VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELGAUM-590 014

IOT based Smart Shopping Cart

A Project Report to Visveswaraiah Technological University in partial fulfillment of the award of degree of
Bachelor of Engineering in Electronics & Communication Engineering

Submitted by

Hanumanth Gowda : 4JN16EC029
Hruthik K B : 4JN16EC033
Karan R : 4JN16EC034
Darshan R : 4JN17EC405

Under the guidance of

Mr. Pradeepa S C

Assistant Professor of Electronics & Communication Engineering

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
JAWAHARLAL NEHRU NATIONAL COLLEGE OF ENGINEERING
SHIMOGA-577204

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JAWAHARLAL NEHRU NATIONAL COLLEGE OF ENGINEERING
SHIMOGA-577204

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Certificate

This is to certify that the Project work entitled "**IOT based Smart Shopping Cart**" is a bonafide work carried

by

Hanumanth Gowda : 4JN16EC029
Hruthik K B : 4JN16EC033
Karan R : 4JN16EC034
Darshan R : 4JN17EC405

in partial fulfillment of the award of the degree of Bachelor of Engineering in Electronics and Communication Engineering of Visvesvaraya Technological University, Belgaum, during the year 2020. It is certified that all corrections / suggestions indicated during internal assessment have been incorporated in the report. The Project report has been approved as it satisfies the academic requirements in respect of Project report.

....	....	....
Mr. Pradeepa. S C	Dr. Sathyanarayana. S V	Dr. H.R.Mahadevaswamy
Asst. Professor, Guide	HOD	Principal

External Viva

Name of the Student :

USN :

Name and Signature of Examiners with date

1.

2.

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Hanumanth Gowda

Hruthik K B

Karan R

Darshan R

Abstract

Regardless of the nearness of E-business individuals in general purchase numerous items just from markets and shopping centers for the purpose of their own fulfilment. Among the troubles faced by the clients one problem is to pursue line through the billing procedure. In spite of the fact that their goal is simply to get a couple of items, holding on to billed items devours time. According to our review cash and normal time spent on every client is high, particularly in packed grocery stores. The business people are prepared to welcome any machines that mechanize the billing procedure to decrease labour and time spent for that procedure. The principle point is to fulfil the needs of the client and furthermore reduce the time spent on the billing. Regardless of the nearness of E-business individuals in general purchase numerous items just from markets and shopping centers for the purpose of their own fulfilment. Among the troubles faced by the clients one problem is to pursue line through the billing procedure. In spite of the fact that their goal is simply to get a couple of items, holding on to billed items devours time. According to our review cash and normal time spent on every client is high, particularly in packed grocery stores. The business people are prepared to welcome any machines that mechanize the billing procedure to decrease labour and time spent for that procedure. The principle point is to fulfil the needs of the client and furthermore reduce the time spent on the billing.

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Chapter 1

Introduction

1.1 General Introduction

In the era of the Internet of Things(IoT), interactions among physical objects have become a reality. Everyday objects can now be equipped with computing power and communication functionalities, allowing objects everywhere to be connected. This has brought a new revolution in industrial, financial, and environmental systems, and triggered great challenges in data management, wireless communications, and real-time decision making. We see nowadays RFID's are boundless and taking job in many propelled extends because of its quick and compelling reaction. RFID are by and large labels that are utilized for one of a kind recognizable proof of items by utilizing radio waves. These RFID's offer more favourable circumstances over regular Barcodes as they have a noteworthy downside. These labels could hold a lot of information like items name, value, size, weight and other data.

By executing this RFID innovation for every item in a market, shopping is accomplished effectively. This should be possible by having Shopping trolley introduced with a RFID per user to check every item. Each new client will be furnished with a RFID based client card which will hold all essential data about the client.

The invention of wireless technology with other communication techniques has been helping us in making electronics domain very popular. A modern futuristic product is the one that provides the comfort, convenience and efficiency in everyday life. Shopping is one of the interesting things and basic need for every human. At present no such embedded system is used in shopping. But this simple task cannot be easily perform because customer has to wait for billing procedure for longtime. The aim of this project is to utilize new updated technologies and overcome from the difficulties during shopping in consumer retail shop. Thus we are proposing the smart trolley system by using microcontroller as an updated technology.

We focus on a smart shopping system based on Radio Frequency Identification (RFID) technology, which has not been well-studied in the past. In such a system, all items for sale are attached with an RFID tag, so that they can be tracked by any device equipped with an RFID reader in the store. For example items put into a smart shopping cart (with RFID reading capability) can be automatically read and the billing information can also be generated on the smart cart. As a result, customers do not need to wait in long queues at checkout. The Smart Shopping Cart has the potential to make the shopping experience more comfortable, pleasurable and efficient for the customer.

1.2 Problem Statement

In realistic, markets are these days utilized by a considerable amount of individuals in order for securing most of items. Item procurement speaks to an unpredictable procedure that involves time spent in passageways, item area and checkout lines. Consumers commonly encounter some problems and difficulty during purchasing. These problems comprise worrying about the money which they have brought would be insufficient for all the items purchased and also dissipating a lot of time at the cashier. And also it is becoming a increasing problem for the merchants to make their shoppers consigned and to anticipate their demands because of the effect of contention and also because of lack of of equipment that isolate application designs.

(a) Barcode Scanner

(b) Customer Line

Figure 1.1: Queue at the Bill Counter and Barcode Scanner.

The method currently being used in Indian supermarkets and shopping malls is the conventional bar code system as shown in the Figure 1.1(a). The problem with such system is that it can scan only a single product at a given time. This consumes a lot of time during the billing process. This wastes a lot of time of the person as well as of the other people behind him and the store authorities. At some instances clients have issues with respect to the inadequate data about the item of discounts and thereby misuse of superfluous time at the counters. We can end this issue by supplanting the omnipresent Universal Product Code (UPC) standardized identification by keen names known as radio frequency identification (RFID) tag. To overcome the above problems, we implement the extensive notion of RFID based keen shopping cart in the field of retail stock.

The trolleys of the present time have to be pushed in order to relocate it. what if a old person has to buy a lot of items making the trolley much heavier to push. So, we have added in our project an easy way of moving even the heaviest of shopping trolleys around. Our project on a remote control trolley can be used not by young and strong people but it is user friendly for each and every person from toddlers to the elderly.

1.3 Aim of the Project

Study and implementation of IOT based smart shopping cart. The study encompasses the following:

- Develop a system that can be used in shopping malls to solve the queue at billing counter using RFID technology.
- Develop an algorithm for billing process.
- Design of RFID tags.
- Design a Hardware prototype of IOT based smart shopping cart.

1.4 Objective

The objective of smart cart is to develop a shopping cart that can solve the problem mentioned as follows:

- To interface the RFID reader and tags with the Raspberry Pi.

- To employ the RFID related surveillance implementation practice in the purchasing cart.
- To study and interface the different sensors with Raspberry Pi.
- To design an algorithm for automatic bill generation.
- To design a human following shopping cart.
- To display shopping details, product purchase, and bills in ThingSpeak IOT platform.

1.5 Methodology

The main objective of our project is to provide a technology oriented, low cost, easily scalable, and rugged system for assisting shopping in person. The RFID powered electronic shopping cart is built to enhance the overall shopping experience for electronic store consumers. Upon placing an item in the shopping cart, the consumer can axis an array product details, product features, product cost and there by he can generate the bill. 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 DC motors. We have used LDR sensor and IR sensor for the automatic start and stopping of the cart. The cart measures weight kept inside it. Now the cart has the technology of remote movement, which means customer wouldn't even be touching the cart while taking it around inside the mall. All these systems combined, make our project ”smart cart” with automated billing and movement with the use of RFID technology, which is a small step towards making a smarter India.

1.6 Scope of the Project

This project can be effectively used wherever importance is given to automation. This design is mainly comprised of low manual operations as well as efficient equipment which can be used in any of the super markets, shopping malls, super bazaars etc. In India there are 7 metropolitan cities. There is at least 3000 plus shopping malls in India. Now a days people are standing in the stretched out line of customers for paying the bill which is a time consuming process. People do visit these shopping malls very frequently. So to minimize the time that has been wasted by the customer in standing at queue, We are proposing the RFID based billing system.

