

# **Embedded Systems**

## **RFID based smart shopping card**

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## **1. AIM**

The aim of our project is to design a RFID enabled smart shopping card using raspberry pi which ultimately shows the list of products present in the shopping cart or basket of each individual customer when scanned by a RFID scanner.

## **2. ABSTRACT**

Today's world thrives making human life easier than it already is with every passing moment. Creating a smart cart that takes care of comfort while shopping is another step taken in the same direction. Product acquisition in large grocery stores with wide range of products is a tedious and time consuming process. The smart shopping cart explores the mini computers and automatic identification technology. Instant billing without queuing and keeping track of the expenditure is the main but not the sole motive of this intelligent cart. The paper is based on development of a project with the aim to reduce the time spent in the store and to make shopping of day to day items an experience instead of a headache. This cart uses modern and cheap technology like RFID and mini computers to make it intelligent and time saving. It helps the consumers to utilise the time saved in other fruitful activities instead of wasting their time by standing in long queues at the checkout counter.

## **3. INTRODUCTION:**

The grocery industry sector is extremely important, not only now but has been so for a very long time. The recent evolution in technology and people's understanding towards the technical advancements have made it possible to develop comfort in the grocery industry. Also consumer perceptions of privacy, security and trust in present commerce mentioned that the proliferation of electronic commerce technologies has utterly transformed the way business is conducted.

Products are lined up in stores, customers check their price and may be their nutrition value too. Put all the stuff in a cart and push it around to fill until its bloating. Standing in a queue for billing wastes an ample amount of time and customers realize they have stuff in their cart more than they can afford to buy. With that starts the segregation of important and useless stuff wasting more time than already has been wasted. Furthermore, the unavailability of exact change starts another round of loitering.

The recent couple of years have witnessed explosive interest in RFID and supporting technologies due to rapid expanding use to track products. Similar technology can be used for unique identification of each product in the supermarket. Since, item-level tagging is not practical due to relatively high cost of RFID cards deployment in respect with the very low profit margin of products, a situation with item tagging with RFID labels can be easily envisioned. Accessorizing each cart with one (or more, depending on the size of the cart) RFID reader makes easy enlisting of items and their cost as and when the items are put into the cart. This enlisting is possible on practically every screen with the personal choice of size. This helps to generate an automated bill along with keeping track of the expenditure.

The addition of items into the system is very easy. The RFID reader are non-contact sensors that can read over a considerable distance. The items are added just by hovering the item over the reader once only. Deleting the item from the cart is just as simple, which can be done by taking the item out of the cart what has the RFID card attached with it.

Every product can be uniquely identified by its RFID reader. Once shopping is complete the user can see the “Enlist” of the items, “Calculate” the total cost and “Send” the generated bill to the billing counter. There the customer can quickly pay and leave. This not only saves money but also helps in easy tracking of lost carts. Putting another concept to use to make it a real time application of the proposed method, the entire bill memo along with the date and time of purchase, taken care of by a real time clock, can be made available over the internet for helpful maintenance of the mart’s product database. This is achieved by creating a server attached to Wi-Fi at the billing counter.

