Visvesvaraya Technological University Belagavi

Project Final Demo

Iot Based Smart Shopping Cart

Presented by

Hruthik K B USN: 4JN16EC033   Karan R USN: 4JN16EC034

Hanumanthgowda USN: 4JN16EC029   Darshan R USN: 4JN17EC405

Under the guidance of
Pradeepa S C

Asst. Professor Dept of ECE

Department of Electronics & Communication Engineering
Jawaharlal Nehru National College of Engineering Shimoga- 577204
2019-2020

Overview

- Introduction
- Motivation
- Aim of the Project
- Objectives
- Block Diagram of the proposed system
- Methodology and Implementation
- Software and Hardware details
- Analysis of Result
- Action Plan
- References

Introduction

- IOT is a network in which all physical objects are connected to the internet through the network devices.

- IOT allows objects to be controlled remotely across existing network infrastructure.

- An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function.

- A good example is the washing machine. Almost every household has one, and tens of millions of them are used every day, but very few people realize that a processor and software are involved in the washing of their clothes.
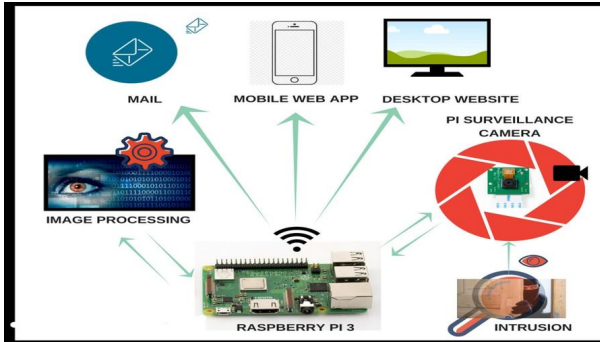
Figure 1: Raspberry pi applications

Introduction

General Trends about the topic:

- Now a days shopping malls is becoming a daily activity in metro cities.

- After purchase, at the billing counter the cashier prepares the bill using bar code reader which is time consuming process and results in long queues.

- Organizations of all sizes are considering the adoption of more efficient billing strategies to reduce capital expenditure and create more efficient business process.

- According to recent studies electronic and automated invoice processes can result in savings of time.

- Automation of billing process enables the flexibility to customers to view and review their products.

Introduction

<div align="center">Problem statement:</div>

- Now a days people are standing in the stretched out line of customers for paying the bill which is a time consuming process.
- So we are developing a RFID based billing system for supermarkets in order to expedite billing process.
- Getting product information is difficult and time consuming.
- At billing counter the cashier prepares the bill using the bar code reader which is very time consuming and results in long queue at billing counter.

Introduction

Figure 2: Barcode scanner and people standing in queue.

Introduction

<div align="center">Applications:</div>

- It can be used in shopping malls.

- It can be used in super markets.

- It will have major impact on metropolitan and urban cities.

Motivation

- In India there are 7 metropolitan cities. There is at least 700 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.

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.

Objectives to be met

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

- To study and interface the different sensors with Raspberry Pi.

- To design an algorithm for automatic bill generation.

- To study and design a server which contains the product data base.
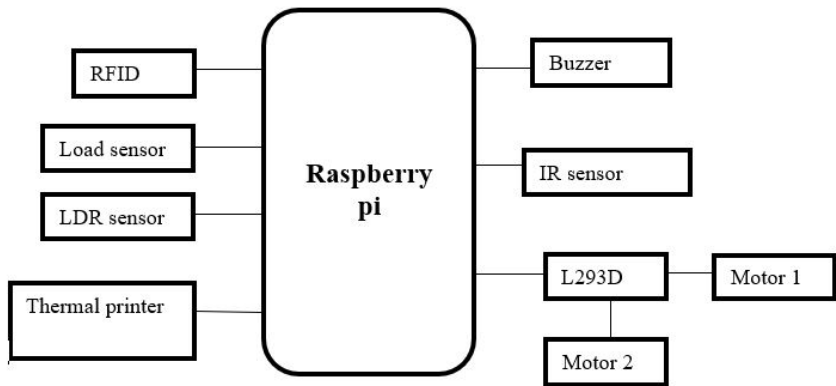
Block Diagram of the proposed system

Figure 3: Block diagram of the proposed system
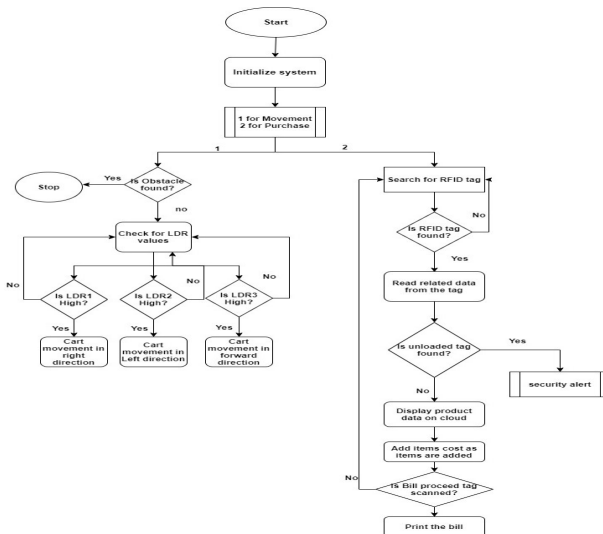
Methodology and Implementation

Figure 4: Flow chart

Methodology and Implementation

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. To design a hardware prototype in order to connect with server:
   - Various hardware and its implementation with the server is explained.
3. To design a cart which follows the customers.

