SMART TROLLEY FOR SHOPPING USING RASPBERRY PI KIT AUTOMATED BILLING SYSTEM VIA IoT

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

Now a days, Shopping have become daily activity in cities. People buys product from shopping mall for their regular use. To get their products scanned using barcode scanner and to get it billed, the customers have to stay in long queues. In this project, developing the trolley where the customer has to scan product barcode which they wish to purchase. The scanned product is dropped into the shopping cart of customer and then the customer can make payment online or at the Billing Counter. This project proposed a technique which means to decrease and perhaps wipe out the aggregate holding up time of client, bring down the aggregate labor prerequisite from charging counter and increment effectiveness by and large. This project helped the shop owners to reduce the manpower in the billing section. The Billing System is the core component of the project, allowing the system to quickly and accurately calculate the total cost of the items in the shopping cart. The system also provides users with a receipt, which can be printed or sent via email. The Smart Shopping Trolley using Raspberry Pi kit is a useful and innovative project that has the potential to revolutionize the shopping experience by simplifying the checkout process and improving customer satisfaction.

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Sl. No.	ACRONYMS	ABBREVATION
1.	AC	Alternating Current
2.	DC	Direct Current
3.	GPIO	General Purpose Input / Output Pins
4.	GPU	Graphical Processing Unit
5.	HDMI	High-Definition Multimedia Interface
6.	IC	Integrated Circuits
7.	IOT	Internet Of Things
8.	LCD	Liquid Crystal Display
9.	LED	Light Emitting Diode
10.	MCU	Micro Controller Unit
11.	OPENCV	Open-Source Computer Vision Library
12.	PIP	Package Installer Python
13.	PWM	Pulse Width Modulation
14.	RFID	Radio Frequency Identification
15.	TWI	Two Wire Interface
16.	UART	Universal Asynchronous Receiver Transmitter
17.	USB	Universal Serial Bus
18.	VGA	Video Graphics Array

CHAPTER 1

INTRODUCTION

1.1 General

Shopping is an essential part of our lives, and with the rise of e-commerce, it has become more convenient than ever before. However, for those who prefer to shop in physical stores, there are still many challenges that need to be addressed. One of these challenges is the checkout process, which can often be time-consuming and frustrating. To address this challenge, the Smart Shopping Trolley using Raspberry Pi kit was developed. This project aims to create an automated billing system for shopping carts that uses modern technology to simplify the checkout process. The project makes use of the Raspberry Pi kit, which provides a compact and powerful computer that can be used for various purposes.

The Smart Shopping Trolley project is an excellent example of how technology can be used to enhance the shopping experience. It is designed to be portable, making it ideal for use in retail outlets of various sizes. The system uses a combination of sensors and actuators to detect and track the movement of the shopping cart, as well as the items being added to the cart. The LCD Display provides users with a visual display of the items being scanned, the total cost of the purchase, and other relevant information. The Keypad allows users to enter their PIN or other details needed for the transaction.

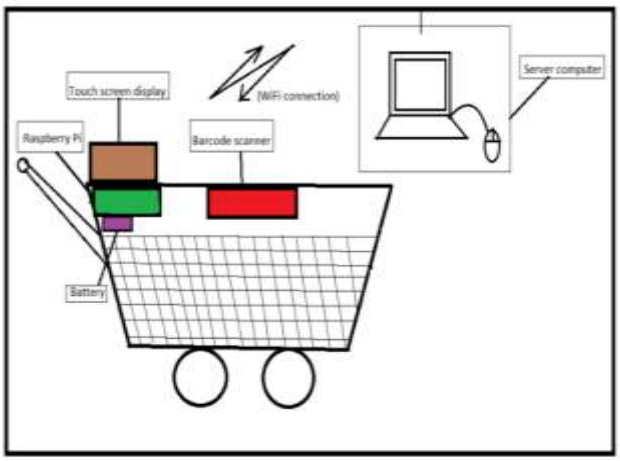


Fig.1.1 Smart Shopping Trolley Model

The Billing System is the core component of the project, enabling the system to quickly and accurately calculate the total cost of the items in the shopping cart. The Smart Shopping Trolley using Raspberry Pi kit is a fascinating project that has the potential to revolutionize the shopping experience. By simplifying the checkout process and improving customer satisfaction, this project can help retailers attract and retain more customers.

Izz Tech Sdn Bhd is introducing a new product to the customers which is the smart trolley by using bar code. The company is targeting supply for smart trolley since it is people can estimate or calculate their daily budget grocer. Smart trolley can make people life easier when they entering the supermarket or hypermarket and also customer friendly which can help people from over budget. People either young or old can use this product safely. Other than that, our product can save people times like when they scanned all their items to the bar code scanner smart trolley can total up all the items and the user can do fast payment without waiting longer to do payment. We will sell our entire product to whole Malaysia to make it the product important to each supermarket. This way can make our company become the largest trolley manufacture. The management teams of company are divided into several sections and each of the section were led by experienced and professional employee to ensure our company's product quality and efficiency.

Fig 1.2. Advanced Smart Trolley in Malaysia – Ref Model

1.2 Aim

The Aim is to save the people time in unnecessary queues in shopping places. This is the major drawback in the billing section. This project will be helpful to the shop owners to decrease the manpower in the billing section. To maintain the employees to another huge works for the shop development.

In this project, introducing a Smart automated billing system in the Shopping markets or any other shops.

1.3 Objective

- To provide the Customer with shopped items without standing on a long queue for billing/payment.
- Aim is to save the time for the Customer that it will be useful for another hold works.
- It is not fully automated but it is very easy to make a bill for the shopped items independently.
- Goal is to reach the project that will be efficiently and easily buyable for the shop owners.

1.4 Scope

The main outcomes that may be considered when searching for and assessing the evidence are:

- Time management in the life
- To decrease the manpower
- Avoid Rushing in the Billing
- Reduce the human error due to urgence
- To satisfy the customers.

CHAPTER 2

LITERATURE REVIEW

In this chapter we present the literature review of the Automated Billing System through IoT and Smart Trolley Projects using RFID and Raspberry IDE.

"Automated Shopping Trolley System Using Raspberry Pi Device" by Ravindra Jogekar, Ruchita Ghodeswar, Payal Kadu proposed the project in IEEE 2018"

The automated shopping trolley system is linked with various devices such as barcode scanner, Raspberry Pi, touch screen. It provides the facility to customer to self-scan the products which the customer wants to purchase. After purchasing or self-scanning, the product if customer wants to make changes in product detail such as add or remove can easily update the products detail by using the touch screen where the add, remove, update, delete keys are provided. A wireless smart device make note of all the scan products of the particular trolley and is linked with supermarket backend database which contains detail of the products such as price, stock. As we have provided the self-scan facility to the user and the wireless smart devices which makes of all the scanned products and connected with supermarket database. The scan products automatically billed in the wireless smart device for their purchase. At the time of purchasing the products customer is aware about the total bill.

"Smart Trolley", proposed by Shailesh, Pragathi Deb and Rajan Chaukan on IEEE 2021 978-1-7281-7741-0/21 (ICACITE-2021)

This study aimed to develop to solve the problem that is faced by people shopping and try make to their shopping more efficient and convenient. Using a simple interface that can be operated by everyone will make it easy to use also. A drawback of this trolley is that the production cost will increase. As a result of this paper, we shall

make an attempt toreduce the time of shopping and would also make shopping easier. Billing time would be reduced and would also make the conventional method of shopping more efficient

"M. Kabil Dev, R. Kannan and M. Agarshan "Automated Billing Smart Trolley and Stock Monitoring" IEEE 2021 DOI: 10.1109/SSD.2021

This paper deals with system are flexible to the customers as it allows them to pay via online as well as offline. All products in the shop are fixed with RFID tag. Our device consists of a RFID reader. When the products are added, the RFID reader reads the particular product's tag and displays in the screen. If any product is to be removed it can be done using the remove switch. Once the bill is generated if any product is added or deleted will be alerted using a led. If the payment is done, it will be indicated so manual checking is not needed. Stock availability can be monitored by the admins if the shopping is done using trolley. Based on the offers at festival time, device will scan the product and calculate the price after discount, display the price in LED screen. It also allows the admin to monitor stock details so, it can be restored once the product gets over.

"SMART *ELECTRONIC TROLLEY FOR SHOPPING MALL"*, by the Sarala T, Sudha Y A and Sindhu K V 2018 3rd IEEE (RTEICT-2018)

The paper is based on the IR sensor, barcode acceptance button, power supply, LCD displays modem, door solenoid, swiping machine, servo motor is connected to the Arduino IDE board. Arduino IDE mega 2560 is an microcontroller board that has 54input/output pins and working frequency of16MHZ. This Arduino IDE mega board connects all other hardware components. Power supply connected to Arduino IDE mega board, rechargeable battery of 12v power supply. since Arduino IDE mega board requires power supply of5v, hence relay connected in between battery and Arduino IDE mega board. So the 12v supply is reduced to 5vand it is supplied to Arduino IDE board.

A barcode reader is connected to Raspberry IDE mega board is a electronic equipment that can read printed barcodes to computer. Barcode reader send products code to Arduino IDE, and the products codes are stored in memory. A 20x4 LCD display is connected to the Raspberry IDE mega board which helps in exhibiting the cost and number of products. The memory which is read by barcode stored on Arduino mega barcode reading exhibits on LCD screen.

"A Smart Trolley for Smart Shopping", proposed a journal publication by T. K. Das, A. K. Tripathy and K. Srinivasan *IEEE 2020 (ICSCAN)*, pp. 1-5-416-298-2020

The desired system must be reliable while scanning the products and should be consistent in providing right responses to the operations and should properly send all details to the online database. We propose a smart trolley system that involves customer to scan the products and complete the billing process in the trolley itself. The customer has to take the trolley, then scan his card and continue to scan the products. If he wants to remove any product from the cart, he has to re-scan it. Once all the products are scanned, he can proceed to checkout. Then has to scan customer card to deduct the amount from card. There is also a feature to check the balance in the card. The customer can also view billing details in the online website of the shop**.** This project uses the Arduino IDE Uno to get a controlled device for the project.