#### **4. LITERATURE SURVEY:**

| <b>PAPER</b> | <b>AUTHOR</b> | <b>JOURNAL</b><br><b>DATE</b> | <b>and</b> | <b>SURVEY</b> |
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| Microcontroller based Attendance Management System | Rashmi S. Moharil Dr. Shankar N. Dandare, | International Journal of Engineering and Innovative Technology (IJEIT) Volume 5, Issue 10, April 2016 | <p>Attendance Monitoring System (AMS) helps us to control labor costs, minimize compliance risk, and improve workforce productivity. It is also reduces the administrative time associated with attendance exceptions and employee inquiries. It is possible to maintain the record of overtime of employee and record of holidays also.</p> <p>In view of this, Attendance Management System is proposed using Radio Frequency Identification (RFID) tag and fingerprint reader. The system takes attendance electronically with the help of the RFID and finger print device, and the recorded attendance is stored in a database.</p> <p>The algorithm and programs are develop using python for the Raspberry Pi 2 Model B. Status of attendance can be observed on Graphical User Interface (GUI). GSM/GPRS module is implemented to send the massages to the parent's mobile periodically.</p> |
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| <p>Ingenious Shopping Cart: RFID Enabled for Automated Billing</p> | <p>Tanushree , Siddharth Yadav , Saksham Aggarwal , Sagar , Mohit Yadav , Neeraj Gupta , Shruti Karkra</p> | <p>International Journal of Computer Science and Mobile Computing, Vol. 5, Issue. 5, May 2016, pg.209 – 214</p> | <p>Today's world thrives making human life easier than it already is with every passing moment.</p> <p>Creating a smart cart that takes care of comfort while shopping is another step taken in the same direction.</p> <p>Product acquisition in large grocery stores with wide range of products is a tedious and time consuming process.</p> <p>The smart shopping cart explores the mini computers and automatic identification technology. Instant billing without queuing and keeping track of the expenditure is the main but not the sole motive of this intelligent cart.</p> <p>The paper is based on development of a project with the aim to reduce the time spent in the store and to make shopping of day to day items an experience instead of a headache. This cart uses modern and cheap technology like RFID and mini computers to make it intelligent and time saving. It helps the consumers to utilise the time saved in other fruitful activities instead of wasting their time by standing in long queues at the checkout counter.</p> |
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| Smart Ration Card System Using Raspberry-pi                          | Kumbhar Aakanksha , Kumavat Sukanya2 , Lonkar Madhuri , Mrs. A.S. Pawar | International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 4, April 2016 | <p>Ration Card is one of the important documents for every Indian family. Every family is given facility by government to receive food grains against a card. But there is lot of corruption involved in TPDS such as black marketing of the subsidized food grains as many families do not claim their quota of food grains and many families claim the quota of other families.</p> <p>As a solution to above problems this paper proposes a system which is highly scalable</p> <p>Ration Distribution System based on embedded system. The main target of this project was to bring transparency between government and customer, and this transparency is provided by webpage. Here the conventional paper ration book is replaced with RFID based smart card. When any transaction is done by customer he/she will receive a message on his mobile through GSM technology.</p> |
| Raspberry Pi Image Processing Based Economical Automated Toll System | Md. Kawser Jahan Raihan, Mohammad Saifur Rahaman, Mohammad Kaium Sarkar | Global Journal of Researches in Engineering Electrical and Electronics Engineering                               | <p>The highway toll system has already been developed and widely used in many developed countries. But most of them use Radio Frequency ID. In developing countries RFID for each car does not exist. And using RFID is still a</p>  |

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|--|------------------|--|--|
|  | & Sekh<br>Mahfuz | Volume 13 Issue 13<br>Version 1.0 Year<br>2013 | <p>costly solution. Some of the developing countries use image processing technique to detect license plate for auto toll system. But the problem is not solved yet due to high price of host device (e.g. computer) to run.</p> <p>Implementation of image processed toll systems are only limited in some places. Keeping these problems in mind we have developed this project where raspberry pi will be used as host. This minicomputer has the ability of image processing and control a complete toll system. A camera will be used to take picture of the vehicle's name plate to sort the toll charge according to vehicles category.</p> <p>Along with multiple automatic tolls taking booth there will be a manual booth with operator also who will handle those vehicles which experience issues with any of the automatic toll taking booth.</p> |
|--|------------------|--|--|



## 5. PROPOSED METHODOLOGY

The following steps are have followed to implement this project.

1. Interfacing of raspberry pi and RFID scanner is done using the jumper wires.
2. Interfacing between the monitor/ laptop and the raspberry pi using the HDMI cable.
3. Then both the raspberry pi and the RFID scanner are powered up using an USB cable which can be seen by blinking of LED in both of them.
4. Then once the entire circuit is made the RFID tags are kept near the RFID scanner for scanning.
5. As soon as the scanning takes up, module which is running on raspberry pi using rasbian OS displays the ID of tags which are scanned and likewise we can see the product getting displayed in our shopping basket.
6. This can be done multiple times and finally the total amount to be paid by the customer is displayed on the screen along list the list of all the products and their respective prices.
7. Once more thing implemented here is if the same RFID tag is scanned twice the product is removed from out shopping cart.

Thus these the above mentioned steps delineate the detailed working and methodology adopted in our project which enables any customer to experience a smart shopping experience without interacting with any employee the supermarket or the store.

