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Periodic Progress Report (PPR)
Patent Drafting Exercise (PDE)

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CHAPTER 1

INTRODUCTION

1.1 PROBLEM SUMMARY

1.2 OVERVIEW

1.3 OBJECTIVE

1.4 LITERATURE REVIEW

1.1 PROBLEM SUMMARY

Problem – 1: Barcode Scanner and Time Consumption



Fig 1.1(a) Barcode Scanner & Queue at the Bill Counter

The method currently being used in Indian supermarkets and malls is the conventional barcode system as shown in the figure.

The problem with such system is that it can scan only a single product at a given time. For example, consider a queue as in figure. Here, if the first person has 20 products in his cart and second person has 15 products but the third person has to buy just a single

item, he will have to wait for much more time than he needs to be taken at the counter due to the people ahead of him.

This wastes a lot of time of the person as well as of the other people behind him and the store authorities.

So, we have come across a far better solution through our project which helps in effective time management during scanning and creating the bill during checkout.

Problem – 2: Pushing a Heavy Trolley



Fig 1.1(b) Pushing a Heavy Trolley

The trolleys of the present time have to be pushed in order to relocate it. What if a person has to buy a lot of items making the trolley much heavier to push?

No wonders, the younger people will be able to move it quite easily. But what about the old people?

So, we have added in our project an easy way of moving even the heaviest of shopping trolleys around. Our project on remote control trolley can be used not only by the young and strong people but it is user friendly for each and every person from toddlers to the elderly!

1.2 OVERVIEW

The shopping trolleys currently being used all over the world are simple carrying basket with wheels as an added facility. These trolleys do not respond in any ways to the user and just serve the purpose of carrying the items to be bought by the person. We, by our project on 'Remote Controlled Smart Shopping Cart', are thinking of ways to make this a more advanced system.

We have in our project added a feature through which the person gets the bill amount of his/her products or items kept in the cart on the cart itself. The product uses a RFID system which is well known for scanning multiple items at a given time.

The RFID reader will be mounted on each cart and as soon as the customer starts keeping items in the cart, the RFID reader starts scanning the tags on each item and displays the total bill amount on the LCD which is attached along with the RFID reader upon the cart. Thus, our Smart Trolley provides a Real Time Response to the people using it.

Another enhancement we have brought into the shopping cart is the Remote controlled movement of the whole cart with variable speed control measurements.

This will be done by using Induction motors along with VFDs or by using Servo motors in the cart.

The cart measures the weight kept inside it and accordingly varies the speed of the cart.

Now, the cart has the technology of remote movement, which means the customer wouldn't even be touching the cart while taking it around inside the mall!

This is done by the use of Accelerometer which moves the cart according to which the user moves his/her hand. A glove with the Remote control system would be provided to the customer.

All these systems combined, make our project "Remote Controlled Smart Shopping Trolley with Automated Billing with the use of RFID", which is a small step towards making a Smarter India!

1.3 AIM & OBJECTIVE

The main aim of our project is to reduce the time spent during the wait in the queue at the billing counter. By using the RFID technology, we are able to scan multiple items at a given time. RFID Reader/Writer is mounted upon the cart which scans Real Time objects placed inside the cart and displays the total amount upon the LCD mounted on the trolley thus reducing the total time taken by any person during checkout.



Fig 1.3(a) Shopping Cart with bill displayed on LCD

The second objective is to help the elderly as well as the handicapped people to move the trolley easily without even needing to push it. We use the encoder decoder and RF module which is placed in the remote and the person can remotely control the cart. This frees the customer of the burden to push heavy trolleys around the shopping mall.



Fig. 1.3(b) Hands free movement for everybody

1.4 LITERATURE REVIEW

Patent 1 – RFID Control System, US10383803

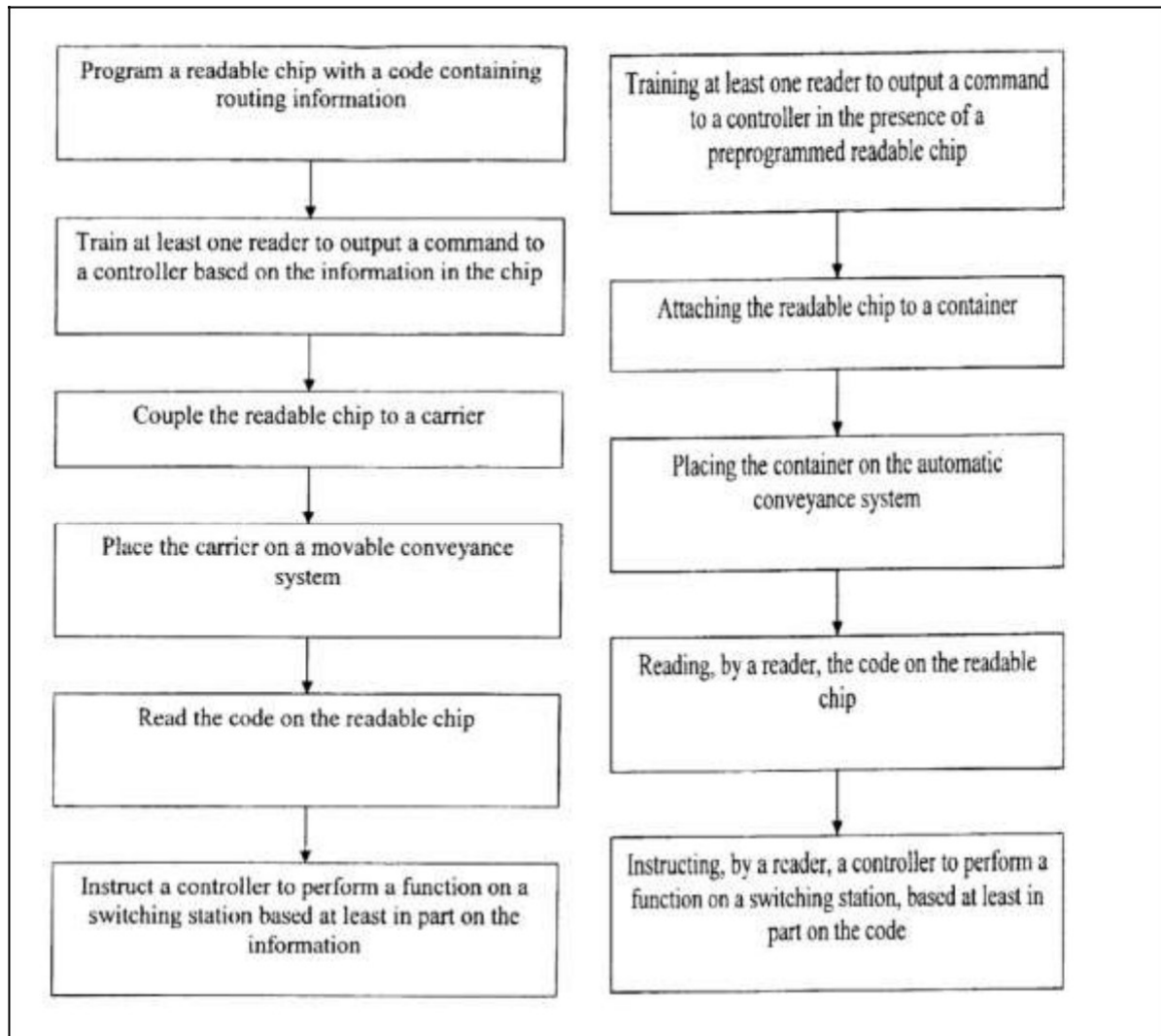


Fig. 1.4(a) RFID Control System

A system and technique for routing a carrier on a movable conveyance system having a multiplicity of shift stations and a minimum of one carrier.

Every carrier has Associate in nursing electronic decipherable tag coupled to that, and every tag includes a specific symbol that may be scan.

A scanner is designed to read the electronic decipherable tag and to speak the tag's symbol to a controller.

The controller, in turn, is designed to regulate a minimum of one shift station of the movable conveyance system based mostly a minimum of partially on the symbol.

Patent 2 – Shopping Trolley Management System, WO2006053381A1

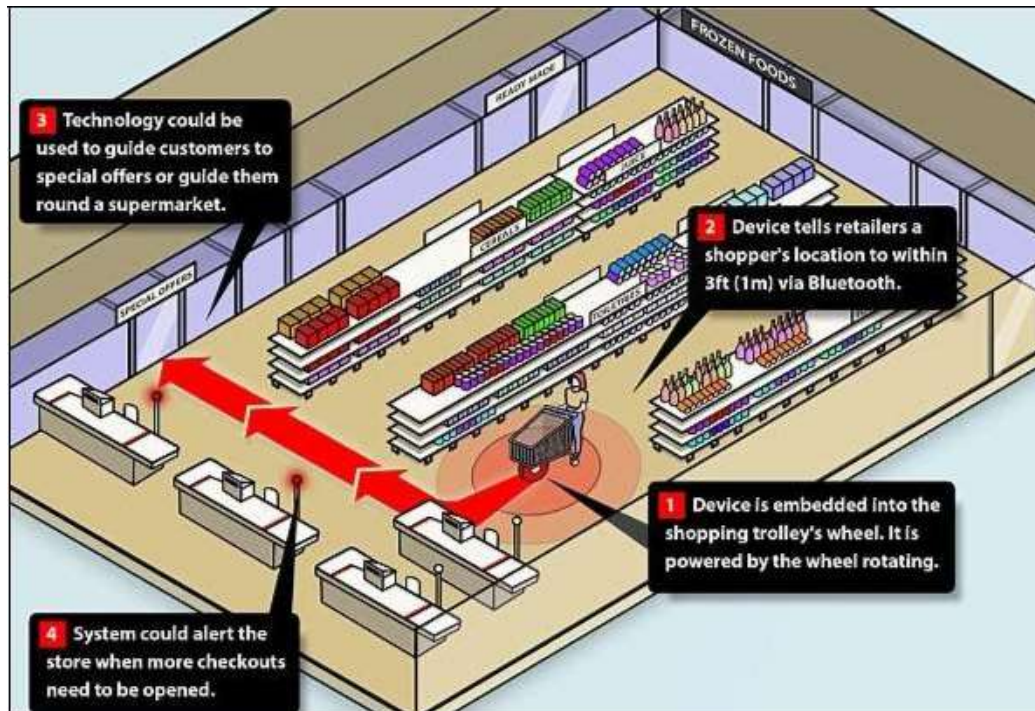


Fig. 1.4(b) Shopping trolley management system

The current creation relates to a shopping trolley management scheme of the kind that would naturally be used in relationship with a supermarket shopping complex.