1.7 Limitations

The main problem here with RFID are reader collision and tag collision. Reader collision occurs when the signal from two or more readers overlap. The tag is unable to respond to simultaneous queries. System must be carefully set up to avoid this problem. Tags used in this project are water sensitive and metal sensitive and have the capacity of reading only one side. So the trolley is now restricted to use water sensitive packaged and metal sensitive packaged products. But the problem can be rectified with the waterproof tags and metal resistant tags which are under research at present.

1.8 Organization of the Report

This project description is divided into 4 chapters. Chapter 1 includes General introduction, Problem Statement, Aim of the project, Objective of the project, Methodology, Scope of the Project, Limitations and Organization of the project. Chapter 2 includes Theoretical background, Basic block diagram, Hardware description such as power supply, Microcontroller, IR. sensors, motor drivers, RFID, dc motors etc. Chapter 3 includes Details of design, Implementation, Circuit diagram, Description, Flow chart and Algorithm of overall project. Chapter 4 includes Result of the project and future scope of the project. Chapter 5 includes Conclusion of the project.

Chapter 2

Theoretical Background

This chapter discuss about modules and softwares employed in Smart Cart.In this chapter we have discussed about RFID technology in section 2.1. Various components required to develop this system are discussed here. Section 3.1 discusses the various hardware modules incorporated in the device. Section 3.1.1 about the Raspberry pi 4. Section 3.1.2 about Motor Driver 1293d. Section 3.1.3 about RFID reader. Section 3.1.4 about Thermal printer. Section 3.1.5 about DC motor. Section 3.1.6 about IR sensor. Section 3.1.7 about LDR sensor. Section 3.1.8 about Load cell. Section 3.1.9 about Buzzer. Section 3.1.10 about HX-711 sensor. Section 3.1.11 about RFID tags. Section 3.2 deals on the softwares used in Smart Cart. Section 3.2.1 Raspbian OS which is debian based OS. Section 3.2.2 Python 3. Section 3.2.3 Advanced IP scanner. Section 3.2.4 VNC viewer. Section 3.2.5 deals with OpenCV. Section 3.2.6 is about ThingSpeak.

2.1 RFID Technology

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID tag consists of a tiny radio transponder; a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to inventory goods. There are two types. Passive tags are powered by energy from the RFID reader's interrogating radio waves. Active tags are powered by a battery and thus can be read at a greater range from the RFID reader; up to hundreds of meters. Unlike a barcode, the tag doesn't need to be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method of automatic identification and data capture (AIDC).

In RFID systems information is stored on an automatic information transfer equipment. This is more or less similar to Smart card. Although the electrical discharge to the information transfer device and the statistics swap are attained with no use of touch like in smart cards but by using magnetic or electromagnetic scopes. A model of RFID system is presented in the figure beneath .Because of the numerous benefits of this when compared to alternate recognition systems these are going to get enacted all around.

A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response. RFID tags are made out of three pieces: a micro chip (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. The RFID tag includes either fixed or programmable logic for processing the transmission and sensor data, respectively. RFID tags can be either passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. However, to operate a passive tag, it must be illuminated with a power level roughly a thousand times stronger than an active tag for signal transmission. That makes a difference in interference and in exposure to radiation.

2.1.1 Analysis in RFID

In 2009, the College of Arkansas Data Innovation Research Establishment done a study which reveals the advantages of tagging products with RFID tags for routine operations and also for business value at any prime retail store. The outcomes exhibited that general stock exactness enhanced by extra of 27 percent, under stocks reduced to 21 percent, and overloads reduced to 6 percent. It likewise also contrasted to what extent it brought with total things utilizing RFID versus a scanner tag reader. With RFID, inspecting 10,000 objects has taken two hours; while a conventional reader has taken 53 hours. In a paper, Alexander has revealed how accessible ID and RFID strengthen effectiveness in building systems, changing the gain of an organisation and significantly building quality of consumer supervision. This advancement reviewed strengthening safety against robbery, lowering loss and smooth running of aligning strategy. Marking at the device proportion are unique favourable circumstances in products getting, inventory and payment in realistic cash becomes faster and further effective thereby additional benefits are made , for instance, customer administration. A significant point can be solved by this innovation is that items which are out of supply , products not seeked at moment as of misty when and where amount of were in deficit supply with case of update .Thus by employing of this advancement in 21 different associations in diverse businesses, it was presumed that there will be four basic benefits of transformation by adapting this technology : decrease in the amount of work , less intervals of time spent , less supervision and low degree of failures. BY analyzing this we can say that RFID is the future of our technology.

2.1.2 Comparison between Barcode and RFID

Table 2.1: Comparison between Barcode and RFID

Barcode	RFID
An individual is need to scan the barcode .	Involuntary perusal of RFID tag from the commodity.
The content updating cant be done.	The content updating can be done .
Line of vision is necessary to study a Barcode.	No line of vision is entailed for this.
The accessibility range is up to few inches.	The accessibility range is up to few meters.
Barcode does not have read and write capability.	RFID tag having read and write capability.
The damaged tags wont work properly.	The damaged tags will work flawlessly.
It does not have read and write capability.	It does have read and write capability.

2.2 Hardware Requirements

2.2.1 Raspberry Pi 4

It is a low cost, credit-card sized computer which is used for implementing small projects. A monitor or TV has to be connected with it externally to visualize its operating system and operate it. We can use a key board and a mouse to provide input to it. An external memory has to be used to load its operating system. We can program it with several languages like C++, Python etc.

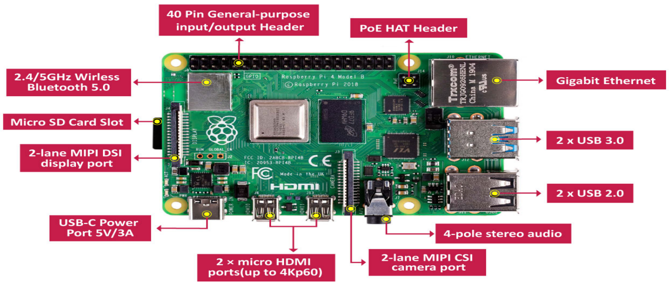


Figure 2.1: Components of Raspberry Pi 4

Raspberry Pi 4 improves on its predecessor, with improved specifications across the board. Raspberry Pi 4 benchmark tests show a huge increase in performance over previous models. It's not hard to see where this benchmark boost comes from. The brand-new BCM2711B0 system-on-chip has more powerful processing cores, the first upgrade to the graphics processor in the history of the project, and vastly improved bandwidth for both memory and external hardware. The current Raspberry Pi models have a built-in real-time clock, so they are unable to keep track of the time of day independently. As a workaround, a program running on the Pi can retrieve the time from a network time server or from user input at boot time,thus knowing the time while powered on. To provide consistency of time for the file system, the Pi automatically saves the current system time on shutdown, and re-loads that time at boot. The Raspberry Pi Foundation provides Raspbian, a Debian-based Linux distribution for download, as well as third-party Ubuntu, Windows 10 IoT Core, RISC OS and specialized media center distributions. It promotes Python and Scratch as the main programming languages, with support for many other languages. The default firmware is closed source, while an unofficial open source is available. Many other operating systems can also run on the Raspberry Pi, including the formally verified microkernel.
The specifications of raspberry pi 4 are:

- SoC: Broadcom BCM2711B0 quad-core A72 (ARMv8-A) 64-bit @ 1.5GHz
- GPU: Broadcom VideoCore VI
- Networking: 2.4GHz and 5GHz 802.11b/g/n/ac wireless LAN
- RAM: 1GB, 2GB, or 4GB LPDDR4 SDRAM

- Bluetooth: Bluetooth 5.0, Bluetooth Low Energy (BLE)
- GPIO: 40-pin GPIO header, populated
- Storage: microSD
- Ports: 2 icro-HDMI 2.0, 3.5mm analogue audio-video jack, 2 SB 2.0, 2 SB 3.0, Gigabit Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI)

2.2.2 Motor Driver 1293d

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. Dual H-bridge Motor Driver integrated circuit (IC).