CHAPTER 3

SYSTEM STUDY

3.1 Existing System

In an existing system, supermarket billing system is built to help supermarkets calculate and display bills and serve the customer in a faster and efficient manner. This software project consists of an effective and easy GUI (Graphic User Interface) to help the employee in easy bill calculation and providing an efficient customer service. Gofrugal's Supermarket software is designed to manage all the supermarket activities like supermarket billing, accounting, inventory from a single POS (Point of Sale) system.

In the existing system, the checkout process for physical stores typically involves manual billing, where a cashier manually enters the price of each item into the billing system, calculates the total cost, and provides a receipt to the customer.. Some stores have attempted to address this issue by implementing self-checkout systems, where customers can scan the items themselves and pay using a card or cash. However, these systems can also be prone to errors, and customers may require assistance from store personnel to complete the checkout process.

- Kind of Sales Management system
- Software pre-defined Application for Billing
- Number of items added to its software library

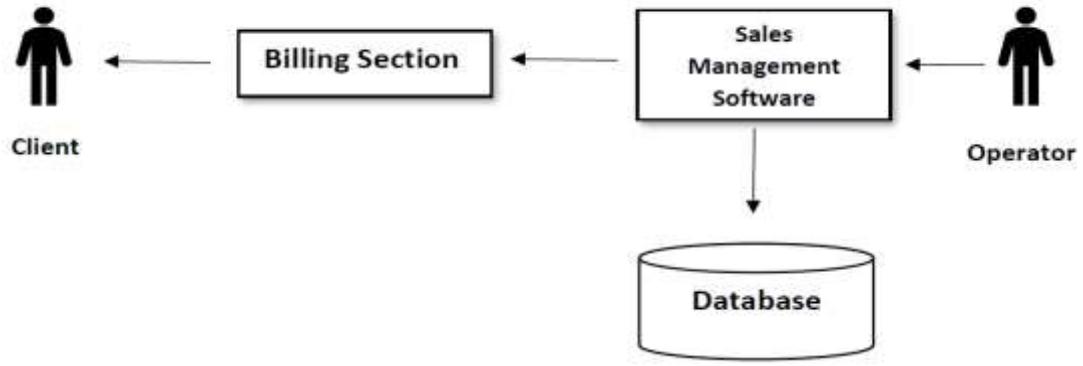


Fig.3.1 Diagram of Existing System

3.2 Disadvantages

Another potential disadvantage is the need for regular maintenance and updates to ensure the system is functioning correctly.

The system relies on various components, which may require calibration or replacement over time, leading to additional maintenance costs.

Additionally, the system may not be suitable for all types of stores, particularly those with limited space or high foot traffic. The use of the system may also require additional training for store personnel and customers, leading to additional costs and time.

Finally, as with any automated system, there is a risk of technical errors and malfunctions, which could lead to delays and frustration for customers. While the Smart Shopping Trolley using Raspberry Pi kit offers significant advantages in terms of efficiency and convenience, there are potential drawbacks that must be considered before implementing this technology in a retail setting.

3.3 Proposed System

This Project is based on the Smart trolley is a shopping assistant who supports customers for displaying more product information, accommodating with personal wheelie trollies/trays. Smart Trolleys and Smart Checkout Systems have been redefining customer experience in retail stores in recent years by automating the checkout process. It is based on the using Raspberry Pi 3 and Barcode scanner using POS (Point of Sale) Billing System. And it has a TFT-LCD screen to display a QR code for the Online UPI Payment to avoid the Cash Problems.

3.4 Advantages

- Increased Efficiency: The proposed system automates the billing process, reducing the time needed for checkout and increasing the speed and efficiency of the system.
- Improved Accuracy: The use of sensors and actuators in the system helps to

reduce errors in the billing process, leading to more accurate transactions.

- Cost Savings: The system can help reduce costs associated with hiring and training additional staff for checkout and reduce losses from errors in manual billing.
- Enhanced Customer Experience: The system offers a user-friendly interface that provides customers with a more convenient and efficient checkout experience, leading to increased customer satisfaction.
- Valuable Insights: The proposed system has the potential to provide valuable data on customer behavior and purchasing patterns, which can be used to optimize inventory management and marketing strategies.
- Portability: The system is designed to be portable, making it ideal for use in retail outlets of various sizes and types.

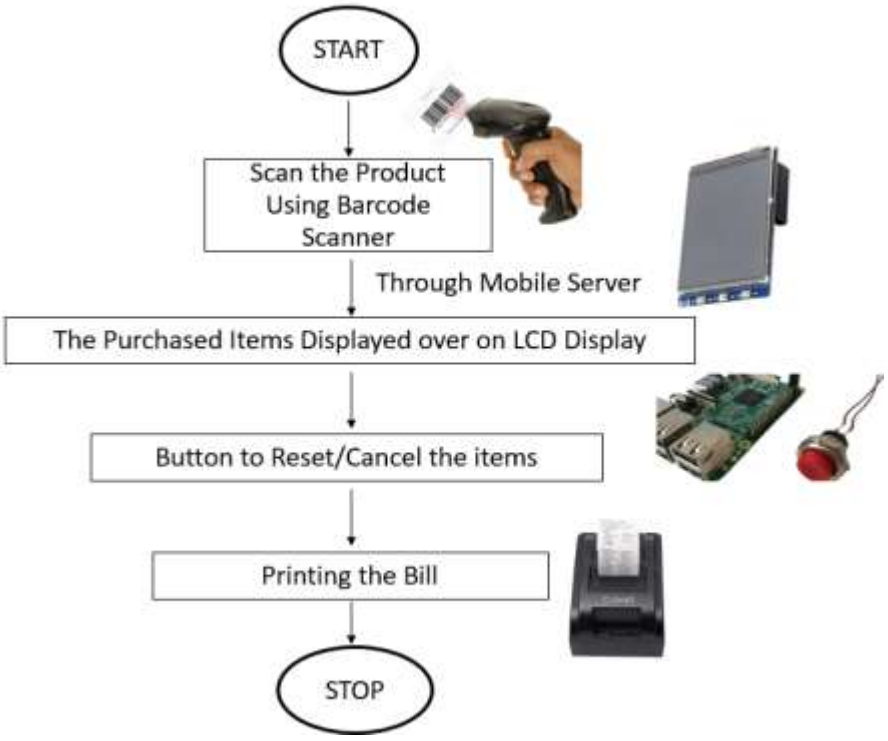


Fig 3.2 Architecture of proposed system

CHAPTER 4

METHODOLOGY

4.1 Block diagram

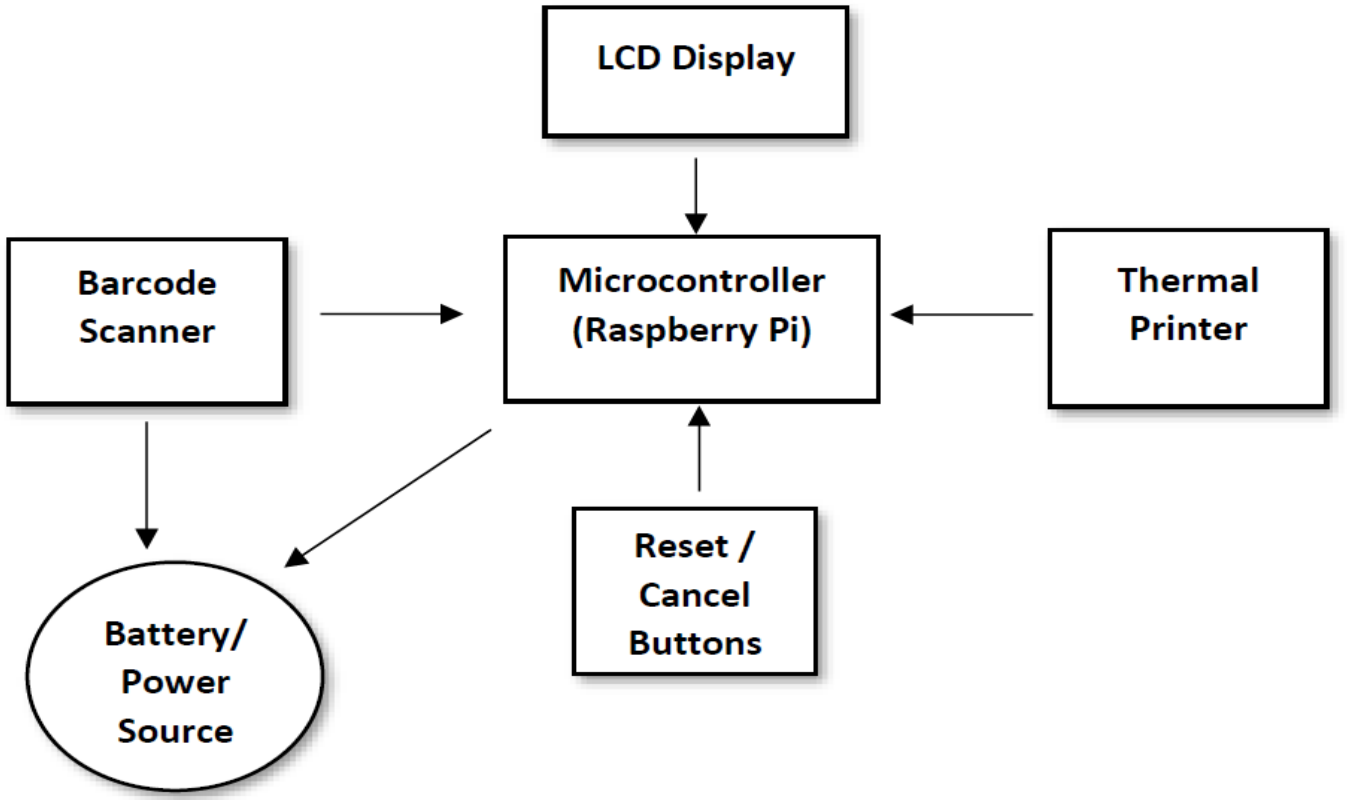


Fig.4.1. Block Diagram

4.2 Module Description

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program. The project “Smart Trolley For Shopping Using Raspberry Pi 3 – Automated Billing System Via IoT” consists of two main modules they are,

- Hardware
- Software

4.3. Hardware Description

4.3.1Raspberry Pi

4.3.1.1 Introduction

Raspberry Pi is a low-cost, basic computer that was originally intended to help spur interest in computing The Raspberry Pi computer is essentially a wireless Internet capable system-on-a-chip (SoC) with 1 GB RAM, connection ports, a Micro SD card slot, camera and display interfaces and an audio/video jack. The Raspberry Pi is a credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote teaching of basic computer science in schools and in developing countries. It does not include peripherals. The organization behind the Raspberry Pi consists of two arms. After the Pi Model B was released, the Foundation set up Raspberry Pi Trading, with Eben Upton as CEO, to develop the third model, the B+.

