

Advance Shopping Cart with Smart Billing Using Arduino

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Abstract: Shopping mall is a place where people get their needs on a daily basis. There has been a growing demand in shopping malls for fast and easy payment of bills. Quite often, shoppers become irritated at finding items on the shopping list while shopping in a supermarket and there is no assistance available. We've designed a smart trolley with a mobile application to solve these problems. This paper includes an application that helps customers find the product's location. It also provides a standardized and secure RFID-based billing system. To recognize the type, each shopping mall commodity, super markets will be fitted with an RFID tag. Each shopping cart is implemented with a product identification device (PID) containing an RFID reader, a microcontroller, an LCD. The purchase of product information will be read on the shopping cart via an RFID reader and displayed in an LCD interfacing with the controller. The total bill will be passed to the PC through the Bluetooth module at the billing counter.

Keywords: RFID reader, RFID tag, LCD, Mobile app.

1. Introduction

Nowadays the interest in shopping malls is rising among people. Customers find various difficulties in the shopping malls. Those difficulties are described below. One third of the biggest shoppers buys groceries on a budget. Most of the time, shoppers come to know that the actual cost is greater than their estimate only at the end of the transaction. Then they spend a lot of time looking for their favorite items and then the whole shopping process also becomes more time-consuming. Because of this, shoppers have been unable to purchase all their favorite goods many times and miss a few pieces. Another big problem that consumers face is that they have to wait for payment in long queues. Thus, all these disadvantages faced by shoppers in shopping malls are overcome by the proposed system. Each object is branded with a specific RFID label in the supermarket. Each shopping cart is equipped or implemented with a Product Identification Device (PID) that includes an RFID reader, a microcontroller, an LCD. RFID Reader recognizes items that have been placed in the cart. Once each item has been located, specific details such as the name of the item price of item will be displayed in the LCD display placed in the cart. Often showed along with this total sum. The total amount of the bill will immediately reach the bill counter through Bluetooth technology. Then the user will only have to pay the total sum

and can quit. Therefore, item level RFID technology implementation allows for fast checkout aisles that scan all items at once and achieve total automatically, removing numerous sectional counters and long queues that are widely identified as one of the most negative aspects of supermarket shopping.

RFID tags allow a bigger set of unique IDs than bar codes and can integrate additional data like manufacturer, product type, and even track environmental factors like temperature. In addition, without human assistance, RFID systems can discern several different tags found in the same general area. Consider, on the other hand, a supermarket checkout counter, where each bar-coded item must be oriented towards a reader before scanning it. So why did this technology take over 50 years to become mainstream? The main reason for this is the cost. To compete with the rock-bottom prices of printed icons, electronic recognition systems must either be equally low-cost or provide a company with ample added value to recover costs elsewhere. RFID is not as cheap as conventional labeling technology, but it provides added value and is now at a crucial price point that could require its large-scale adoption to handle retail goods for customers. Here we are introducing RFID principles, discussing its primary technologies and applications, and reviewing the challenges that 5 organizations will face when deploying this technology. RFID is used to automatically capture data to allow communication with less radio frequency detection of objects. RFID in contrast with BAR CODES.

- Similarly – a tool for automating processes and improving management of operations.
- Reduces labor and eliminates human mistakes.
- Place your fingertips with a wealth of data.

Similar in the following:

- Embedded and concealed tags without the need for line-of-sight. They can be read through any medium except metal through wood, plastic, cardboard.
- Applicable in harsh environments such as marine, chemical, humidity and high temperature settings.

The Smart Trolley concept stood out from many of the team's ideas based on how the idea would be turned into an innovative technology product that is simple, easy to use and efficient, including being an add-on service for the current self-checkout program. Since the concept was technology-based, it was

important to get the consumer insight for which the idea was designed. The reason for this was to examine the position of the stores and their everyday customers' beliefs, attitudes and expectations towards the Smart Trolley concept for supermarket outlets that was introduced. The Smart Trolley idea is based on most retail stores' most popular automated self-checkout system. The idea is built into a smaller version of the automatic self-checkout system on a shopping trolley with a user interface screen that allows customers to pay for goods that have been checked and put in the trolley before leaving the store entrance. During peak hours, this is to release pressure on the tills. The Smart Trolley comes with all the standard services including scanning an item to check for price and information, as well as other additional features that will be included in the design such as finding an item in the store by entering the item's name in the user interface screen search field that will automatically display the position of the item in the store. The Smart Trolley is designed with security measures to prevent it from being wheeled out from the premises of the store and also to protect the card details of the customer as it is intended to accept only card payment for items purchased in the store.

The system only works for those customers that have the mall membership card. Use the RFID Tag and RFID Reader to incorporate the. Customers allow the installation of a membership card which is also a RFID tag and inserts it into a position where RFID Reader is present. When RFID Reader senses the existence of RFID tag only then the shopping trolley or basket can become smart.

Item-level implementation of RFID technology would also allow fast checkout aisles that scan all items at once and remove queues that are widely identified as one of the most negative aspects of shopping in the supermarket. For identify individuals, a simple extension of this framework would be to use RFID embedded in customer loyalty cards. This method could be useful for quicker device login and directly paying the shopping cost to the point-of-sale (POS) customer account.

2. Problem definition

Current shopping usually involves waiting in line to scan your items for checkout. This can cause customers to waste a lot of time. In addition, the technology currently used in barcodes checkouts-was developed in the 1970s from another era. Barcodes are used on virtually every object today. Barcodes are a common technology because they are the standard for retail products; stores that own a barcode reader will scan and print barcodes on the products. The most important factor involved with barcode scanning is that the product should be in the reader's line of sight (LOS) to scan the barcode on the package.

