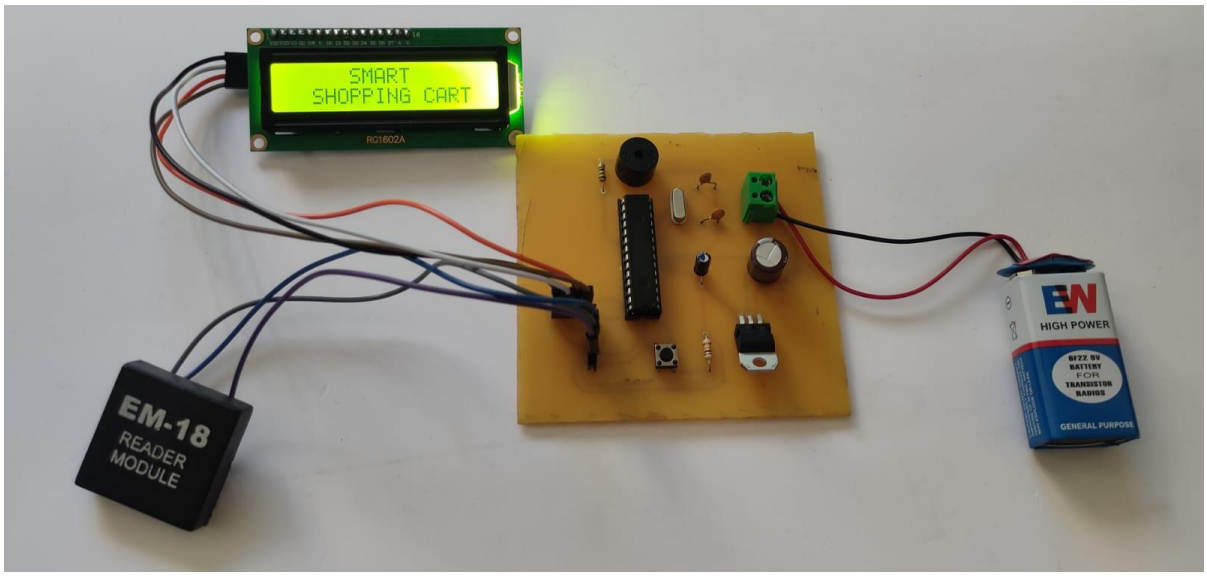

Fig. 7.2. Hardware implementation using PCB and EM 18

The system starts with greeting to the customer fig 7.1 shows ‘WELCOME’ message on the LCD display and followed by ‘SMART SHOPPING CART’ showed in fig 7.2.

