

RFID Based Super Market Billing And Management System

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Abstract : Nowadays supermarkets have become an integral part of our life and we find ourselves at this place very often. But what we also find is a real long queue at this place during the billing of items which does hinder the total experience and consumes a lot of time.

This paper summarises on the idea of implementation of RFID based supermarket billing system unlike the traditional methodology of fixing RFID sensor on the trolley the RFID'S are fixed on the shelf to detect movement of item. User just needs to tap on the shelf to grant access to the item's. To add convenience to this system user have option to pre-fill the amount into the e-wallet for lag less billing experience also if a customer crosses the amount limit pre filled in his e-wallet he/she is notified and reminded to top up his/her wallet to the soonest. For added security user's are also allowed to pay via online methodology at the end of shopping cycle. If any customer tries to exit super market without paying the bill a warning sound would start playing loud as soon as he/she gets put and security gates notified. This system not only helps in smooth billing and amount collection but also helps in stock management of the supermarket.

IndexTerms- Radio Frequency Identification Reader (RFID), RFIDTAG, RFID Reader, E-Wallet, Stock Management. -

I. INTRODUCTION

1. Introduction

Shopping malls or the supermarket have become an integral part of our life providing us all the necessities to us that we use daily like that of milk, bread, vegetables or that of other essentials like shoes, clothes, bottles. Though supermarket's happens to be a boon in our daily life but it comes with a drawback of long queues at the billing counter.

To overcome this problem the proposed RFID based system would surely bring relief to this problem. Here the RFID readers would be placed on the shelf a person needs to tap his/her RFID card on the scanner on the shelf. As soon as the shelf grants access to the customer the customer removes items he needs and puts it up in his carriage. So soon as the product is picked out of the shelf it gets billed to the particular customer who tapped the card to grant access. In this way the totalling happens as soon as the customer picks up the item hence saving billing time and has facility to pay via pre filled e-wallet of the option of online payments or the traditional way of swiping the card. This system is designed to encourage digital payment methodology.

II Previous Work.

Paper(1)The implementation of RFID based Supermarket Shopping System(1) on a trolley Was proposed where the billing was done when the item was put in the trolley it used to get billed.

Paper (2) shows the integration of IOT to the trolley calling it automated trolley system. This system is used to ease the queues in malls by using RFID module and IOT.

Paper(3) Shows the implementation of a smart shopping cart using Wireless sensor networks. This is a reliable and cost efficient system design. Where this attracts both the buyers for its ease and seller as an USP.

Paper(4) Explains the working of passive RFID at the shelf where the system uses the algorithm of localization. For the billing and stock management of the items. Thus the object is sensed very accurately.

III Design

A. Power Supply

230v 50hz AC main gives output of 5 volt using a step down transformer where the bridge type rectifier consists of four diodes which are used to rectify the output of the transformer. A capacitor is used to filter the output and filter output of 5volt supply is provided by LM7805 regulator.

B. RFID(Radio Frequency Identification)

These are very high performance readers which works on the principle of proximity where the operating frequency is 125Khz.This tags consist of an silicon chip which uses radio waves to transfer data to the chip this tags include Non-volatile and basic modulation circuitivity.



C. Serial Communication

➤ RS 232

It's a low power receiver/driver that features a DC/DC converter. Its RS 232 Its main work is to act as an interface between the interface data terminal (DTE) with data circuit terminating (DCE).

➤ Max 232

Such converters are required for connecting RS232 to micro controller in a serial communication where this converts TTL-1 levels logic levels to RS 232 voltage.

2pins PORT C RC6 (TxD) , RC7 (RxD) for the transmission and reception of serial data. TTL compatible MAX 232 has two sets of F receivers and Line drivers to make RS232 compatible. This needs 4 capacitor.

D. RF transceiver

CC2500 happens to be low cost RF transceiver works in the frequency of 2.4 GHz which is designed to be low power wireless application which follows 24000-2483.5 MHz ISM frequency and SRD.

Where the bill is wirelessly sent from the shelf to the cloud of each user and to the system for the billing.

E. Payment Gateway

To make this process of billing totally lag-less we need to have an online payment gateway to process the billed amount. Clients like Citrus pay would be helpful to process the billed amount where the payment would be paid by the customer by online method of pay. Or else another solution to the payment would be the card swiping machine which would bill the customer accordingly.

F. Detectors and Alarms

This is essential part of the whole system. The function of detector is to scan and detect the unsettled RFID user cards or un-scanned RFID tags.

Suppose a customer picks up multiple item and tries to get out of the supermarket without paying all the bill or paying half way. As soon as he taps his unbilled card the door doesn't open and even if he tries to sneak out when the door opens for other billed customer and tries to go out at same instant the alarm starts ringing as soon as unbilled items are detected by the sensor. Alarm starts ringing alerting the security of the super market.