This initiative provides enormous opportunities for retailers to market using technologies for Radio Frequency Identification (RFID). Traditionally, RFID has been used to track stock along supply chains, and retailers have placed RFID tags on pallets. Now with these automated system retailers will

recognize the value of tagging individual merchandise items that will overcome the issue of the product being in the reader's Line of Sight (LOS).

3. Proposed system

Technological developments also provided the organization with new opportunities to carry out its business activities. There are several smartphone technology bases that have been popular among people, according to the report published by technasia, and it plays a large part of a daily requirement. Mobile technology is evolving very rapidly and allows for a new approach to e-marketing. Consumers today surf more, browse more, and socialize more on their mobile devices. A smartphone application will be used in this article. This indicates the list of products that are available and their prices. Choose the items is requested from the customer. Upon completion of the selection process, the items are sorted and presented according to their location. As an alternative to barcode systems, radio frequency identification (RFID) is becoming preferred technology. RFID systems provide an automated identification method that uses RFID tags or transponders to store data remotely. An RFID tag is an item that can be attached to or inserted in a product, animal or entity for the purpose of radio wave identification. RFID tags based on chips include silicon chips and antennas. We built a smart shopping cart program in this paper that enables customers to control their shopping list when shopping and only pay the bill at the checkout counter. The shopping cart will automatically measure and display the total prices of all the items within it. It makes it easy for the customer to know how much they have to pay during the shopping and not at the checkout counter. It helps the customer to get faster service at the checkout. The downside for the shop owners is that they would require less cashiers, resulting in a major cost reduction.

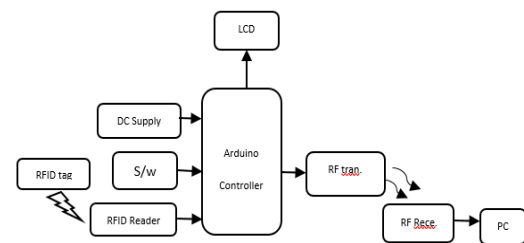


Fig. 1: Block diagram of smart trolley

4. System description

A. Trolley unit

The Arduino microcontroller is connected to a barcode reader and RFID reader in this device. The reader on the trolley reads the tag as the user puts the items in the trolley and sends a signal to the controller. This is then stored in the memory by the controller and compared to the lookup table. If it matches, the item name will be shown on the LCD as well as the total

amount of items purchased.

B. Billing Unit

The customer comes close to the billing segment as soon as the shopping is over. On the billing screen, the total bill will be shown.

C. Power Supply

The AC supply is connected to the transformer with step down of 12V. The output of the transformer is the 12V AC rectified by a diode bridge. The 5V DC Diode Bridge output is routed into condensers.

D. RFID Tags

Tags are of two types: passive tags without battery life and active tags with battery life. RFID tags are released for automatic identification of a person, package or item. These are information-transmitting transponders. There are two pieces to the RFID tag. One is an integrated circuit for the modulation, storage and processing of radio frequency (RF) signal information and demodulation. The second is a signal processing and transmission antenna.

E. RFID Reader

RFID reader is an RF module that functions as a radio frequency signal transmitter and receiver. Transmitter consists of an oscillator to establish carrier frequency; a modulator to impact this carrier signal on data commands; and a receiver that includes demodulator to collect the returned data.

F. LCD Display

LCD is capable of viewing numbers, characters and graphics. The monitor is attached to the microcontroller's I/O port (P0.0-P0.7). The monitor is in multiplexed mode i.e. there is only one display at a time. The next monitor turns on within 1/10 of a second. Thanks to the persistence of Vision, the sequential on and off display can result in continuous count view.

G. RF Module (13.56 MHz)

RF module consists of RF and RF transmitter. It is a small electronic circuit used for radio signal transmitting and reception. This chooses one of several frequencies of the carrier. RF module types are: 1) Transmitter module 2) Receiver module 3) Tran Receiver module. We used Tran Receiver type RF module in this project. It is a small assembly of PCBs and is capable of transmitting and modulating a data-carrying radio wave. In addition to a micro controller, transmitter modules are implemented that will provide data that can be transmitted to the module.

5. Incentives

A. Benefit to the customers

This system allows the product to be scanned spot and shows the price information on LCD. It allows consumers to match the total price prior to payment with the budget in the wallet.

Whenever a customer shops and is close to the billing counter, the data from the LCD will be transferred via NRF24101 to the billing counter computer. By doing so, it will also save customers' money.

B. Benefit to the mall

This system only works for those clients with the mall's membership card. Using the RFID Tag and RFID Reader, this is done. Customers need to insert the membership card, which is also an RFID tag, and insert it into a place where RFID Reader is present. Once RFID Reader only detects the presence of RFID Tag, it will enable the trolley or basket to become smart. If not, it will act as a trolley.

C. Reason behind using Arduino

Using the Arduino Development Board, we designed the framework. It gives full access to microcontroller or microprocessor functions such as programming the controller, using input/output buttons, interacting. The Arduino system is less voluminous and can easily be transferred from one place to another. It requires less power supply and due to its easy programming we can easily improve the system if necessary.

D. Cost efficient and user friendly

Because we built this system using Arduino and user Smart Mobile Phone to serve as a Barcode Scanner, this system requires less design costs. This system requires less power supply and the total amount is displayed to the user so that this system is user-friendly.

6. Conclusion

This paper reviews RFID Based Intelligent Shopping Cart will act as an alternative to traditional trolleys, saving a lot of customer time by reducing the time before the queue. It also makes shopping for both the customers and the shopkeeper an easy and comfortable experience. It can be considered as the perfect technology for the shopping plan or achievement of the future. Supermarkets, textiles and electronic gadgets store are the main areas of its application.

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