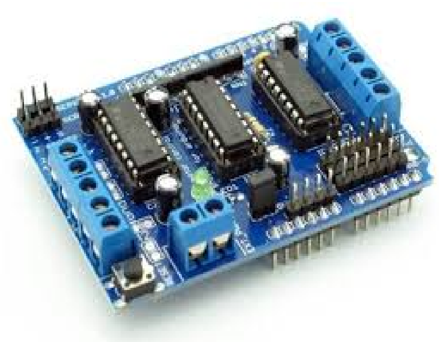


Figure 2.2: Motor driver

Features of Motor Driver:

1. Can be used to run Two DC motors with the same IC.
2. Speed and Direction control is possible.
3. Motor voltage Vcc2 (Vs): 4.5V to 36V
4. Maximum Peak motor current: 1.2A
5. Maximum Continuous Motor Current: 600mA
6. Supply Voltage to Vcc1(vss): 4.5V to 7V

7. Transition time: 300ns (at 5Vand 24V)

8. Automatic Thermal shutdown is available

9. Available in 16-pin DIP, TSSOP, SOIC packages

Detailed specification of Motor Driver is available in the reference website.

2.2.3 RFID reader

EM-18 is a nine pin device. Among nine pins, 2 pins are not connected, so we basically have to consider seven terminals.

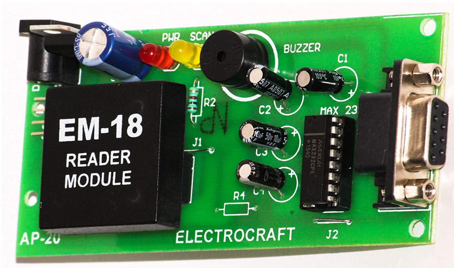


Figure 2.3: EM-18 Reader module

EM-18 is used like any other sensor module. First we choose the mode of communication between MODULE and CONTROLLER. Next we will program the controller to receive data from module to display. Next power the system. When a tag is brought near the MODULE it reads the ID and sends the information to controller. The controller receives the information and performs action programmed by us.

Step1: Establishing a mode of communication. EM-18 can provide ouput through two communication interface. One is RS232 and another is WEIGAND. The form of communication is selected by SEL pin. If SEL pin is selected HIGH then form of communication is RS232 and if SEL pin is pulled LOW then form of communication is WEIGAND. Usually the RS232 is selected because it's popular so SEL pin is pulled HIGH.

Step2: The output of MODULE bit rate is 9600bps (bit per second). The controller should be programmed to receive information from MODULE at this rate. If bit rate of controller mismatches then the system will not work correctly.

EM-18 Features and Specifications:

1. Operating voltage of EM-18: +4.5V to +5.5V

2. Current consumption:50mA
3. Can operate on LOW power
4. Operating temperature: 0C to +80C
5. Operating frequency:125KHz
6. Communication parameter:9600bps
7. Reading distance: 10cm, depending on TAG
8. Integrated Antenna

2.2.4 Thermal Printer

A thermal printer is a printer that makes use of heat in order to produce the image on paper. Due to quality of print, speed, and technological advances it has become increasingly popular and is mostly used in airline, banking, entertainment, retail, grocery, and healthcare industries.

Figure 2.4: Thermal Printer

Thermal printing does not make use of ink or toner unlike many other printing forms but largely depends on thermal papers for producing the images.They are also quiet popular in creating labels owing to speed of printing.

2.2.5 DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either

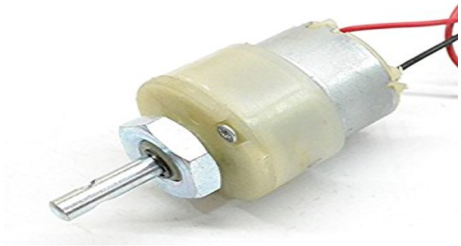


Figure 2.5: DC Motor

electromechanical or electronic, to periodically change the direction of current in part of the motor. A DC motors speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications. Two 100 rpm motors are used in our project for bot movement.

2.2.6 IR Sensor

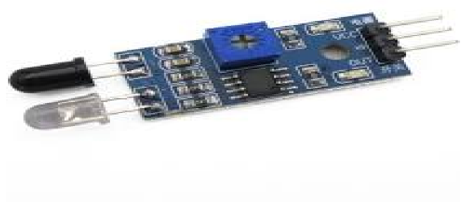


Figure 2.6: IR sensor

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensor measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode that is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received. In our project IR sensor is used to stop the DC motor whenever the customer is very near to cart.

2.2.7 LDR Sensor

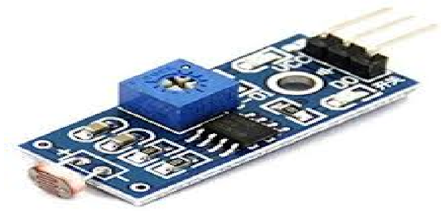


Figure 2.7: LDR Sensor

The Light Dependent Resistor (LDR) is just another special type of Resistor and hence has no polarity. Meaning they can be connected in any direction. They are breadboard friendly and can be easily used on a perfect board also. The symbol for LDR is just as similar to Resistor but adds to inward arrows as shown above. The arrows indicate the light signals. A LDR (Light Dependent Resistor), as the name suggests will change it resistance based on the light around it. That is when the resistor is placed in a dark room it will have a resistance of few Mega ohms and as we gradually impose light over the sensor its resistance will start to decrease from Mega Ohms to few Ohms. This property helps the LDR to be used as a Light Sensor. It can detect the amount of light falling on it and thus can predict days and nights. So if you are looking for a sensor to sense light or to distinguish between days and nights then this sensor is the cheap and modest solution for you. In our project LDR sensor is used as an input for providing direction of movement to the DC motor like right left and forward directions.
Features of LDR sensor shown in figure 2.7:

1. Can be used to sense Light
2. Easy to use on Breadboard or Perf Board
3. Easy to use with Microcontrollers or even with normal Digital/Analog IC

4. Small, cheap and easily available
5. Available in PG5 ,PG5-MP, PG12, PG12-MP, PG20 and PG20-MP series

2.2.8 Load Cell

A load cell is a transducer that is used to convert a force into electrical signal. The most common use of this sensor is in weighing machine. Every weighing machine which shows weight has a loadcell as sensing element. This conversion is indirect and happens in two stages. Through a mechanical arrangement, the force being sensed deforms a strain gauge. The strain gauge measures the deformation (strain) as an electrical signal, because the strain changes the effective electrical resistance of the wire. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. Load cells of one strain gauge (quarter bridge) or two strain gauges (half bridge) are also available.

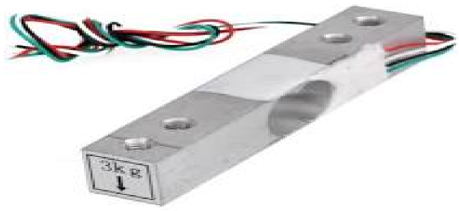


Figure 2.8: Load Cell

The electrical signal output is typically in the order of a few millivolts and requires amplification by an instrumentation amplifier before it can be used. The output of the transducer is plugged into an algorithm to calculate the force applied to the transducer. Load cells are used in several types of measuring instruments such as weighing scales, universal testing machines.

2.2.9 Buzzer

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications. There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application.

Figure 2.9: Buzzer

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.