Figure 4.2 Raspberry Pi 3

4.3.1.2 Features

- Central Processing Unit (CPU) Every computer has a Central Processing Unit and so does the Raspberry Pi.
- HDMI port.
- Graphic Processing Unit (GPU)
- Memory (RAM)
- Ethernet port.
- SD card slot.
- General Purpose Input and Output (GPIO) pins.
- LEDs.

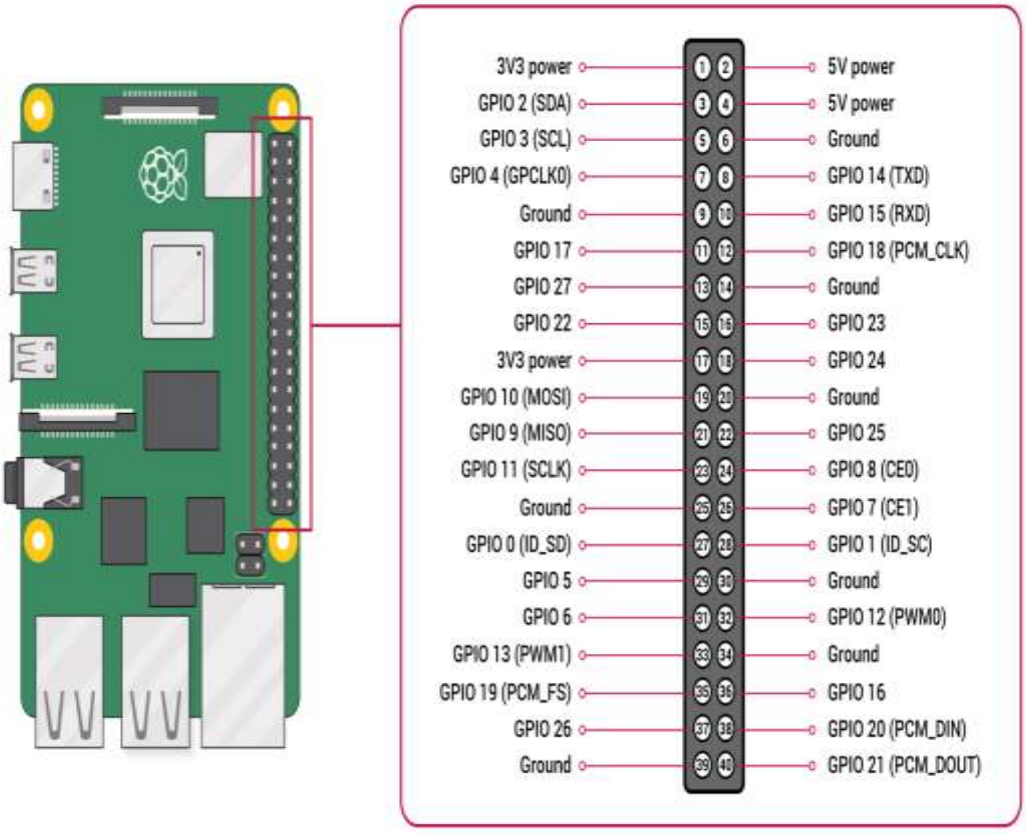


Figure 4.3 Pin Configuration

PIN GROUP	PIN NAME	DESCRIPTION
POWER SOURCE	+5V, +3.3V, GND and Vin	+5V -power output +3.3V -power output GND – GROUND pin
COMMUNICATION INTERFACE	UART Interface (RXD, TXD)[(GPIO15,GPIO14)]	UART (Universal Asynchronous Receiver Transmitter) used for interfacing sensors and other devices.
	SPI Interface (MOSI, MISO, CLK,CE)x2 [SPI0-(GPIO10, GPIO9, GPIO11, GPIO8)] [SPI1--(GPIO20,GPIO19, GPIO21 ,GPIO7)]	SPI (Serial Peripheral Interface) used for communicating with other boards or peripherals.
	TWI Interface(SDA, SCL) x 2 [(GPIO2, GPIO3)] [(ID_SD,ID_SC)]	TWI (Two Wire Interface) Interface can be used to connect peripherals.
INPUT OUTPUT PINS	26 I/O	Although these some pins have multiple functions they can be considered as I/O pins.
PWM	Hardware PWM available on GPIO12, GPIO13, GPIO18, GPIO19	These 4 channels can provide PWM (Pulse Width Modulation) outputs. *Software PWM available on all pins
EXTERNAL INTERRUPTS	All I/O	In the board all I/O pins can be used as Interrupts.

Table 4.3 (i) Pin description of Raspberry Pi

4.3.2 Microcontroller

A Micro controller consists of a powerful CPU tightly coupled with memory RAM, ROM or EPROM, various I / O features such as Serial ports, Parallel Ports Timer/Counters, Interrupt Controller, Data Acquisition interfaces Analog to Digital Converter (ADC), Digital to Analog Converter (ADC), everything integrated onto a single Silicon Chip. It does not mean that any micro controller should have all the above said features on chip, depending on the need and area of application for which it is designed, the on-chip features present in it may or may not include all the individual section said above. Any microcomputer system requires memory to store a sequence of instructions making up a program, parallel port or serial port for communicating with an external system, timer / counter for control purposes like generating time delays, Baud rate for the serial port, apart from the controlling unit called the Central Processing Unit

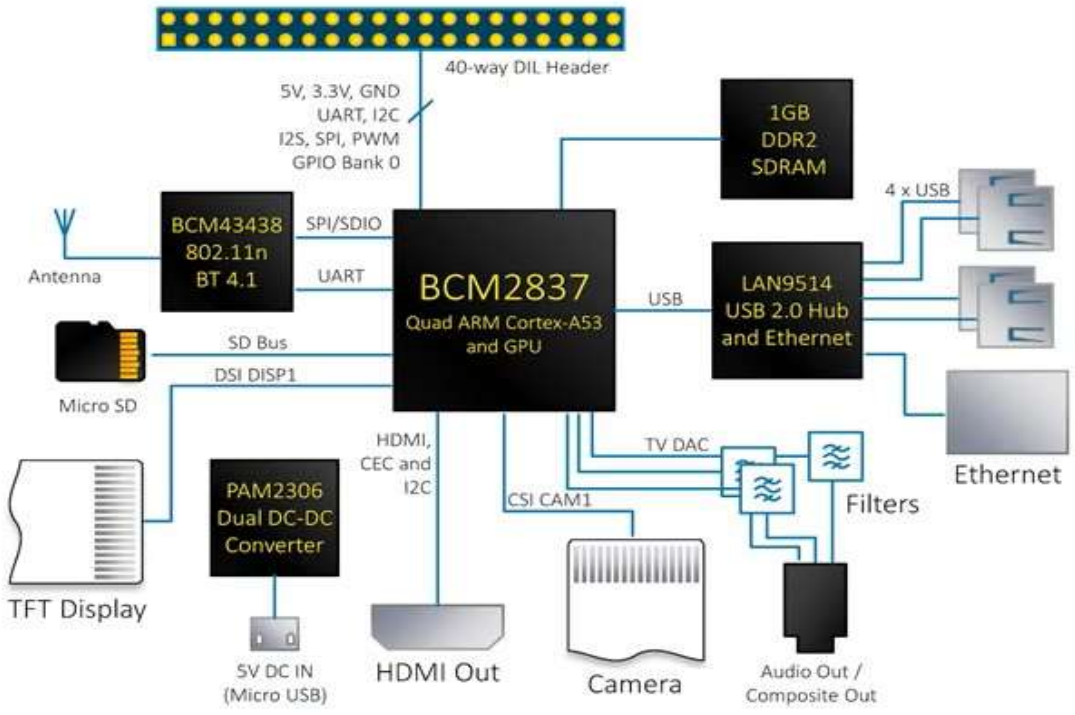


Figure 4.4 Micro Controller Kit – Raspberry pi

4.3.2.2 Application

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems.In the context of internet of things, microcontrollers are an economical and popular means of data collection, sensing and actuating the physical world as edge devices. Raspberry Pi is the one of the Micro Controller has the following application of:

- Hobby projects
- Low-cost PC/tablet/laptop
- IoT applications
- Media center
- Robotics
- Industrial/Home automation
- Server/cloud server
- Print server
- Security monitoring
- Web camera
- Gaming
- Wireless access point
- Environmental sensing/monitoring (e.g., Weather Station)

4.3.3 20x4 LCD Display

4.3.3.1Introduction

LCD stands for Liquid Crystal Display. They come in many sizes 8x1 , 8x2 , 10x2 ,16x1 , 20x4 , 16x4 , 20x2 , 20x4 ,24x2 , 30x2 , 32x2 , 40x2 etc Many multinational companies like Philips Hitachi Panasonic make their own special kind of LCD'S to be used in their products. All the LCD'S performs the same functions

display characters numbers special characters ASCII characters etc. Their programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15). Alphanumeric displays are used in a wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc.

LCD is a type of flat panel display which uses liquid crystals in its primary of operation. LCD draws its definition from its name itself. It is combination of two states of matter, the solid and the liquid. LCD uses a liquid crystal to produce a visible image. LCD's technologies allow displays to be much thinner when compared to cathode ray tube (CRT) technology.

