



SMART GO-CART WITH AUTOMATIC BILLING SYSTEM THROUGH RFID AND ZIGBEE

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Abstract

A Shopping mall or a Complex is a place where people regularly buy goods. Customer have to wait in long queues to use barcode scanner to check their goods and get it billed. To get rid of this, we have proposed a new Radio Frequency Identification(RFID) Smart Shopping Trolley. This technology is used to help a person shopping and also to stop waiting in long queues and save time as a result. The Smart Shopping Trolley could be the Microcontroller, Android Computer, RFID Scanner and Electronic Display. The Shopping center products will have RFID tags to retrieve/access information about it. When a customer places a product in the Smart Trolley, RFID Reader reads the products ID and the related information is stored in the device. Communication will take place between android device, main server, and gate system via ZigBee Module. Total quantity of the items in the cart will be measured using android device and will be updated on the server and the Central Billing System and one additional features will be added, which is a warning intimation of obstacles.

Keywords- RFID tags, Infrared sensors, ZigBee, Radio frequency identification (RFID) Readers, LCD, MAX232 and Buzzer.

I. INTRODUCTION

Humans have always invented and developed a technology to support their needs ever since the beginning of mankind. The basic purpose of advancement in technology has been in minimizing tasks and making everyday chores easier and faster, irrespective of the various domains available. A major task on which human beings are found spending considerable amount of time is shopping. According to a

Survey, approximately most of the humans spend 1.5 hours daily on shopping. A large number of customers will always tend to walk out of a queue if the queue is very long. The current shopping environment can simply be classified into two categories (1) Shopping in-person and (2) Shopping in absentia. Shopping in-absentia is supported in many ways including online shopping, tele-shopping, etc. wherein a shopper or a customer does not have to be present physically in the shopping arena. Shopping in-person involves a personal visit of a person to the shopping malls or centres and selecting the product/s based on the various factors including need, fashion, convenience, brand, etc. The enhanced Smart Shopping Cart System intends to assist shopping in-person which will minimize the considerable amount of time spent in shopping. It is also aimed in providing the store management section with real-time updates on the inventory. The proposed system is based on four important technologies (i) Infrared sensors (ii) RFID tags for product identification (iii) ZigBee for achieving wireless communication with Server, and (iv) Integrated System with display for billing and inventory management. Radio frequency identification (RFID) is a rapidly growing technology. RFID systems consist of small tags, attached to physical objects. When wirelessly interrogated by RFID Readers, tags respond with some identifying information that may be associated with arbitrary data records. Thus, RFID systems are one type of automatic identification system, similar to optical bar codes. In this paper, we discuss about opportunities of enhancing the cart to make it into a commercially viable product as an excellent way to help customers reduce the time spent in shopping by displaying the list of products, their cost and automatic billing. The

system helps the store management section with an automatic update of the inventory on every purchase of a product. The Smart Shopping Cart has the potential to make the shopping experience more comfortable, pleasurable and efficient for the customer and the inventory control easier for the store management.

II. PROBLEM STATEMENT

Main aim of this paper was to provide an automatic billing to avoid queue in malls and super markets. Supermarket is the place where customers come to purchase their daily using products and pay for that. So there is need to calculate how many products are sold and to generate the bill for the customer. Cashier's desks are placed in a position to promote circulation. At present, many supermarket chains are attempting to further reduce labor costs by shifting to self-service check-out machines, where a single employee can oversee a group of four or five machines at once, assisting multiple customers at a time.

III. OBJECTIVES

1. Switch on the power supply of hardware kit. Connect the ZigBee Module to the Computer through USB.
2. Add the items to the cart by keeping RFID card near the RFID Reader then product information is displayed in the LCD display.
3. While adding the items, we can delete an item by pressing the cancel button in the kit.
4. After completion of adding item to the cart, press the transmission button in the kit to pay bill using RFID ATM card.