2.2.10 HX-711 sensor

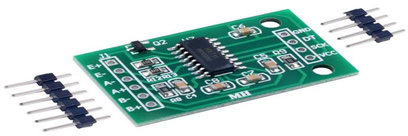


Figure 2.10: HX-711 sensor

HX711 is a precision 24-bit analog to-digital converter (ADC) designed for weigh scales and industrial control applications to interface directly with a bridge sensor. The input multiplexer selects either Channel A or B differential input to the low-noise programmable gain amplifier (PGA). Channel A can be programmed with a gain of 128 or 64, corresponding to a full-scale differential input voltage of 20mV or 40mV respectively, when a 5V supply is connected to AVDD analog power supply pin. Channel B has a fixed gain of 32. On chip power supply regulator eliminates the need for an external supply regulator to provide analog power for the ADC and the sensor. Clock input is flexible. It can be from an external clock source, a crystal, or the on-chip oscillator that does not require any external component. On-chip power on-reset circuitry simplifies digital interface initialization. There is no programming needed for the internal registers.

2.2.11 RFID tags

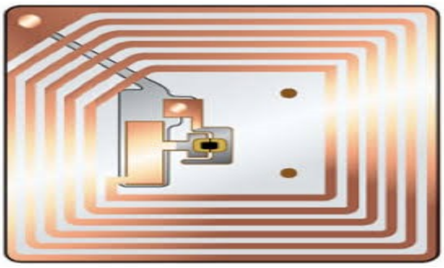


Figure 2.11: RFID tags

A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory.

2.3 Software Requirements

2.3.1 Raspbian OS

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Buster and Raspbian Stretch. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. The initial build was completed in June 2012. The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi lines low-performance ARM CPUs.

Raspbian uses PIXEL, Pi Improved X-Window Environment, Lightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Openbox stacking window manager with a new theme and few other changes. The distribution is shipped with a copy of the algebra program Wolfram Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.Raspbian is the recommended operating system for normal use on a Raspberry Pi.Raspbian comes with over 35,000 packages: pre compiled software bundled in a nice format for easy installation on your Raspberry Pi.

Figure 2.12: Raspbian OS Logo

Setting Up Raspian OS:

Connect the board with all the necessary accessories to install and run an OS.

1. Take the Pi out of its anti static cover and place it on the non-metal table.
2. Connect the display Connect the HDMI cable to the HDMI port on the Pi and the other end of the HDMI cable to the HDMI port of the TV.
3. Connect your Ethernet cable from the Router to the Ethernet port on the Pi
4. Connect your USB mouse to one of the USB ports on the Pi
5. Connect your USB Keyboard to the other USB port on the Pi
6. Connect the micro USB charger to the Pi but dont connect it to the power supply yet
7. Flash the SD Card with the Raspian OS.

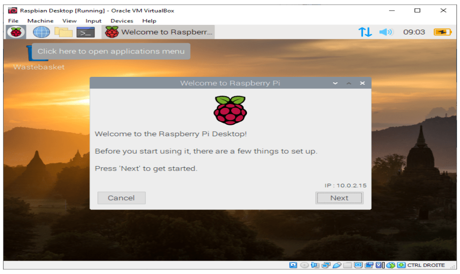


Figure 2.13: Raspbian OS Installation

2.3.2 Python 3

Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991, Pythons design philosophy emphasizes code readability with its notable use of significant whitespace. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

Python is dynamically typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly, procedural), object-oriented, and functional programming. Python is often described as a batteries included language due to its comprehensive standard library.

Python was conceived in the late 1980s as a successor to the ABC language. Python 2.0, released in 2000, introduced features like list comprehensions and a garbage collection system capable of collecting reference cycles. Python 3.0, released in 2008, was a major revision of the language that is not completely backward-compatible, and much Python 2 code does not run unmodified on Python 3.

Figure 2.14: Python 3

Python in Raspberry pi

Raspberry pi boards are build for beginners to start in world of real time control of electronics with real time operating system because they are made for complete beginers thats why they use python language for raspberry pi easy to learn you can very easily understand the langauge by just reading, its line not like java , C or ,C++ it can be implemented very easily in web or database or for making GUI applications.Some Python packages can be found in the Raspbian archives and can be installed using apt.

Figure 2.15: Python Packages installation in Raspberry pi

2.3.3 Advanced IP Scanner

Advanced IP Scanner is fast and free software for network scanning. It will allow you to quickly detect all network computers and obtain access to them. With a single click, you can turn a remote PC on and off, connect to it via Radmin, and much more. Figure shows how the advance ip scanner scans all ip addresses including Raspberry pi.

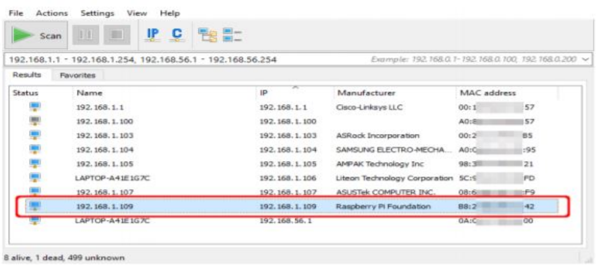


Figure 2.16: Advance IP Scanner

2.3.4 VNC Viewer

In computing, Virtual Network Computing (VNC) is a graphical desktop-sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer.

It transmits the keyboard and mouse events from one computer to another, relaying the graphical-screen updates back in the other direction, over a network.

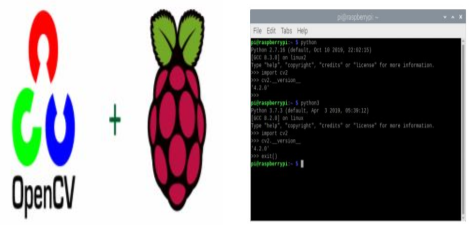
VNC is platform-independent there are clients and servers for many GUI-based operating systems and for Java. Multiple clients may connect to a VNC server at the same time. Popular uses for this technology include remote technical support and accessing files on ones work computer from ones home computer, or vice versa.

VNC was originally developed at the Olivetti and Oracle Research Lab in Cambridge, United Kingdom. The original VNC source code and many modern derivatives are open source under the GNU General Public License.

Figure 2.17: VNC Viewer Logo

2.3.5 Open CV

OpenCV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez (which was later acquired by Intel). The library is cross-platform and free for use under the open-source BSD license.



(a) Open CV (b) Installing Open CV in Raspberry pi

Figure 2.18: Open CV setup

Installing Open Cv in Raspberry pi

1. Select OpenCV version to install. First lets prepare the system for the installation.
2. Update Packages. view source.
3. Install OS Libraries.
4. Install Python Libraries.
5. Download opencv and opencv-contrib.
6. Compile and install OpenCV with contrib modules.
7. Reset swap file.

2.3.6 ThingSpeak

According to its developers, ThingSpeak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates. ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications. Internet of Things (IoT) describes an emerging trend where a large number of embedded devices (things) are connected to the Internet. These connected devices communicate with people and other things and often provide sensor data to cloud storage and cloud computing resources where the data is processed and analyzed to gain important insights. Cheap cloud computing power and increased device connectivity is enabling this trend.

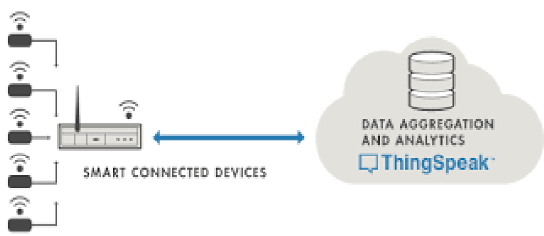


Figure 2.19: ThingSpeak Logo

Steps involved in uploading Raspberry pi data to ThingSpeak:

1. Sign up for ThingSpeak.
2. Create a Channel for Your Data.
3. Getting API Key in ThingSpeak.
4. Python Code for Raspberry Pi.
5. After installing required libraries run your python code.
6. Check ThingSpeak site for Data Logging.