4.3.3.2 Functions

- LCD 20x4 is a 16-pin device that has 4 rows that can accommodate 20 characters each.
- LCD 20x4 can be used in 4-bit mode or 8-bit mode.
- It is also possible to create custom characters.
- It has 8 data lines and 3 control lines that can be used for the control purposes.
- For more information about LCD 20x4 and how to use it, refer the topic LCD 20x4 module in the sensors and modules section

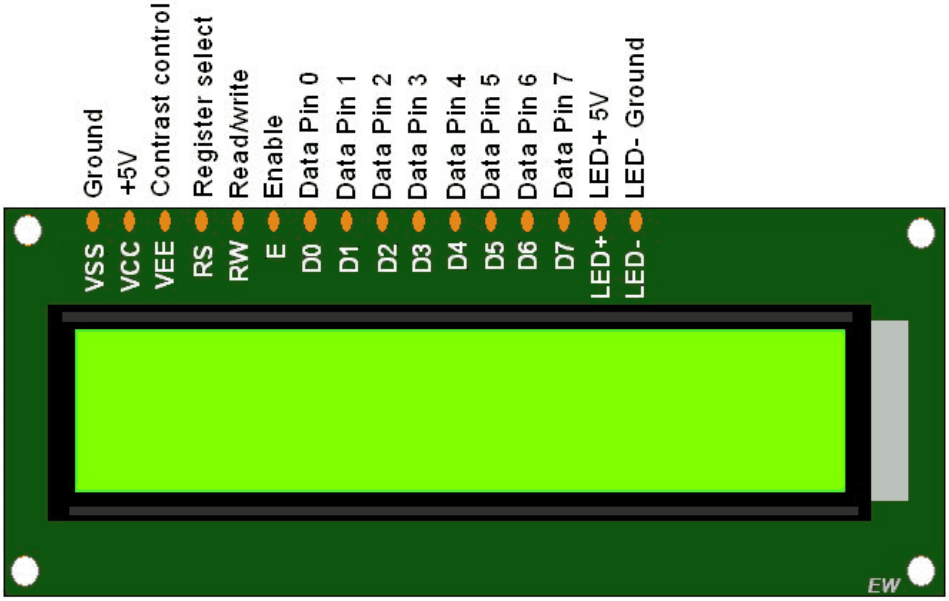


Figure 4.5 LCD Display

4.3.3.3 Description

This is an LCD Display designed for E-blocks. It is a 20 character, 4-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply. The 20x4 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply(+5V).

Fig. 4.6. 20x4 LCD

4.3.3.4 Features

- Input voltage: 5v
- E-blocks compatible
- Low cost
- Compatible with most I/O ports in the E-Block range
- Ease to develop programming code using Flow code icons

4.3.4 Power Supply

Power supply is the backbone of any electric system. The power supply takes AC from the wall outlet, converts it to unregulated DC, and reduces the voltage using and input power transformer, typically stepping it down to the voltage required by the load.

4.3.5 Battery

4.3.5.1 Introduction

A 12-volt **battery** has six single cells in series producing a fully charged output voltage of 12.6 volts. A **battery** cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between. This is a rechargeable 12volt 1.2AH Sealed Lead Acid Battery Our Power-Sonic or Equivalent valve regulated sealed lead acid batteries are maintenance free, easy to handle, rugged and economical. It has a characteristic of high discharge rate, wide operating temperature, long service life and deep discharge recover. This product has Absorbent Glass Mat (AGM) technology for superior performance. This product is approved for transport by air.

A **12-volt** motorcycle **battery** is made up of a plastic case containing six cells. Each cell is made up of a set of positive and negative plates immersed in a dilute sulfuric acid solution known as electrolyte, and each cell has a voltage of around 2.1 volts when fully charged

4.3.5.2 Battery Configuration

Fig. 4.7. Battery 6v -1.3 Ah

Voltage	Amp Hours (20 hour)	Size (inches)
6	0.2	3.82 x 1.77 x 2.09
6	0.9	7.01 x 1.34 x 2.36
6	1.3	7.01 x 1.34 x 2.36

Table 4.3 (ii) Battery Configuration

4.3.6 Buttons

4.3.6.1 Introduction

A button switch is a small, sealed mechanism that completes an electric circuit when you press on it. When it's on, a small metal spring inside makes contact with two wires, allowing electricity to flow. When it's off, the spring retracts, contact is interrupted, and current won't flow. Button (spelled button)is a simple switch mechanism to control some aspect of a machine or a process.

Buttons are typically made out of the hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily pressed or depressed.

4.3.6.2 Functions

Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-ed state. Buttons allow us to power the circuit or make any particular connection only when we press the button. Simply, it makes the circuit connected when pressed and breaks when released.

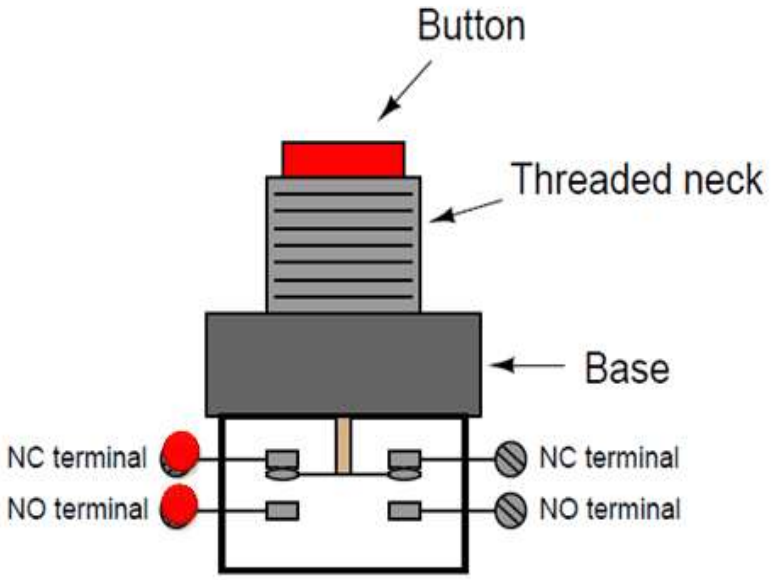


Fig. 4.8. Button Working Process

A button is also used for triggering of the SCR by gate terminal. A Button switch is a type of switch which consists of a simple electric mechanism or air switch mechanism to turn something on or off. Depending on model they could operate with momentary or latching action function.

The button itself is usually constructed of a strong durable material such as metal or plastic. To make switch allows electricity to flow between its two contacts when held in. When the button is released, the circuit is broken. This type of switch is also known as a Normally Open (NO) Switch. (Examples: doorbell, computer case power switch, calculator buttons, individual keys on a keyboard).

4.3.7 Switch

4.3.7.1 Introduction

In electrical engineering, a switch is an electrical component that can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another. The most common type of switch is an electromechanical device consisting of one or more sets of movable electrical contacts connected to external circuits. When a pair of contacts is touching current can pass between them, while when the contacts are separated no current can flow.

Switches are made in many different configurations; they may have multiple sets of contacts controlled by the same knob or actuator, and the contacts may operate simultaneously, sequentially, or alternately.

A switch may be operated manually, for example, a light switch or a keyboard button, or may function as a sensing element to sense the position of a machine part, liquid level, pressure, or temperature, such as a thermostat. Many specialized forms exist, such as the toggle switch, rotary switch, mercury switch, pushbutton switch, reversing switch, relay, and circuit breaker. A common use is control of lighting, where multiple switches may be wired into one circuit to allow convenient control of light fixtures.

4.3.7.2 Functions

Switches in high-powered circuits must have special construction to prevent destructive arcing when they are opened. Electrical circuits only work when the electricity is free to move through in a continuous loop. Once that loop is broken, the electricity is cut off. This is where the switch comes in. An on/off toggle circuit breaks the current when it's in the "off" position.

The power-off symbol (circle) on a button or toggle, indicates that using the control will disconnect power to the device, the power on-off symbol (line within a circle), is used on buttons that switch a device between on and fully off states.

Fig. 4.9. Switch Core Model

4.3.6 IC 7805

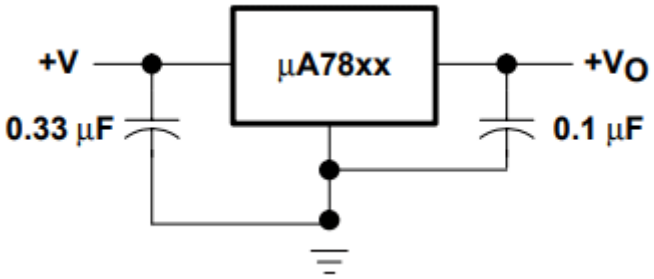
4.3.8.1 Introduction

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects.

The name 7805 signifies two meaning, “78” means that it is a positive voltage regulator and “05” means that it provides 5V as output. So our 7805 will provide a +5V output voltage. The output current of this IC can go up to 1.5A. But the IC suffers from heavy heat loss hence a Heat sink is recommended for projects that consume more current. For example, if the input voltage is 12V and you are

consuming 1A, then (12-5) * 1 = 7W. This 7 Watts will be dissipated as heat.

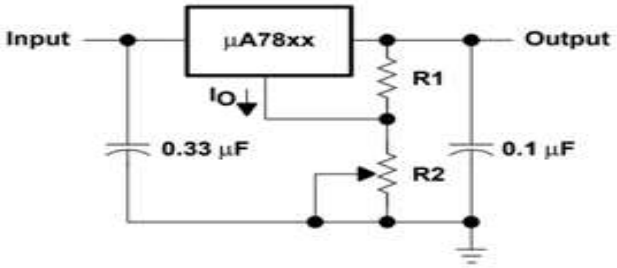
4.3.8.2 7805 as +5V Voltage Regulator



This is a typical application circuit of the 7805 IC. The input capacitor 0.33uF is a ceramic capacitor that deals with input inductance problem and the output capacitor 0.1uF is also a ceramic capacitor that adds to the stability of the circuit. These capacitors should be placed close to the terminals for them to work effectively. Also, they should be of ceramic type, since ceramic capacitors are faster than electrolytic.

4.3.8.3 7805 as adjustable output Regulator

This IC can also act as an adjustable output voltage regulator, meaning you can also control the output voltage for your desired value using the below circuit.



