International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 06 | June-2016 www.irjet.net p-ISSN: 2395-0072

AUTOMATED SMART CART FOR RETAIL MARTS

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Abstract *- Shopping is a daily seen activity and purchasing at big malls is becoming more familiar in city areas as a result we can see a decent rush causing a long checkout. This becomes heavy during holidays and weekends. Customer after completion of purchases needs to go to billing counter for payments. At billing counter the cashier scans the product using barcode which is very time consuming process and results in long queue at billing counter. In order to address this a reliable, effective approach is presented titled as* ***Automated Smart Cart for Retail Marts****. This system helps in automating the billing process using the RFID and Zigbee technology. Here Barcodes are replaced with RFID tags and all the necessary billing information required take place while customer drops the required product into trolley which scanned using RFID reader and at the end this information sent to server computer using Zigbee.*

Key words *: RFID, Barcode, Zigbee.*

1.INTRODUCTION

Shopping mall is a place where people get their daily necessities ranging from food products, clothing, electrical appliances etc.

Now a day's numbers of large as well as small shopping malls has increased throughout the global due to increasing public demand & spending. Sometimes customers have problems regarding the incomplete information about the product on sale and waste of unnecessary time at the billing counters. Barcodes have been in existence for many years to manage checkouts at supermarket.

However, it is no longer the effective way for operation. With the technology Improvement and large-scale production of semiconductor wireless components, led to the use of RFID also known as smart tags. RFID stands for Radio Frequency Identification.

In this system RFID and Zigbee technology is used to make cart Automation. The automated cart is equipped with Radio Frequency Identification (RFID) reader for product identification and Zigbee to communicate with the shop's server. Besides, it also has an LCD display that informs customers about the product prices, discounts, offers and total bill. As soon as the object is dropped into or moved from the cart, the RFID tag identifies the product and updates the bill. When the customer is done with shopping the details are sent to the shop's server and the customer has to pay just the amount and leave. The proposed cart is easy to use and does not need any special training. The cart's inbuilt automatic billing system makes shopping a breeze and has other positive spin-offs such as freeing staffs from repetitive checkout scanning and increasing operational efficiency in stocktaking.

2. LITRATURE SURVEY

Shopping in the present day usually involves waiting to get items scanned for checkout. This can result in a great deal of wasted time for customers. Furthermore, the technology currently used in checkouts developed in the 1970s. Today barcodes are found on almost every item. Barcodes is a universal technology in that they are the norm for retail products stores that own a barcode reader can process barcodes and imprint it on the products.

The most important factor that is involved in barcode scanning is that the product should be in the Line of Sight (LOS) of the reader in order to get the barcode imprinted on the product scanned which slows the checkout process. [1]

Long checkouts at the grocery store which is one of the biggest problems can be made disappear replacing Universal Product Code (UPC) bar code by smart labels, also named as radio frequency identification (RFID) tags. RFID tags are intelligent bar codes that can trace by the reader [2].Radio Frequency Identification (RFID) is becoming preferable technology as an alternative to barcode systems. RFID systems provide an automatic identification method, relying on storing and remotely retrieving data using RFID tags or transponders. An RFID tag is an object that can be attached

to or incorporated into a product for the purpose of identification using radio waves. Chip-based RFID tags contain silicon chip and an antenna. [3,4]

3. EXISTING MODE

Barcoding technique is the currently available billing process method at shopping malls. Here in this process all items with a barcode label are scanned using a barcode readable scanner. A barcode reader is an electronic device that is designed specially to extract the information from the barcodes.

It consists of a light source and lens with a light sensor converting optical impulses into electrical ones and may also additionally contain a decoder circuitry for analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.

4. PROPOSED MODE

RFID technology is used in the proposed work which poses more suitability compared to barcode technique. Barcode technology works on optics principles that require direct line of sight whereas RFID technology works on the principle of RF waves which is not restricted to line-of-sight. Hence no visible contact is needed in order to read the tag making it possible to read many tags simultaneously.

RFID tags can be read at much greater speed and reader can access information from a tag at distances up to 300 feet. The range to read a barcode is much less, typically no more than fifteen feet. RFID readers can interrogate the tags much faster at a rate of forty or more tags per second but for barcodes it is more time-consuming.