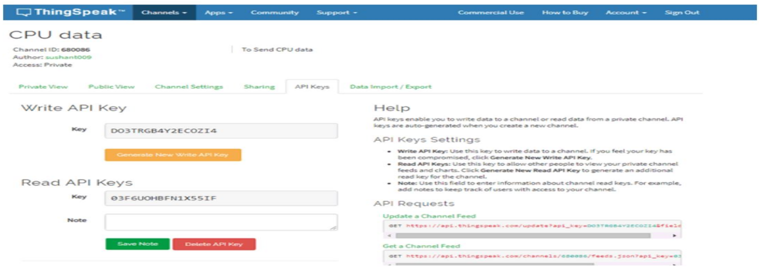


Figure 2.20: To generate new unique API key

2.4 Summary

In this section, the basic theoretical details about the hardware and the softwares used in the design of Smart Cart are discussed. The hardware modules used such as RFID reader module EM-18 used for scanning of RFID tags, printer, LDR sensor, IR sensor, motor driver, DC motor, buzzer, load cell and Raspberry Pi 4, which is the main unit of the project. The softwares used in the implementation of the project are OpenCV, Python and ThingSpeak.

Chapter 3

Design and Implementation

This chapter deals with the detail description of design and implementation of our project. Section 3.2 about system design. Section 3.2.1 discuss about the overall block diagram and the overview of the system. In section 3.3 we have discussed about circuit description. In section 3.4 we have discussed about Implementation, section 3.4.1 is about Methodology, section 3.4.2 is about Working Principle and section 3.4.3 is about flow chart. Finally section 3.5 gives the summary of this chapter.

3.1 Introduction

The proposed system uses Raspberry Pi board as a main controlling unit for all of its objectives. The objective of this project is to design and develop an IOT based Smart Shopping Cart which is capable of automatic billing. RFID is an up coming innovation which has as of late pulled in light of a legitimate concern for the exploration group in view of the uncommon advantages it offers over the other existing recognizable proof and information detecting advancements. The smart cart is having two DC motors connected for the movement of the cart in forward, backward, left and right directions. A RFID reader is connected to the Raspberry pi through usb port in order to scan the products with RFID tag. As the product with RFID tag is scanned RFID reader reads the related data from the tag and sends it to the Raspberry pi. The product details will be displayed in the cloud where the customer can watch about his shopping details like total cost and total weight. The Raspberry pi and cloud are connected through an application program interface(API). We have used two DC motors to provide automatic movement to the smart cart. These two Dc motors are connected to Motor driver l293d and this driver is connected to Raspberry pi. We have also used three LDR's and an IR sensor for the smart cart. The Raspberry

Pi is being used to control the movement of the cart and to read related data from RFID reader interfaced with others components. The advantage using Raspberry Pi is that many functions can be added on to it by adding extra components and also it has a more powerful GPU/CPU pair. This cart is programmed for automatic movement and automatic billing in shopping malls.

3.2 System Design

The proposed system of our project will be implemented in three parts. First part is the initialization of the Raspberry Pi for the set up of RFID Reader. Second part is the tag detection of products by RFID Reader which are placed in the cart and sending of product information from cart to ThingSpeak cloud through Raspberry Pi. Third part is the initialization of the Raspberry Pi for the set up of automatic movement of cart which follows the customer. These three parts will be explained thoroughly in this chapter.

The architectural implementation of the system and the main end of the system is to allow the consumer a new enhanced way of shopping. The normal shopping experience till date, after the invent of various supermarkets is:

1. Enter the store.
2. Take a trolley and push it around the entire store in search of the products needed.
3. Load them into the trolley and stand in queue.
4. Pay the bill and exit from store.

From the proposed model, the usage of RFID comprehends benefits such as consequent reduction in product cost, reduced human intervention and labour cost, availability of accessing the real time information about the diverse products inside the shopping cart. The necessary requirements for the proposed system are discussed briefly in this chapter 3.

The system block diagram is shown in fig 2.20, where it consists of Raspberry Pi (RPi) 4 board, model - B. Rpi 4 is 64 bit CPU with continuous improvement and ability to load normal Linux OS and there are many Linux Distributions exclusively for RPi and Windows 10 IoT Core is also possible to load in RPi. Actually RPi uses softwares which are either free or open source. It provides direct accessible processor pins as GPIOs. So prototyping your vision project or learning computer science from scratch in such a device is better. The Raspberry pi board is a portable and low cost. The Raspberry Pi uses a SD card for storage, which is fast and has no moving parts and the Pi is completely silent.

3.2.1 Block Diagram

Figure 3.1 shows the block diagram of the proposed system. The RFID reader which is placed in the cart is connected to the Raspberry pi through USB-Port. Raspberry-Pi will be placed in the Cart. IR sensor, LDR sensor, load cell, Buzzer, Motor driver and Thermal printer are connected to the different GPIO pins of Raspberry pi 4.

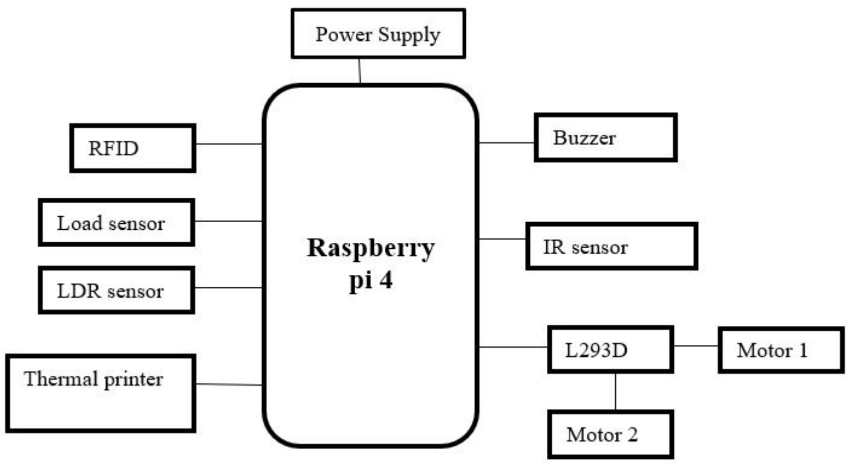


Figure 3.1: Block Diagram

3.3 Circuit Description

Figure 3.2 shows circuit description of Smart Cart project. The proposed system uses RPi 4 Model B board, where all the components are interfaced to the specific pins as follows:

- RFID reader Module EM-18 is connected to Raspberry pi through the RX and TX pins.
- Pin numbers 32,36,38,40 of Raspberry pi are connected to the motor driver respectively.

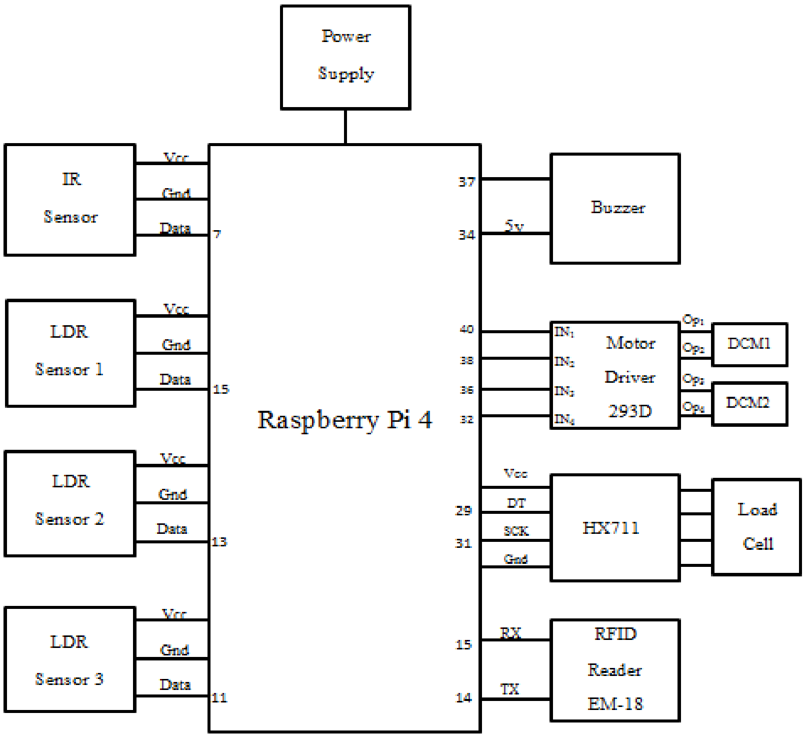


Figure 3.2: Circuit Diagram

- Pin number 7 of Raspberry pi is connected to the IR sensor.
- Three LDR sensors are connected to pin number 13, 15 and 17 respectively.
- Pin number 37 and 34 of Raspberry pi is connected to the Buzzer.
- Pin number 29 and 31 of Raspberry pi is connected to the HX-711 weight sensor.
- Motor driver l293d's output is connected to the Dc Motor.
- HX-711 sensor is interfaced with the load cell.

