Presidency University IOT Applications on Secure Smart Trolley System

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Abstract

An automated secure billing system is created by introducing the construct of IOT. This advancement in technology has eased the way of living for the humans. Demands were made to make billing fast and simple at the supermarkets. Secure smart trolley is a way to make automated system that would save time and be a helpful tool to the business world, which can create searching expertise simple, user friendly also maintain the privacy of the user. The existing system has resulted in huge crowd gathering at the departmental stores which results in longer waiting time at the request counter as the cashier should scan each product's bar-code then manually enter it into the stores' database .The current billing method is time consuming .Therefore " Secure Smart Trolley System " is best approach for the higher than aforesaid downside. This is often supported ATmega328 Controller fitted with a RFID reader.The RFID technology makes the wireless network to figure simply between a precise ranges. The temporary interpretation of the features is, once you choose a product and place inside the trolley, the RFID reader present in the cart will scan the product's distinctive RFID .And then its value gets displayed on the phone screen exploitation Bluetooth.

Keywords: RFID technology, Bluetooth, IOT Applications

Introduction

In this world with internet of things (IOT), interactions with the physical objects became the reality. Every day to day things would be currently ready for outfitting with the computing power and also with communications functionality, allowing the object for all over which is related to each other. The essential plan of our project, Smart trolley secure system is for intelligence request for the integration with RFID technology employed for department stores also for several supermarkets. Bar-codes are been used for many years now and has been managed by employees in many stores also in many supermarkets so that they can manage the purchases for there customers to keep the track of the inventory. So however the barcodes system method that is no longer the most effective method used for business purposes. The customers that are uninterested for waiting in long queues, And slow in moving queues for supermarkets and malls. There is a little decrease in costs through the efficiency for the present technologies and large-scale in the production for wireless elements, It also have been the probe in brand spanking for current markets within the RFID labels are often used. The RFID stands for Radio frequency Identification. During the study we tend to exploitation by using the RFID technologies that creates a smart trolley secure system with an automated billing system. Here the payment details of the items purchased using smart trolley are displayed in mobile phones with the help of Bluetooth connection. The details like product name, product quantity, range of amount etc. The system displays the purchaser's name for the merchandise and related value.

Smart trolley secure system used to automate the billing system is additionally applicable for varied applications and exploitation of correct interface the recorded data are often downloaded and maintain a track of the database that has been stored for generating automated bills. The smart trolley being wireless carries with RFID technology. The required system that has been associated economically for the advertisement purpose because it is a smaller amount time intense and simple to regulate. A store or shopping malls are collection of the buildings with the retailers for interconnecting the walkways guests for simply walk from one floor to another. This growth has fueled for rising huge incomes, bigger convenience for credits and the business lifestyles. Buying and hence searching things at massive huge malls are turning into everyday activity . They are able to witness massive huge crowd at these malls and departmental stores on the holidays or weekends. We also witness the crowd becomes more once the stores are offered special discounts.

Later after finishing the total purchases he/she has been compelled for the billing counters for the payments. At the billing counters in the earlier the cashiers used to prepare there total bill with bar-code readers that are extremely more time intense method later ends up at long lines in billing. These past few years we have seen the explosion for the interest for radio-frequency identification also there support for the technology, by using RFID technology there is increase in exploitation for checking the availability of the product by using the data stored in the database. Presently these applications are monitored in store units instead of the individual item. Keeping the economic and the technical considerations . It's simple for us to see at grocery store within which every item is labeled using RFID labels and every one searching the features of cart using RFID tags. The items in carts are displayed in customer's mobile phones with the help of Bluetooth that acknowledge product placed within which the show data along with promotions that retrieved wireless for there system backside. Product-level preparation of the RFID technologies that would conjointly leave fast checkout lines that scan all product quickly and therefore eliminate queues, that are systematically report able jointly for there foremost negative aspects at grocery store searching. The straightforward extension for there technique used to graft the RFID devices for customers' loyalty and for frequently shopping cards that can spot people.

