

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 3, March 2019

Automatic Navigational Trolley Using ZigBee Technology

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ABSTRACT: A shopping mall is a place where every people using them to get their daily necessities. At the time of getting their necessities they have to pay, For this payment definitely, they have to get the right product. For selecting the right product we have to know about the product information and expiry date. And the other thing is the trolley, The selected Items are taken into the trolley. For the movement of the trolley, we have to use some manual force and effort. This will also make shopping more difficult. For overcoming this problem we implement the automatic navigational trolley using ZigBee technology along with the billing section to reducing the human effort in the supermarket during purchasing and billing. The navigational trolley movement was controlled by using the accelerometer and the direction commands for the trolley that was given by the mobile controlled application through via Bluetooth. The billing of product that was generally done by using the product manufacturing bar codes. In this project we use the RFID Tag alternative for the manufacturing product code. In future, the RFID Tag will be used as a product manufacturing bar code. When we read the RFID tag it shows the details of the product on the LCD display. If the date of the product is expired it indicates the expired date with the buzzer sound. Finally, all purchasing is finished we have to use the push button for sending the purchasing product details with total amount through the ZigBee wireless communication to pc with the help of RS232.

KEYWORDS: Indicate the date of Expiry; Time Reduction; RFID; Transponder; accelerometer.

I. INTRODUCTION

A Shopping mall is a place where every people using them to get daily necessities like food, clothes, electrical appliances etc. A large number of people using the same mall at the same time, so the customers are difficult to understand the information about the product and the date of expiry. In between the crowd, these are not easy and it takes too much time. The traditional billing is also consumed more time during billing. Day to day life, time is the most important thing so the saving of time is more important

To overcome these problems we have to improve the existing Systems. The common thinking of every human is to develop the technology day by day. As per the human thinking, we have to design the smart trolley for shopping. We implement the automatic navigational trolley using ZigBee technology along with the billing section to reducing the human effort in the supermarket during purchasing and billing. The billing of product that was generally done by using the product manufacturing bar codes. In this project, we use the RFID Tag alternative for the manufacturing product code. In the future, the RFID Tag will be used as a manufacturing product code. Finally, the purchasing is finished the total number of product and the total amount that was transferred to the pc by using ZigBee and RS232.

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II. MOTIVATION

Our main motivation of this project is to reduce the timing of billing from the queue, increasing the reliability of the product and implementing the automation in the trolley to reducing the human effort. During weekends and festival times, the use of shopping mart is more important. At the time of shopping, they have to face many problems and the people worrying about their money due to overcrowd.



III. WORKING PRINCIPLE

The whole process of the automatic navigational trolley workings is fully controlled by the microcontroller Atmega328p. The RFID reader, LCD display, switch and push button that was fixed along with the trolley. When the RFID Tag read by the RFID reader the information of items that was shown on the LCD display. The information on items that are found easily and it makes shopping also easy. The LCD display shows the product name, price, total amount, total number of the product. The Battery is used as a power source for these operations.

During shopping in case of manual control it is difficult to pull and push the trolley with 30kg above weight and it easily makes you tired. For resolve this problem we make the trolley that can move automatically. The direction that was controlled by accelerometer connected with the mobile through Bluetooth. the trolley just easy to control like a remote car and there is some added future of direction and movement controlled by using the gesture mode. After that one more future is the shopping is completed we should have to push the push button for transfer the purchased items data from the trolley to pc for billing. For this data transaction, the two ZigBee modules used one for the trolley and another for pc. Making of connection with pc there is a small circuit where used this consist step down transformer, regulator IC, ZigBee, and RS232. Regular Ac current used for the Power supply for this circuit and it is fixed nearby the pc computer for displaying the bill. The important parts are shown in below block diagram.

