Design and Implementation of IoT Based Smart Shopping Cart using RFID Technology

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Abstract- Electronic Commerce has become extremely popular with the rise in wireless technologies and other communication techniques [4]. In this paper we are discussing about the "Smart Shopping Cart using IoT" for the real time applications. The entire system is designed using the single board processor with the 1GHz processing speed i.e., raspberry-pi. The single board processor is different from the normal computers that is having the on board memory, wifi module, onboard processor etc. In this we are using the RFID (Radio Frequency and Identification) technology a term that sums up all the technologies that use radio frequencies to identify the objects. In this RFID technology both the RFID reader and tags are used for reading the information from the tags. The tags consist of the respective product information and it gets read by the reader. The RFID reader will read the tag data and the amount and it will be sent to the server using the wifi module with operating frequency (2.4GHZ) with IEEE 802.11b/g standard used for communication. The wifi module can transmit and receive the data with 115200 baud rate. Here we are using the python language for programming the kit. The SQL (structured query language) is used for communication with the database, personnel home page which is an open source and popular language for web development which is an HTML embedded. Hypertext transfer protocol is used to serve the files in the form of web pages to users with respect in their requests, which are forward by HTTP clients. It is used to establish the channels between the IOT system and database in the client.

Key Words- RFID technology, decentralized billing unit, IOT, cloud computing.

I. INTRODUCTION

In the present days with the increase in the technology the food items are available at our door steps without any human effort. But going to the mall and the things what we need is more advantageous and useful for us. At the same time it is having disadvantages also like mainly the important reason is waste of time by standing in the long queues for the payment of the bill. While coming to advantages we can judge the product quality and quantity by seeing the product structure and verifying that the product is not having any damages. So in order to overcome all these problems we are introducing the smart shopping cart has additional features which will be helpful for the customer and the shopkeeper. In this the stock level will be updated whenever the products are sold out. The main technologies that play an intense role in this project are as follows: 1) A single board computer which is used to connect to the server wirelessly. 2) RFID tags and reader for the product information and details. 3) Infrared sensors which are used to know the product count. 4) Creation of the web application for the display of the total amount of the customer and the remaining product count to the shopkeeper.

RFID technology is the latest and fast growing technology in the present. RFID means Radio Frequency and Identification in which the small tags are present which are added to the tags. In this systems RFID readers are used which will wirelessly read the information of the RFID tags based on the inductive coupling technique. The rfid reader will collect the information about the products that are stored predefined in the database. Thus it identifies the object automatically and collects the information regardingly. The small tags used are a passive tag which consists of a small chip inside it.

II. EXISTING METHOD

In the existing model the mainly used technology is the barcode scanner in most of the shopping malls. The barcode represents a series of thick black lines which are of different widths and separation between those lines. These lines can be coded into the data or information. Each product is equipped with the barcode and it is scanned by the barcode scanner. The data stored in the PC of respective barcode will be displayed and the total amount will be added and the total bill will be generated.

Barcode scanners are mainly made up of light source, photo diode, camera based scanners or simple decoders. In this the barcode scanner scans the black and white elements of the barcode by illuminating the code with a red light, which is then converted into the matching language.

III. PROPOSED METHOD

In the proposed system we are using the latest RFID (radio frequency and identification) technology. In this it is having mainly 2 components such as the RFID tags and the RFID reader.

These tags are attached or incorporated to the products for the purpose of the identification using the radio waves. The tags used are the passive tags or battery less tags or chip based tag which consists of the chip and antenna. In this paper we have developed a smart shopping cart that allows the user to manage their list while shopping and easily pays the bill at the exit door. The cart is equipped with the kit that displays the total amount of bill for all the products which are placed inside the trolley. By this process it is easier for the customer in knowing of how much bill they should pay. By this way time will be saved and customer gets the faster service. This will be helpful for the shopkeeper in reducing the cash counters.
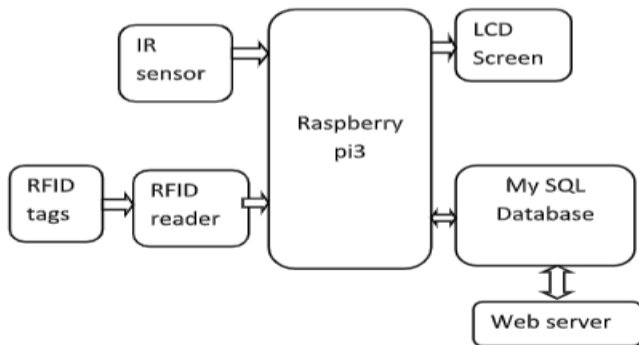
A. BLOCK DIAGRAM