Here, the input voltage can be anywhere between 9V-25V, and the output voltage can be adjusted using the value of resistance R1 and R2. The value can be calculated using the below formulae.

$$V_O = V_{xx} + \left(\frac{V_{xx}}{R1} + I_Q\right)R2$$

Where, Vxx=5, IQ = 5*10-3

7805 voltage Regulator:

Pin Number	Pin Name	Description
1	Input (V+)	Unregulated Input Voltage
2	Ground (Gnd)	Connected to Ground
3	Output (Vo)	Outputs Regulated +5V

Table 4.3 (iii) Pin Configuration 7805

4.3.8.4 Features

- 5V Positive Voltage Regulator
- Minimum Input Voltage is 7V
- Maximum Input Voltage is 25V
- Operating current (I_Q) is 5mA
- Internal Thermal Overload and Short circuit current

  limiting protection is available.

- Junction Temperature maximum 125 degree Celsius

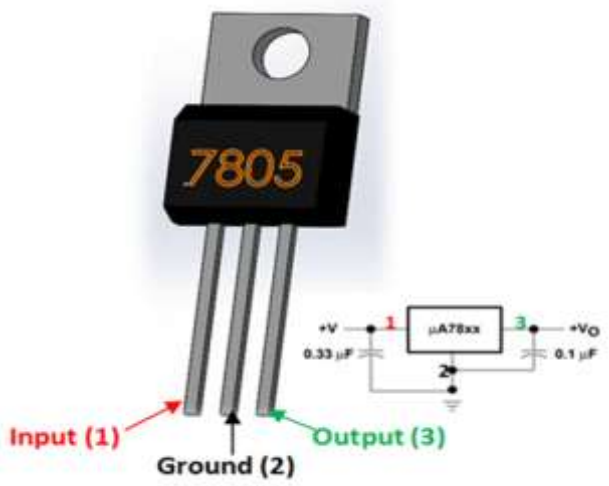


Fig. 4.10. Pin diagram 7805 Regulator

4.3.8.5 Applications

- Constant +5V output regulator to power microcontrollers and sensors
- Adjustable Output Regulator
- Current Limiter for certain applications
- Regulated Dual Supply
- Output Polarity-Reversal-Protection Circuit

Component	Function
C1	This capacitor is known as bypass capacitor and is employed to bypass extremely tiny duration spikes to the ground with no distress the other components.
C2	C2 is the filter capacitor employed to steady the slow changes in the voltage applied at the input of the circuit. Escalating the value of the capacitor amplify the stabilization as well as the declining value of the capacitor reduces the stabilization. Moreover, this capacitor is not alone capable to ensure very constricted period spikes emerge at the input.
C3	C3 is known as a filter capacitor employed in the circuit to steady the slow alterations in the output voltage. Raising the value of the capacitor enlarges the stabilization furthermore declining the value of the capacitor declined the stabilization. Moreover, this capacitor is not alone capable to ensure very fine duration spikes happen at the output.
C4	C4 is known as bypass capacitor and worked to bypass very small period spikes to the earth with no influence the other components.
U1	U1 is the IC with positive DC and it upholds the output voltage steady exactly at a constant value even although there is major deviation in the input voltage.

Table.4.3 (iv) Working of the Components

PIN NO	PIN	DESCRIPTION
1	INPUT	In this pin of the IC positive unregulated voltage is given in regulation
2	GROUND	In this pin where the ground is given. This pin is neutral for equally the input and output
3	OUTPUT	The output of the regulated 5V volt is taken out at this pin of the IC regulator

Table.4.3 (v) Pin explanation of IC 7805

4.3.7 Features of Other Components:

Automated billing system: The system should be able to automatically generate a bill based on the items scanned or added to the trolley.

- Barcode scanner: The trolley should have a barcode scanner that can read the barcode of each item added to the trolley and automatically add it to the bill.
- LCD display: The trolley should have an LCD display that can show the total cost of the items in the trolley, as well as any other relevant information such as discounts or promotions.
- Keypad: The trolley should have a keypad that allows users to input any necessary information such as coupons or loyalty program information.
- Connectivity: The trolley should have Wi-Fi or Bluetooth connectivity to communicate with the billing system and transmit the data needed to generate the bill.
- Battery: The trolley should have a rechargeable battery to power the system and ensure that it can be used without being tethered to a power outlet.
- On/Off switch: The trolley should have an on/off switch to conserve battery life when not in use.

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CHAPTER 5
SOFTWARE DESCRIPTION

5.1 Python IDLE

5.1.1 Introduction

Python is a high-level, interpreted programming language that was first released in 1991. It is known for its simplicity, ease of use, and readability, making it one of the most popular programming languages in use today. Here are some key features and benefits of Python:

Readability: Python code is easy to read and understand, even for beginners. This makes it easier to maintain and modify code, and reduces the time and effort required for debugging.

Versatility: Python is a versatile language that can be used for a wide range of tasks, from web development to data analysis and scientific computing.

Interpreted: Python is an interpreted language, which means that code is executed line by line by the interpreter. This makes it easy to test and debug code, and allows for a faster development cycle.

Large standard library: Python comes with a large standard library that provides a range of tools and functions for various tasks such as file handling, networking, and database access. This reduces the need for external libraries and simplifies the development process.

Third-party libraries: Python has a large and active community that has developed many third-party libraries and modules that can be used to extend its functionality. Some popular libraries include NumPy, Pandas, and Matplotlib.

Cross-platform: Python can run on multiple platforms such as Windows, Linux, and macOS, making it easy to develop and deploy applications across different environments.

Easy to learn: Python has a simple syntax that is easy to learn for beginners. This, combined with its readability and ease of use, makes it an ideal language for new programmers.

Python is a powerful and versatile programming language that is widely used in a variety of industries and applications. Its simplicity, ease of use, and large community make it a popular choice for developers and data scientists.

5.1.2 Python-OpenCV

OpenCV (Open-Source Computer Vision Library) is an open-source library of programming functions mainly aimed at real-time computer vision applications. It is written in C++ and has bindings for various programming languages including Python.

OpenCV provides various functions and algorithms that can be used for tasks such as image and video processing, object detection and recognition, face detection, feature extraction, and more. Python is a popular programming language for working with OpenCV due to its simplicity, readability, and ease of use.

5.1.3 Some of the key features of OpenCV for Python include:

- Image and video input/output - OpenCV provides functions to read and write images and videos from various file formats.
- Image processing - OpenCV provides functions for basic image processing operations such as filtering, thresholding, and morphological operations. Object detection and recognition - OpenCV provides algorithms for object detection and recognition, including Har cascades and HOG descriptors.
- Feature extraction and matching - OpenCV provides functions for extracting features from images and matching them between different images.
- Deep learning integration - OpenCV can be used in conjunction with deep learning frameworks such as TensorFlow and Keras for tasks such as object

detection and recognition.

- GUI programming - OpenCV provides functions for creating GUI applications that allow users to interact with image and video data.
- OpenCV is a powerful and versatile library for image and video processing that can be used for a wide range of applications. Its integration with Python makes it accessible to a large community of developers and researchers, and its continued development ensures that it will remain a valuable tool for computer vision in the years to come.
- OpenCV-Python makes use of NumPy, which is a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from NumPy arrays.
- This also makes it easier to integrate with other libraries that use NumPy such as SciPy and Matplotlib.
- OpenCV introduces a new set of tutorials which will guide you through various functions available in OpenCV-Python. This guide is mainly focused on OpenCV 3.x version (although most of the tutorials will also work with OpenCV 2.x).
- Prior knowledge of Python and NumPy is recommended as they won't be covered in this guide. Proficiency with NumPy is a must in order to write optimized code using OpenCV-Python.

5.2 Raspberry IDE

Raspberry IDE is an open-source electronic prototyping platform that is based on a simple microcontroller board. It was created to help artists, designers, and hobbyists build interactive projects that incorporate sensors and actuators. Raspberry IDE boards are easy to use and come with a user-friendly software development environment.

Here are some key features and benefits of Raspberry IDE:

- Open-source: Raspberry IDE is an open-source platform, which means that the hardware and software designs are freely available for anyone to use, modify, and distribute.
- Easy to use: Raspberry IDE boards are easy to use, even for beginners with no prior experience in electronics or programming. The boards come with a simple, intuitive programming language and a range of built-in sensors and actuators.
- Low cost: Raspberry IDE boards are relatively inexpensive compared to other microcontrollers, making them accessible to a wide range of people.
- Versatile: Raspberry IDE boards can be used to build a wide range of projects, from simple LED blinkers to complex robots and home automation systems.
- Community: Raspberry IDE has a large and active community of users and developers who share their knowledge and experience through forums, tutorials, and online resources.
- Extensible: Raspberry IDE boards can be easily extended with additional shields, which are plug-in modules that provide additional functionality such as Wi-Fi, GPS, or motor control.

CHAPTER 6

SYSTEM DESIGN

6.1 Circuit Diagram

In our proposed system, we designed a method to make the bill for the Shopped product in the Trolley using automated billing system. A billing system is a software application that manages the process of creating and tracking invoices for products or services provided to customers. The billing system typically stores customer information, tracks usage or sales data, calculates charges or fees, and generates invoices or statements. Product or service tracking: This involves tracking usage or sales data, such as the quantity of products sold, hours of service provided, or data usage. Invoice or statement generation: The system generates invoices or statements based on the calculated charges, customer information, and billing preferences. Payment processing: The billing system may also include features for processing payments, such as credit card or online payments, and recording payment information.