Literature Survey

1.In this paper *[1]* the author has built a smart trolley. They have used a RFID reader which will scan the RFID id tags present on each product. The total bill is calculated in the trolley. They have also used LCD on the trolley to display the total bill. At the request counter the final bill will be sent to the main computer using a radio frequency. Few disadvantages of this is,after the bill is sent to the main computer no item can be added or removed.

2.The author in *[2]* this as used Zigbee RFID Reader, IR sensors are used to do the functionalities like adding, removing of the product. Also there is cancel button which will be used to remove the product. Few drawbacks of this are that price of implementing Zigbee is more when compared to using a Wi-Fi.

3.The author in this paper *[3]* have built a centralized smart system for billing system. Each trolley has a product identification device which has hardware components like RFID reader, LCD, EEPROM, Microcontroller and a Zigbee for communication. The Advantage is the author has enabled option for customers to go cashless this will reduce the queue in billing counter.

4.In this paper *[4]* the system of shopping uses the NFC card technology for shopping. In shopping malls, there is an enormous demand to make a quick and easy payment of bills. An app, which helps the customers in scanning. It provides an automated and centralized billing system. The author has used Raspberry pie which has a embedded chip with two bar-code scanners to self-checkout the users at supermarket are integrated with the smart trolley. The main objective is to reduce the time consumed in request counter using an Intelligent Shopping Basket. A Bar-code scanner does not allow users to self-checkout and it also increases productivity time.

5.This paper *[5],* through a web application, the author puts across an architecture or a design of a smart trolley which comes up with, anti-theft system and a automatic billing which also provides with a inventory management. A cloud-based platform as been used, they have used RFID and Wi-Fi technology. The main aim is to reduce waiting time and labor cost by providing economical, easily accessible , and technology-based shopping system. By using automated system there is a 26% reduction in time which was spent waiting at the billing counters when compared to conventional billing method.

6. In this paper *[6]* author proposed to build a smart trolley system which will keep a monitor the purchased items and the transactions, using RFID and ZigBee technology for billing. From a centralized system, it will also give recommendation for user about which products to buy based on the customers purchase history. All the products in the Shopping Mall will have a RFID tag, and all the trolley will have a RFID reader and ZigBee placed in it. To avoid theft RFID reader will be installed on exit doors.
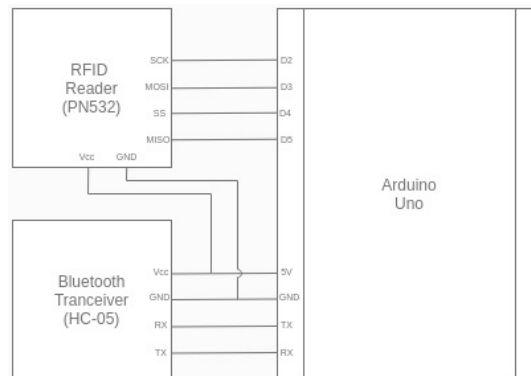
Architecture And Design Details

Figure 1.1

The methodology we used in our project is based on the idea of creating   an automatic billing system here we can make shopping possible using RFID assisted by other IOT based technologies. All the products in the supermarkets are labeled with a unique RFID tag in-place of a bar code. Each shopping trolley has its own setup which contains an RFID reader, a push button to make payments or cancel orders, and a Bluetooth transceiver connected to the users phone to display all information related to the items in the cart.

Micro-controller: Here we are using ATMEGA. It is an 8-bit micro-controller chip that delivers high performance at a low cost. This Arduino UNO used by us is a micro-controller which is based on ATmega328P. This ATmega328P consists of 14 digital input and output pins(6 can be used as PWM outputs), and 6 analog inputs, and a 16 MHz ceramic resonator (CSTCE16M0V53-R0), it also has a USB connection, and a power jack, an ICSP header and a reset button.

