ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

A Review on Electronic Shopping Cart Based on RFID

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Abstract
Automation has created a bigger hype in the electronics. The major reason for this hype is automation provides greater advantages like accuracy, security, reliability and more over the automated systems do not require any human attention mostly for security concerns. Any one of the requirements stated above demands for the design of an automated security device. Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. One among the technologies which had greater developments is RF communications. The result of this is the RFID cards which transmit a unique identification number. This number transmitted by the RFID can be read with the help of a RF reader. This paper focuses on the RFID technology concept, and different ways of its usage for security in areas like shopping malls, employee and student's identification, patient details monitoring system.

Index terms: ***RFID, Zigbee modules, microcontrollers.***

I.INTRODUCTION

Highly interaction in human machine in daily lives has made user interaction progressively very important. Expansion of sensor based advanced technology sophisticated human force and stress along with security with automation system. Radio Frequency Identification (RFID) is a promising technology that has been implemented lately in airports, shopping malls, theaters etc. RFID tags are used to identify and track the scanned luggage's also goods or items selected in shopping malls railway stations. This paper investigates the use of an interactive bracelet that communicates with the RFID system by mean of a database application.

The database system interacts with the RFID tag is attached to each and every good package. When the goods are placed in the trolley the RFID tags attached to the goods are decoded by the RFID reader interfaced to the microcontroller and the information is stored and displayed on LCD. The system automatically sends the selected good number along with cost onto the PC of billing counter using wireless zigbee. The proposed database design and implementation are also discussed to describe the different functionalities of the application. These had greater importance than any other technologies due its user-friendly nature. In nowadays, we must make use of various high-tech tools and equipments to get our jobs done and make our life secure and comfortable. The controlling device of the whole system is a Microcontroller. The Microcontroller is programmed using Embedded C language.

Fig-1: RFID based Electronic shopping cart

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II. REVIEW WORK:

The idea behind the security system for shopping cart is to design and an RFID based tracking system analysis. The RFID system is used to record and track the movement of a good or item of shopping mall in the airport through radio frequency communication. This system is composed of two parts: the reader and the transponder. This latter is also known as the tag. It is made up of an antenna and a silicon microchip. It has a unique identification number and carries information. This data represents the information of the goods in the mall, or an identity code that is stored in binary format. Tags can be either passive or active.

RFID is an acronym for Radio Frequency Identification**.** RFID (radio frequency identification) is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person. RFID is coming into increasing use in industry as an alternative to the bar code. The advantage of RFID is that it does not require direct contact or line-of-sight scanning. An RFID system consists of three components: an antenna and transceiver (often combined into one reader) and a transponder (the tag). The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. The data is used to notify a programmable logic controller that an action should occur. The action could be as simple as raising an access gate or as complicated as interfacing with a database to carry out a monetary transaction. Low-frequency RFID systems (30 KHz to 500 KHz) have short transmission ranges (generally less than six feet). High-frequency RFID systems (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) offer longer transmission ranges (more than 90 feet). In general RFID is the higher the frequency, the more expensive the system. RFID is sometimes called dedicated "short range communication (DSRC)."

Radio Frequency Identification (RFID) is a means of identifying a person or object using a radio frequency transmission. The technology can be used to identify, track, sort or detect a wide variety of objects. Communication takes place between a reader (interrogator) and a transponder (tag). Tags can either be active (powered by battery) or passive (powered by the reader field), and come in various forms. Some variants of tags and readers are shown RFID Tag and RFID Reader respectively. The communication frequencies used depends to a large extent on the application, and range from 125 kHz to 2.45 GHz.

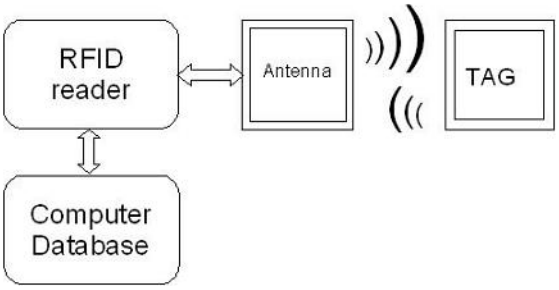

Fig-2: RFID reader and tags

Working of RFID:

In a typical RFID system, tags are attached to objects. Each tag has a certain amount of internal memory (EEPROM) in which it stores information about the object, such as unique ID (serial) number, or in some cases more details including manufacture date and product composition. When these tags pass through a field generated by a reader, they transmit this information back to the reader, thereby identifying the object.