3.4 Implementation

The goal of our project is to create a best friendly and easy way of shopping for all age group of people, and all of our hardware and software components must fit to that goal. Our project is designed to run on all kinds of shopping platforms in big cities of our country.

3.4.1 Methodology

1. **To initialize Raspberry pi 4 and interface with sensors:**

   - Installing Raspberry Pi operating system.
   - Installing required libraries in python.
   - Sensor interfacing(Weight sensor, RFID sensor, IR sensor, LDR sensor) with Raspberry pi.

2. **Design a cart which follows the customers:**

   For the movement of the trolley we have connected 4 wheels. The Dc motor is connected to Rpi through the motor driver. It acts as an interface between the motors and the control circuits. The functioning of motor driver is to take a low - current signal and then turn it into a high current signal that can drive a motor. The code is stored in RPi board for forward and side ways movement of the cart. In this part we have connected 3 LDR sensors for the movement detection, like one ldr sensor for right movement, one for left movement, and another one for straight movement. A sharp laser light is given to the customer. The incident of this laser to any of the LDR's by the customer will decide the direction of the cart whether to move right, left or forward direction. If the customer wants to stop the cart, an IR sensor is also connected as whenever IR sensor senses the obstacle it sends data to the Raspberry pi and so then stops the cart.

3. **Design a cart which capable of automatic billing:**

   In this part as RFID reader is connected to the raspberry pi , whenever any product is placed in the trolley it consists of a unique RFID number used to detect which product is placed in the trolley, here RFID reader is connected to the raspberry pi through the RX and TX pins of the RFID. We are 3 RFID different RFID tags over here. one which contains product ID and other details, second one is used for billing, whenever we scan this bill receipt is delivered through thermal printer and the third tag is unauthorized RFID tag whenever this tag is scanned malware detection message appears and beep sound from buzzer. We are using a Thermal printer for the billing Part , external power supply is used for this printer as we require more power supply. Finally all the information of the product and billing is continuously uploaded on the cloud.

3.4.2 Working Principle

The overview working of this system is - This proposed system works as on customer getting into the mall she/he first takes a trolley. Every cart is connected with a RFID reader , a Raspberry pi and a cloud connection ThingSpeak IOT platform which he/she can open using mobile with active internet connection where he/she can see the shopping's billing information. When the customer starts dropping products into the trolley, tags will be read by the reader and the reader sends the information to the Raspberry pi. The Raspberry pi checks the information sent by the reader. If the data is valid then the cost of that product will be displayed on the cloud address for user. The RFID Reader will be placed in the mid position on the base/bottom of the trolley. If RFID tag which is used for automatic billing is scanned, then the bill is printed in the thermal printer.

We have provided automatic movement to our cart, by using two DC motors connected to Rpi through Motor drivers. We have coded in such a way that automatic movement is done. For this automatic movement we have used three LDR's placed in right corner, middle and left corner of the cart. Customer is provided with sharp laser light, to which LDR the light is incidents, in that direction cart moves. For stopping of cart we have used Ir sensor which is placed in center of the cart, whenever it senses the obstacle then the cart stops.

ThingSpeak is an open IoT platform for monitoring your data online. In ThingSpeak channel you can set the data as private or public according to your choice. ThingSpeak takes minimum of 15 seconds to update your readings. Its a great and very easy to use platform for building IOT projects. Click on API Keys button to get your unique API key for uploading your CPU data. To send data to ThingSpeak, we need an unique API key, which we will use later in our python code to upload our CPU data to ThingSpeak Website. Like this we can send any data connected with Raspberry pi to the ThingSpeak Cloud.

3.4.3 Flow chart

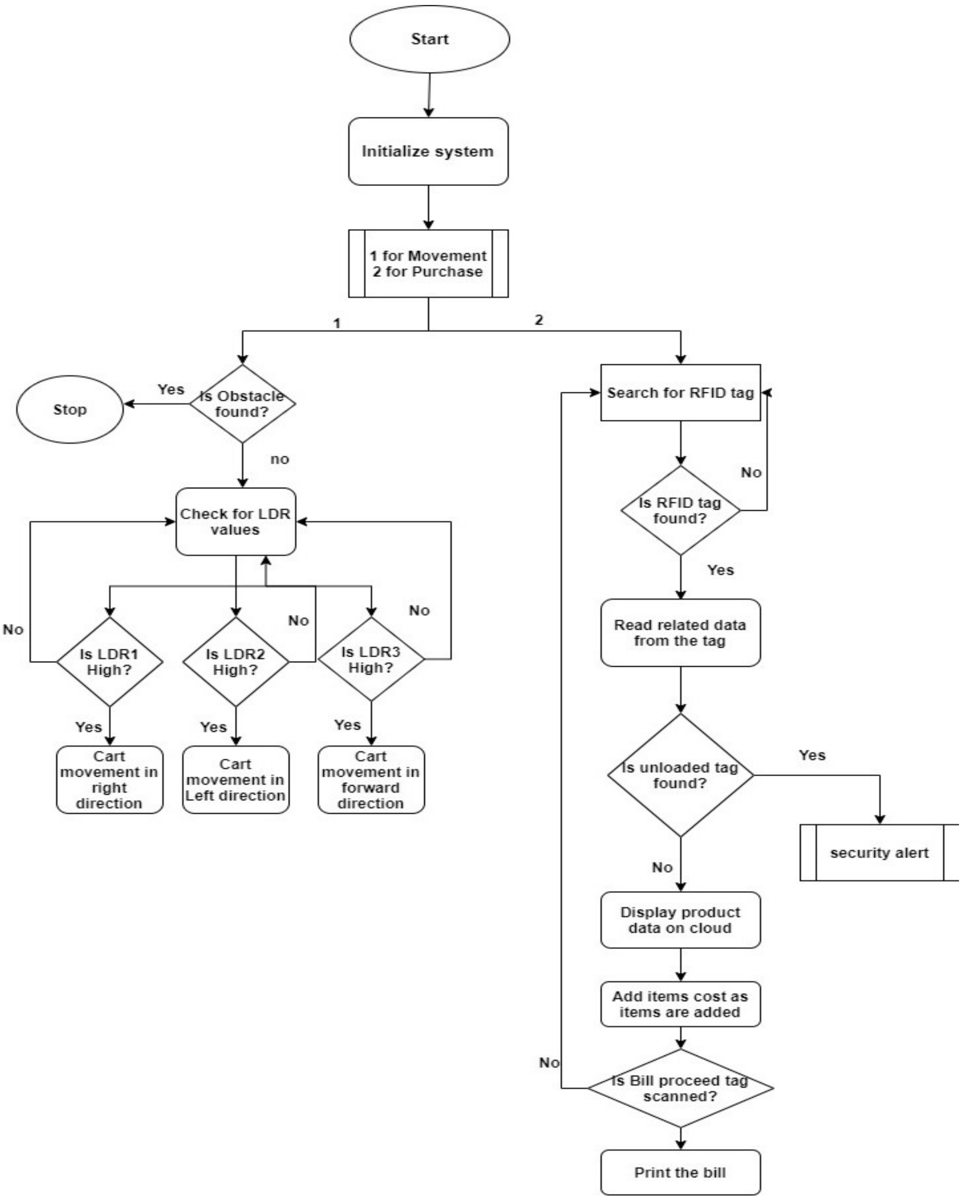


Figure 3.3: Flow chart of entire project

The Figure 3.3 shows flow chart of entire project.

The algorithm for bill generation:

Step-1: Start.

Step-2: Run.

Step-3: Press 1 for movement and press 2 for purchase.