The modules used in our project are:

1. To create a database which contains the list of all products present in the supermarket and to extract the product details once its RFID tag gets scanned.

```
import sqlite3
connection = sqlite3.connect("super.db")

cursor = connection.cursor()

sql_command = """
CREATE TABLE object (
rfid varchar(20) unique not null,
objid integer not null,
objname varchar(10) not null,
price integer not null);"""

cursor.execute(sql_command)

sql_command = """INSERT INTO object (rfid, objid, objname, price)
VALUES ("0200FF6D72C", 101, "Chocolate", 100);"""
cursor.execute(sql_command)

sql_command = """INSERT INTO object (rfid, objid, objname, price)
VALUES ("19004AC80E95", 102, "Face wash", 150);"""
cursor.execute(sql_command)
```

```

sql_command = """INSERT INTO object (rfid, objid, objname, price)
VALUES ("19004AC4D84F", 101, "Chocolate", 100);"""
cursor.execute(sql_command)

connection.commit()

connection.close()

```

## 2. For interfacing the raspberry pi and RFID scanner and to enlist the products in the shopping cart

```

import serial
import sqlite3

conn = sqlite3.connect("super.db")
c = conn.cursor()

rfidlist=[]

while(True):
    def read_rfid ():
        ser = serial.Serial ("/dev/ttyAMA0")
    #Open named port
        ser.baudrate = 9600
    #Set baud rate to 9600
        data = ser.read(12)
    #Read 12 characters from serial port to data
        ser.close ()
    #Close port
        return data
    #Return data

    id = read_rfid ()
    #Function call

    a = id
    #a=input()
    if a in rfidlist:
        rfidlist.remove(a)
    else:
        rfidlist.append(a)
    print(rfidlist)

    try:
        num0=rfidlist[0]
    except IndexError:
        num0=0

    try:
        num1=rfidlist[1]
    except IndexError:
        num1=0

    try:
        num2=rfidlist[2]
    except IndexError:
        num2=0

```

```

c.execute("SELECT objname, price, count(*) FROM object where rfid in
(?,?,?) group by objid;", (num0,num1,num2,))

pr = c.fetchall()
print(pr)

b = 0
if b in rfidlist:
    rfidlist.remove(b)
if b in rfidlist:
    rfidlist.remove(b)
if b in rfidlist:
    rfidlist.remove(b)

conn.close()

```

## 6. RESULTS AND DISCUSSIONS

Tools used in this project were:

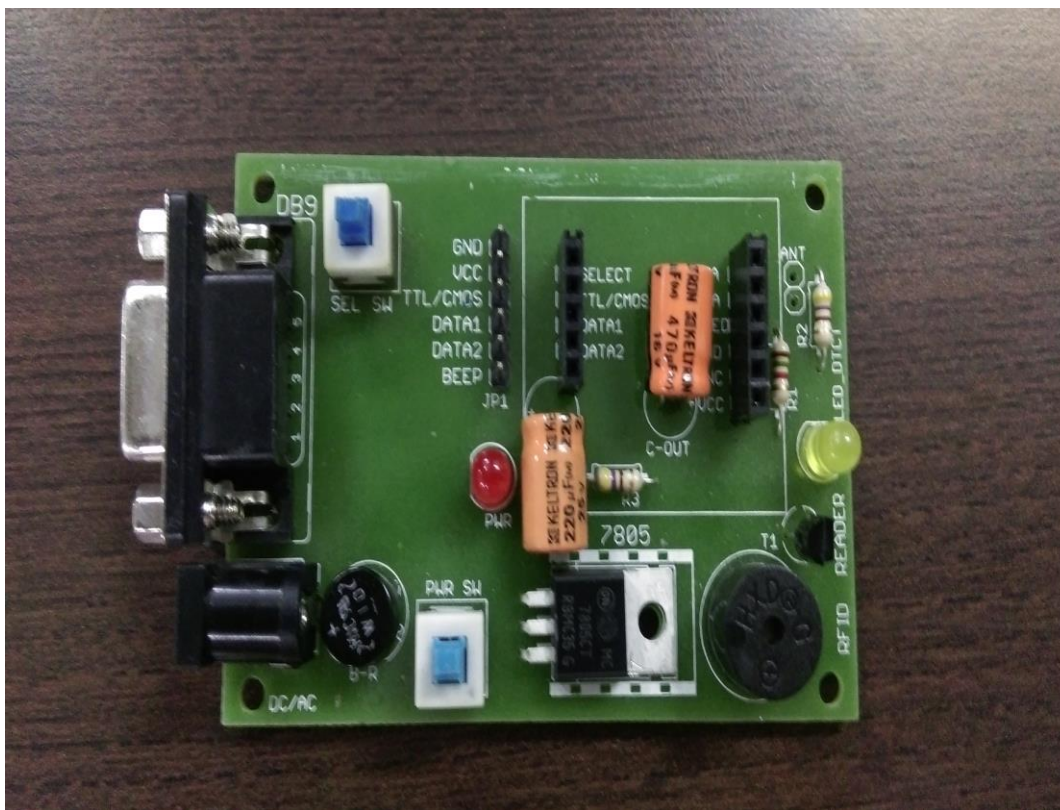
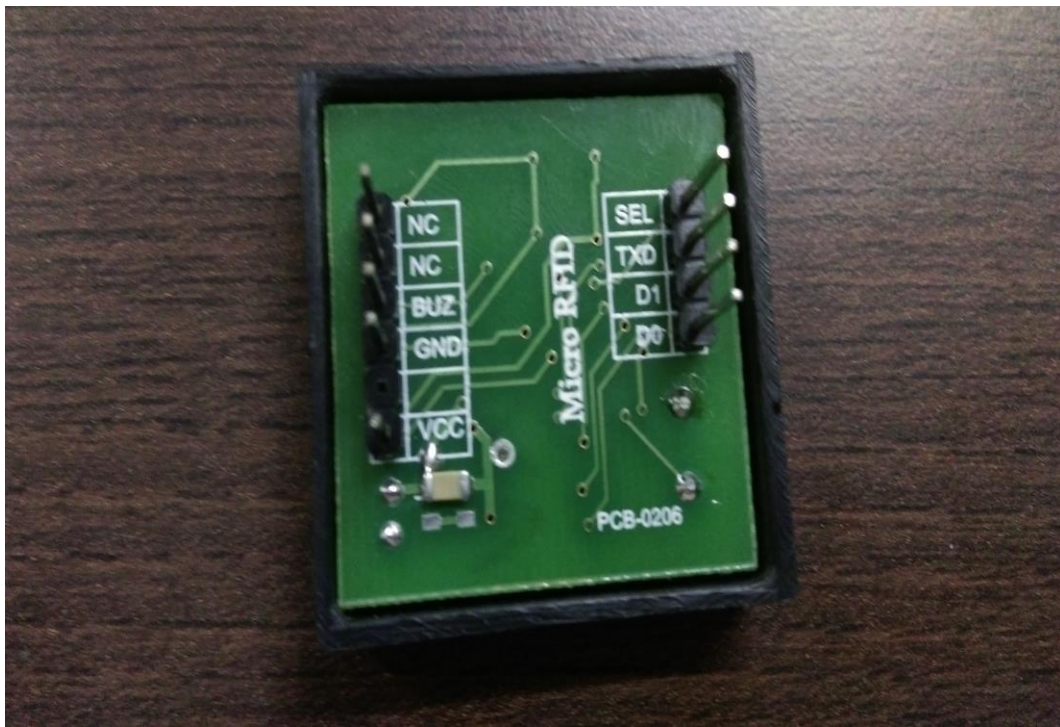
### 1. Raspberry Pi

This contains the Raspbian OS for running the programs.



### 2. RFID Scanner

This scans the RFID tags.