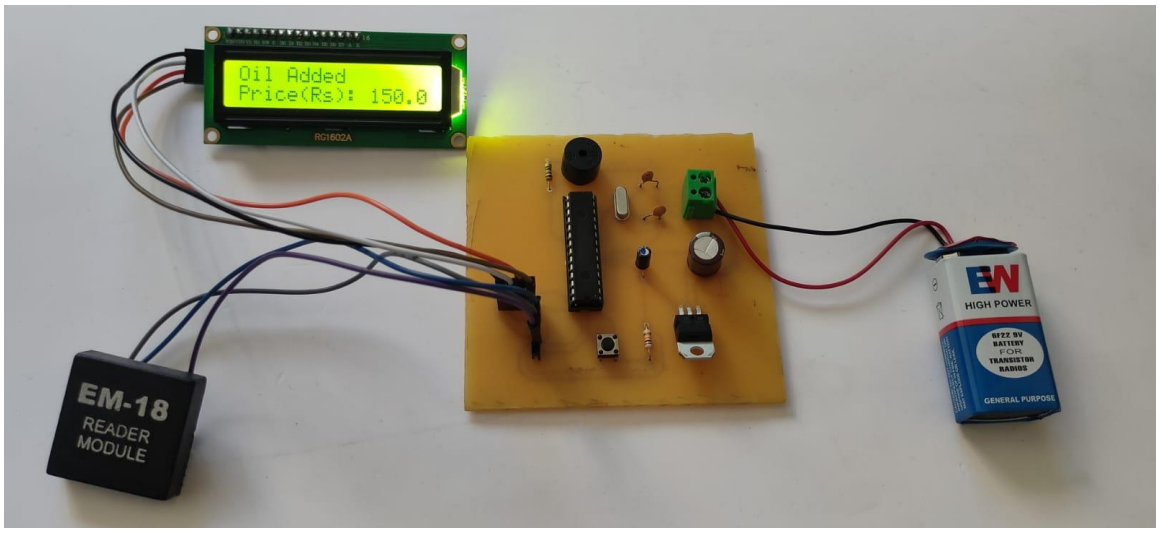

Fig. 7.3. Hardware implementation using PCB and EM 18

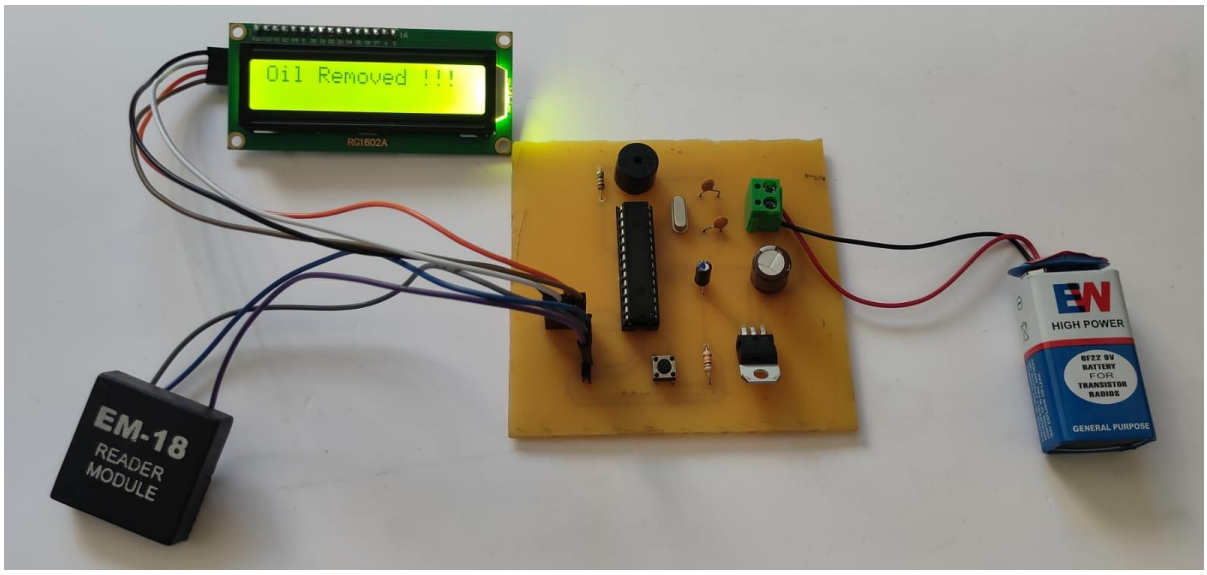

Fig. 7.4. Hardware implementation using PCB and EM 18

Then customer puts his/her preferred product in the cart the EM 18 detects the products shows the message on LCD display, fig 7.3 shows ‘oil added’ in the cart and its ‘price’. The customer removed the product, fig 7.4 shows the ‘oil removed’ message.