Step-4: key 2 is pressed, Search for RFID tag.

Step-5: If RFID tag containing product information is scanned then the product information is sent to RPi and information related to product is displayed in ThingSpeak cloud.

Step-6: If unauthorized RFID tag is scanned, then security alert will be provided and Buzzer will be beeped.

Step-7: If RFID tag is scanned which is used for bill generation is scanned then the bill is generated.

Step-8: print the bill.

Step-9: Stop

The algorithm for remote movement of Smart Cart.

Step-1: Start.

Step-2: Run.

Step-3: Press 1 for movement and press 2 for purchase.

Step-4: key 1 is pressed, check for three LDR sensors value.

Step-5: Based on which LDR'S value is high, the cart will move in that direction. If LDR right value is high cart will move in right direction, similarly in forward and left directions.

Step-6: Is any obstacle detected by the IR sensor?

Step-7: Stop the cart.

3.5 Summary

This chapter deals with the design and implementation of the Smart Cart. This consists starting from overall block diagram, hardware block diagram, Circuit Description, system design, flow chart, methodology and algorithms used in this project. Interfacing of all sensors with Raspberry pi is explained in detail.

Chapter 4

Results and discussions

This chapter provides results of the rfid based smart shopping cart using raspberry pi 4 capable of remote movement and automatic billing.

4.1 Results

The result of this project is mainly based on six objectives they are listed below:

(a) To interface the RFID reader and tags with the Raspberry Pi.

(b) To employ the RFID related surveillance implementation practice in the purchasing cart.

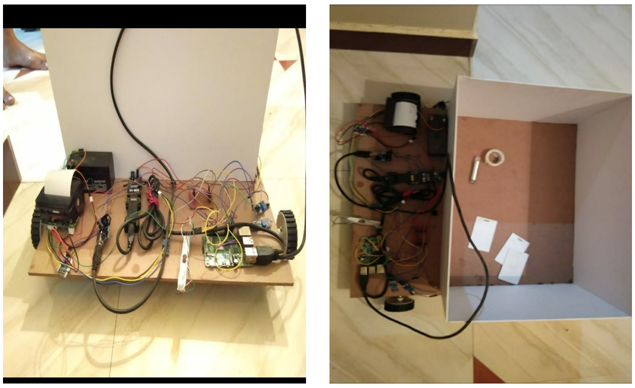
(c) To study and interface the different sensors with Raspberry Pi.

(d) To design an algorithm for automatic bill generation.

(e) To design a human following shopping cart.

(f) To display shopping details, product purchase, and bills in ThingSpeak IOT platform.

- Figure 4.1 shows the Final Bot hardware design.



(a) Front view (b) Top View

Figure 4.1: Smart shopping cart

- Figure 4.2 shows the console window, where key selection option occurs. Key 1 is for movement and key 2 is for purchase.

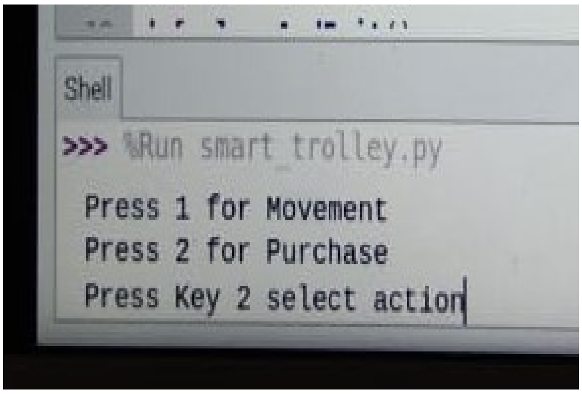


Figure 4.2: Action selection

- Figure 4.3 shows the console window, where suspicious activity is detected.

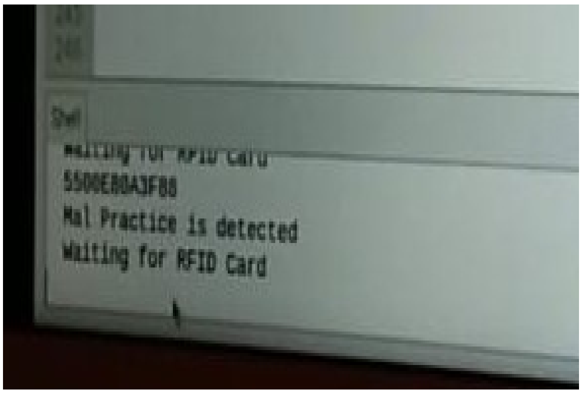
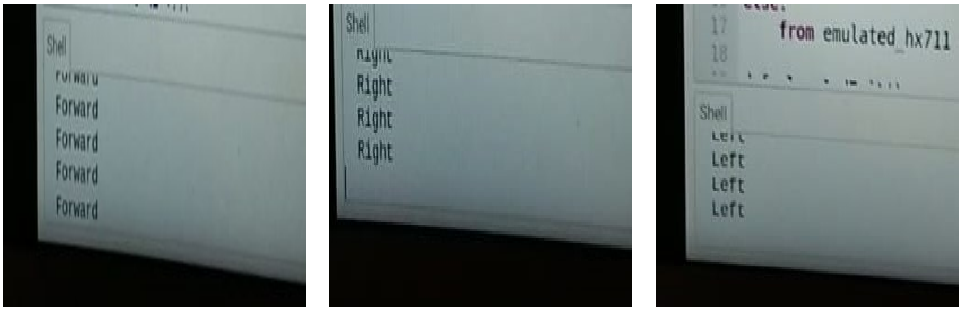


Figure 4.3: Malware detected

- Figure 4.4 shows the console window, where the movement of direction of the cart is shown.



(a) Forward (b) Right (c) Left

Figure 4.4: Movement of direction of cart

- Figure 4.5 shows the generated bill receipt printed by the thermal printer.

Figure 4.5: Bill receipt

- Figure 4.6 shows the product details shown in ThingSpeak cloud.

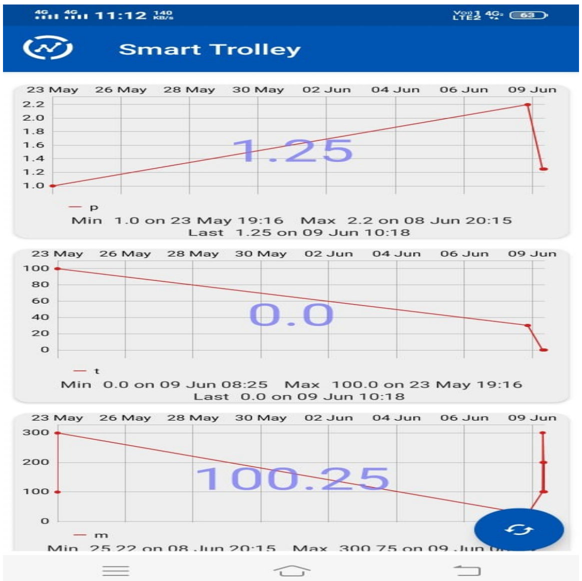


Figure 4.6: Product details shown in cloud

Chapter 5

Conclusion and Future Scope

5.1 Conclusion

The advancement in science and technology is a persistent process. Latest gadgets and latest technology are being designed and developed . This project which can be used in shopping malls for assisting customers by saving a lot of time in buying commodities. In this project RFID is used as safety access for the item which thereby enhances the surveillance performance. This implementation initiates for an automated billing system in shopping malls and supermarkets. With this, shoppers no longer have to wait near counters for payment of bills because of their purchased item information getting transferred to billing unit in cloud. By this billing process speed increases and becomes much more simpler. In addition to this capability, the mechanism also assures recognition of cases of theft induced by fraudulent consumers which makes the system more reliable and fascinating to both customers as well as sellers. This will enhance the shopping experience to a new level. In addition to this the remote control movement of the cart assures this kind of system can be used by all age groups of people with ease. Our project prototype results says that the system works better in large shopping malls and more real time efficiency can be experienced.

5.2 Advantages

- The system helps in achieving a faster billing system.
- The innovation payment method avoid the long wasting time.