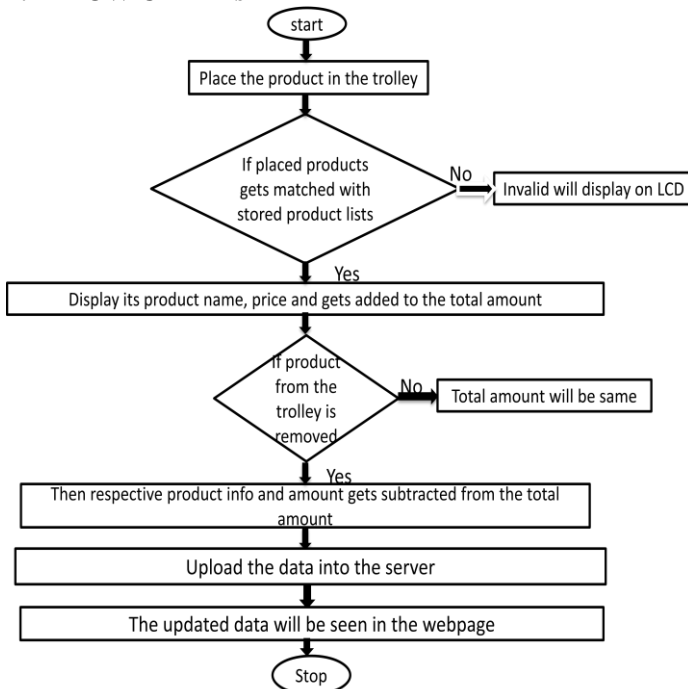Fig.1: Proposed block diagram

B. FLOW CHARTs

Fig.2: Proposed flow chart

C. Raspberry pi3:

It is the third generation raspberry pi. This is faster than the previous models such as Raspberry pi model B+ and Raspberry pi2 model B. it is the single board computer can be used for various applications and implementations. The processor used is Broadcom BCM2387 chipset with 1.2GHz Quad-Core ARM Cortex-A53 (64bit). The wireless LAN is IEEE 802.11 b/g/n with the Wi-fi protocol as WEP<WPA WPA2, algorithms such as AES-CCMP (maximum key length of 256 bits), the maximum range of 100 meters. The Bluetooth is IEEE 802.15 which uses symmetric encryption algorithm, advanced encryption standard (AES) with 128 bit key and the maximum range of 50 meters. This is operated with 5.1V micro USB supply. Generally it uses 700-1000mA depending on what peripherals are connected to it. This power requirement will increase depending on different interfaces attached to it. The graphical user interface is the 400MHz video core. The RAM size is 1GB RAM and 64 bit CPU. The network connectivity is the 1x10/100 Ethernet. There are total 4 USB ports. There are total 40 pins out of which there are 28 GPIO pins and each pin uses16mA. The HDMI port uses 50mA and the camera uses the 250mA and the key board and the mouse uses 100mA. It is having micro SD port for loading your system and storing the data.

D. IR Obstacle Sensor:

On the basis of the simple idea the IR sensor is easy to built, easy to calibrate and provides a detection range up to 10-30cm. the frequency of the IR sensor is more than the microwave and less than the visible light. This is mostly used in the indoor applications where there ambient light is present. In this the basic idea is to transmit the infrared light through the IR-LED'S, which are reflected back when it hits an obstacle. The object can be anything which has certain shape and the size. The infrared technology is used widely in wireless applications. Here the IR-LED will transmit the signal and when these are hit by an obstacle they get reflected back and are received by the IR-receiver which may be either the photo diode or photo transistor which is used to decode the signal. In the electromagnetic spectrum the infrared area is mainly divided into the 3 regions such as near, mid and far field regions. These are divided based upon the wavelengths and their applications [3].

Region	Wavelength	Application
1) Near field region	700 nm to 1400 nm	Fiber optics
2)Mid field region	1400 nm to 3000 nm	Heart sensing
3)Far field region	3000 nm to 1 mm	Thermal imaging

The ir sensor is having mainly 3 pins such as: 1) active high output, 2) power supply ground, 3) power supply input. The

operating voltage is +5v DC regulated and when any obstacle is detected it is indicated by active high output.

E. RFID System:

An RFID system consists of RFID reader, RFID tag, information managing host computer. The reader consists of RF transceiver (transmitter and receiver), a signal processor, a control unit, a coupling element and a serial data interface to the host system. The tag used is the passive tag which acts as a programmable data-carrying device. The passive tags which no battery on it has called as battery less tags. The absence of the power supply makes them cheaper and reliable. The RFID systems in the market are divided into two categories: near field systems and far field systems. There is a distance commonly known as the "radial sphere" inside which one is said to be near field and the field outside is the far field region. The near field systems are used for the systems operating in the LF and HF bands which are relatively short reading distances. In this the coupling technique used is inductive coupling. The tag properties are as follows:

| Tag Type	Passive
Technology	Inductive Coupling
Frequency	125 KHz / 134 KHz
Read Rage	Short (few cm to Inches)
Read Speed	Slow
Works with Metal	Yes
Works with Liquids	Yes
Cost	Low

F. LCD Display:

LCD (Liquid Crystal Display) is an electronic display module and finds the wide range of applications in today's world. There are varieties of LCD's in the market. Here we are using the 16x2 LCD which is the very basic module and commonly used in the various devices and circuits. 16x2 means it can display 16 characters per line and there are 2 such lines.

IV. RESULTS AND DISCUSSION

The system has been implemented with the above mentioned features and put into the use. With the help of this system the user can know the information of the shopping and the manager knows the stock information. This system can be easily arranged in the cart and it is feasible.
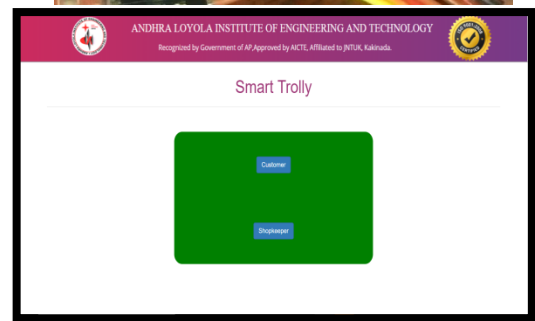
V. FUTURE SCOPE

In future we can pay the bill at the cart itself after shopping and we can predict the products that are needed excess in the future based on the sales in the present. By placing a screen on the cart we can select the list of products we want to purchase and we can also know where the product is located in the market (by placing a location sensor mapping can be made possible). By inserting the load cell we can know the weight of the products. By implementing this if any object is not read by the reader it will give an error by checking the weight of products in the cart.

VI. REFERENCES

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