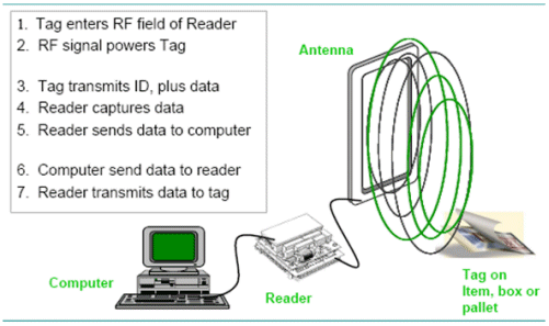

Fig-3: Working of RFID reader and tags

The communication process between the reader and tag is managed and controlled by one of several protocols, such as the ISO 15693 and ISO 18000-3 for HF or the

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

ISO 18000-6, and EPC for UHF. Basically what happens is that when the reader is switched on, it starts emitting a signal at the selected frequency band (typically 860 – 915 MHz for UHF or 13.56 MHz for HF). Any corresponding tag in the vicinity of the reader will detect the signal and use the energy from it to wake up and supply operating power to its internal circuits. Once the tag has decoded the signal as valid, it replies to the reader, and indicates its presence by modulating the reader field.

Types of RFID Tags:

The two types RFID tags are there. They are

1. Active Tags
2. Passive Tags

Active Tags:

Active tags have their own transmitter and power source to transmit the information stored on the microchip. They operate at 455 MHz, 2.45 GHz, or 5.8 GHz, and they typically have a read range of 60 feet to 300 feet (20 meters to 100 meters). The battery-supplied power of an active tag generally gives it a longer read range. The trade off is greater size, greater cost, and a limited operational life that may yield a maximum of 10 years, depending upon operating temperatures and battery type.

There are two types of active tags: *transponders* and *beacons*. Active transponders are woken up when they receive a signal from a reader. These are used in toll payment collection, checkpoint control and in tracking cargo. Transponders conserve battery life by having the tag broadcast its signal only when it is within range of a reader. Beacons are used in most real-time locating systems (RTLS), where the precise location of an asset needs to be tracked. In an RTLS, a beacon emits a signal with its unique identifier at pre-set intervals. It could be every three seconds or once a day, depending on how important it is to know the location of an asset at a particular moment in time. RTLS are usually used outside, say, in a distribution yard, but automakers use the systems in large manufacturing facilities to track parts bins. Active tags generally cost from $10 to $50, depending on the amount of memory, the battery life required, any on-board sensors, and the ruggedness. A thicker, more durable plastic housing increases the cost.

Passive Tags

Passive tags do not have a power source, but simply reflect back or backscatter the energy coming from the reader antenna. Passive tags are consequently much lighter than active tags, less expensive, and offer a virtually unlimited operational lifetime. The trade off is that they have shorter read ranges than active tags and require a higher-powered reader. Passive tags operate at low, high, and ultra-high frequencies. Low-frequency systems generally operate at 124 kHz, 125 kHz or 135 kHz. High-frequency systems use 13.56 MHz. Ultra-high frequency (UHF) systems operate at approximately 900 MHz and 2.45 GHz. The tags used in the supply chain operate between 860 and 960 MHz and are the most common. Common frequencies used by passive systems are shown in Table 2.

Table 2. Common RFID frequencies and passive ranges

Frequency Band	Description	Range
125 – 134 KHz	Low frequency (LF)	To 18 inches
13.553 – 13.567 MHz	High frequency (HF)	3 -10 feet
400 – 1000 MHz	Ultra-high frequency (UHF)	10 – 30 feet
2.45 GHz	Microwave	10+ feet

Comparisons Passive and Active Tags:

Characteristics	Passive RFID tag	Active RFID tag
Power Source	Provided by a reader	Inbuilt
Availability of power	Within the field of reader	Continuous
Signal Strength (Reader to Tag)	High	Low
Signal Strength (Tag to Reader)	Low	High
Communication range	< 3meters	>100 meters
Tag reads	< 20 moving tags @ 3mph in few seconds	>1000 moving tags @ 100mph in 1 sec
Memory	128 bytes	128 Kbytes
Applicability in supply chain	Applicable where tagged items movement is constrained	Applicable where tagged items movement is variable and unconstrained
Expense	$0.05	$10.00-$50.00

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III. RELATED WORK

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are Microprocessors and Microcontrollers.