A searching streetcar management system includes a plurality of searching trolleys, every streetcar being fitted with a streetcar lockup member. The searching streetcars area unit of typical style comprising a basket mounted on a wheeled trolley frame.

The streetcar lockup member engages with a wheel lockup rail once the streetcar is came back to a storage bay of the system, to forestall unauthorized removal of the streetcar. The streetcars area unit ideally fitted with associate RFID tag for distinguishing the streetcar as associate authorized trolley.

Associate electronically discharged latching mechanism is meant to act with a streetcar wheel to forestall removal of the streetcar unless payment of a delegated cost is formed.

A card management unit receives payment of a delegated cost from a worth card once a consumer desires to get rid of a streetcar from the streetcar storage bay, associated credits the selected cost to the worth card once an authorized streetcar is came back.

Patent 3 – Shopping cart that enables self-checkout, US 09/738,491

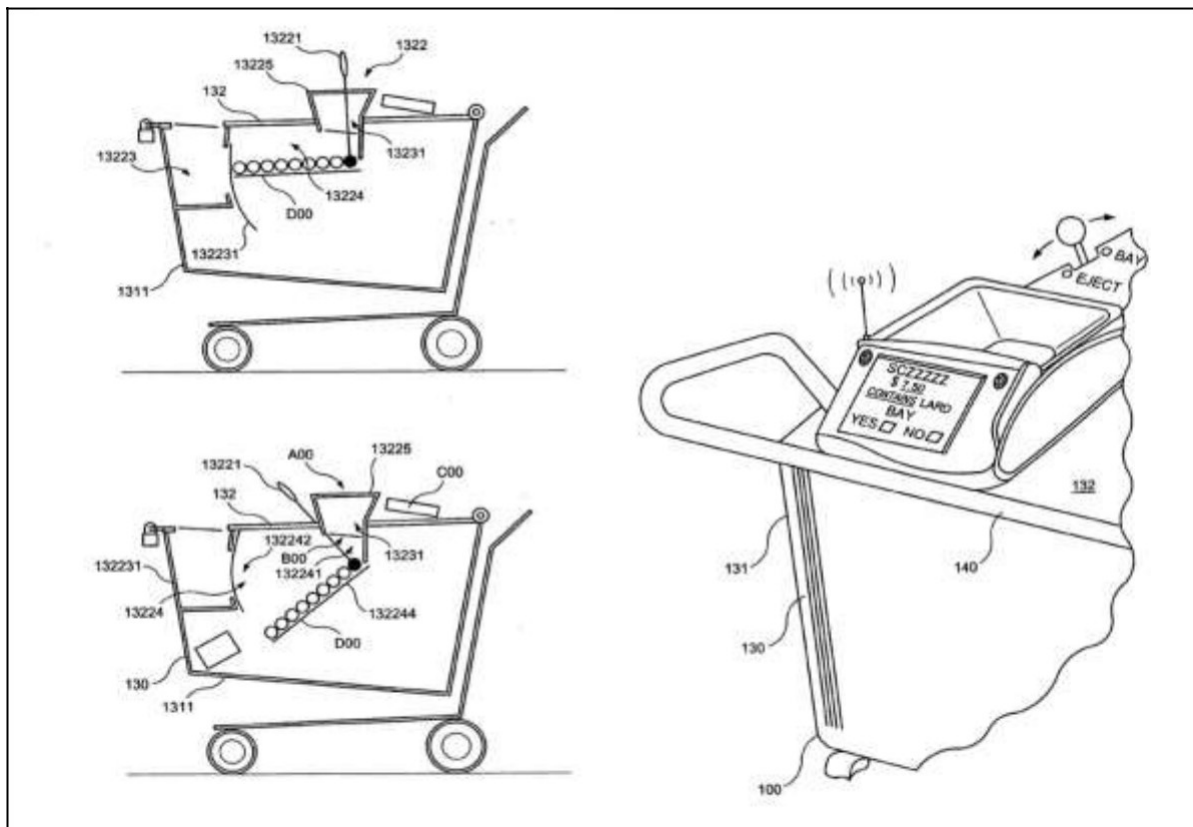


Fig. 1.4(c) Shopping cart that enables self checkout

The shopping basket rejects non-filtered products and acknowledges or rejects examined merchandise as coordinated by the customer. In another encapsulation, the shopping basket incorporates a web-empowered PC with show. The PC shows item particular data.

The shopping basket PC may segregate from the truck—with or without its frill. The customer can utilize the same PC at home to peruse the web, to plan for the shopping excursion, to do different exchanges.

The customer places merchandise in an info receptacle of the shopping basket. One or

more scanners joined to the info receptacle check the item for character.

The PC recovers item particular data and showcases this data on its show. On the effective examining of an item and a show of the item's data, the customer can acknowledge or dismiss the item.

CHAPTER 2

ANALYSIS, DESIGN METHODOLOGY AND IMPLEMENTATION STRATEGY

2.1 AEIOU SUMMARY CANVAS

2.2 IDEATION CANVAS

2.3 PRODUCT DEVELOPMENT CANVAS

2.4 EMPATHY SUMMARY CANVAS

2.1 AEIOU SUMMARY CANVA

AEIOU Summary:		Group ID:	Date:	Version:
Domain Name:				
Environment: <ul style="list-style-type: none"> - General impressions / observations (Style, material & atmosphere) - Floor plan - Elements, features and special notes - Scenes 	Interactions: <ul style="list-style-type: none"> - General impressions / observations (Who is interacting with whom, what?) - Scene of interaction (How it is being done) - Elements, features and special notes 	Objects: <ul style="list-style-type: none"> - General impressions / observations (What components are involved? How?) - Inventory of key objects - Elements, features and special notes 		
Activities: <ul style="list-style-type: none"> - General impressions / observations - Sketch/photo Summary of activity - Elements, features and special notes 	Users: <ul style="list-style-type: none"> - General impressions / observations (Who is present? Role and responsibilities) - Scene of user in context - Elements, features and special notes 			

Fig. 2.1(a) AEIOU Summary Canvas

ACTIVITIES: This section consists of the various activities which are achieved by our project such as Automatic Billing, Virtual Money Transaction, Immunity to

Theft, Radio Frequency Identification, Crowd and Time Management and Remote-Controlled Movement.

ENVIRONMENT: This section consists of the various impacts our project will be having on the environment. As it is an electronics project it is completely environment friendly. Even then, some of the factors which we discuss are that our project would be using radio and micro waves to transmit and receive data.

INTERACTIONS: This section focuses on the interactions between human and machine. So, we, in this project, will be using Graphical User Interface, Human Machine Interface and Wireless Interface between two devices.

OBJECTS: This section comprises of the inventory of key objects, which components are involved and how. Thus, main components in our project include RF module, Arduino, RFID Reader/Writer and Accelerometer.

USERS: This section describes the people who would be using our project and who would be benefitted from it. So, the users of Smart Shopping Trolley would be of course the customers of the malls and supermarket stores, the employees of those stores and benefactors will be the Engineers, Mall Owners, etc.

2.2 IDEATION CANVAS

The Ideation Canvas is all about discussing the various ideas related to the project.

PEOPLE: It consists of the people related to the project i.e., for which people the project is for, who would be benefitted by it, who will be its users, etc. Some of the types of people we have added are Store and Mall Owners, Engineers, Investors, Proprietors, IT Industry, Automation Companies, etc.

ACTIVITIES: This section is probably similar to the Activity section in previous canvas. The activities undertaken by our project are Automatic and Faster Billing and Checkout Process, Remote Control or Hands-free movement, Virtual Money Transaction, Time and Crowd Management, etc.

SITUATION/CONTEXT/LOCATION: It consists of the various situations where our product would be helpful, and which locations are preferred for it. So, when there is a need of faster checkout and easier crowd management system, Smart Shopping Cart would be of great use. It can only be used at specific locations such as malls, supermarkets, shopping stores, etc.

PROPS/POSSIBLE SOLUTIONS: This section includes the various props used in the project for betterment and enhancement of the current conventional system. Props include RFID Reader/Writer, RFID tags, Counters, Servo Motors, Arduino, Encoder/Decoder, LCD, Accelerometer, etc.

