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RFID Based Trolley for Supermarket Automation System

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ABSTRACT

Now a days purchasing and shopping at big malls is becoming a daily activity in metro cities. There are huge rushes at malls on holidays. The rush is even more when there are special offers and discounts. People purchase different items and put them in trolley. After total purchase one needs to go to billing counter for payments. At the billing counter the cashier prepare the bill using bar code reader which is a time consuming process and results in long queues at billing counters. The aim is to develop a system that can be used in shopping malls to solve the above mentioned challenges. Then the system will be placed in all the trolleys. It will consist of a RFID reader. All the products in the mall will be equipped with RFID tags. When a person puts any products in the trolley, its code will be detected and the price of those products will be stored in memory. When the people put the products, the cost will get added to total bill. Thus the billing will be done in the trolley itself. Item name and its cost will be displayed in LCD. Also the products name in the selves will be displayed in LCD and by using another RFID reader, outside the trolley also. At the billing counter the total bill data will be transferred to PC by wireless RF modules.

Keywords: RFID reader and tag, ATMEGA162 Microcontroller and LCD Display.

1. INTRODUCTION

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 checkout machines, where a single employee can oversee a group of four or five machines at once, assisting multiple customers at time. An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data. An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. "RFID" stands for Radio Frequency Identification. The tag's antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information) [1].

When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory. When the people put the products, the cost will get added to total bill. Item name and cost will be displayed in LCD [2]-[4]. Also the products name in the selves will be displayed in the LCD, by using another RFID reader which is placed outside the trolley. At the billing counter the total bill data will be transferred to PC by RS232 serial port [5]-[8].

2. GOAL

The main goal of RFID based trolley for supermarket automation system is to generate the bill data in the trolley and display the products name which is placed in the selves will be displayed in the LCD. When the people put the products the name, cost and weight also displayed in the LCD. This reduces the precious time of the people.

3. OBJECTIVES

The objective of the project is to develop automatic generation of data bill which is displayed in LCD, placed inside the trolley itself.

4. DESCRIPTION

4.1 RFID Tag and Reader

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves; the tag responds by sending back its data. An RFID tag is a microchip combined with an antenna in a compact package; the packaging is structured to allow the RFID tag to be attached to an object to be tracked. "RFID" stands for Radio Frequency Identification. The tag's antenna picks up signals from an RFID reader or scanner and then returns the signal, usually with some additional data (like a unique serial number or other customized information). A passive tag is an RFID tag that does not contain a battery; the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The tag then sends the information encoded in the tag's memory [9].

RFID systems are closely related to the smart cards described above. Like smart card systems, data is stored on an electronic data-carrying device — the transponder. However, unlike the smart card, the power supply to the data-carrying device and the data exchange between the data-carrying device and the reader are achieved without the use of galvanic contacts,

using instead magnetic or electromagnetic fields. The underlying technical procedure is drawn from the fields of radio and radar engineering. The abbreviation RFID stands for radio frequency identification, i.e. information carried by radio waves. Due to the numerous advantages of RFID systems compared with other identification systems, RFID systems are now beginning to conquer new mass mark

In a nutshell, RFID involves detecting and identifying a tagged object through the data it transmits. This requires a tag (a.k.a. transponder), a reader (a.k.a. interrogator) and antennae (a.k.a. coupling devices) located at each end of the system [10]-[14]. The reader is typically connected to a host computer or other device that has the necessary intelligence to further process the tag data and take action. The host computer is often a part of a larger network of computers in a business enterprise and, in some cases, is connected to the Internet.

One key element of operation in RFID is data transfer. It occurs with the connection between a tag and a reader, also known as coupling, through the antennae on either end. The coupling in most RFID systems is either electromagnetic (backscatter) or magnetic (inductive). The method used in a particular implementation depends on the application requirements, such as the cost, size, speed, and read range and accuracy [15]. For example, inductively coupled RFID systems typically have a short range, measured in inches. These types of systems are used mostly in applications, such as access control, where short range is advantageous. In this case a tag only unlocks an RFID-enabled door lock when it is moved within close range of the reader, not when people who may be carrying a tag in their wallet or purse are walking past the reader in a hallway in front of the door.The element that enables the tag and reader communication is the antenna. The tag and the reader each has its own antenna [16]-[18]. Another important element in an RFID system is the frequency of operation between the tag and the reader. Specific frequency selection is driven by application requirements such as speed, accuracy, and environmental conditions, with standards and regulations that govern specific applications. For example, RFID applications for animal tagging have been operating in the 135 kHz frequency band, based on longstanding regulations and accepted standards.

Although hardware components are responsible for identifying and capturing data, software components of an RFID application are responsible for managing and manipulating the data transmitted between the tag and the reader and between the reader and the host computer.