Microprocessors are commonly referred to as general purpose processors as they simply accept the inputs, process it and give the output. In contrast, a microcontroller not only accepts the data as inputs but also manipulates it, interfaces the data with various devices, controls the data and thus finally gives the result.

In this paper we presented a review report on an advanced wireless automatic shopping trolley and data storing system of the number goods on trolley in big shopping malls and hidden items detection using RFID technology along with cost details and display on the LCD (Liquid Crystal Display) using wireless zigbee communication along with PIC and ARM7 microcontrollers. ZigBee is a wireless communication technology based on the IEEE802.15.4 standard for communication among multiple devices in a wireless personal-area network (WPAN). ZigBee is designed to be more affordable than other WPANs (such as, for example, Bluetooth) in terms of costs and, above all, security. A ZigBee personal-area network (ZBPAN) consists of at least one coordinator, one (or more) end device(s) and, if required, one (or more) router(s).

The network is created when a coordinator selects a channel and starts the communication, henceforth, a router or an end device can join the network. The typical distance of a ZigBee transmission range, depending on the environment conditions and the transmission power, shifts from tens to hundreds of meters, and the transmission power is deliberately kept as low as possible (in the order of a few milliwatts) to maintain the lowest energy consumption. The Microcontrollers used in the project are programmed using Embedded C language.

Monitoring or PC section-

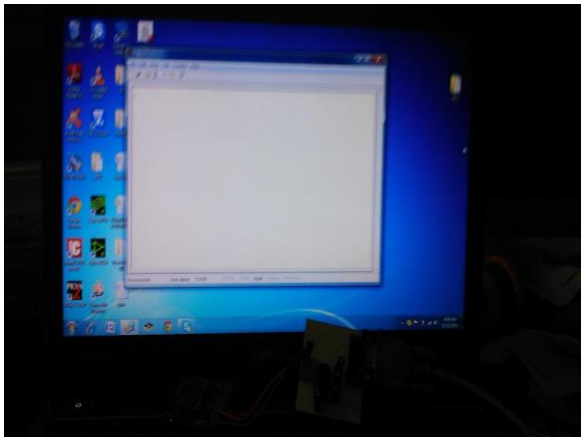

Fig-4: HyperTerminal window on monitor

In the remote monitoring section of the proposed system we interface the zigbee module directly to PC for monitoring the selected items in shopping mall. The details of selected items along with costs are automatically fed as input to microcontroller using zigbee module and displayed on to the monitor of PC. User needs to follow the steps to connect hyper terminal of the PC.

START—All Programs—Accessories—Communications—Hyper Terminal—now the user should can enter a suitable name for his/her hyper terminal (Ex-abc)—now needs to select com port (generally COM1) —one dialogue box gets opened—need to enable the restore setting button to select the properties of select communication—hyper terminal window gets connected.
Connect a zigbee module at the com port of PC using DB-9 Serial RS-232cable.

IV.ADVANTAGES AND DIADVANTAGES

Advantages:

- User-friendly interfacing of the input and output modules to microcontrollers.
- Information related to the goods display on LCD.
- Automatic billing with selected items onto the billing counter PC using wireless zigbee
- Audible and visual alerts using LCD and buzzer

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- RFID based identification technology with Wireless Communication.
- Automatic Hidden items or stolen items identification and alerting using RFID and buzzer.

Disadvantages:

- Zigbee module supports only for limited distance.
- RFID reader cannot decode the tags simultaneously when passed two at a time
- RFID Reader supports only limited distance for Decoding from tags.