IV. PROPOSED METHODOLOGY

Radio frequency identification system is most popular method in the field of wireless identification system. It involves radio frequency tag or card and an RF reader, the card is attached with each product, it contains the price of the product. Initially, the information about the card is stored in the ARDUINO UNO with the help of control keys connected with the ARDUINO UNO. Here we can set a limit value for purchasing. This limit value can also be entered with the help of control key. The RFID reader system is attached with the trolley. While purchasing,

the items should be shown to the reader. When the tag is brought near to the RFID reader, the RFID card emits an RF wave, the emitted wave contains the price of that product, which is received by the RFID reader and the reader is directly interfaced to the ARDUINO UNO. ARDUINO UNO calculates the total amount by adding that product price with the purchase bill. ARDUINO UNO send data through RF module to the receiver side in the search mode if the particular product is selected using key pad. Send data is corresponds to product details that the customer wants to search in the super market. If any obstacle interrupt occur the microcontroller activates the alarm circuit to ring. A liquid crystal display is used for displaying the entire status of the system. A 16X2 character LCD is used in this project. The module has the capability to display 32 characters as total in 2 lines, 16 characters in each line. Here it displays the product price and total purchased amount.

V. ARDUINO UNO

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing plat form based on a simple microcontroller board, and a development environment for writing software for the board.

Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicating with software running on your computer. The boards can be assembled by hand or purchased pre-assembled. Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 k Ohms.



Fig.1 Hardware Design of Arduino UNO

VI. RFID TAG

RFID tagging is an ID system that uses small radio frequency identification devices for identification and tracking purposes. An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission. An RFID tag (sometimes called an RFID transponder) consists of a chip, some memory and an antenna.

RFID tags that contain their own power source are known as *active* tags. Those without a power source are known as *passive* tags. A passive tag is briefly activated by the radio frequency (RF) scan of the reader. The electrical current is small -- generally just enough for transmission of an ID number. Active tags have more memory and can be read at greater ranges.



Fig.2 RFID Tag

VII. RFID READER

RFID stands for Radio Frequency Identification. The RFID device serves the identical cause as a bar code or a magnetic strip on the returned of a credit card or ATM card; it provides a unique identifier for that object. And, simply as a bar code or magnetic strip must be scanned to get the data, the RFID device ought to be scanned to retrieve the identifying data. An RFID reader's function is to interrogate RFID tags. The method of interrogation is wi-fi and because the space is fairly short; line of sight between the reader and tags isn't necessary. A reader contains an RF module, which acts as each a transmitter and receiver of radio frequency signals. A modulator to impinge data commands upon this service signal and an amplifier to enhance the signal sufficient to awaken the tag.

The receiver has a demodulator to extract the returned facts and also contains an amplifier to bolster the sign for processing. An RFID reader, also known as an interrogator, is a device that provides the relationship between the tag statistics and the agency device software that wishes the information. The reader communicates with tags that are within its field of operation, appearing any quantity of tasks along with simple non-stop inventorying, filtering, writing (or encoding) to choose tags, etc. The transmitter consists of an oscillator to create the provider frequency; a modulator to impinge information instructions upon this carrier signal and an amplifier to reinforce the sign enough to awaken the tag. The receiver has a demodulator to extract the returned facts and also carries an amplifier to strengthen the sign for processing. An RFID reader, also called an interrogator, is a device that offers the connection among the tag data and the company system software program that wishes the records.



Fig.3 RFID Reader

VIII. ZIGBEE

ZigBee is an IEEE 802.15.4-based specification for a collection of high-level communicate protocols used to create personal region networks with small, low-strength virtual radios, alongwith for domestic automation, medical tool statistics collection, and other low-strength low-bandwidth needs, designed for small scale initiatives which need wireless connection. The generation defined by the ZigBee specification is supposed to be easier and less costly than other wireless personal region networks (WPANs), together with Bluetooth or greater fashionable wireless networking inclusive of Wi-Fi. Applications consist of wi-fi mild switches, domestic electricity monitors,

traffic control systems, and different patron and commercial device that require short - range low - rate wi-fi information transfer. Its low power intake limits transmission distances to 10–a hundred meters line-of-sight, depending on electricity output and environmental characteristics. ZigBee gadgets can transmit records over long distances by means of passing statistics thru a mesh community of intermediate devices to attain extra distant ones. ZigBee is typically utilized in low facts charge packages that require lengthy battery existence and stable net working (ZigBee networks are secured by means of 128 bit symmetric encryption keys.) ZigBee has a defined price of 250 kbit/s, exceptional appropriate for intermittent data transmissions from a sensor or input tool.