RFID Tags: The tag which we are using is fitted with a microchip that is used for storing the number and coil which is used like an antenna for the radiation of information through radio-frequency waves. Depending on whether the kind is active or passive, it may or may not be equipped with a power source .Here the Active tags have their own battery in which they can operate the circuitry and emit electromagnetic ways to generate a current in the antenna.

RFID Reader: the RFID reader which we are using in the smart trolley is reinforced with a RFID reader, and this RFID which we are using is RFIDRC522. RFID is a low-cost RFID reader which can also write data into the tags and if required it can be directly loaded into the reader module for modulation and demodulation of signals.

Bluetooth Transceiver: The Bluetooth we are using here is HC-05 Bluetooth Transmitter. This HC-05 Bluetooth transmitter is simple to use Bluetooth Serial Port Protocol(SPP),this Bluetooth is made for transparency of wireless serial connection setup which makes an easy way to interact with controller or PC.

Module details

Figure 2.1

Micro-controller: ATMEGA is an 8-bit micro-controller chip that delivers high performance at a low cost.

RFID Reader: Each cart is reinforced with an RFID reader, and the type of reader that is used is RFIDRC522

Bluetooth-Transceiver:
HC-05 Bluetooth transmitter is simple to use Bluetooth Serial Port Protocol(SPP),this Bluetooth is made for transparency of wireless serial connection setup which makes an easy way to interact with controller or PC.
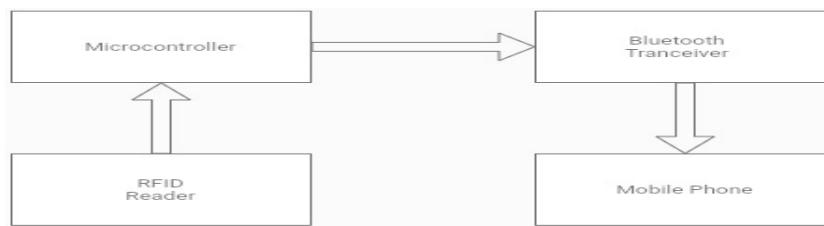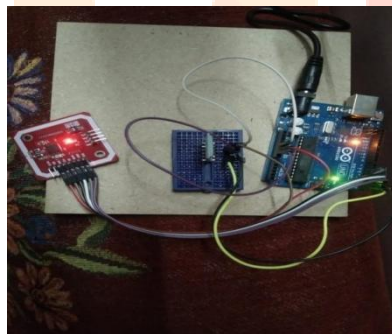
Experimental Result

From the project what we got is an effective outcome where we are replacing bar-code with RFID technology because bar-code has many drawbacks. It requires the line of sight and it should be given in the coverage area only. Whereas RFID tags is more durable than bar-code.

In this experiment :-

```
                        Total      100
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product1   100         1          100
2         Product2   120         1          120
                        Total      220
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product1   100         1          100
2         Product2   120         1          120
3         Product4   35          1          35
                        Total      255
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product1   100         1          100
2         Product2   120         1          120
3         Product3   50          1          50
4         Product4   35          1          35
                        Total      305
```

RFID reader detects the RFID tags and can scan one or more products and the items will all be displayed on the phone

```
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product1   100         1          100
2         Product2   120         1          120
3         Product3   50          2          100
4         Product4   35          1          35

                        Total      355
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product2   120         1          120
2         Product3   50          2          100
3         Product4   35          1          35

                        Total      255
```