V.FUTR SCOPE AND CONCLUSION

The RFID technology and its usage development helps the sense impaired people to experience a new way of security at shopping malls. As literature survey continues more advanced feature may be part of this implementation such as RFID based airport luggage scanning, security at parking areas, security at hotels, etc detection and how the concept of image processing will be used in scanning the goods or items is considered to be future work. The project can be extended using GSM module using which the hidden or stolen goods and its details can be sent as alerting message to the owners. The system can also extend by GPRS module using which the packages and billing details concerned with customer trolley can be directly monitored from predefined weblink. In future we can use it in several applications by adding additional components to this project. The controlling of devices can be done using mobile phone technology, personal computers, touch screens, remote controls etc. GUI developed makes the job easier for any user with little computer knowledge. By creating a proper network with ZigBee, this system can be deployed to bill and monitor more shopping malls system spread over a vast area.

REFERENCES

[1] RAN Jian-hua. Application analysis of RFID in Jiuzhaigou National Park[J]. Railway Computer Application. 2009.18(3),PP34-36

[2] XU Guang-wei, CHEN Jin-ying, WANG Xiao-wei, Etc. RFID Application in Touristm Scenic-spot Automatic Ticketing System[J]. Communications Technology. 2009. 42 (7),PP192-194

[3] RAN Jian-hua. Application analysis of RFID in Jiuzhaigou National Park[J]. Railway Computer Application. 2009.18(3),PP34-36

[4] AeroAssist, "RFID in Aviation: airport luggage control," AeroAssist.pt, Jun. 2008.

[5] Y. Ouyang, Y. Hou, L. Pang, D. Wang, and Z. Xiong, "An intelligent RFID reader and its application in airport baggage handling system", 4th International Conference on Wireless Communications, Networking and Mobile Computing, pp. 1-4, Oct. 2008.

[6] C. Jacinto, M. Romano, A. Montes, P. Sousa, M. S. Nunes, "RFID tuning methodology applied on airport baggage tracking," IEEE Conference on Emerging Technologies & Factory Automation, pp. 1-4, Sep. 2009.

[7] C. R. Medeiros, J. R. Costa, and C. A. Fernandes, "Passive UHF RFID tag for airport suitcase tracking and identification", Antennasand Wireless Propagation Letters IEEE, Vol. 10, pp. 123-126, Feb. 2011.

[8] RFID Journal, "How much does an RFID tag cost today ?". URL: http://www.rfidjournal.com/faq/20/85.

[9] RFID Journal, "How much do RFID readers cost today ?". URL: http://www.rfidjournal.com/faq/20/86.

[10] B. Chen, "price 128x64 graphic lcd module". URL: http://www.alibaba.com/productgs/ 666312166/price_128x64_graphic_lcd_module.html.

[11] P. Baronti, P. Pillai, V. Chook, S. Chessa, A. Gotta and Y. Hu, "Wireless sensor networks: A survey on the state of the art and the 802.15.4 and ZigBee standards,communications," 2007.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

[12] C.-Y. Lin, W.-C. Peng and Y.-C. Teseng, "Efficient in Network moving Object Tracking in wireless Sensor Networks," vol. 5, no. 8, pp. 1044-1056, 2006.

[13] Y.-C. K. S.-P. L. H.-W. &. H.-F. Tseng, "Location tracking in a wireless Sensor Network bu mobile Agents and its Data Fusion Strategics," vol. 4, no. 47, pp. 448-460, 2004.

[14] Q. Li, M. DeRosa and D. Rus, "Distributed Algorithm for Guiding Navigation Across a Sensor Network," 2003.

[15] K. Gill, S.-H. Yang, F. Yao and X. Lu, "A ZigBee-Based Home Automation System," IEEE Transactions on Consumer Electronics, vol. 55, no. 2, pp. 422-430, 2009.

[16] S. Kim, J. . S. Kang, H. . S. Park, Y. J. Kim and D. Kim, "UPnP-ZigBee Internetworking Architecture Mirroring a Multihop ZigBee Network Topology," IEEE Transactions on Consumer Electronics,, vol. 55, no. 3, pp. 1286-1294, 2009.

[17] M.-S. Pan, C.-H. Tsai and Y.-C. Tseng, "The Orphan Problem in ZigBee Wireless Networks," IEEE TRANSACTIONS ON MOBILE COMPUTING, vol. 8, no. 11, pp. 1573-1584, 2009.

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