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BLOCK DIAGRAM

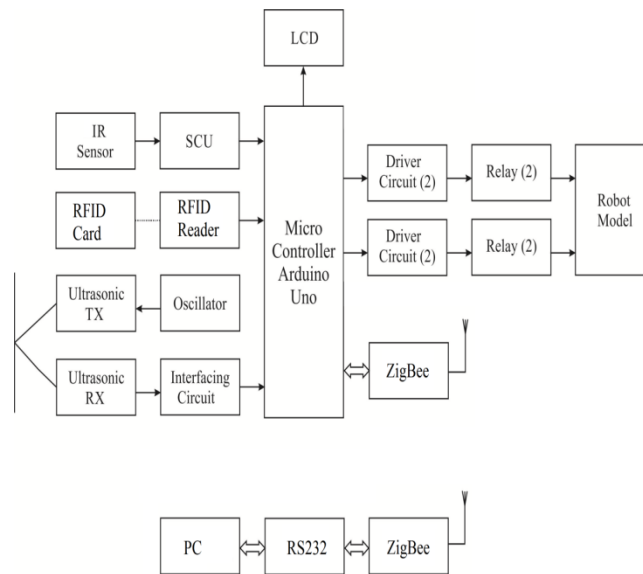


Fig.1. Block Diagram

A. Arduino Uno

Arduino/Genuino Uno is a microcontroller board, based on the ATmega328p. this microcontroller has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a power jack, a USB connection, and ICSP header and a reset button. It contains anything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, In case of worst scenario you can replace the chip for a few dollars and easy to start over again.

B. Transponder

The Transponder or tag is fixed on to the baggage or product to be tracked in the airport. When this tag comes within the range of the reader or integrator, the tag gets energized. Now, this tag transmits the data to the reader. This data is automatically transferred to the micro-controller for further processing. The time at which the tag is sensed is sent to the micro-controller from the RTC (Real Time Clock). These information are displayed on LCD (Liquid Crystal Display). The same data is sent to the EEPROM (Electrically Erasable and Programmable Read Only Memory), which is used as a backup. It can be store and retrieved.

C. Passive Tag and Reader

Passive tags are those energized by the reader itself, they don't need a power source, typically have a very long life (near indefinite) a drawback over active tags is the read range, typically 2cm to 1.5m, a strong positive is individual tag cost. RFID Passive tag is combined of an integrated electronic chip and an antenna coil that includes basic modulation circuitry and non-volatile memory. For most of the applications, passive tags are usually the most cost-effective. These are made in a wide variety of sizes and materials.

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Fig.2.RFID Tag Reader

where item tracking is needed or elsewhere security aspects are important. Most tags also carry an unalterable unique electronic serial number and it makes RFID tags potentially very useful in applications.

D. ZigBee

The main part of the ZigBee device Working Group is to bring about the existence of a broad range of interoperable consumer devices by establishing open industry specifications for unlicensed, unbound outermost, control devices requiring the lowest price and lowest power consumption communications between compliant devices anywhere in and around the required range. The specification of ZigBee is a combination of Home RF Lite and the 802.15.4 specification. The spec operates in the 2.4GHz (ISM) radio band - the same band as 802.11b standard, Bluetooth, microwaves and other devices. It is capable of connecting 255 devices per single network. The data transmission rates of up to 250 Kbps at a range of up to 30 meters. ZigBee technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power.

General Characteristics

- 1 Dual PHY (2.4GHz and 868/915 MHz)
- 2 Data rates of 250 kbps (@2.4 GHz), 40 kbps (@ 915 MHz), and 20 kbps (@868 MHz)
- 3 Optimized for low duty-cycle applications (<0.1%)
- 4 CSMA-CA channel access Yields high throughput and low latency for low duty cycle devices like sensors and controls
- 5 Low power (battery life multi-month to years)
- 6 Multiple topologies: star, peer-to-peer, mesh
- 7 Address in space of up to:- 18,450,000,000,000,000 devices (64 bit IEEE address)- 65,535 networks
- 8 Optional guaranteed time slot for applications requiring low latency
- 9 Fully hand-shake protocol for transfer reliability
- 10 Range: 50m typical (5-500m based on environment)

Typical Traffic Types Addressed

- 1 Periodic data
- 2 Application defined rate (e.g., sensors)
- 3 Intermittent data
- 4 Application/external stimulus defined rate (e.g., light switch)
- 5 Repetitive low latency data.