Barcodes have no read or write capability and rewriting is not possible but RFID tags have be read/write capability where altering is possible. Line of sight requirements also limit the ruggedness of barcodes as well as the reusability of barcodes as the printed barcode must be exposed on the outside which subjects to greater wear and tear. RFID tags are typically more rugged as it can be implanted within the product itself, guaranteeing greater ruggedness and reusability.

5. PROPOSED SYSTEM DESIGN

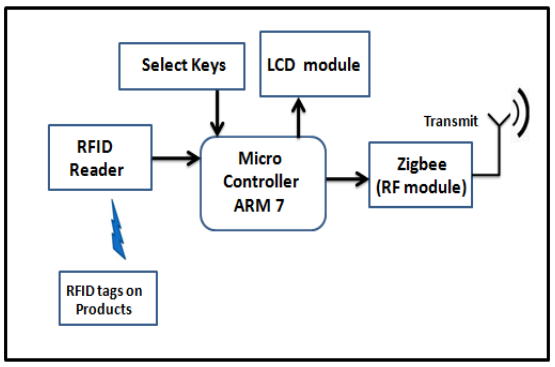

Fig 5.1: Transmitter Block Diagram

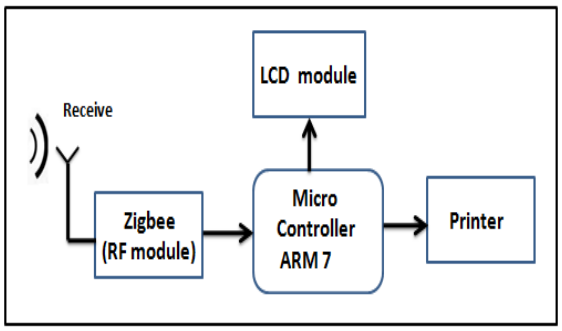

Fig 5.2: Receiver Block Diagram

6. SYSTEM FLOW

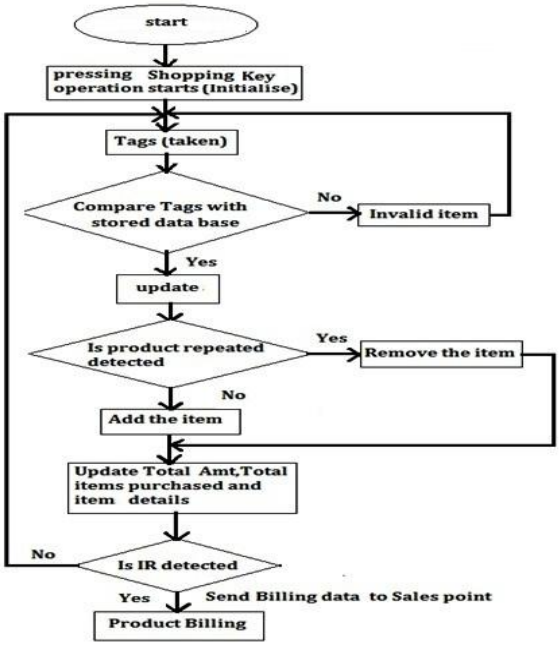

Fig 6.1: Flow Diagram

7. SYSTEM ARCHITECTURE

- Microcontroller
- RFID System
- Zigbee
- Printer
- Keypad
- display

7.1 LPC 2148

The LPC2148 is the widely used IC from ARM-7 family. It is a 32-bit Reduced Instruction Set Computer processor architecture controller manufactured by Philips (NXP) and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option. Figure 7.1 shows the LPC 2148 controller chip. The Features of LPC 2148 [5] are as follows

- 40 kB of on-chip static RAM and 512 kB of on-chip flash memory.
- Embedded ICE RT and Embedded Trace interfaces.
- USB 2.0 Full Speed compliant Device Controller.
- Two 10-bit A/D converters and single 10-bit D/A converter.
- Two 32-bit timers/external event counters ,PWM unit and watchdog.
- Multiple serial interfaces including two UARTs , two Fast I2C-bus,SPI and SSP
- Vectored interrupt controller with configurable priorities and vector addresses.
- 5 V tolerant 45 fast general purpose I/O pins in a tiny LQFP64 package.
- Nine edge or level sensitive external interrupt pins available.
- On-chip integrated oscillator and power saving modes including Idle and Power-down.