- Helps the buyer to know the bill details in advance so that he can plan for affordable purchase.
- Helps in business promotions for the supermarkets by gaining more customers providing quick service.
- easy to use and doesn't need any special training.
- It also reduces the payoff given for workers.

5.3 Future Scope

At first glance, the smart cart looks like a good innovation, but we can add further updates for it and make it the best innovation. In our project we have not provided the feature of navigation system. further more updates which can be done are listed below:

- Development of the shopping list and navigation system to search the products in mall can be implemented.
- Low cost RFID scanner can be manufactured which can scan multiple tags simultaneously for faster processing and lesser resources.
- They can be voice assistance included.
- Robotic arm can be used for picking and dropping products in which case theft can be avoided.
- Using the GSM model we can transfer the bill to the mobile instead of printing it. This saves paper.

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Appendix A

Program codes

Python programs are used throughout the thesis for analysis of results. Source code is attached here.

```
import RPi.GPIO as GPIO
from time import sleep
import serial
from urllib.request import urlopen
import time


EMULATE_HX711=False

referenceUnit = 1

if not EMULATE_HX711:
    import RPi.GPIO as GPIO
    from hx711 import HX711
else:
    from emulated_hx711 import HX711

def cleanAndExit():
    print("Cleaning...")

    if not EMULATE_HX711:
      GPIO.cleanup()

    print("Bye!")
    sys.exit()

def loadread():
    hx = HX711(29, 31)
    hx.set_reading_format("MSB", "MSB")
    #hx.set_reference_unit(92)

    hx.reset()
```

```
        hx.tare()

        print("Tare done! Add weight now...")

        try:
          val = hx.get_weight(5)
          print(val)
          hx.power_down()
          hx.power_up()
          time.sleep(0.1)

        except (KeyboardInterrupt, SystemExit):
          cleanAndExit()
        return val

    def fward():
        GPIO.output(m1,1)
        GPIO.output(m2,0)
        GPIO.output(m3,1)
        GPIO.output(m4,0)

    def bward():
        GPIO.output(m1,0)
        GPIO.output(m2,1)
        GPIO.output(m3,0)
        GPIO.output(m4,1)

    def stopm():
        GPIO.output(m1,0)
        GPIO.output(m2,0)
        GPIO.output(m3,0)
        GPIO.output(m4,0)

    def rw():
        GPIO.output(m1,1)
        GPIO.output(m2,0)
        GPIO.output(m3,0)
        GPIO.output(m4,0)

    def lw():
        GPIO.output(m1,0)
        GPIO.output(m2,0)
        GPIO.output(m3,1)
        GPIO.output(m4,0)

    def revievezigbee():
        status1=0
        SerialPort = serial.Serial("/dev/ttyUSB0", baudrate=9600, timeout=1)
        sdata=str(SerialPort.readline(13).decode('utf-8'))
```

```
        return(str(sdata))

    pr1=0001.25
    pr2='0002'
    pr3='0003'
    pr4='0004'
    pr5='0005'
    mr1=100
    mr2=200
    mr3=300
    mr4=400
    mr5=500
    GPIO.setmode(GPIO.BOARD)
    GPIO.setwarnings(False)
    ib1=0
    ib2=0
    ib3=0
    ib4=0
    ib5=0
    ib6=0

    m1=40
    m2=38
    m3=36
    m4=32
    ir=7
    ldrl=15
    ldrm=13
    ldrr=11
    buzz=37
    GPIO.setup(buzz,GPIO.OUT)
    GPIO.setup(m1,GPIO.OUT)
    GPIO.setup(m2,GPIO.OUT)
    GPIO.setup(m3,GPIO.OUT)
    GPIO.setup(m4,GPIO.OUT)
    GPIO.setup(ir,GPIO.IN)
    GPIO.setup(ldrl,GPIO.IN)
    GPIO.setup(ldrm,GPIO.IN)
    GPIO.setup(ldrr,GPIO.IN)

    def sendard( tt):

        SerialPort = serial.Serial("/dev/ttyUSB1", baudrate=9600, timeout=1)
        SerialPort.write(str.encode('Tea Bag\r'))
        SerialPort.write(str.encode(' '+str(mr1)+'\r'))
        time.sleep(2)
        SerialPort.write(str.encode('Total is'+' '+str(tt)+'\r'))

    def sendard2( tt):
```

```
    SerialPort = serial.Serial("/dev/ttyACM0", baudrate=9600, timeout=1)
    SerialPort.write('Book \r')
    SerialPort.write(' '+str(mr2)+'\r')
    time.sleep(2)
    SerialPort.write('Total is'+' '+str(tt)+'\r')

def sendard3(tt):

    SerialPort = serial.Serial("/dev/ttyACM0", baudrate=9600, timeout=1)
    SerialPort.write('Perfume \r')
    SerialPort.write(' '+str(mr3)+'\r')
    time.sleep(2)
    SerialPort.write('Total is'+' '+str(tt)+'\r')

def sendard4(tt):

    SerialPort = serial.Serial("/dev/ttyACM0", baudrate=9600, timeout=1)
    SerialPort.write('LED Bulb\r')
    SerialPort.write(' '+str(mr4)+'\r')
    time.sleep(2)
    SerialPort.write('Total is'+' '+str(tt)+'\r')

def sendard5(tt):

    SerialPort = serial.Serial("/dev/ttyUSB1", baudrate=9600, timeout=1)
    SerialPort.write(str.encode('T Shirt \r'))
    time.sleep(1)
    SerialPort.write(str.encode((' '+str(mr5)+'\r\n')))
    time.sleep(1)
    SerialPort.write(str.encode(('Total is'+' '+str(tt)+'\r\n')))
    time.sleep(1)
    SerialPort.write(str.encode(('\r\n')))
    time.sleep(1)
    SerialPort.write(str.encode(('\r\n')))
    time.sleep(1)
    SerialPort.write(str.encode(('\r\n')))

# main() function
def main():
    # use sys.argv if needed

    t=0
    p=''
    m=''
    t1=''
    #baseURL = 'https://api.thingspeak.com/update?api_key=690S3KXDC270S92
    WRITE_API = "O3M8H1DWOI6VUZTX" # Replace your ThingSpeak API key here
    BASE_URL = "https://api.thingspeak.com/update?api_key={}".format(WRIT

    ThingSpeakPrevSec = 0
```

```
    ThingSpeakInterval = 20 # 20 seconds
    while True:
      stopm()
      print('Press 1 for Movement')
      print('Press 2 for Purchase')
      RH=str(input('Press Key 2 select action'))
      while(RH=='1'):
        if(GPIO.input(ldrl)==0):
        print('Left')
        lw()
        if(GPIO.input(ldrm)==0):
        fward()
        print('Forward')
        if(GPIO.input(ldrr)==0):
        rw()
        print('Right')
        if(GPIO.input(ir)==0):
        stopm()
        print('stop')
        RH='0'
        break;

      while(RH=='2'):
        print('Waiting for RFID Card')
        RH1=revievezigbee()
        print(RH1)
        if(RH1=='5500C91F0B88'):
          p=pr1
          m=str(mr1)
          t=t+mr1+0.25
          tot=t
          t1=str(abs(loadread()))
          print('Product Code is ',str(p))
          print('Load value is '+str(t1))
          print ('Price is ',str(tot))
          #sendart()

          thingspeakHttp = BASE_URL +
"&field1={:.2f}&field2={:.2f}&field3={:.2f}".format(float(pr1), float(t1)
          print(thingspeakHttp)

          conn = urlopen(thingspeakHttp)
          print("Response: {}".format(conn.read()))

          conn.close()
        if(RH1=='5500E80A3F88'):
          GPIO.output(buzz,1)
          time.sleep(2)
          GPIO.output(buzz,0)
          print('Mal Practice is detected')
```

```
            if(RH1=='5500B70F52BF'):
              RH1='aa'
              sendard5(tot)
              break

            # except:
            # print 'exiting.'
            # break

            # call main

if __name__ == '__main__':
    main()
```