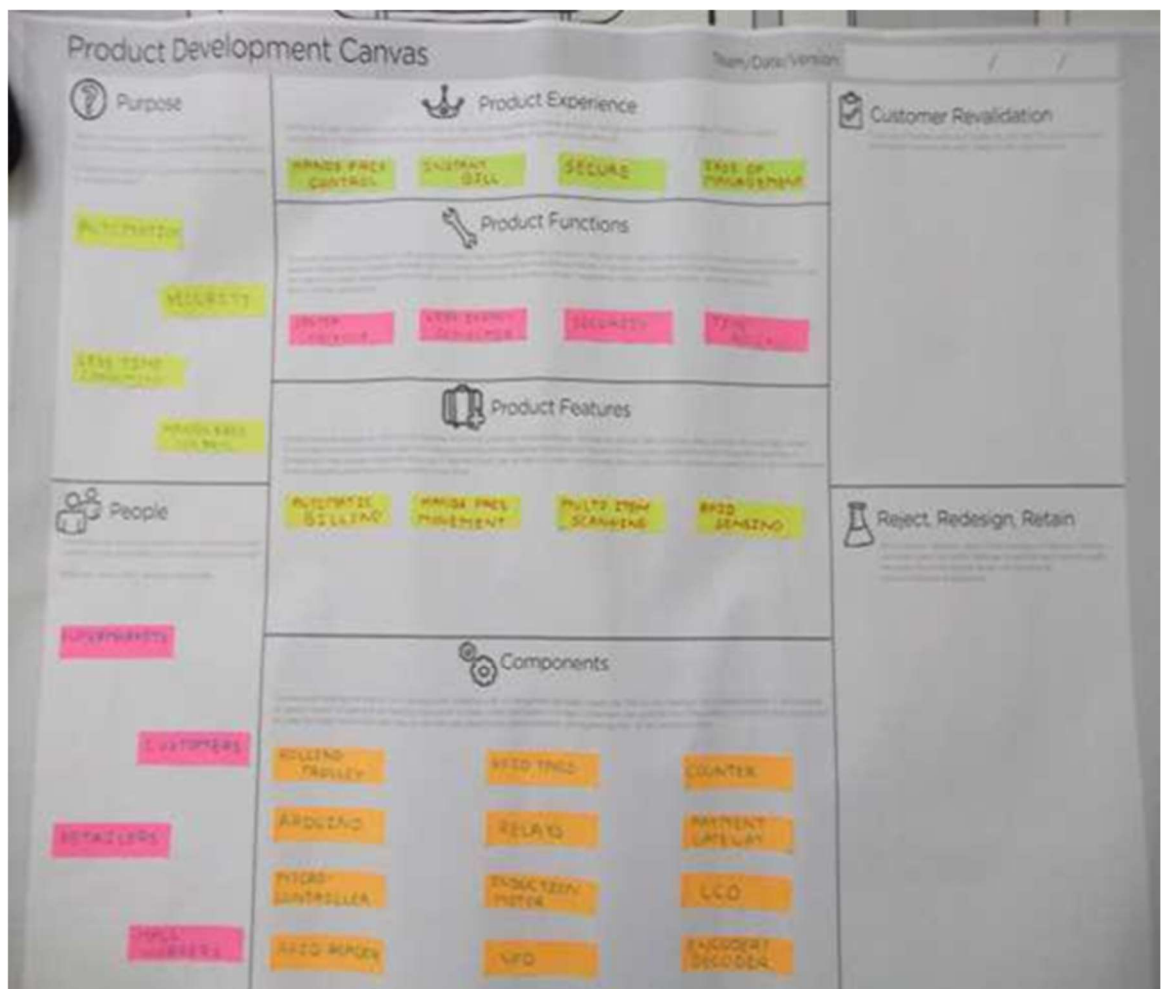


Fig. 2.2(a) Ideation Canvas

2.3 PRODUCT DEVELOPMENT CANVAS

Product Development Canvas explains the reason and the steps taken for development of the product which will result in the betterment of mankind.

This canvas consists of the purpose behind the project; the people affected due to it, about how was the product's experience to the people, product's functions and its features and lastly describe the components dealt with. It also lets the customers of this product to revalidate their experiences and give us an honest review.

Our **Purpose** behind this project is solely to reduce the time spent in the queue and for helping the elderly and the handicapped to move freely inside the mall without needing anyone's help.

The Product's **Functions** and **Features** include Faster Checkout, Automatic Billing, Multi Item Scanning, Negligible Time Consumption and Hands-Free Movement.

Customer Revalidation and the section of **Reject/Redesign/Retain** haven't been done yet, as the project is still on its way to reality.



Fig. 2.3(a) Product Development Canvas

2.4 EMPATHY SUMMARY CANVAS

Empathy Canvas deals with the helpfulness of this project to each and every class of man. It deals with Users and Stakeholders of the product, Activities related to the product, and contains Happy and Sad short stories of public experiences.

The shopping trolleys currently being used all over the world are simple carrying basket with wheels as an added facility. These trolleys do not respond in any ways to the user and just serve the purpose of carrying the items to be bought by the person.

We, by our project on ‘Remote Controlled Smart Shopping Cart’, are thinking of ways to make this a more advanced system.

The following incident demonstrates the need for this task:

HAPPY STORY

There is a man named Rajesh Kumar. He always reached his office on time. One day, he had to buy some stuff for his office. He went to a supermarket and started taking the items in his shopping cart. He saw the time and it was already nearing his office hours. Now, if the billing counter took too much time in billing, he would definitely get late for his office. But thanks to the ‘Smart Shopping Trolley’ they had in their supermarket, the billing process took less than a minute. Also, there was no need of standing and waiting in a queue too. Mr. Rajesh was happy as he reached his office on time once more!

SAD STORY

Mrs. Sameera Rai had a little daughter aged 5 years. Her school started sharply at 11:00 p.m and Sameera made sure her daughter always reaches school on time. One day Sameera got late in making lunch for her daughter, so she decided to buy some snacks from a store on the way to school. She stopped before a store but there were so many people waiting in the queue at the billing counter, as the billing procedure was slow and lengthy. So, sadly, Mrs. Sameera was forced to send her daughter to school without a lunch box.

SCIET

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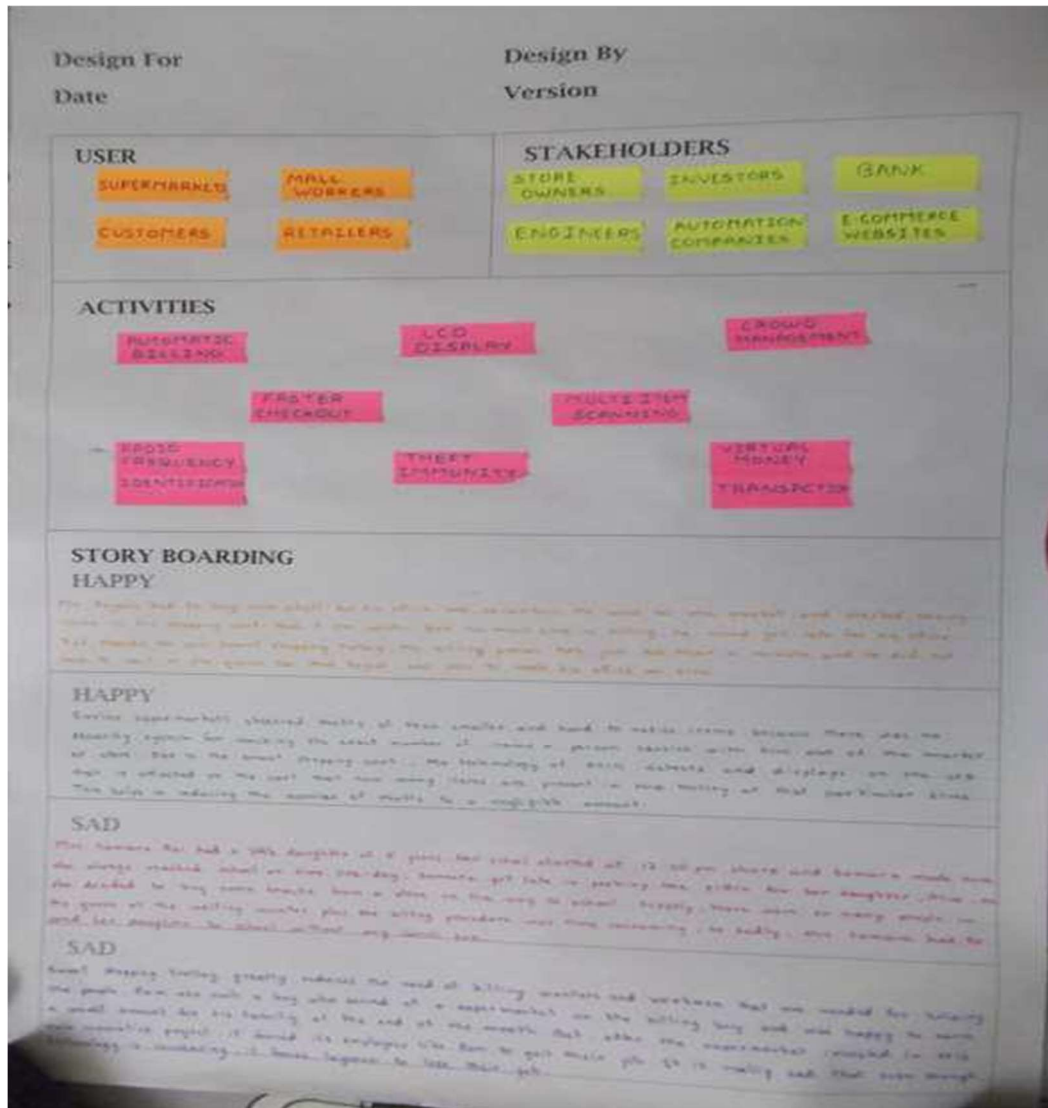


Fig. 2.4(a) Empathy Summary Canvas

2.5 BUSINESS MODEL CANVAS

The Business Model Canvas is a strategic management and lean startup template for developing new or documenting existing business models. It is a visual chart with elements describing firms or product's value proposition, infrastructure, customers, and finances.