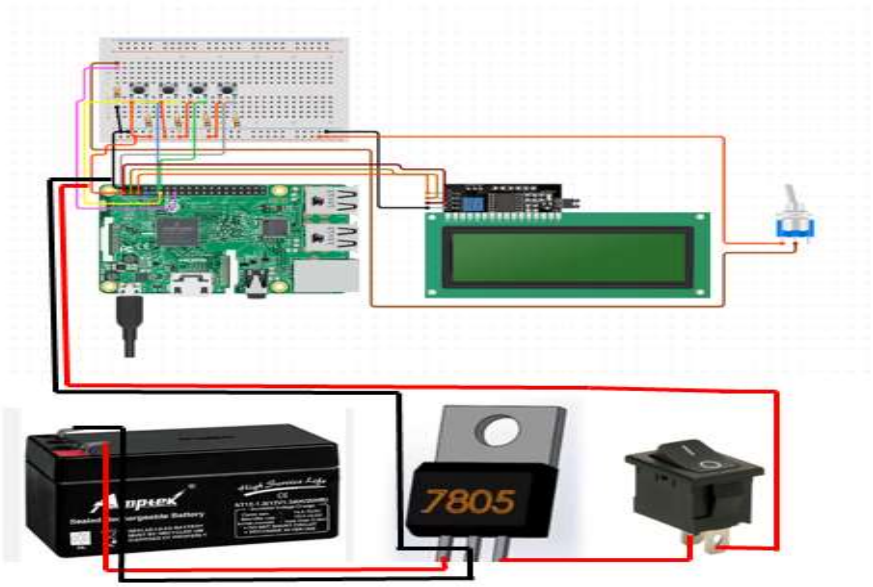

Figure 6.1 Circuit diagram

6.2 Data Flow Graph

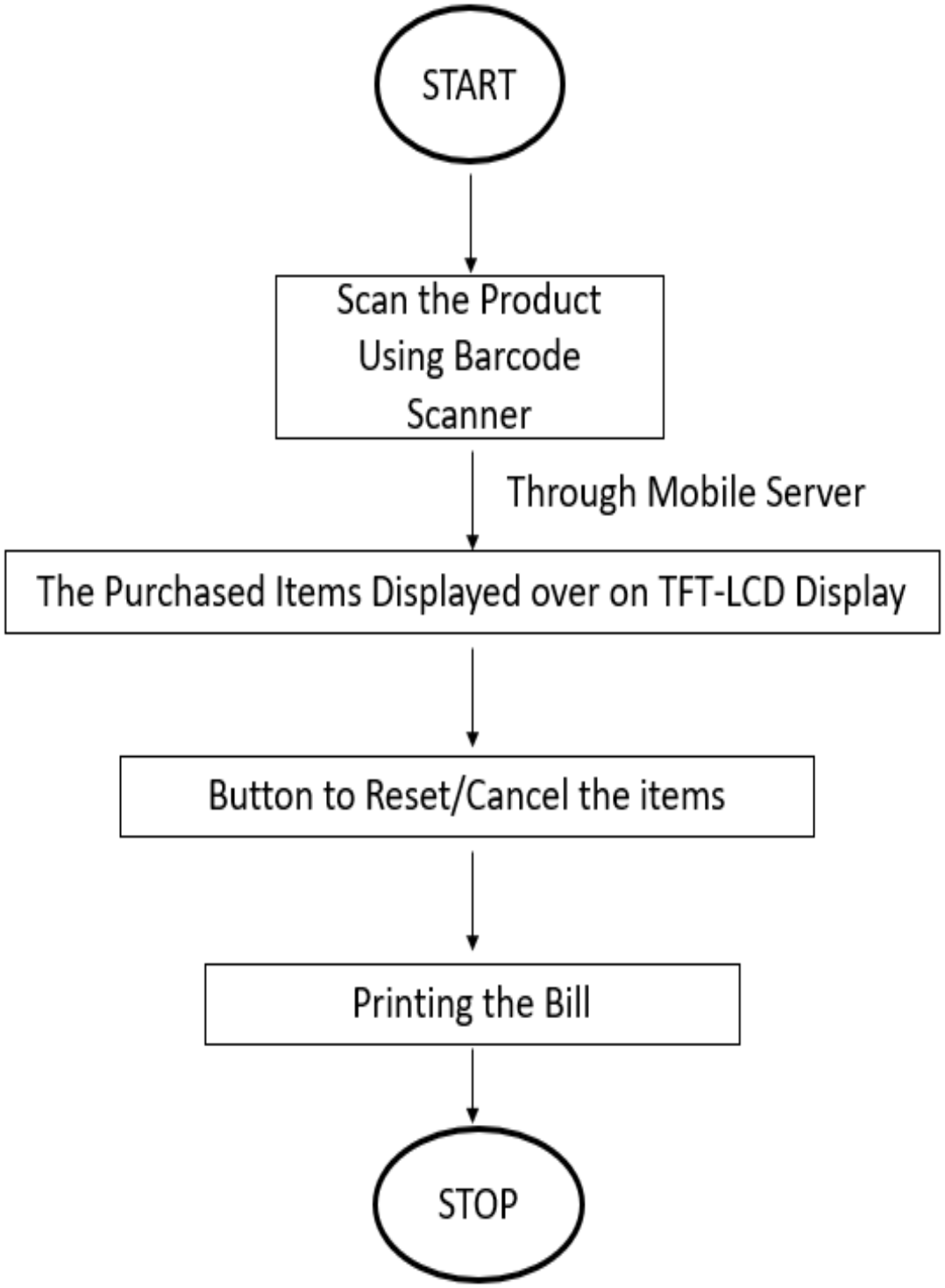

Figure 6.2 Data Flow diagram

CHAPTER 7

SYSTEM TESTING AND IMPLEMENTATION

7.1 Testing Analysis

The billing system may also include features for processing payments, such as credit card or online payments, and recording payment information. Once the system testing is complete and the system is fully functional, it can be implemented in a real-world scenario. The implementation involves installing the smart shopping trolleys in a supermarket or grocery store and providing training to the store employees on how to use and maintain the system. During the implementation phase, it is important to monitor the system and gather feedback from users to identify any issues or improvements that need to be made. This feedback can be used to make modifications to the system and improve its functionality and usability

7.2 System Implementation

The implementation involves installing the smart shopping trolleys in a supermarket or grocery store and providing training to the store employees on how to use and maintain the system. System testing and implementation for a Smart Shopping Trolley using Raspberry Pi kit - Automated Billing System involves the following steps:

- Unit Testing: This involves testing each module of the system individually to ensure that it is functioning as expected. For example, testing the Raspberry Pi kit, LCD display, keypad, variable parts, battery, on-off switch, and billing system individually.
- Integration Testing: This involves testing the integration of all the modules to ensure that they work together seamlessly. For example, testing the communication between the Raspberry Pi kit, LCD display, and keypad to ensure that the input from the keypad is displayed on the LCD screen. System

Testing: This involves testing the entire system as a whole to ensure that it meets all the requirements and performs as expected. For example, testing the smart shopping trolley to ensure that it can scan and add items to the cart, display the total cost, and generate a bill.

- User Acceptance Testing: This involves testing the system with real users to ensure that it meets their needs and is user-friendly. For example, testing the smart shopping trolley with actual shoppers to ensure that they can easily use the system and understand how it works.

7.3 Methodologies

The billing process is how a company or individual charges for their goods or services. The billing process will generally start with the company or individual providing an estimate, or quote, of the cost of the goods or services. After purchase, the billing process typically includes creating an invoice, sending it to the customer, and tracking payments The first step in the billing process is to create the invoice. An invoice lists the products or services a business has provided to a customer and the price for each item. The invoice must be accurate and include all the information the customer will need to pay for the items on the bill. Several factors go into creating an accurate invoice, such as ensuring that the correct items are included, calculating the correct totals, and applying for any discounts or credits. The invoice must also be formatted in a way that is easy for the customer to understand. This may include providing explanations of any charges, listing payment terms, and including contact information.

The final step in the billing process is to collect payment from the customer. Once the invoice has been sent, the business waits for the customer to pay. This can be done through various methods, such as online payments or over the phone. Additionally, companies need to track payments. Payment tracking can be accomplished by keeping track of payments in a ledger or by using billing software. This information can help determine revenue, late payments, and invoices.

CHAPTER 8

RESULTS AND OUTPUTS

8.1 Proposed System Hardware Kit

In our proposed system, we designed a method to make the bill for the Shopped product in the Trolley using automated billing system. The following diagram shows our proposed model,

Fig.8.1 Proposed System

The Billing process through scanning barcodes and display the product info is given below,

Fig.8.2. Before Making Bill

Fig.8.3. After Making Bill

8.2 Output Of the Printed Receipt

After making a bill in the LCD display, the print button is used to print the bill in the thermal printer. The diagram of message is given below,

Fig.8.4 Receipt after the Billing process

CHAPTER 9

CONCLUSION

9.1 Conclusion

In this project work, an attempt to design a model of Smart Shopping Trolley. From the project we conclude that:

- The Smart Shopping Trolley using Raspberry Pi kit - Automated Billing System is a useful and innovative system that can make shopping more efficient and convenient for customers.
- The system uses machine learning algorithms to automatically scan and add items to the cart, display the total cost, and generate a bill.
- By using a Raspberry Pi kit, LCD display, keypad, variable parts, battery, on-off switch, and billing system, the smart shopping trolley can accurately and quickly calculate the cost of items, making it easier for shoppers to keep track of their spending.
- The system provides numerous benefits, including faster checkout times, reduced waiting times, and improved accuracy in billing. It also helps reduce human error and eliminates the need for manual scanning, which can save time and effort for both shoppers and store employees.
- The Smart Shopping Trolley using Raspberry Pi kit - Automated Billing System has the potential to revolutionize the shopping experience by making it faster, more convenient, and more accurate. It is an example of the power of technology and innovation in improving everyday tasks and processes
- IoT does not have any range limit so that, doctor can prescribe treatment at any location through tele-communication.
- Our project reveals the use of INTERNET OF THINGS (IoT), which exhibit many of the characteristics desirable for high performance pavement applications, including data breach, easy access, high speed, complexity, better time management and adapting to new standards.

9.2 Future Development

In our proposed system, we considered the anti-theft criteria to attach a sensor without making a bill it will creates a beep sound and it will be protected from the theft and misuse. Further high usage of this project, Touch Screen will be implemented for the better usage.

In software, we used Python IDLE or VSC (Visual Studio Code) to implement the python coding with a OpenCV Library function to add the items in the Software. In future, a greater number of items added not only the Supermarket products as well as the Medicines, Gifts, Food items, etc., were added to the code to maintain the stock monitoring.

It will sure attract those shop owners and peoples for their easy usage and availability. It will helpful to the development of the electronics based on the research of the developing stage of Iot and AI/DS/ML fields.