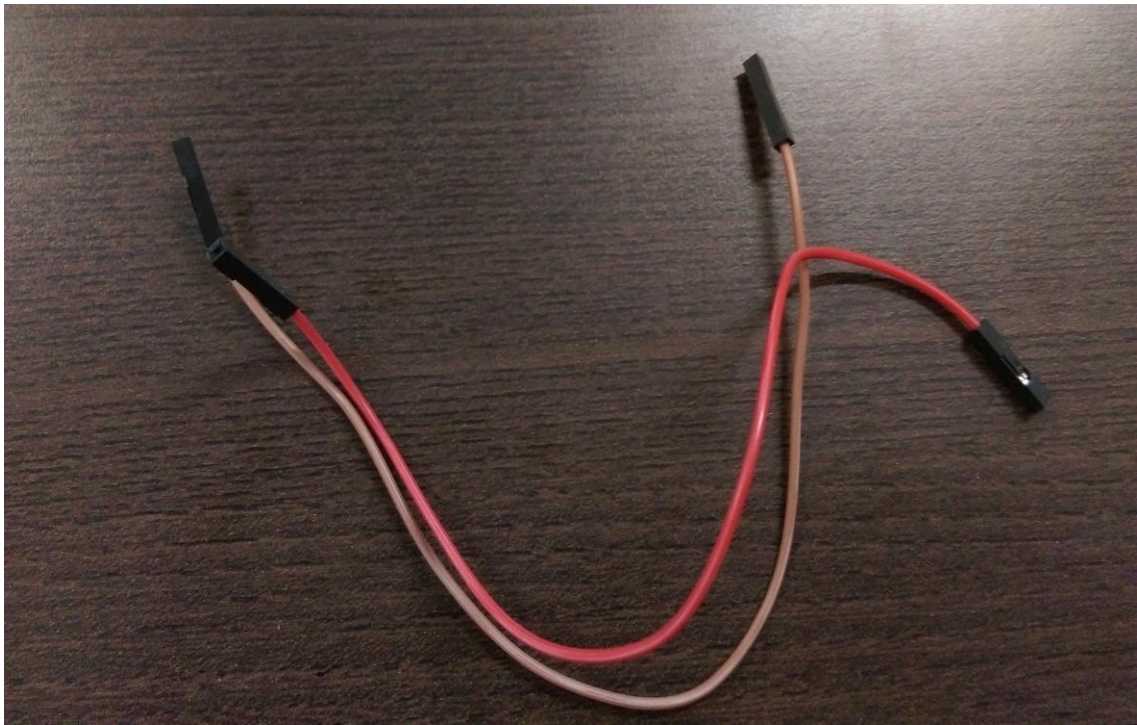


### 3. Passive RFID tags

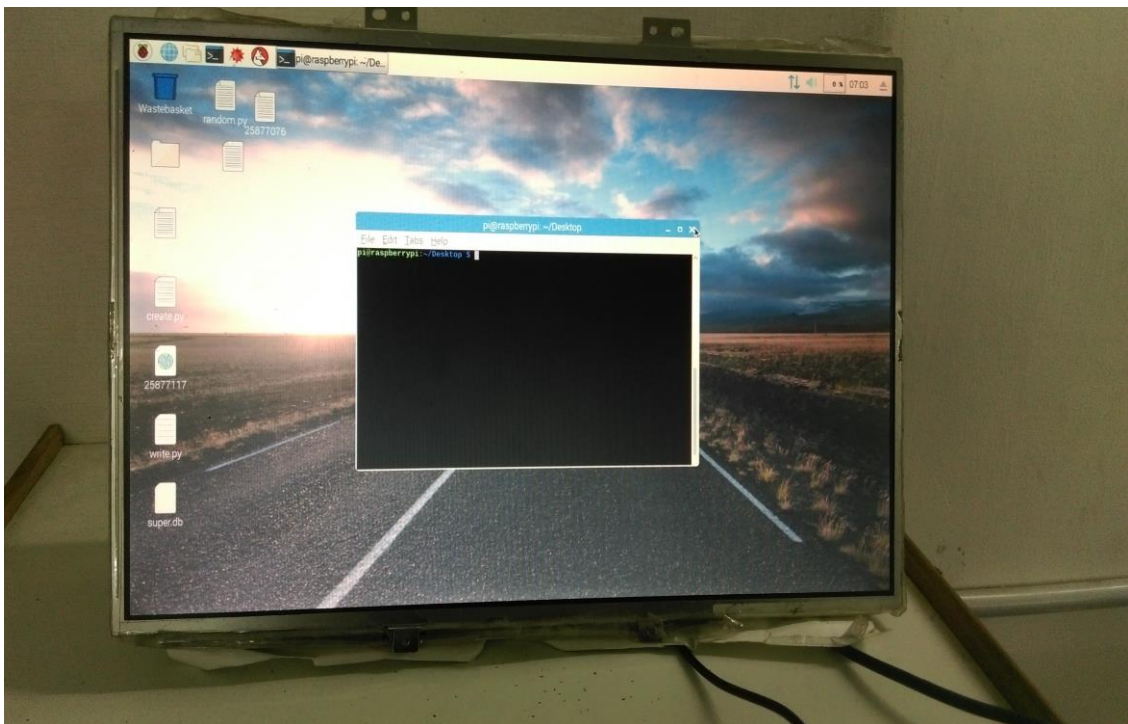


### 4. Jumper wires

They are used for interfacing between the raspberry pi and RFID scanner.