E. IR Sensing Circuit

when the signal is high the transmitted signal is given to IR transmitter, the IR transmitter LED is conducting it passes the IR rays to the receiver. These sensors are used to count the number of a product that is put into the trolley. Because the customers sometimes forgot the product was put into the trolley or not. For this problem, we use the IR sensors to count the number of the product.

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ALARM CIRCUIT

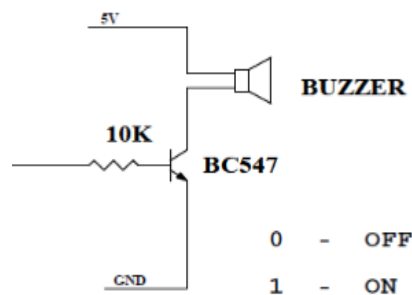


Fig.5. Alarm Circuit

TABLE I: Alarm Logic Circuit

Voltage Signal from Microcontroller or PC	Transistor	Buzzer
1	On	on
0	off	Off

H. Accelerometer

An **accelerometer** is a device that measures proper acceleration, the acceleration experienced connective to free fall. Single-axis model and multi-axis model are available to find magnitude and direction of the acceleration as a vector quantity and can be used to sense adjustment, acceleration, vibration shock, and falling. Micromachined accelerometers are increasingly present in portable video game controllers and electronic devices, to detect the position of the device or provide for game input.

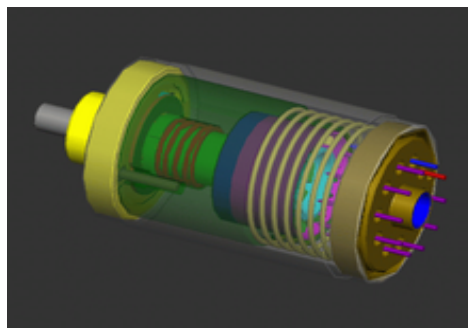


Fig.6. Accelerometer

An accelerometer measures proper acceleration, which is the acceleration it experiences relative to free fall and is the acceleration felt by people and objects. This accelerometer used for control the direction of the trolley movement by using the Bluetooth. In addition to extra future, the gesture mode can be used alternative for the manual remote control

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I. BLUETOOTH

Bluetooth is an open wireless technology standard for exchanging data over short distances (using short wavelength radio transmissions) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. It was paired with mobile for transfer the command from mobile to trolley Bluetooth receive the command. The command that was given like a remote controller button from the mobile. Bluetooth is a standard communications protocol primarily designed for low power consumption, with a short range (power-class-dependent: 100 m, 10 m, and 1 m, but ranges vary in practice; see table below) based on low-cost transceiver microchips in each device. Because the devices use a radio (broadcast) communications system, they do not have to be in a line of sight of each other.

TABLE II: Operating Ranges

Class	Maximum Power	Operating Range
Class 1	100mW(20dBm)	100 meters
Class 2	2.5mW(4dBm)	10 meters
Class 3	1mW(0dBm)	1 meters

IV. CONCLUSION

By means of this paper we intent to simplify the billing process, make it easy & increase the security using of RFID technique. This will take the overall shopping experience next level for the upcoming generation peoples. The easiest way of finding information's about the product such as product name, price, total amount, total number of product and the important thing expiry date, these all reduce the time and it helps the customer to get more details about the product. This with the help of the final conclusion we can say that

- Automatic billing of product by using RFID technology will be more viable in option in future.
- The system based in RFID technique is more reliable and more efficient.
- Automatic trolley that can be easy to control and make your shopping easy

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ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

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Vol. 8, Issue 3, March 2019

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