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APPENDIX

I . Main code

```
import RPi.GPIO as GPIO
import time

import serial



GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)

port=serial.Serial('/dev/ttyUSB0',9600)

#port.write(str.encode('    hai welcome how aare u'+'\n'))
#port.write(str.encode('    hai welcome how aare u'+'\n'))
#port.write(str.encode('    hai welcome how aare u'+'\n'))

# Define GPIO to LCD mapping
LCD_RS = 2
LCD_E  = 3
LCD_D4 = 4
LCD_D5 = 17
LCD_D6 = 27
LCD_D7 = 22

sw1=23
sw2=24
sw3=25
sw4=8


GPIO.setup(LCD_E, GPIO.OUT)  # E
GPIO.setup(LCD_RS, GPIO.OUT) # RS
GPIO.setup(LCD_D4, GPIO.OUT) # DB4
GPIO.setup(LCD_D5, GPIO.OUT) # DB5
GPIO.setup(LCD_D6, GPIO.OUT) # DB6
GPIO.setup(LCD_D7, GPIO.OUT) # DB7

GPIO.setup(sw1, GPIO.IN)
GPIO.setup(sw2, GPIO.IN)
```

```
GPIO.setup(sw3, GPIO.IN)
GPIO.setup(sw4, GPIO.IN)
# Define some device constants
LCD_WIDTH = 20    # Maximum characters per line
LCD_CHR = True
LCD_CMD = False

LCD_LINE_1 = 0x80 # LCD RAM address for the 1st line
LCD_LINE_2 = 0xC0 # LCD RAM address for the 2nd line
LCD_LINE_3 = 0x94 # LCD RAM address for the 2nd line
LCD_LINE_4 = 0xD4 # LCD RAM address for the 2nd line

# Timing constants
E_PULSE = 0.0005
E_DELAY = 0.0005

total=0

data1= serial.Serial(
                port='/dev/ttyACM0',
                baudrate = 9600,
                parity=serial.PARITY_NONE,
                stopbits=serial.STOPBITS_ONE,
                bytesize=serial.EIGHTBITS,
                timeout=.5
                )


def lcd_init():
  # Initialise display
  lcd_byte(0x33,LCD_CMD) # 110011 Initialise
  lcd_byte(0x32,LCD_CMD) # 110010 Initialise
  lcd_byte(0x06,LCD_CMD) # 000110 Cursor move direction
  lcd_byte(0x0C,LCD_CMD) # 001100 Display On,Cursor Off, Blink Off
  lcd_byte(0x28,LCD_CMD) # 101000 Data length, number of lines, font size
  lcd_byte(0x01,LCD_CMD) # 000001 Clear display
  time.sleep(E_DELAY)

def lcd_byte(bits, mode):

  GPIO.output(LCD_RS, mode) # RS

  # High bits
```

```
  GPIO.output(LCD_D4, False)
  GPIO.output(LCD_D5, False)
  GPIO.output(LCD_D6, False)
  GPIO.output(LCD_D7, False)
  if bits&0x10==0x10:
    GPIO.output(LCD_D4, True)
  if bits&0x20==0x20:
    GPIO.output(LCD_D5, True)
  if bits&0x40==0x40:
    GPIO.output(LCD_D6, True)
  if bits&0x80==0x80:
    GPIO.output(LCD_D7, True)

  # Toggle 'Enable' pin
  lcd_toggle_enable()

  # Low bits
  GPIO.output(LCD_D4, False)
  GPIO.output(LCD_D5, False)
  GPIO.output(LCD_D6, False)
  GPIO.output(LCD_D7, False)
  if bits&0x01==0x01:
    GPIO.output(LCD_D4, True)
  if bits&0x02==0x02:
    GPIO.output(LCD_D5, True)
  if bits&0x04==0x04:
    GPIO.output(LCD_D6, True)
  if bits&0x08==0x08:
    GPIO.output(LCD_D7, True)

  # Toggle 'Enable' pin
  lcd_toggle_enable()

def lcd_toggle_enable():
  # Toggle enable
  time.sleep(E_DELAY)
  GPIO.output(LCD_E, True)
  time.sleep(E_PULSE)
  GPIO.output(LCD_E, False)
  time.sleep(E_DELAY)

def lcd_string(message,line):
  # Send string to display
```

```
  message = message.ljust(LCD_WIDTH," ")

  lcd_byte(line, LCD_CMD)

  for i in range(LCD_WIDTH):
    lcd_byte(ord(message[i]),LCD_CHR)



def main():
    lcd_init()

    lcd_string("  Smart Trolley         ",LCD_LINE_1)
    lcd_string("  Billing System        ",LCD_LINE_2)
    lcd_string("  Using Barcode         ",LCD_LINE_3)
    lcd_string("   System               ",LCD_LINE_4)
    time.sleep(1)
    global total
    add_product=0
    remove_product=0
    total=0
    bill=0
    maricold=0
    milkbikis=0
    dairy_milk=0
    bill=0
    while True:
          if bill==1 and (maricold>0 or milkbikis>0 or dairy_milk>0):
             print("Product.Name    Quantity     price")
             port.write(str.encode("Product             Q    price"+'\n\r'))
             if maricold>0:
                print("maricold :        ",end=' ')
                port.write(str.encode('maricold:       '))
                print(str(maricold),end=' ')
                port.write(str.encode(str(maricold)))
                print("          "+str(maricold*10))
                port.write(str.encode("          "+str(maricold*10)+'\n'))
             if milkbikis>0:
                print("milkbikis :        ",end=' ')
                port.write(str.encode('milkbikis:    '))
                print(str(milkbikis),end=' ')
                port.write(str.encode(str(milkbikis)))
```

```
        print("          "+str(milkbikis*10))
        port.write(str.encode("          "+str(milkbikis*10)+'\n'))
    if dairy_milk>0:
        print("dairy_milk :        ",end=' ')
        port.write(str.encode('dairy_milk:        '))
        print(str(dairy_milk),end=' ')
        port.write(str.encode(str(dairy_milk)))
        print("              "+str(dairy_milk*5))
        port.write(str.encode("     "+str(dairy_milk*5)+'\n'))

    print("----------------------------------------")
    port.write(str.encode("----------------------------"+'\n'))
    print("Total:                    ",end=' ')
    port.write(str.encode("Total:                  "))
    print(str(total))
    port.write(str.encode(str(total)+'\n'))
    print("----------------------------------------")
    port.write(str.encode("-------------------------------"+'\n'))
    port.write(str.encode("                                "+'\n'))
    port.write(str.encode("                                "+'\n'))
    port.write(str.encode("                                "+'\n'))

    lcd_string("    Thank u         ",LCD_LINE_1)
    lcd_string("    purchase                  ",LCD_LINE_2)

    lcd_string("  Successfuly          ",LCD_LINE_3)
    lcd_string("  filled              ",LCD_LINE_4)
    bill=0
if add_product==1:
    remove_product=0
    x=data1.read(14)
    print(x)
    if x==b'8901063162426\r':
      maricold=maricold+1
      total=total+10
      lcd_string("  Marie-Gold-10           ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(maricold)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("       "+str(total)+"      ",LCD_LINE_4)
    if x==b'8901063012530\r':
      milkbikis=milkbikis+1
      total=total+10
```

```
      lcd_string("  milkbikis-10            ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(milkbikis)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("      "+str(total)+"      ",LCD_LINE_4)
    if x==b'8901233030517\r':
      dairy_milk=dairy_milk+1
      total=total+5
      lcd_string("dairy_milk=dairy_milk-10            ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(dairy_milk)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("      "+str(total)+"      ",LCD_LINE_4)


if  remove_product==1:
    add_product=0
    x=data1.read(14)
    print(x)
    if x==b'8901063162426\r' and maricold>0 :
      maricold=maricold-1
      total=total-10
      lcd_string("  Marie-Gold-Removed            ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(maricold)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("      "+str(total)+"      ",LCD_LINE_4)
    if x==b'8901063012530\r' and  milkbikis>0:
      milkbikis=milkbikis-1
      total=total-10
      lcd_string("  milkbikis-Removed            ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(milkbikis)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("      "+str(total)+"      ",LCD_LINE_4)
    if x==b'8901233030517\r' and dairy_milk>0:
      dairy_milk=dairy_milk-1
      total=total-5
      lcd_string(" dairy_milk-Removed            ",LCD_LINE_1)
      lcd_string(" Quantity-"+str(dairy_milk)+ "     "   ,LCD_LINE_2)

      lcd_string("    ToTal            ",LCD_LINE_3)
      lcd_string("      "+str(total)+"      ",LCD_LINE_4)
```

```
        if GPIO.input(sw1)==False:
          lcd_string("    ADD             ",LCD_LINE_1)
          lcd_string("   PRODUCT          ",LCD_LINE_2)

          lcd_string("    ToTal           ",LCD_LINE_3)
          lcd_string("      "+str(total)+"      ",LCD_LINE_4)
          remove_product=0
          add_product=1
        if GPIO.input(sw2)==False:
          lcd_string("    Delete          ",LCD_LINE_1)
          lcd_string("   PRODUCT          ",LCD_LINE_2)

          lcd_string("    ToTal           ",LCD_LINE_3)
          lcd_string("      "+str(total)+"      ",LCD_LINE_4)
          remove_product=1
          add_product=0
        if GPIO.input(sw3)==False:
          lcd_string("    Total Product           ",LCD_LINE_1)
          lcd_string("                        ",LCD_LINE_2)

          lcd_string("    ToTal           ",LCD_LINE_3)
          lcd_string("      "+str(total)+"      ",LCD_LINE_4)

        if GPIO.input(sw4)==False:
          bill=1


if __name__ == '__main__':

  try:
    main()
  except KeyboardInterrupt:
    pass
  finally:
    lcd_byte(0x01, LCD_CMD)
    GPIO.cleanup()
```

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Smart Shopping Trolley Using Raspberry Pi Kit - Automatic Billing System via IOT

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ABSTRACT: Now a days, Shopping have become daily activity in cities. People buys product from shopping mall for their regular use. To get their products scanned using barcode scanner and to get it billed, the customers have to stay in long queues. In this project, we are developing the trolley where the customer has to scan product barcode which they wish to purchase. The scanned product is dropped into the shopping cart of customer and thenthe customer can make payment online or at the Billing Counter. We have proposed a technique which means to decrease and perhaps wipe out the aggregate holding up time of client, bring down the aggregate labor prerequisite from charging counter and increment effectiveness by and large.