Two or more item of the same product can be added as per the number of item the unit price will also be increased and will be displayed on the phone
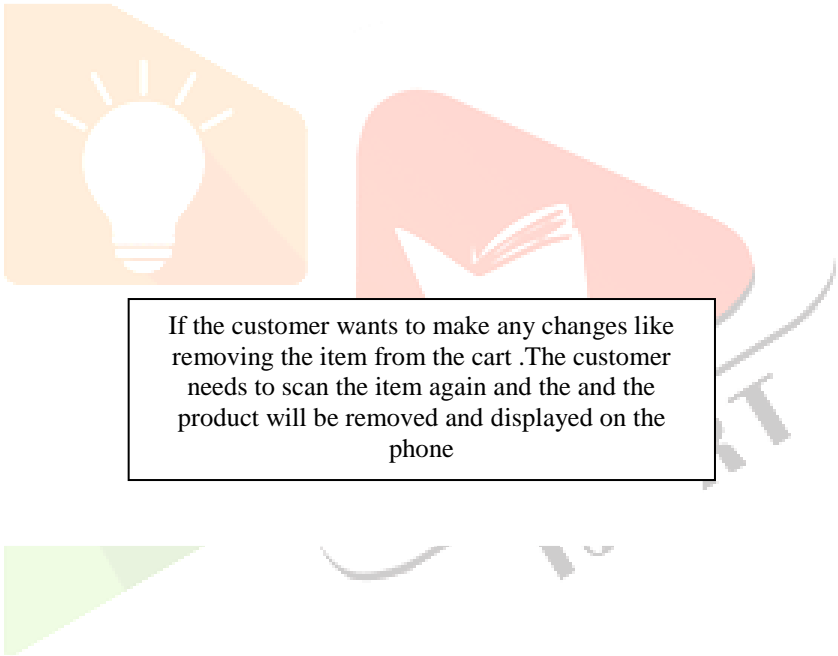
```
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product2   120         1          120
2         Product3   50          1          50
3         Product4   35          1          35

                        Total      205
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product2   120         1          120
2         Product4   35          1          35

                        Total      155
Sl.No.    Item      Unit Price  Quantity   Amount
1         Product4   35          1          35

                        Total      35
Cart is empty!
```

If the customer wants to make any changes like removing the item from the cart .The customer needs to scan the item again and the and the product will be removed and displayed on the phone

Cart is empty!					
Sl.No.	Item	Unit Price	Quantity	Offer	Amount
1	Product1	100	1	N/A	100.00
				Total	100.00

If there is any offer on a particular product the offer will be displayed and the total amount will be displayed on the phone

Sl.No.	Item	Unit Price	Quantity	Offer	Amount
1	Product1	100	1	N/A	100.00
2	Product2	120	1	10.00% Off	108.00
				Total	208.00

1	Product1	100	1	N/A	100.00
2	Product2	120	1	10.00% Off	108.00
3	Product3	50	1	BOGO	50.00
				Total	258.00

If there is Buy1Get1 offer on a product the offer will be displayed and the total amount will be displayed on the phone

Sl.No.	Item	Unit Price	Quantity	Offer	Amount
1	Product1	100	1	N/A	100.00
2	Product2	120	1	10.00% Off	108.00
3	Product3	50	2	BOGO	50.00
				Total	258.00

The customer can connect his/her phone through Bluetooth. Any Bluetooth terminal from the play store can be downloaded and it will be ready it use the product can be scanned on the reader and the total amount item number of products will be displayed in the screen any discount or any Buy1Get1 offer will also be displayed on the screen and the total amount will be given .

Conclusion

From this project we have tried to bring up with an idea of Secure Smart Trolley which we have tested and implemented with RFID tags and RFID reader. We would
Like to tell that we got great inspiration and idea for the project by seeing so many people standing in shopping centre, to scan their product and to pay the bills. While working on this we all learnt many advanced things about how RFID technology works, from our project it would save a lot of time. And we would guarantee less time consumption compared to other billing methods. In the project which we have proposed, a secure smart trolley by using RFID technology which will enhance a great shopping experiences .This trolley can detect the items by reading the RFID signals from the tags. And the value of the product scanned will be displayed on the phone with the product name, offers, discount and the total bill .Finally can complete their purchase without any hassles.

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