Software and Hardware Details

Software Details

1. Python 3.7

- Python is a programming language which can be easily available. This programming language used in many areas of programming platform.

- Python is easy to understandable language as compare to other programming languages.

- Python is a high level programming language. Python has a designed such that it focuses on code readability and a syntax that allows programmers to express concepts.

- The easiest introduction to Python is through Thonny, a Python3 development environment.

- Open Thonny from the Desktop or applications menu: Thonny gives you a REPL (Read-Evaluate-Print-Loop), which is a prompt you can enter Python commands into. Because it's a REPL, you even get the output of commands printed to the screen without using print.

- In the Thonny application, this is called the Shell window.

Software and Hardware Details

Software Details

2. ThingSpeak

- ThingSpeak is an IoT analytics platform service that allows you to aggregate, visualize and analyze live data streams in the cloud.

- ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB code in ThingSpeak you can perform online analysis and processing of the data as it comes in.

- ThingSpeak is often used for prototyping and proof of concept IoT systems that require analytics.

- 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.

Software and Hardware Details

Software Details

3. Raspbian OS

- Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware.

- An operating system is the set of basic programs and utilities that make your Raspberry Pi run.

- However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

- The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible.

Software and Hardware Details

Hardware Details

1. Raspberry pi 4

- Many interfaces is present like HDMI, multiple USB, Ethernet,onboard Wi-Fi and Bluetooth, many GPIOs, USB powered, etc.

- Easy connectivity with wifi or ethernet.

- Supports Linux, Python will making it easy to build applications.

- It has the SD card interface which can store the local database present .

- Developing such an embedded board is going to cost a lot of money and effort.

- Raspberry Pi 4 Model B comes with 64 bit quad core processor, on board WiFi and Bluetooth and USB features.

- It has a processing speed ranging from 700 MHz to 1.4 GHz where RAM memory ranges from 1GB to 4GB.

- The Board has four USB ports that are used for communication and SD card is added for storing the operating system.
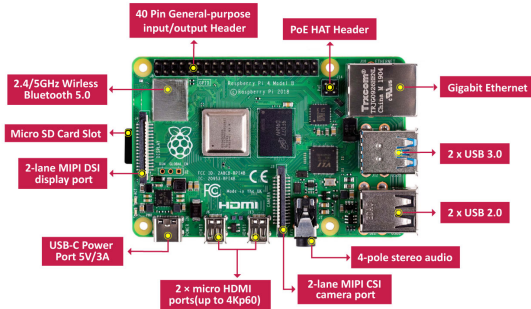
Components of Raspberry Pi 4

Figure 5: Components of Raspberry pi 4

Software and Hardware Details

Hardware Details

2. Motor driver

- 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.

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

3. DC Motor

- Dc motors are motion components that take electrical power in the form of direct current (or some manipulated form of direct current) and convert it into mechanical rotation.

Software and Hardware Details

Hardware Details

4. IR sensor

- An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings.
- It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion.

5. EM-18 reader module

- EM-18 is a nine pin device. Among nine pins, 2 pins are not connected, so we basically have to consider seven terminals.
- EM-18 is used like any other sensor module. First we choose the mode of communication between MODULE and CONTROLLER.
- 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.

Software and Hardware Details

Hardware Details

5. EM-18 reader module

- 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.

- 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.

Software and Hardware Details

Hardware Details

6. 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.The symbol for LDR is just as similar to Resistor but adds to inward arrows as shown above. The arrows indicate the light signals.

7. 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.

Software and Hardware Details

Hardware Details

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.

9. Buzzer

- A buzzer is a small yet efficient component to add sound features to our project/system.