KEYWORDS: Billing System, Raspberry Pi 3, IOT, Smart trolley, Barcode Identification

I. INTRODUCTION

Humans want to decrease the tasks using the technology in a easier way. A main thing where the humans spend maximum time is shopping. All the supermarkets and malls will have a shopping trolley and baskets for the customers to purchase the products. Time is most valuable in every one's life, no one wants to waste their time. But while shopping everyone waste most of the time at the billing counters by standing in queue. If it is a festivalseason, the crowd is usually high and billing time will increase promotionally. Shopping needs more time whichincludes the long queue. Smart Trolley is also known as "***Electronic Shopping Trolley***". It is used in various application Oriented fields to make a Bill/Payment for purchased Grocery, Medicines, Supermarket items, etc. It will reduce the Manpower in Billing section. Most consumers will worry the amount of money brought is not enough to pay for all the things that wanted to be bought until it comes to our turn to pay at the cashier. If the technology of RFID is implemented. Consumers will be able to get information of all the items at shopping mall,total up the prices of items as they shop, and save unnecessary time which is wasted unnecessary at the cashier.

Paper is organized as follows. Section II describes automatic billing and detection scheme, connected component analysis and set of selection or rejection criteria. The flow diagram represents the process of the algorithm. After scanning process, how billing region is filled using a Software technique that is given in Section III. Section IV presents experimental results showing results of images. Finally, Section V presents conclusion.

II. RELATED WORK

The Paper that had proposed that Automatic Billing System using Li-Fi Module will be the effective way to reducethe human effort. LiFi is cellular wireless networking (re)using lights. Specifically, light emitting diodes (LEDs)are used in LiFi as visible light transmitters and its very costly. Another Paper proposed that automated billing system using RFID and ZigBee communication [1]. Here, each product of shopping mall, super markets will be provided with a RFID tag, to identify its type. Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, an RFID reader, EEPROM, and ZigBee module [2]. Automatic Toll Gate System Using Advanced RFID [3] and GSM Technology [4]. In that, the frame composing and working flow of the system is described and data information is also easily exchanged between the motorists and toll authorities, thereby enabling a more efficient toll collection by reducing traffic and eliminating possible human errors. [5] Here the

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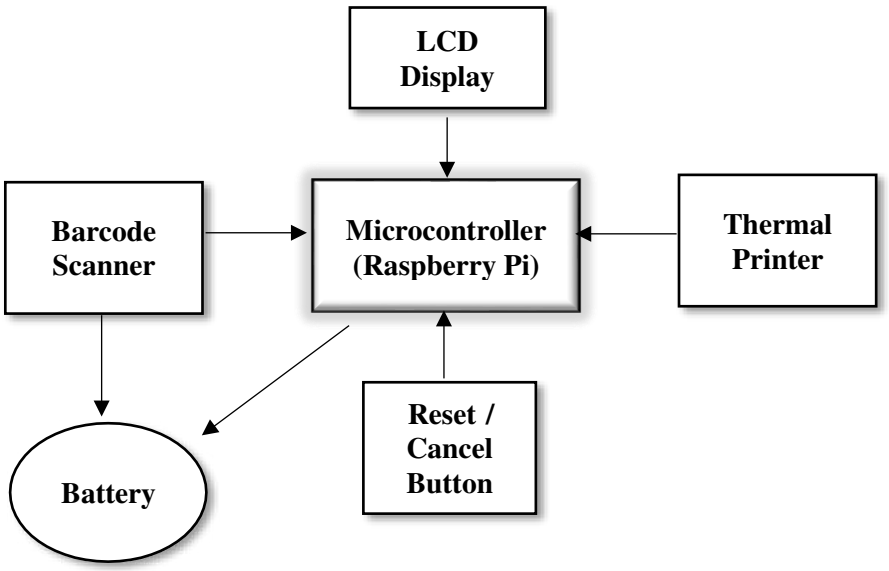
vehicle information is got through the RFID whereas we use RFIDfor the scanning of products. [6] Automatic Power meter reading using GSM network. In that, GSM Power DigitalMeter (GPM) is installed in every consumer unit and an electricity billing system at the energy provider side. Theweb portal is used in the power meter reading wherein we use a mobile applicati0on for the trolley. The work in this paper is divided in three stages. 1) Automation 2) Scanning 3) Billing - these are the following process in thisbilling System.

III. METHODOLOGY

Raspberry pi is a microcontroller that is used in this project and it acts as a controlling device in this project RFID is interfaced with raspberry pi for billing purposes through python that relatedto the installation of openCV (open-source computer vision library) to get the product information. the TFT or alphanumeric lcd display is interfaced with raspberry pi which is used for displaying purposes. the thermal printer is interfaced with the raspberry pi 3 to print the bill for the purchased items. our project is based on the smart trolley is a shopping assistant who supports customers for displaying more product information, accommodating with personal wheelie trollies/trays. smart trolleys and smart checkout systems have been redefining customer experience in retail stores in recent years by automating the checkout process. it is based on the using raspberry pi 3 and barcode scanner using pos (point of sale) billing system. and it have a TFT-LCD screen to display a QR code for the online UPI payment to avoid the cash problems.



Raspberry Pi is a low-cost, basic computer that was originally intended to help spur interest in computing The Raspberry Pi computer is essentially a wireless Internet capable system-on-a-chip (SoC) with 1 GB RAM, connection ports, a Micro SD card slot, camera and display interfaces and an audio/video jack. The RaspberryPi is a credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

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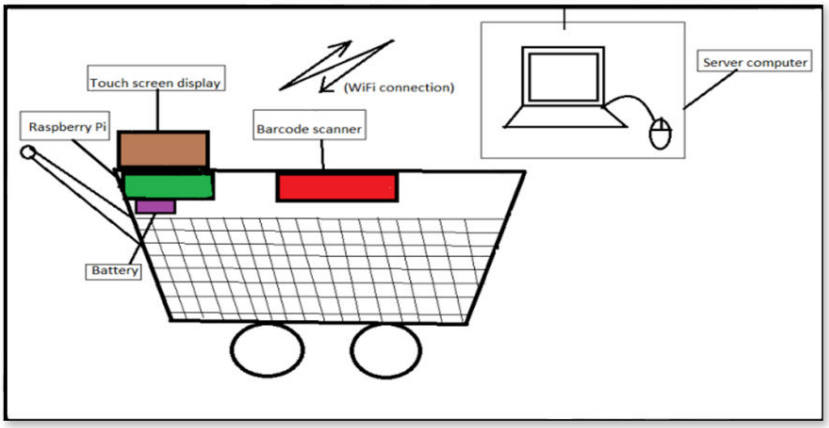

IV. EXPERIMENTAL RESULTS

In this project we are going to build a Smart Shopping cart by interfacing a thermal receipt printer, LCD, and a USB barcode scanner with Raspberry Pi. This Smart Shopping cart will scan an item's Barcode, display its information on 20x4 LCD, create the invoice, and print it using a Point of Sale (POS) Thermal Printer. We will be using a Google spreadsheet to retrieve the data associated with the respective scanned barcode, like item Name, Price, etc. Also, we will create an online database using Google Spreadsheet where the information of all the items is already stored. You should check out our Reference Articles related to this project, if you want to know the interfacing of Raspberry PI and Barcode Scanner with Thermal Printer and LCD. The model consists of IOT as hardware and python 3.11.2 as software coding. The project datasets consist of a product detail such as product name, product weight, cost and ID of the product which is stored in raspberry Pi database. This information can be used later for fetching details of the product from the database corresponding to the barcode. The project uses ZBar algorithm to encode and decode the barcode. ZBar is an open-source software which helps to read barcodes from various sources like video streaming, image files and raw intensity sensors.

Attributes of ZBar are high speed, small memory and unlimited images. The Pi camera uses an OS called OpenCV. Open CV is a cross platform library which used to develop real time computer vision application and it is used in image capturing.

The steps are as follows:

a. Initialize the system i.e., power up raspberry pi, LCD.

b. To add a product into the trolley, switch on the add button.

c. Scan each product and add it to the trolley, the corresponding product name, price, weight and Id will be displayed on the LCD.

d. Once all the products are scanned switch off the RESET button.

e. If any of the products need to be removed, switch on the delete button and scan the product to be removed and then switch off the delete button

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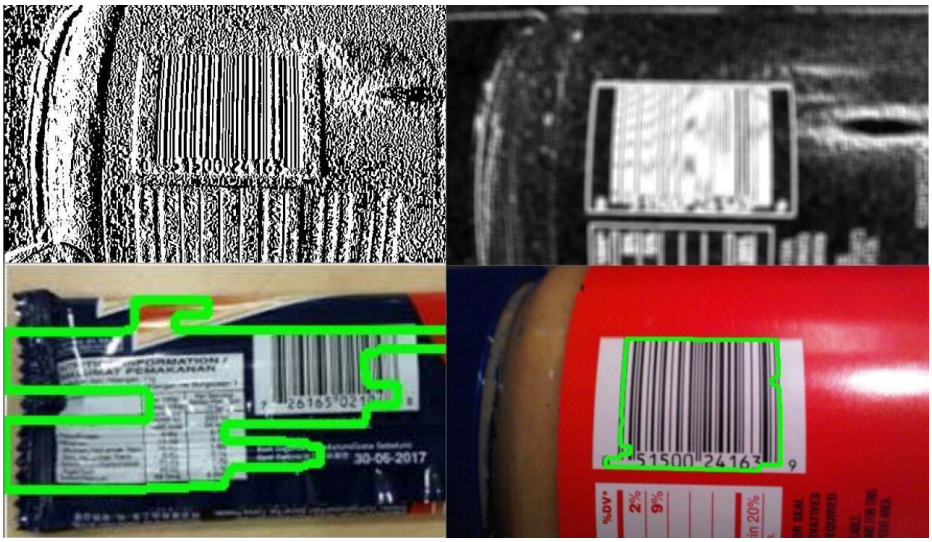

V. CONCLUSION

We have implemented the Smart Billing System across the multi-purpose it will be more useful in the shopping field. Our paper will be more helpful in the field of IOT and Electronics. These are the above-mentioned processis able to build the smart trolley. Billing will be handled by all kinds of people whether they are educated persons or uneducated persons all of us can be easily accessible. The Shop owner used to buy this project it will regret the high paid workers instead of that high salary expectation and time to make the bill for a long hour. It will able to save the time and to avoid billing queues This project may be got successful or not sure it will help all the people to save the time in unnecessary activities.

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