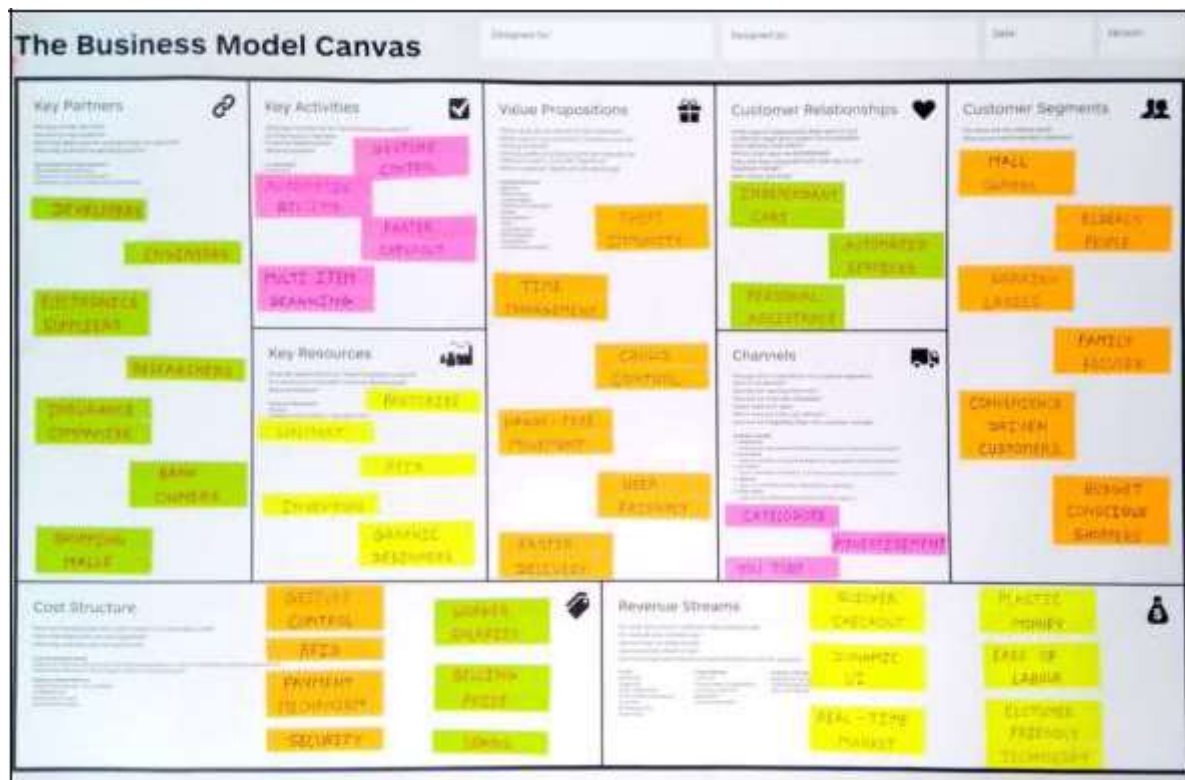


Fig. 2.5(a) Business Model Canvas

KEY PARTNERS: In order to optimize operations and reduce risks of a business model, organization usually cultivate buyer-supplier relationships so they can focus on their core activity. The Developers, Engineers, Researchers will be a helping hand in the initial part of the project while the Mall Owners and Banks will be the epitome of creating the smart project into a distant reality.

KEY ACTIVITIES: The trolley is basically controlled by remote controller. So, it can be operated by the user even without touching it. The bill of purchased items is

calculated automatically by using RFID module. A product allows us to check out faster as it eliminates standing in long queues for the billing process.

KEY RESOURCES: The resources those are necessary to create value for the customer. Key resources for smart shopping trolley would include Factories, Wal-Mart, RFID, Inventors, and Graphic designers.

VALUE PROPOSITIONS: The collection of products and services a business offers to meet the needs of its customers. If someone does not scan the product through RFID module and tries to take it out of the mall without scanning, the Ultra-High-Frequency RFID module attached to the door at the exit turns the alarm ON.

CUSTOMER RELATIONSHIPS: To ensure the survival and success of any businesses, companies must identify the type of relationship they want to create with their customer segments. Various forms of customer relationships include - Personal Assistance, Dedicated Personal Assistance, Self Service, Automated Services, Communities, Co-creation.

CHANNELS: A company can deliver its value proposition to its targeted customers through different channels. Channels to reach customer include Blogs, Facebook, Google Ad Sense, YouTube Channel, Television Ads and Catalogs.

CUSTOMER SEGMENTS: To build an effective business model, a company must identify which customers it tries to serve. The different types of customer segments include: Mass Market, Niche Market, Segmented, Diversify, Multi-Sided Platform / Market.

COST STRUCTURE: This describes the most important monetary consequences while operating under different business models. In our project, the Fixed Costs are the RF remote control, RFID, Payment Mechanism, Marketing cost, Security while the Variable Costs include R&D Cost, Employee Salaries and Loans.

REVENUE STREAMS: The way a company makes income from each customer segment. Several ways to generate a revenue stream: Asset Sale, Usage Fee, Subscription Fees, Lending/Leasing/Renting, Licensing, Brokerage Fees, Advertising.

CHAPTER 3

IMPLEMENTATION

3.1 DESIGN OF PROPOSED SOLUTION

3.2 COMPONENTS

3.3 CODING

3.4 AUTOMATIC BILLING RFID

3.5 COST ANALYSIS

3.1 DESIGN OF PROPOSED SOLUTION

To expand a not expensive, sharp looking, make easy, that assists the client to position and choose device/s and tell them on the item for consumptions details with dynamism as they move within the looking field. Additionally, with each product recognized completely and follow of central server, hold request and record update.

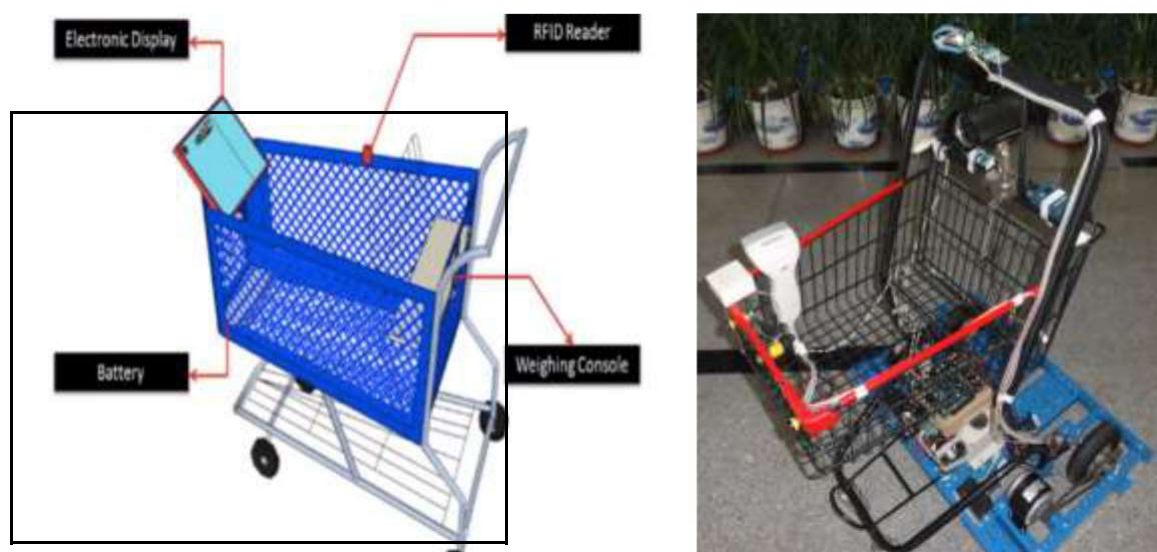


Fig. 3.1(a) Design of Solution

Design Description

While a user collects an item for consumption from the shopping mall and puts it into the trolley, the code written within the frequency Identification antenna (RFID) tag strikes to the merchandise is while not human intervention browses by the RFID reader put in within the trolley.

The RFID code is then checked with the catalogue system for the equivalent product.

Then the merchandise is further to the bill for the customer. With every dive of the merchandise into the trolley the reader reads the RFID code from the merchandise to the bill for the customer.

One time the RFID report the code, the liquid visual {display unit computer screen video display} permanent on the trolley display the value and amount of each product.

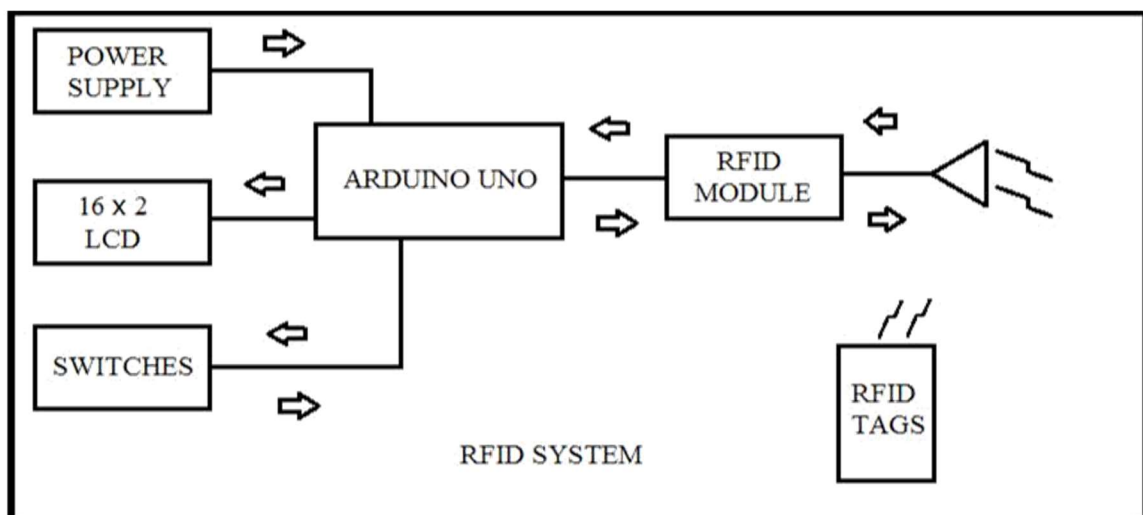


Fig 3.1(b) Block Diagram of Automatic Billing System

The client has the choice of keeping back the merchandise and therefore the system would deduct the merchandise from the bill.