G. Return Basket

To make the system more reliable and error proof. After every two consecutive shelf's there would be a return shelf. The purpose of this is if a customer picks up a wrong or undesired product he or she can return the same at this shelf called return basket.

Here the coding would be done in reverse that is a person needs to tap his/her card on the tap and the shelf opens and the person needs to drop the item in it. The scanner for this would be placed a bit lower and farther so the customer has to have drop the item in it and the code gets scanned and the item from the list gets deleted.

H. Server

To process this scanning of data tapping of card and networking the same we need a server to store all the data server would store all the on-going transaction and would keep a track on the action of every customer, sales of product and t's stock too.

And the data from the server would also help analyse the sales data and also to understand the market trend.



Fig 2 Outlook

I. Setup

This system consists of many closed transparent shelf's which are almost as same as that of regular supermarkets but in this case there's a unique thing in them.

Each shelf's would be having a closed transparent lid which would be locked by a magnetic strip or other locking mechanism. To open this mechanism one needs to tap his/her RFID card on the tapping spot.

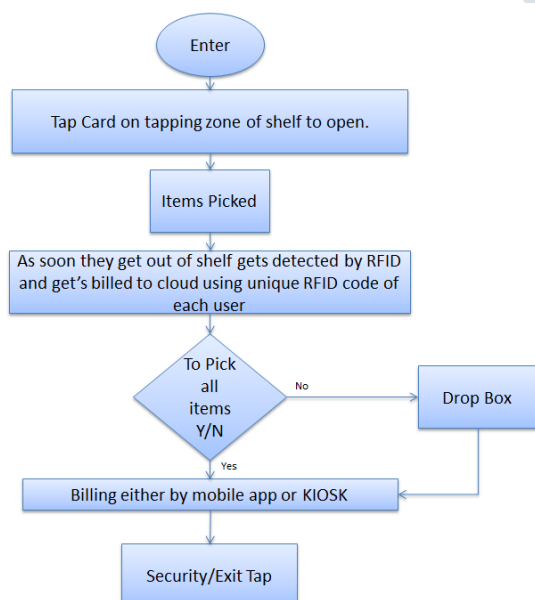


What this tapping spot does is it not only unlocks the magnetic strip it also identifies who is accessing the shelf. And each shelf's border (towards billing side) is been fitted with RFID reader's so as soon as the user picks up and takes it out it gets billed to his/her unique id which is updated to server instantly.

And at the same time it get's updated to user's app updating about the total bill instantly. By which he she can keep a track on the budget. If the user wants to cancel an item then they can drop the item at the drop box where as soon as the item falls into the basket it cancels itself from the total bill.

At the end when the user done with shopping then he/she can pays the bill using their mobile app and payment can be done using card/upi/netbanking/wallet. Also if user does choose to not to use mobile app they can go to the billing KIOSK and tap their card and here along with the payment methods they had in mobile app they can pay through cash. Where a machine similar to cash collection machine would be present to collect cash.

After the billing process user can leave the shopping mall only and only after tapping his/her card at the exit gate by this if a user has paid the bill or would not get detected and the sensor eventually would check for unbilled items making the system almost full proof.



Until now we have seen automated billing system on the basis of trolley identification system. Where when put the item in the trolley it gets detected and billed but it had a big flaw of chance of having non-billed item. That is a person doesn't put the item in the trolley and instead he/she carries in hand so by this the item doesn't get billed. Which was a loop hole in the system another loop hole was if we double tap on the trolley the items would get cancelled so if we wished to buy two same item's there were chances of trolley nullifying the system and causing error in the bill which would lead to further losses.

J. Advantages

- >Almost no billing time.
- >Decreases the manpower
- >User has live track about the total bill.
- >Ease of payment through card or online portals.
- >Eliminates threat of stealing by tampering the RFID tags and stealing without scanning case.
- >Generation of E-Bill hence saving paper.
- >Server storing and analysing sales and having a count on stock

K. Disadvantages

- >Whole supermarket requires constant power backup hence the whole ecosystem may get paralysed if the electricity goes away therefore a alternative sources of power is surely required for backup.
- >If a customer doesn't use any Smartphone he/she may have to wait in line for the offline billing.
- >Also to the customer opting for cash as payment method.
- >If the customer loses the RFID card He/She may have to regenerate the card.
- >High initial cost of the ECOSYSTEM.
- >Only selected user can have access to the supermarket. That is user's only with the card has the access to the supermarket but this at the same time increases the security of item's. Making the management system even stronger.
- >Complex system.
- >Requires continuous internet connection and a great IT team to maintain the system.

L. Application

- 1 Supermarket
- 2 Grocery Stores
- 3 Hardware Stores
- 4 Warehouses

M. Reference

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