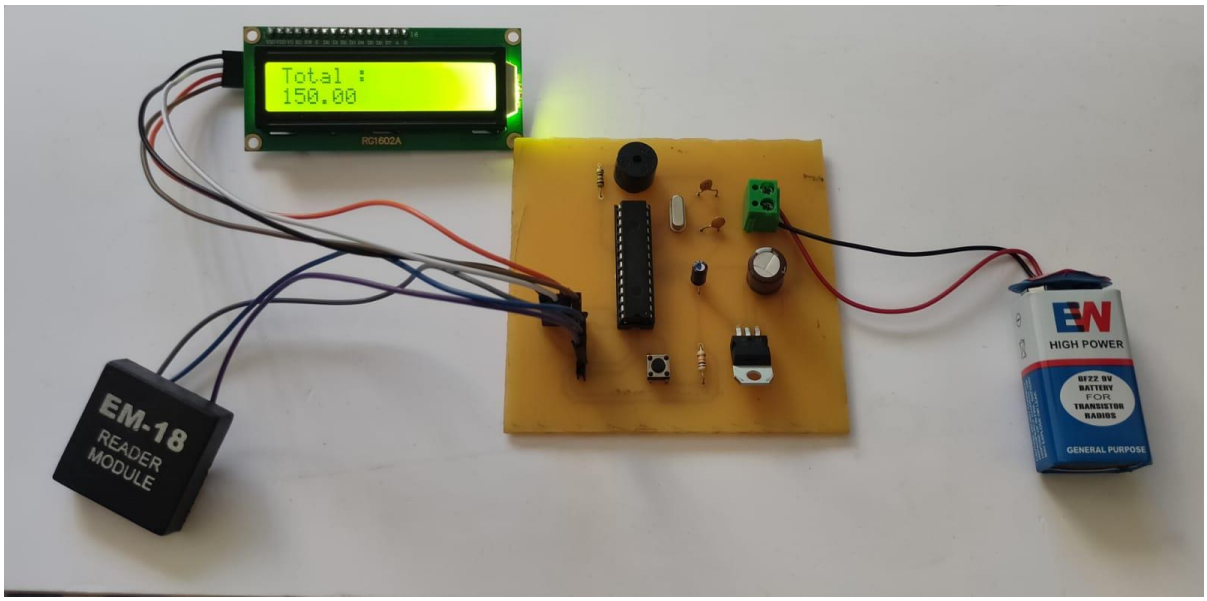

Fig. 7.5. Hardware implementation using PCB and EM 18

Total price gets automatically deducted and final bill is shown on LCD display, fig 7.5 shows 'Total' bill that is Rs 150.

.

Fig. 7.6 Final Product

Fig 7.6 shows the final Smart Shopping Cart.

7. Conclusion

- **Conclusion**

  As we know time is the money so this system is introduced to reduce the lot of time spent on the billing counters as well as this system will help customers to quickly check the price of the product and know the total amount.

- **Future Scope**
-

  We can use QR scanners, Barcode scanner in the further advancements.
  We can provide online payment facility.

8. Bill of Material

Sr.no	Item	Quantity	Rate	Amount
1.	ATmega328pu	1	360	360
2.	Em 18 reader	1	600	600
3.	Em 18 tags	5	20	100
4.	LCD 16 X 2	1	150	150
5.	I2C	1	90	90
6.	16 MHz Xtal	1	10	10
7.	FTD232	1	275	275
8.	Buzzer	1	15	15
9.	Battery 9V	1	35	35
10.	LM7805	1	15	15
11.	22pf Capacitor	2	4.5	9
12.	330nf capacitor	1	10	10
13.	10k Resistor	10	1	10
14.	Push button	1	6	6
15.	Basket	1	160	160
16.	PCB(clad,FeCl3,sheet)	1	280	280
17.	Sheet	1	180	180
18.	Total	-	-	2305

Table 2. Bill of material

9. References

[1]. http://www.ise.ait.ac.th/wp-content/uploads/2018/03/Final-thesis-report-Smart Shopping-Cart.pdf
[2]. https://www.slideshare.net/MahanteshHiremath11/smart-shopping-system-77464373
[3]. https://www.youtube.com/watch?v=WeLET1tZPaE
[4]. https://youtu.be/eXYHNWLKg-g
[5]. https://youtu.be/WMVx3MIUApU
[6]. https://youtu.be/CKkRuYHrPXk
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[8]. https://youtu.be/So83sH6-jwM
[9]. https://youtu.be/d8_xXNcGYgo

Appendix I : Datasheets

[1]. https://components101.com/modules/em18-rfid-reader-module

[2]. https://ww1.microchip.com/downloads/en/DeviceDoc/Atmel-7810-Automotive-Microcontrollers-ATmega328P_Datasheet.pdf

[3]. https://www.sparkfun.com/datasheets/Components/LM7805.pdf