After getting, the client will provide a final enter command to the asking system, the ultimate bill together with the value is written. The client will use his revolving credit to buy the merchandise by swiping it through the revolving credit reader put in inside the asking system.

3.2 COMPONENTS

RFID Tags 125 kHz



Fig. 3.2(a) RFID tags

Radio-frequency identification (RFID) could be a technology to record the presence of associate object victimisation radio signals. It's used for internal control or temporal arrangement sporting events.

RFID isn't a replacement for the bar-coding, however a complement for distant reading of codes. The technology is employed for mechanically characteristic an individual, a package or associate item.

To do that, it depends on RFID tags. These area unit little transponders (combined radio receiver and transmitter) which will transmit identity info over a brief distance, when asked.

Most RFID tags contain a minimum of 2 components. One is associate microcircuit for storing and process info, modulating and de-modulating a radio-frequency (RF) signal, and alternative specialized functions. The second is associate antenna for receiving and transmission the signal.

There are usually 2 kinds of RFID tags: active RFID tags, that contain battery, and passive RFID tags, that don't have any battery.

Micro-controller ATmega32

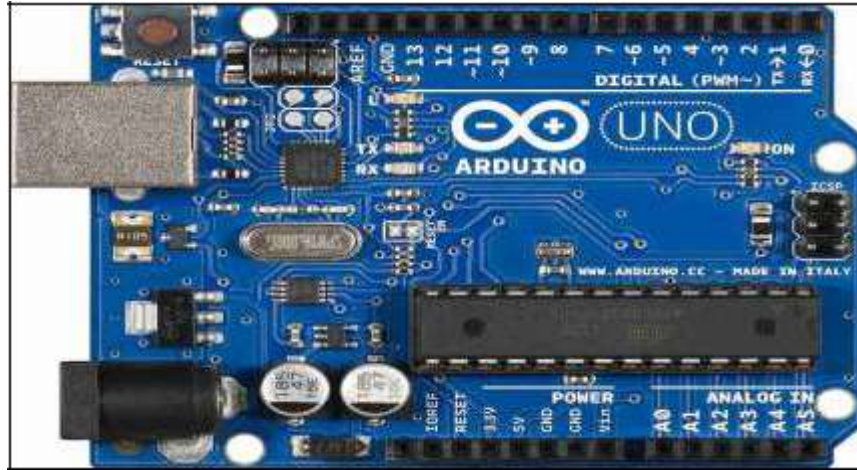


Fig. 3.2(b) Arduino

Arduino is associated with ASCII text file projects that created microcontroller-based kits for building digital devices and interactive objects that may sense and manage physical devices.

The project is predicated on microcontroller board styles, created by many vendors, victimization varied microcontrollers.

These systems give sets of digital and analog input/output (I/O) pins that may interface to numerous enlargement boards (termed shields) and different circuits.

The boards feature serial communication interfaces, as well as Universal Serial Bus (USB) on some models, for loading programs from personal computers.

For programming the microcontrollers, the Arduino project provides associated integrated development surroundings (IDE) supported an artificial language named process, that conjointly supports the languages C and C++.

RFID Reader/Writer EM-18

An RF module (radio frequency module) may be a (usually) little device wont to transmit and/or receive radio signals between 2 devices.

An RFID module essentially consists of 2 elements, namely, a tag (RFID card) and a reader. A typical RFID system consists of associated degree antenna, a transceiver and a electrical device (RF tag).

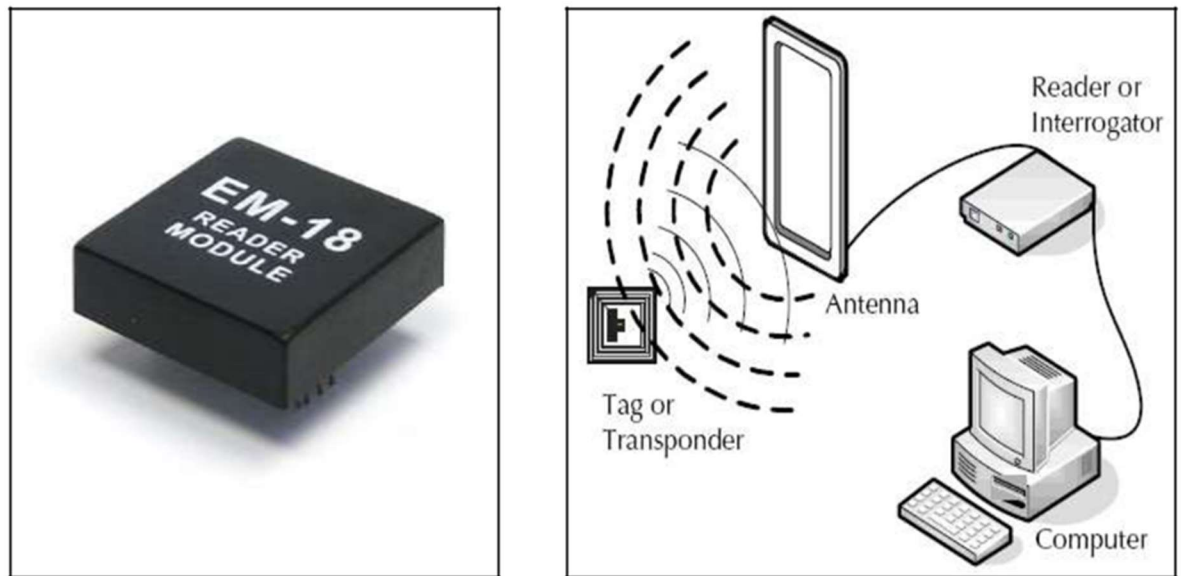


Fig. 3.2(c) RFID Reader

The frequency is scan by the transceiver and also the info is transferred to a tool for any process. the knowledge (the distinctive serial number) to be transmitted is hold on within the RF tag or electrical device.

The electrical device contains a chip associate degreed an antenna mounted on a substrate. The chip transmits the relevant info through antenna.

The antenna additionally receives the magnetic force waves sent by the RFID reader.

The RFID tags consists of a loop antenna and a chip which stores the data of the product it is attached to.

When brought near the reader, it transmits data taking power from the reader.

Max Range of EM-18 RFID reader/writer module is 10 cm with a voltage of 12V.

RFID Reader with a range of more than 1m is currently in development; after which this technology would be grateful in providing security too

Liquid Crystal Display (LCD) 16x2

A liquid-crystal show (LCD) may be a flat-panel show or different electronic visual show that uses the light- modulating properties of liquid crystals.

Liquid crystals don't emit light directly.

Liquid crystal displays area unit usually employed in powered devices, like digital watches, as a result of they use little electricity. They're conjointly used for flat screen TV's.



Fig. 3.2(d) LCD

LCDs work well by themselves once there's different light around (like in a much lit area, or outside in daylight). For smart phones, pc monitor, TV's and a few different functions, a back-light is constructed into the merchandise.

In our project the LCD will be used for displaying the scanned product's price.

Other details which are available in the RFID tags can also be displayed on it.

In the near future, touch screen LCDs would be used which will also be showing locations of specific products in the shopping mall.

DC Motor

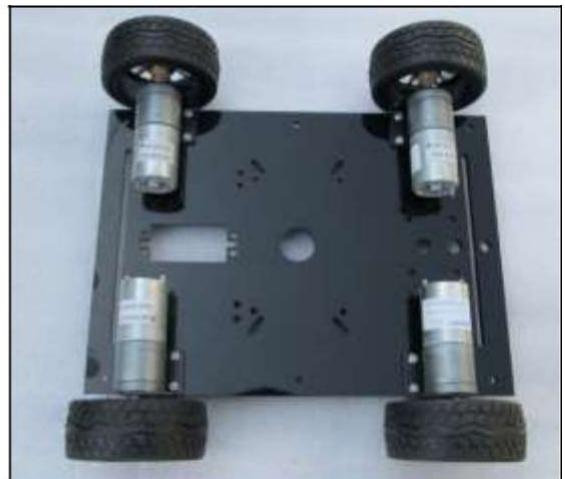


Fig. 3.2(e) DC Motor

A brushed DC motor is Associate in nursing internally commutated motor designed to be run from an instantaneous current power supply. Brushed motors were the primary commercially necessary application of electrical power to riving energy, and DC distribution systems were used for over a hundred years to control motors in industrial and industrial buildings.

Brushed DC motors may be varied in speed by dynamic them in operation voltage or the strength of the force field. reckoning on the connections of the sector to the facility provide, the speed and torsion characteristics of a brushed motor may be altered to supply steady speed or speed reciprocally proportional to the mechanical load.

Brushed motors still are used for electrical propulsion, cranes, paper machines and steel rolling mills. Since the brushes alter and need replacement, brushless DC motors victimization power electronic devices have displaced brushed motors from several applications.

Encoder HT12E & Decoder HT12D

The HT12E Encoder ICs are specially designed for Remote Control applications.

Using associate degree measuring system and a transmitter circuit tied with a jeweller variety of module or a pocket device to client.

The encoded data is transmitted through antennas and decoder decodes it to provide its specific output

Each address/data input is externally programmable.