- The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and require interval.
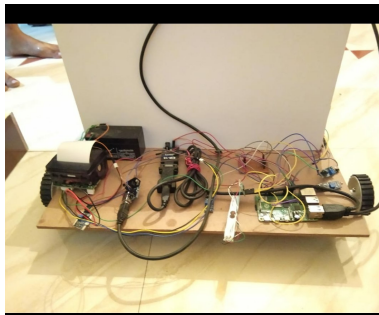
Analysis of Results

Figure 6: Complete model of Smart Cart

Figure 7: Complete model of Smart Cart

Analysis of Results

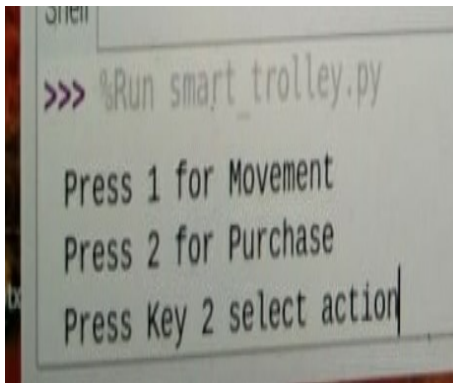Figure 8: Option for movement or Purchase

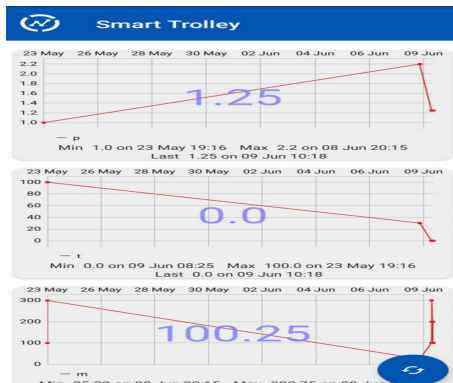Figure 9: Bill generated Picture

Figure 10: Product Info shown in cloud

Analysis of Results

Algorithm for Bill generation.

Step-1: Start

Step-2: Run

Step-3: In console we have a option Press 1 for movement and press 2 for purchase

Step-4: If key 1 is pressed then cart will follow the customer. As we have placed 3 LDR's for cart movement in right left and forward direction.

Step-5: A high beam of LED light is focused on these LDR's for cart movement

Step-6: Whenever IR sensor's value is high, stop Dc motor's movement

Step-7: If key 2 is pressed then wait for RFID tag. 3 different RFID tags are there, 1 tag which contains product information, 2nd tag for to end purchase, 3rd for malpractice

Analysis of Results

Algorithm for Bill generation.

Step-8: If RFID tag containing product information is scanned then the product information is displayed in ThingSpeak platform

Step-9: If RFID tag is scanned which is used for bill generation is scanned then the bill is printed in printer

Step-10: If unauthorized RFID tag is scanned security alert will be provided, Buzzer will be beeped.

Step-11: After the all the purchase If RFID tag is scanned which is used for bill generation is scanned then the bill is printed in printer

Step-12: STOP

Action Plan

Sl.No	Task to be completed	Deadline	Status
1.	Literature survey	21/11/2019	Completed
2.	Referring some more papers on RFID technology	17/02/2020	Completed
3.	study the features pin description and advantages of Raspberry Pi 4 model	18/02/2020	Completed
4.	Installation of Raspberry Pi operating system	20/02/2020	Completed
5.	Interfacing of weight sensor HX-711 and load cell	28/02/2020	Completed

Action Plan

Sl.No	Task to be completed	Deadline	Status
6.	Interfacing of Dc motor and IR sensor with Raspberry Pi	03/03/2020	Completed
7.	Interfacing of RFID reader with Raspberry Pi	05/03/2020	Completed
8.	Interfacing of LDR sensor with Raspberry Pi	20/05/2020	Completed
9.	Interfacing of HX-711 weight sensor with Raspberry pi	22/05/2020	To be Completed

Action Plan

Sl.No	Task to be completed	Deadline	Status
10.	Study and Interfacing of Thermal printer with Raspberry Pi	27/05/2020	To be Completed
11.	Preparing for demonstration	03/06/2020	To be Completed
12.	Practical demonstration	10/06/2020	To be Completed

References

1. Jadhav Rahul Shankar, Avale Pradeep Nandkumar, Tarali Shivkumar, Vaijanath and Prof. Pawar S.U "RFID based Automatic Billing Trolley", IJSRD - International Journal for Scientific Research and Development Vol. 3, Issue 02, 2015.

2. Rachana Doshi, Amrita Sutar, Sonali Aher, Sanvida Dalvi and Prof. B R Chandani5, "RFID Based Smart Trolley for Automatic Billing System", IJESC - International journal of Engineering Science and Computing Volume 7, Issue No.6, 2017.

3. Udita Gangwal, Sanchita Roy and Jyotsna Bapat, "Smart Shopping Cart For Automated Billing Purpose Using Wireless Sensor Networks", ICCMIT7026 VOL.5 NO. 2 pp 168-172, 2013.

4. Ruinian Li, Tianyi Song, Nicholas Capurso, Jiguo Yu, Jason Couture, and Xiuzhen Cheng, "IoT application on Smart Shopping System", DOT 10.1109/JIOT.2017.2706698, IEEE Internet of Things Journal 2016.

5. Raju Kumar, K. Gopalakrishna and K. Ramesha, "Intelligent Shopping Cart", International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 4, July 2013.