## 5. Monitor

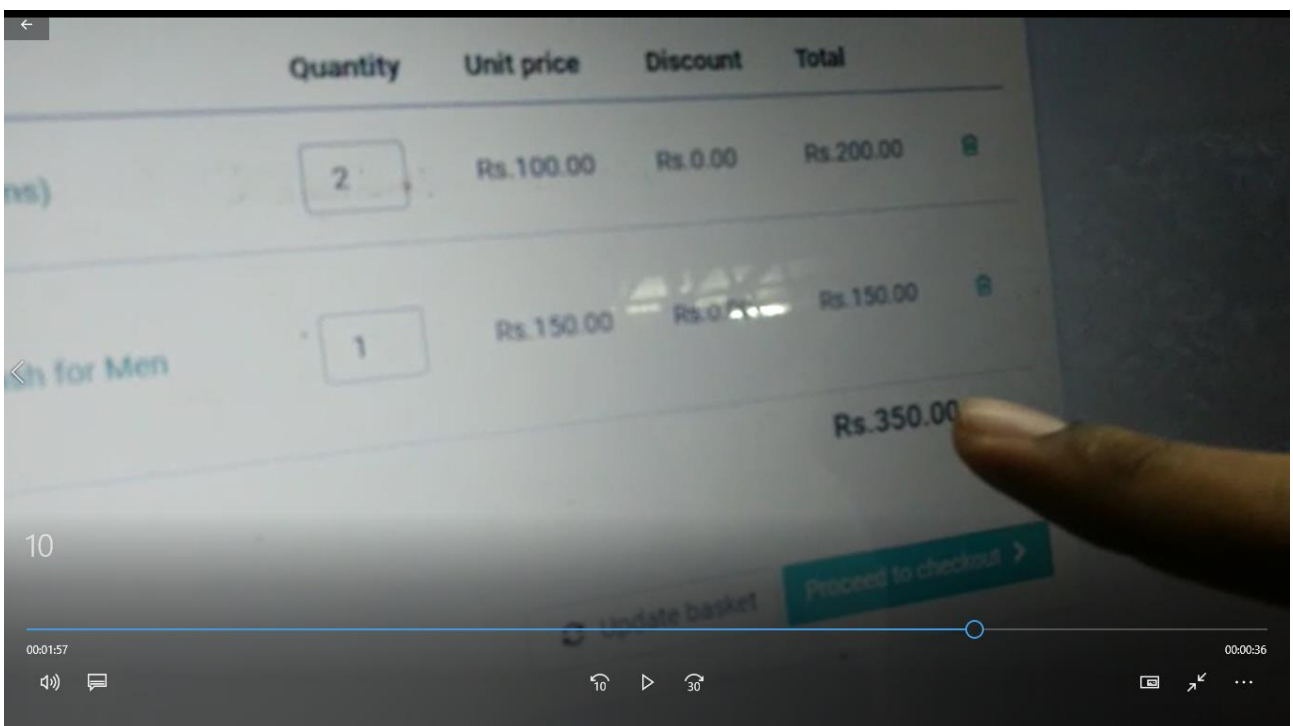
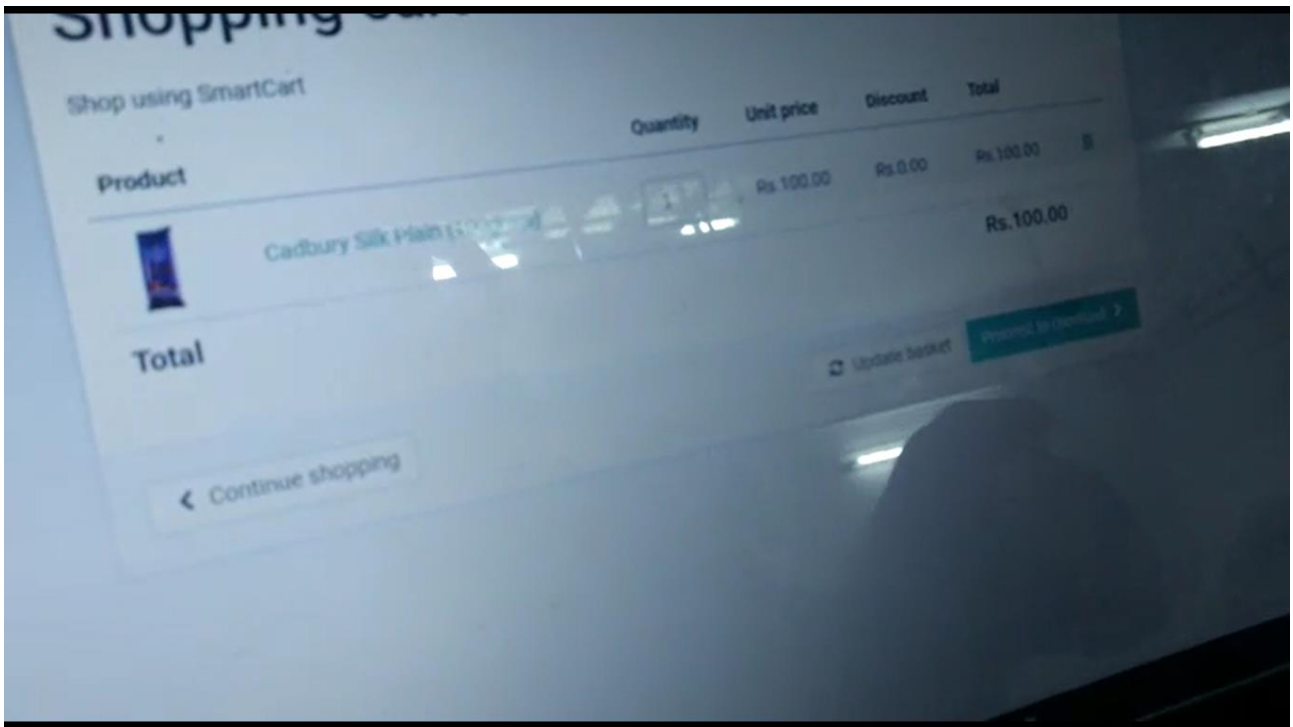