The HT12E Encoder ICs are series of CMOS LSIs for Remote Control system applications. They are capable of Encoding 12 bit of information which consists of N address bits and 12-N data bits. Each address/data input is externally programmable if bonded out.

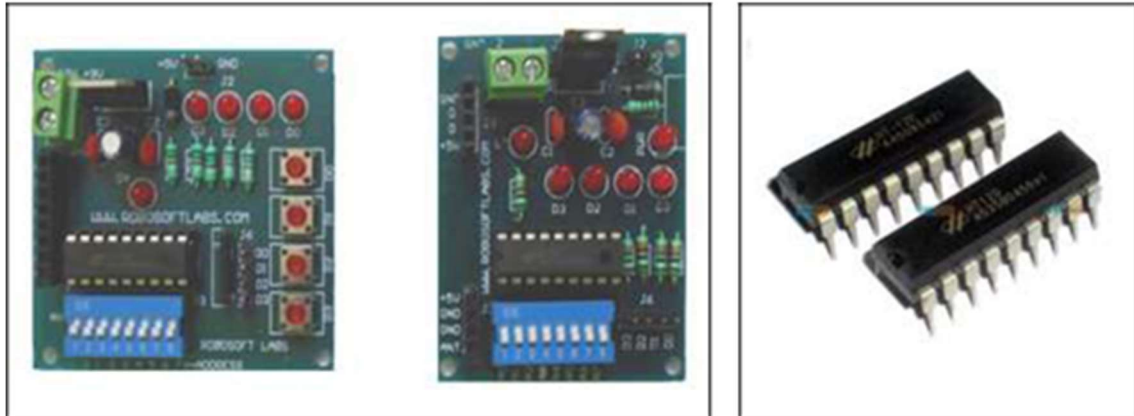


Fig. 3.2(f) Encoder and Decoder

The HT 12D ICs are series of CMOS LSIs for remote control system applications. These ICs are paired with each other. For proper operation a pair of encoder/decoder with the same number of address and data format should be selected. The Decoder receive the serial address and data from its corresponding decoder, transmitted by a carrier using an RF transmission medium and gives output to the output pins after processing the data.

Compatible with RF Modules 433 MHz Link : RF Modules (Tx + Rx Pair) 433 MHz

433 MHz RF Module (Tx & Rx)

Radio frequency (RF) is any of the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300GHz, which include those frequencies used for communications or radar signals.

RF usually refers to electrical rather than mechanical oscillations. However, mechanical RF systems do exist (see mechanical filter and RF MEMS).

Although radio frequency is a rate of oscillation, the term "radio frequency" or its abbreviation "RF" is used as a synonym for radio – i.e., to describe the use of wireless communication, as opposed to communication via electric wires.

This component plays a major role in transmitting the data from the encoder to the decoder. The transmitter and receiver work at a frequency of 433 MHz and provide a max range of almost 3 meters unambiguously.

In our project there are 4 switches whose data is encoded and sent through this equipment. The receiver sends the encoded data to the decoder which successfully interprets the actual data and sends further the data to the motor driver through the microcontroller.

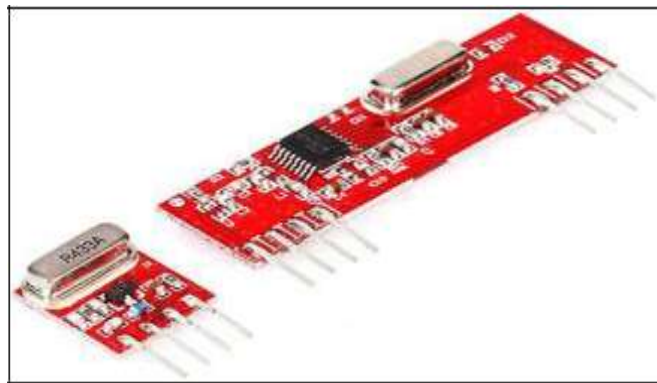


Fig. 3.2(g) 433 MHz RF Modules

Motor Driver L293D

It is the main component responsible for driving the 12V DC motors. L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction.

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its direction for being able to rotate the motor in clockwise or anticlockwise direction, hence H-bridge IC are ideal for driving a DC motor.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors.

There are two Enable pins on L293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction.

The Arduino after receiving the decoded data sends signal to this IC which provides voltage to the two 12V DC motors accordingly.

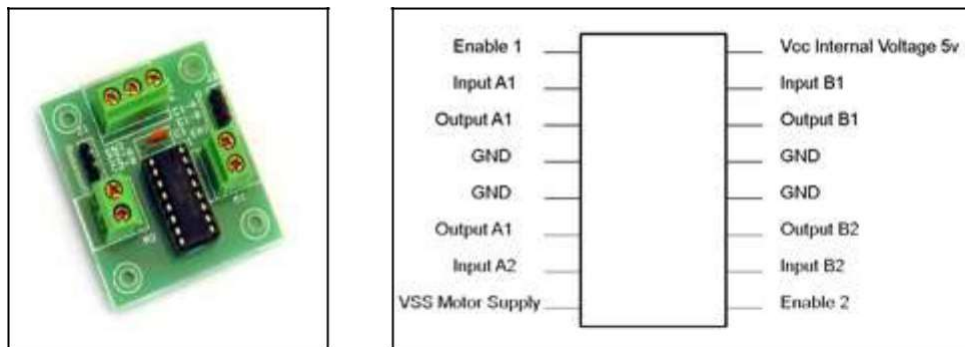


Fig. 3.2(h) Motor Driver

Hex Keypad

A keypad is a set of buttons arranged in a block or "pad" which bear digits, symbols or alphabetical letters. Pads mostly containing numbers are called a numeric keypad. Numeric keypads are found on alphanumeric keyboards and on other devices which require mainly numeric input such as calculators, push-button telephones, vending machines, ATMs, Point of Sale devices, combination locks, and digital door locks.

We all know keypad is one of the most important input devices used in electronics engineering. Keypad is the easiest and the cheapest way to give commands or instructions to an electronic system. Whenever a key is pressed in keypad module the Arduino Uno detects it and shows the corresponding key on 16x2 LCD.

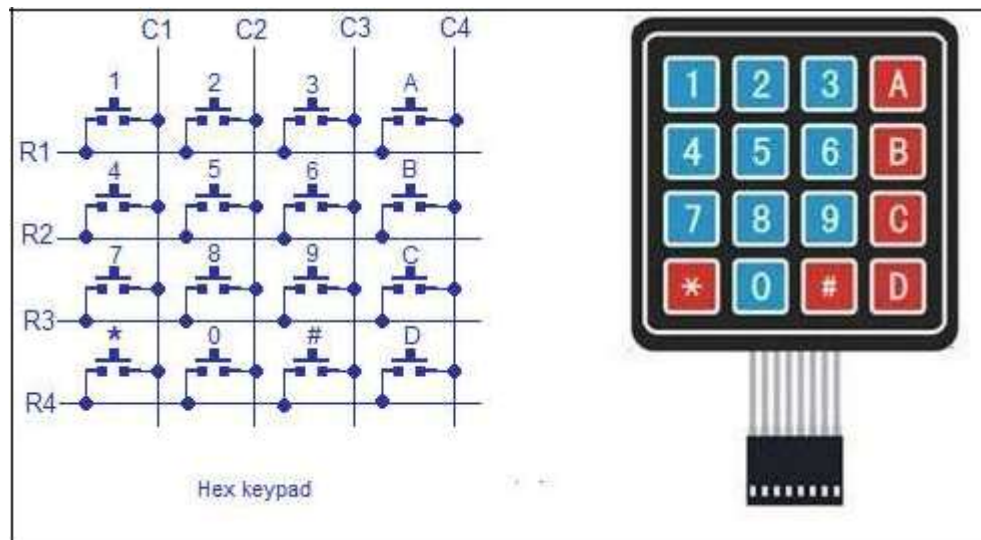


Fig. 3.2(i) Hex Keypad

Matrix keypad use a combination of four rows and four columns to provide button states to the host device, typically a microcontroller. Underneath each key is a push button, with one end connected to one row, and the other end connected to one column. This 16-button keypad provides a useful human interface component for microcontroller projects. Convenient adhesive backing provides a simple way to mount the keypad in a variety of applications.

3.3 CODING

RFID Module Interfacing with Arduino

Input

```

SmartTrolley_RFID
void setup()
{
  lcd.begin(16, 2);
  mySerial.begin(9600);
  Serial.begin(9600);
  lcd.setCursor(0,0);
  lcd.print("Welcome to the");
  lcd.setCursor(0,1);
  lcd.print("Future Store!");
}

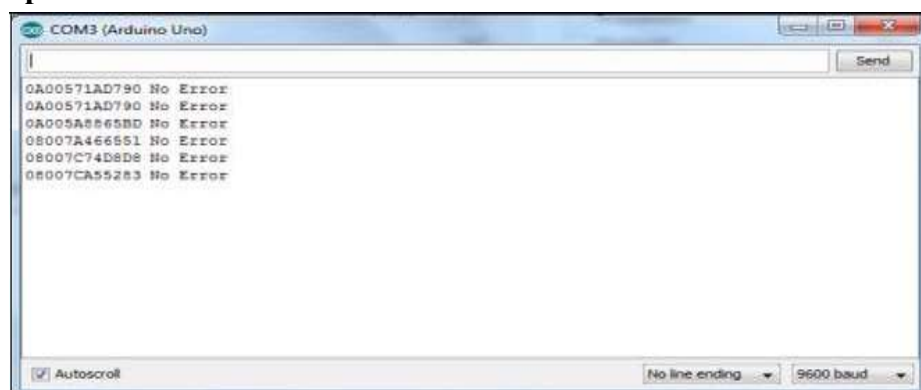
void loop()
{
  RecieveData();
  StoreData();
  PrintData();

  //1st item
  if (compare(data_store, data1, 12, 12) == true)
  {
    al=al+1;
    if (al==1)
    {
      rs1=10;
      Serial.println("10 Rs");
      lcd.clear();
      lcd.setCursor(0,0);
      lcd.print("Balaaji Chat Chaska");
      lcd.setCursor(0,1);
      lcd.print("Rs. 10");
    }

    else
    {
      rs1=0;
      Serial.println("Removed");
      lcd.clear();
      lcd.setCursor(0,0);
      lcd.print("Balaaji Chat Chaska");
      lcd.setCursor(0,1);
      lcd.print("Removed!");
    }
  }
}