Fig 7.1 : LPC 2148 Controller

7.2 RFID READER

The RFID reader is a decoder module that reads and translates the data. It has two parts – a transceiver and an antenna. The transceiver generates a radio signal and this signal is necessary to the tag and is transmitted through the antenna. The signal itself is a form of energy that can be used to power the tag.

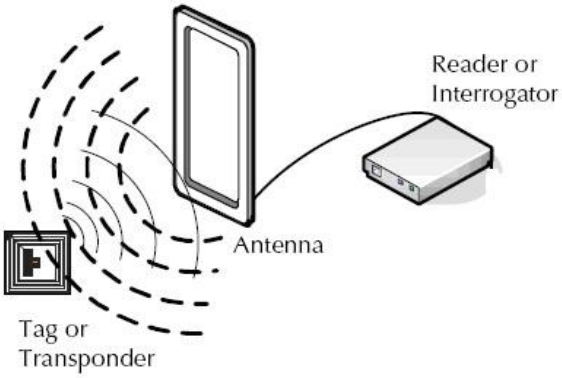

Fig 7.2: RFID System

7.3 RFID TAGS

An RFID tag is comprised of an integrated circuit (called an IC or chip) attached to an antenna .It is also called a transponder and works in different frequency .The Low frequency (LF) RFID systems operate in the 30 KHz to 300 KHz range, and have a read range of up to 10 cm. While they have a shorter read range and slower data read rate. High frequency (HF) RFID systems operate in the 3 MHz to 30 MHz range and provide reading distances of 10 cm to 1 m. Ultra-high frequency (UHF) RFID systems have a frequency range between 300 MHz and 3 GHz, offer read ranges up to 12 m, and have faster data transfer rates. Lower the frequency of the RFID system, the shorter the read range and slower the data read rate.

7.3.1 RFID TAG TYPES

Depending on the way the tag communicates with the reader, tags are classified as

- Active RFID Tags
- Passive RFID Tags

In active RFID systems, tags have their own transmitter and power source. Usually, the power source is a battery. Active tags broadcast their own signal to transmit the information stored on their microchips. Active RFID systems

typically operate in the ultra-high frequency (UHF) band and offer a range of up to 100 m.

In passive RFID systems, the reader and reader antenna send a radio signal to the tag. The RFID tag then uses the transmitted signal to power on, and reflect energy back to the reader. Passive RFID systems can operate in the low frequency (LF), high frequency (HF) **or** ultra-high frequency (UHF) radio bands. As passive system ranges are limited by the power of the tag's **backscatter** (the radio signal reflected from the tag back to the reader), they are typically less than 10 m. Figure 7.3 shows passive RFID tag. Passive tags are Smaller, cheaper and more flexible having higher range of tag options and can live without a battery.

Fig 7.3: Passive RFID Tag

7.4 ZIGBEE MODULE

RF module contains a transmitter and a receiver sharing a common circuitry. It is a electronic devices used in many data applications. RF transceivers consist of an antenna to receive transmitted signals and a tuner to separate a specific signal from all of the other signals that the antenna receives. Detectors or demodulators extract information that was encoded before transmission. Radio techniques are used to limit localized interference and noise. To transmit a new signal, oscillators create sine waves which are encoded and broadcast as radio signals.

7.5 PRINTER

Commonly used output device responsible for taking electronic data stored on a computing device and generating a hard copy of that data.

8 ADVANTAGES

- It can be used in shopping markets shopping to reduce the billing time.
- This can also be used to track and manage inventory.
- Helps in managing the work force effectively.

9 CONCLUSION

The presented work along with the ability of billing automation, its design also ensures assistance invoked by the customers, which helps to keep their clients loyal and to predict their needs makes the system smart fair and attractive to both the buyers and sellers. This system based on RFID technique is efficient, compact and shows promising performance.

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