Fig.4 ZigBee Module

IX. IR SENSORS

Infrared (IR) era addresses a broad variety of wi-fi programs, especially in the regions of sensing and faraway control. To recognize infrared generation, the pleasant start line is the electromagnetic spectrum. The IR portion of the electromagnetic spectrum is usually divided into three regions: the near-mid- and far- infrared. Infrared wavelengths variety from crimson to violet. The frequencies are higher than microwave but shorter than visible light. Focusing on near infrared gadgets and applications, Photo-Optic technologies are used for optical sensing and optical communications with numerous popular market packages, since light is less complex than RF when carried out as the signal supply.

X. POWER SUPPLY UNIT

Regulated DC 5V is used for Harvard architecture primarily based microcontroller, caution indication (i.e. LED indication), audio in a position alarm unit

and Safety tracking unit i.e. LCD Display unit. Unregulated DC voltage is used for relay circuit that's used to controlling and triggering the diverse output gadgets that's to be within the car that which has been followed with driver circuit. Since all digital circuits work simplest with low D.C. Voltage we need a strength supply unit to provide the suitable voltage supply. This unit includes transformer, rectifier, filter out and regulator.



Fig.5 Regulated DC 5V (Power Supply)

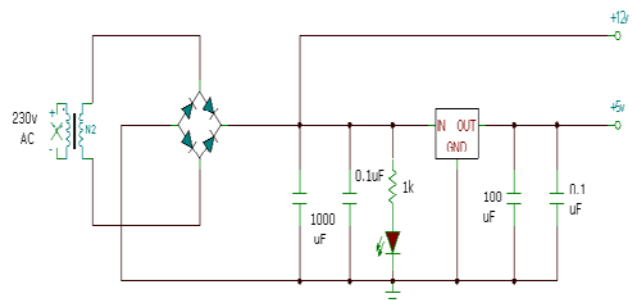


Fig.6 Power supply circuit diagram

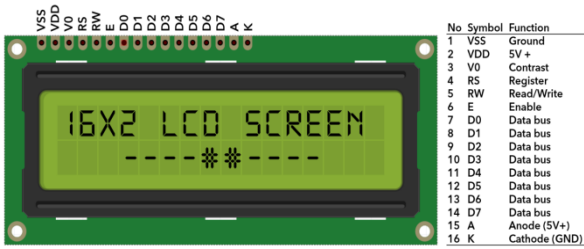
XI. LCD

A liquid crystal display (commonly abbreviated LCD) is a thin, flat display device made up of any variety of coloration or monochrome pixels arrayed in front of a light source or reflector. It is frequently utilized in battery-powered electronic devices because it uses very small quantities of electric electricity. Each pixel of an LCD commonly consists of a layer of molecules aligned among two transparent electrodes, and polarizing filters, the axes of transmission of which are (in maximum of the cases) perpendicular to every different.

Using the LCD Module with an PIC Microcontroller

The LCD Module can effortlessly be used with an 8051 microcontroller along with the PIC16F877A covered with the

microcontroller newbie kit. The LCD Module comes with a 16 pin connector. The pins at the 16 pin connector of the LCD Module.



XII.RESULTS



XIII. CONCLUSION

The smart purchasing trolley utility creates an automated principal billing machine (acbs) for supermarkets and malls. Using pid (product identification), clients will now not ought to wait close to coins counters for their bill payment. Since their bought product records is transferred to relevant billing gadget. Customers can pay their bill through credit score/debit cards as well. The gadget proposed is noticeably dependable, authentic, truthful and time-effective. There may be discount in salary amount given to employees, discount in theft. Also, the device may be very time-efficient.

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