```

Output



```

COM3 (Arduino Uno)
0A00571AD790 No Error
0A00571AD790 No Error
0A005A8865BD No Error
08007A466551 No Error
08007C74D8D8 No Error
08007CA55283 No Error

```

Fig. 3.3(a) RFID Interfacing with Arduino

LCD Interfacing with Arduino

- Input

```
LCD
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // sets the interfacing pins

void setup()
{
  lcd.begin(20, 4); // initializes the 20x4 LCD
}

void loop()
{
  lcd.setCursor(0,0);          //sets the cursor at line 0 column 0
  lcd.print("20x4 LCD MODULE"); // prints characters - 20x4 LCD MODULE
  lcd.setCursor(5,3);          //sets the cursor at line 3 column 5
  lcd.print("HELLO WORLD");    // prints HELLO WORLD
}
```

- Output



Fig. 3.3(b) LCD Interfacing with Arduino

Final Coding of the Automatic Billing System on Arduino

```

#include<SoftwareSerial.h>
#include<Wire.h>
#include <LiquidCrystal.h>

SoftwareSerial mySerial (9, 10);

int read_count = 0;
int i=0, j=0;
float rs1=0, rs2=0, total;
int a1=0, a2=0;
char data_temp,
RFID_data[12], data_store[12];
boolean disp_control;
char data1[13] =
{"11004DD7EF64"};
char data2[13] =
{"11004DCA3DAB"};
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup()
{
  lcd.begin(16, 2);
  mySerial.begin(9600);
  Serial.begin(9600);
  lcd.setCursor(0,0);
  lcd.print("Welcome to
the"); lcd.setCursor(0,1);
  lcd.print("Future Store!");
}

void loop()
{
  RecieveData();
  StoreData();
  PrintData();

  //1st item
  if (compare(data_store, data1, 12, 12)
== true)
  {
    a1=a1^1;
    if (a1==1)
    {
      rs1=10; Serial.println("10 Rs");
      lcd.clear(); lcd.setCursor(0,0);
      lcd.print("Balaji Chat
Chaska"); lcd.setCursor(0,1);
      lcd.print("Rs. 10");
    }
  }
  else
  {
    rs1=0;
    Serial.println("Removed");
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Balaji Chat
Chaska"); lcd.setCursor(0,1);
    lcd.print("Removed!");
  }
}
}

```

```

//2nd item
else if (compare(data_store,
data2, 12, 12) == true)
{
a2=a2^1;
if (a2==1)
{
rs2=111.10;
Serial.println("111 Rs");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Subway");
lcd.setCursor(0,1);
lcd.print("Rs. 111.10");
}

else
{
rs2=0;
Serial.println("Removed");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Subway");
lcd.setCursor(0,1);
lcd.print("Removed!");
}
}
if (digitalRead(13)==0)
{
total = rs1+rs2+rs3+rs4+rs5+rs6;
Serial.println("Printing Total");
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Total Bill");

```

```

lcd.setCursor(0,1);
lcd.print(total);
}
data_store[1]=0;
}

//FUNCTIONS:
void RecieveData()
{
if (mySerial.available() > 0)
{
data_temp = mySerial.read();
RFID_data[read_count] =
data_temp; read_count++;
}
}

void StoreData()
{
if (read_count == 12)
{
disp_control = true;

for (j = 0; j < 12; j++)
{
data_store[j] = RFID_data[j];
}

read_count = 0;
}
}

void PrintData()
{

```

```
if (disp_control == true)
{
    for (j = 0; j < 12; j++)
    {
        Serial.write (data_store[j]);
    }
    Serial.println ("");
}
disp_control = false;
}
```

```
boolean compare (char *a, char *b,
int len_a, int len_b)
```

```
{
    int n;

    if (len_a != len_b)
        return false;

    for (n = 0; n < len_a; n++)
    {
        if (a[n] != b[n])
            return false;
    }
    return true;
}
```

3.4 AUTOMATIC BILLING RFID

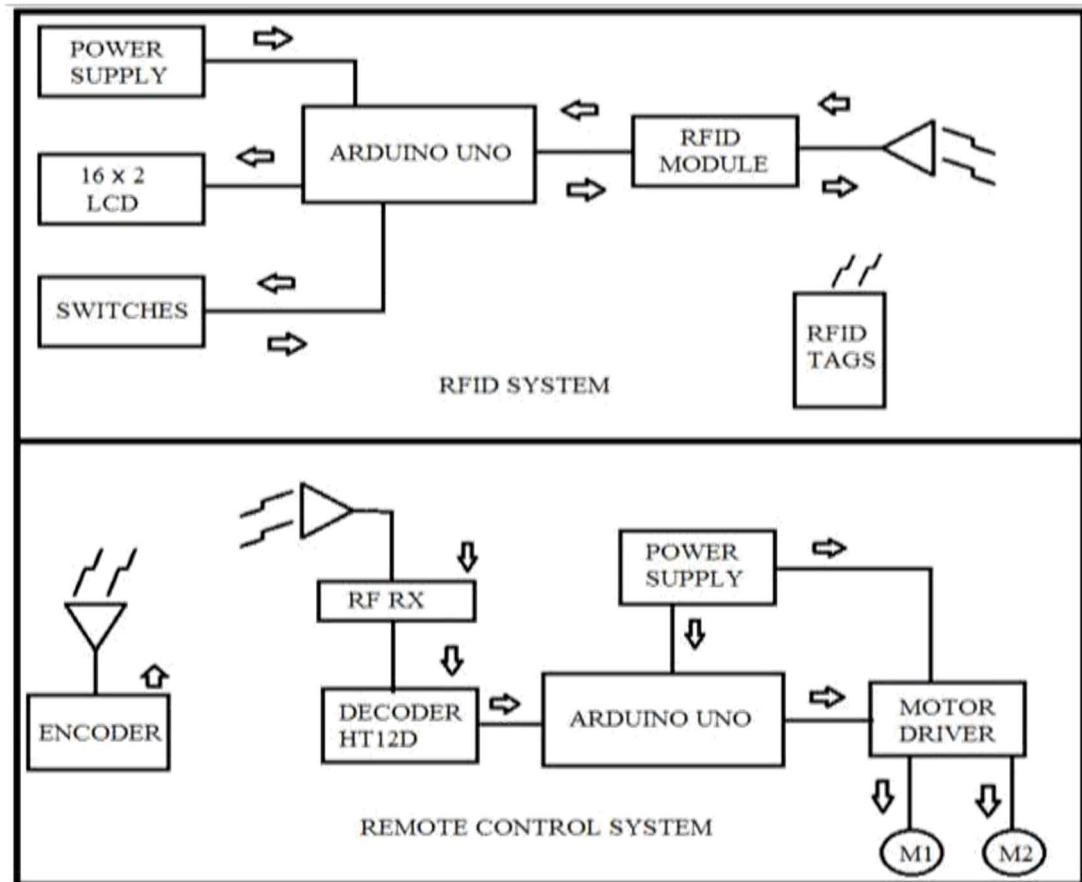


Fig. 3.4(a) Block Diagram of Smart Shopping Trolley

The automatic asking system can calculate the overall bill by reading the RFID tags connected to the merchandise place within the cart and can send total worth to the show. Additionally the cart is connected through UART to the printer to get text of the bill.

RFID is that the special sort wireless card that has intrinsically the embedded chip beside loop antenna. The intrinsically embedded chip represents the twelve-digit card variety. This magnetic signal is transmitted by the loop antenna connected beside this circuit that is employed to browse the RFID card variety.

RFID reader is interfaced with the microcontroller. RFID reader works on Weygand protocol and transmits the wireless signal at a hundred twenty-five kHz. RFID reader has 2 information lines i.e. DATA0 and DATA1. Each the lines area unit active low and is connected at the external interrupt pins (INT0, INT1) of the microcontroller.

Logic one is transmitted on DATA1 line and logic zero is transmitted on DATA0 line.

Interfaced RFID reader unceasingly transmits the magnetic attraction field across it.

When the RFID tag/card comes at intervals this range; the RFID card gets supercharged up and provides their twenty six bit ID knowledge to the RFID reader.

Here every product has the individual RFID card that represents the merchandise name. Here the microcontroller is already programmed with card variety and interfaced with four switches.

When person puts any item within the tram its code are detected and therefore the value of that item are hold on in memory. If user needs to delete any product from the tram, then he simply got to get rid of that product from the tram.