## 6. Ethernet cable

For providing Wifi or internet.







## 7. CONCLUSION

This smart trolley envisions to the contents and their total cost by helping customers in creating a shopping session which lasts until the customer commands it to be cleared. This session maintains



the data of each product in the basket by using RFID tags to make the entry. It also helps in keeping the shopping experience in budget by displaying the total cost to the customer. By the emerging trend of online shopping, which reduces the hassle while shopping at stores, introduction of smart carts not only help the stores to eliminate the surge but also help to reduce the usage of paper, unnecessarily wasted in printing copies of bill, and the number of employees making it more economical and environment friendly.

## **8. FUTURE PROSPECTS**

- A simple extension of this system would be to use RFID embedded in consumers' loyalty cards to that identify individuals. This option could be useful for faster login to the system by creating a swiping end at the cart itself and to charge the shopping directly to the customer account at the point-of-sale.
- Using a dynamo on cart wheels for a rechargeable battery to power Arduino.
- Using a larger screen for navigation purpose in the mart itself.
- Using the screen for promotions as a way to mint money and make better profit margin.

## **9. REFERENCES**

1. Microcontroller based Attendance Management System, Rashmi S. Moharil Dr. Shankar N. Dandare, International Journal of Engineering and Innovative Technology (IJEIT) Volume 5, Issue 10, April 2016.
2. Ingenious Shopping Cart: RFID Enabled for Automated Billing, Tanushree, Siddharth Yadav, Saksham Aggarwal, Sagar Mohit Yadav, Neeraj Gupta, Shruti Karkra, International Journal of Computer Science and Mobile Computing, Vol. 5, Issue. 5, May 2016, pg.209 – 214
3. Smart Ration Card System Using Raspberry-pi, Kumbhar Aakanksha, Kumavat Sukanya, Lonkar Madhuri, Mrs. A.S. Pawar, International Journal of Advanced Research in Computer and Communication Engineering Vol. 5, Issue 4, April 2016
4. Raspberry Pi Image Processing Based Economical Automated Toll System, Md. Kawser Jahan Raihan, Mohammad Saifur Rahaman, Mohammad Kaium Sarkar & Sekh Mahfuz, Global Journal of Researches in Engineering Electrical and Electronics Engineering Volume 13 Issue 13 Version 1.0 Year 2013