3.5 COST ANALYSIS

Component	Approximate Cost (INR)
RFID Reader Module	850
RFID Tags x 6	150
DC Motor x 2	600
LCD Display	150
Encoder Decoder	650
Arduino Uno x 2	1200
Wheels x 4	200
Motor Driver	150
12V DC Battery	400
Connecting Wires x 50	250
TOTAL	4600

CHAPTER 4

SUMMARY

4.1 COMPARISON WITH CONVENTIONAL METHOD

4.2 EXPECTED OUTCOME

4.3 CONCLUSION

4.4 SCOPE OF FUTURE WORK

4.1 COMPARISON WITH CONVENTIONAL

Sr. No.	Existing System	Proposed System
1.	Person is important to scan barcode on product.	Automatic sense of RFID tag from product.
2.	Line of sight needed to scan a barcode.	No line of sight needed to browse RFID.
3.	Barcode should be visible on the surface of product.	RFID is placed within the merchandise.
4.	Short reading space.	Long reading space.
5.	The readability of barcodes is impaired by dirt, moisture, abrasion, or packaging.	RFID tags don't seem to be laid low with such conditions.
6.	Barcode doesn't have scan and write capability.	RFID tag having browsed and write capability.

4.2 EXPECTED OUTCOME

Shopping in the vicinity of current days sometimes involves waiting in line to induce your things scanned for checkout. This will end in an excellent deal of wasted time for patrons. What is more, the technology presently employed in checkouts barcodes - is from another era, developed within the Seventies.

Nowadays barcodes square measure found on nearly each item. Barcodes square measure a universal technology therein they're the norm for retail merchandise; stores that own a barcode reader will method barcodes and imprint it on the products.

The foremost vital issue that's concerned in barcode scanning is that the merchandise ought to be within the Line of Sight (LOS) of the reader so as to induce the barcode imprinted on the merchandise scanned.

In 2009, the University of Arkansas data Technology analysis Institute completed a study to work out the business worth of RFID item-level tagging for day-after-day operations at a serious luxury distributor.

The chain's management evaluated the service of RFID tags within the denim class. The results incontestable that overall inventory accuracy improved by quite twenty seven %, beneath stocks diminished by twenty one %, and overstocks diminished by six %. The study additionally compared however long it took to count things victimization RFID vs. a barcode reader. With RFID, scanning ten, 000 things took 2 hours; scanning with a barcode reader took fifty three hours.



Fig. 4.2(a) Normal Trolley vs. Smart Trolley

This translated into a median of four, 767 counted things per hour victimization RFID, and 209 things per hour employing a barcode system—a ninety six % reduction in cycle-counting time.

Nearly fifteen billion pairs of shoes and ten billion fashion attire things ship from makers per annum. The prices for conducting manual inventory of those things, managing out-of-stocks, and preventing felony still rise. Entire retailer's area unit space adopting item-level chase to change correct visibility of every garment.

Perpetual inventories area unit running at 60-70 pace in period of time, creating it tough to form proactive business choices for making in-store sales elevate. Specialty attire retailers that style, source, and sell product bearing their own brands area unit realizing vital results, like fourteen pace sales elevate and a ninety-pica reduction within the time needed to conduct weekly inventory.



Fig. 4.2(b) Smart Shopping Cart

In sensible tram, there ought not to pull an important tram, no ought to wait in request queue and no want of wondering budget. The microcontroller based mostly tram mechanically follows the client.

With the assistance of Omni wheels, it'll be simple for the tram to keep up its

orientation and with inaudible sensors; absolute shunning of the obstacles is feasible. It provides variety of merchandise in tram and total price of the merchandise on the spot.

Using such a product, the request counter work are reduced to nearly null because the bill has already been generated. More if MasterCard facility or the other wireless cash transfer facility is obtainable on the tram, the request counter are often completely eliminated.

The payment of bill by standing in long queue could be a wearing issue once folks need to get commodities from marts. Although folks will pay instantly victimization electronic cash facility, they're forced to attend within the queue for extended time. The concept that is planned victimization RFID technology can overcome the matter and it provides. The combined effects of simple and versatile implementation, secure transmission of account info, and reduced disputes supply the subsequent edges for all. It'll save time, energy and work force of client, owner and provider.

4.3 CONCLUSION

The sensible looking self-propelled vehicle application creates an automated central asking system for supermarkets and malls. Exploitation PID (product identification), customers won't got to wait near money counters for his or her bill payment. Since their purchased product data is transferred to central asking system. Customers pay their bill through credit/debit cards furthermore.

The system planned is extremely dependable, authentic, trustworthy and time-effective. There will be reduction in earnings quantity given to workers, reduction in larceny. Also, the system is extremely time-efficient.

Our expertise with good looking has indicated that there is a unit many technical challenges to be met in deploying a pervasive retail system.

First, technologies that capture info concerning interactions between physical objects don't seem to be nevertheless mature enough for the consumer market as they're comparatively pricey.

Even when such knowledge becomes on the market the task of decoding it's often as difficult as its registration, since no standardized classification theme or applicable taxonomy exists. Many efforts to make standards area unit underway however area unit still a minimum of years away.

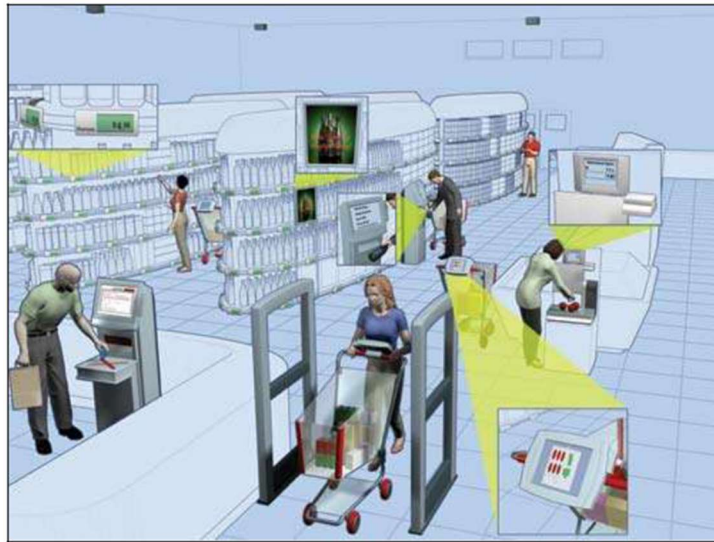


Fig. 4.3 (a) Future of the Shopping-Mall

Though within the relatively controlled surroundings of the good-looking trolley project it's been potential to deal with this downside on a wireless basis it's arduous to examine a scenario wherever widely deployed retail services will operate while not such standards.

A connected downside is that new systems should be integrated in existing retail infrastructures, which regularly operate victimization inheritance and incompatible systems.

Moreover, the readying of retail causes important growth in electronic group action hundreds that current systems area unit unable to deal with.

Like good looking ought to be available on no matter device shoppers have at hand. Although substantial advances are created during this area, developing and maintaining such applications remains a major challenge.

4.4 SCOPE OF THE FUTURE WORK

The planned sensible looking out tram System intends to assist looking out in-person that is in a position minimize the wide amount of it slow spent in looking out nonetheless on time required in locating the desired product with ease. The consumer merely should kind the name of the merchandise he desires to book on the automaton device, and so the cart will mechanically guide him/her to the product/s locations.

Smart cart will be interfaced with wireless technologies to form it fully transportable within the close to future. Payment of bills victimization mobile will be enforced. a coffee value RFID scanner will be factory-made and used which may scan multiple tags (products) at the same time for quicker process and lesser resources. Automatic scanning & accessibility of product will be introduced. Pay programming feature are going to be the most recent trend in coming years attributable to the boost within the e-commerce business.

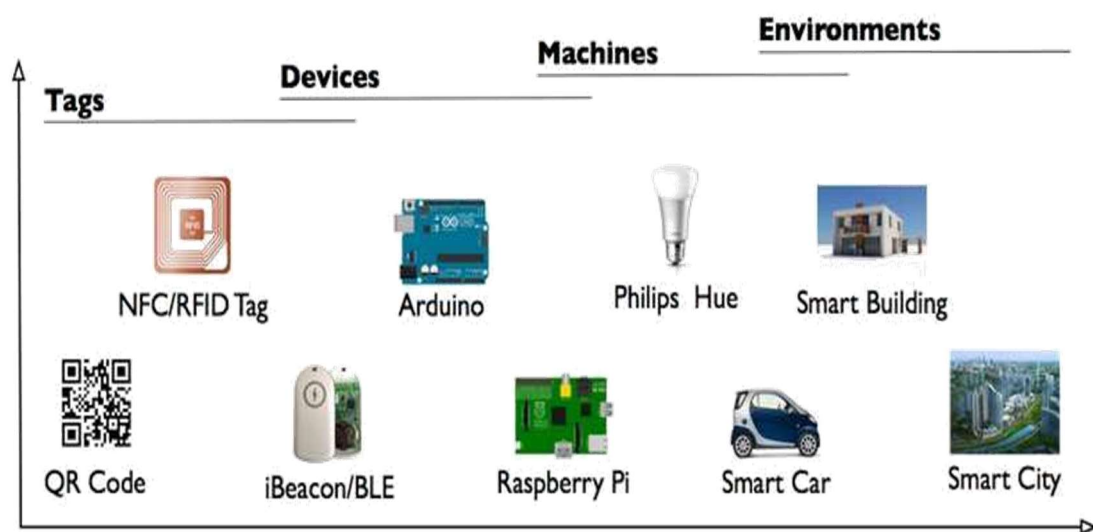


Fig. 4.4(a) Scope of the Future

We are also planning to add webcam for detecting the person's face so that the trolley knows its owner. If a GPS is installed in the system then the owner can also know where his/her trolley is currently.

An interactive LCD, which can show location of the items a customer wants to buy, also other details of the scanned product, can be thought of appending along too.

The RFID system which can scan multiple tags at a time with 100% accuracy is still under development. Once it is available, this technology can attain new heights with least time consumption and higher security



Fig. 4.4(b) RFID Reader reading multiple tags

Instead of the user pushing the buttons to control the trolley, we can add a webcam and using image processing we can make the trolley follow the specific person around.



Fig. 4.4(c) Smart Trolley following its Owner

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