4.2 LCD

LCDs are common in consumer devices such as DVD players, gaming devices, clocks, watches, calculators, and telephones, and have replaced cathode ray tube (CRT) displays in nearly all applications. They are available in a wider range of screen sizes than CRT and plasma displays, and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to image persistence [19]. LCDs are available to display arbitrary images (as In a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements

Fig.1. LCD Display

4.3 Microcontroller

ATmega162 is an 8-bit high performance microcontroller of Atmel's Mega AVR family with low power consumption. ATmega162 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin microcontroller. There are 32 I/O (input/output) lines which are divided into four 8-bit ports designated as PORTA, PORTB, PORTC and PORTD [20]-[21].

Peripheral Features:

- It consist of two transmitter and receiver.
- Real-time Counter with separate oscillator.
- Six PWM channels. Dual Programmable Serial USARTs.
- Master/Slave SPI Serial Interface.
- On-chip Analog Comparator.
- Programmable Watchdog Timer with Separate On-chip Oscillator

4.4 RS232 Serial Port

In communications, RS-232 is a standard for serial binary data interconnection between a *DTE* (Data terminal equipment) and a *DCE* (Data Circuit-terminating Equipment). It is commonly used in computer serial ports.

Scope of the Standard:

The Electronic Industries Alliance (EIA) standard RS-232-C [3] as of 1969 defines:

- Electrical signal characteristics such as voltage levels, signaling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behavior, maximum stray capacitance and cable length
- Interface mechanical characteristics, pluggable connectors and pin identification
- Functions of each circuit in the interface connector
- Standard subsets of interface circuits for selected telecom applications

The standard does not define such elements as character encoding (for example, ASCII, Baud rate or EBCDIC), or the

framing of characters in the data stream (bits per character, start/stop bits, parity). The standard does not define protocols for error detection or algorithms for data compression.

The standard does not define bit rates for transmission, although the standard says it is intended for bit rates lower than 20,000 bits per second. Many modern devices can exceed this speed (38,400 and 57,600 bit/s being common, and 115,200 and 230,400 bit/s making occasional appearances) while still using RS-232 compatible signal levels.

Details of character format and transmission bit rate are controlled by the serial port hardware, often a single integrated circuit called a UART that converts data from parallel to serial form. A typical serial port includes specialized driver and receiver integrated circuits to convert between internal logic levels and RS-232 compatible signal levels.

4.5 Power Supply

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage.

This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

The potential transformer will step down the power supply voltage (0-230V) to (0-15V and 0-9V) a level. If the secondary has less turns in the coil then the primary, the secondary coil's voltage will decrease and the current or AMPS will increase or decreased depend upon the wire gauge.

This is called a STEP-DOWN transformer. Then the secondary of the potential transformer will be connected to the rectifier.

4.6 Keypad

When the customer wants to take some of the products outside the trolley, the key is pressed and then the product is taken out. Automatically the cost of the product which is taken out is reduced. And another key is used for the indication of completion of product purchasing. After that the bill will be displayed in LCD and generated in PC.

5. CONCLUSION

In this project the controller is attached to a RFID reader and tag. As the user puts the items in the trolley the reader on the trolley reads the tag and sends a signal to the controller. The controller then stores it in the memory and compares it with the lookup table. If it matches then it shows the name of item, weight and cost of the product on LCD &also the total number of items purchased.

REFERENCES

[1] T. M. Choi "Coordination and risk analysis of VMI supply chains with RFID technology", *IEEE Trans Ind. Informat.*, vol. 7, no. 3, pp.497 504 2011.

[2] J. D. Porter and D. S. Kim "An RFID-enabled road pricing system for transportation", *IEEE Syst. J.*, vol. 2, no. 2, pp.248 -257 2008.

[3] H. H. Bi and D. K. Lin "RFID-enabled discovery of supply networks", *IEEE Trans. Eng. Manag.*, vol. 56, no. 1, pp.129 -141 2009.

[4] K. Finkenzeller "RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification", 2003: *Wiley.*

[5] J. Z. Gao, L. Prakash and R. Jagatesan "Understanding 2D-BarCode technology and application in M-commerce-design and implementation of a 2D barcode processing solution", *Proc. Comput. Softw. Appl. Conf.*, pp.49 -56 2007.

[6] D. Hahnel, W. Burgard, D. Fox, K. Fishkin and M. Philipose "Mapping and localization with RFID technology", *Proc. IEEE Int. Conf Robot. Autom.*, pp.1015 -1020 2004.

[7] J. Y. Zhou, J. Shi and X. L. Qiu "Landmark placement for wireless localization in rectangular-shaped industrial facilities", IEEE *Trans. Veh. Technol*, vol. 59, no. 6, pp.3081 -3090 2010.

[8] S. S. Saad and Z. S. Nakad "A standalone RFID indoor positioning system using passive tags", *IEEE Trans. Ind. Electron.*, vol. 58, no. 5, pp.1961 -1970 2011.

[9] Khalifa. O, Islam. MDR and Khan. S, "Cyclic redundancy encoder for error detection in communication channels", *RF and Microwave Conference*, 2004.

[10] Matloff N, "Cyclic redundancy checking", *Department of Computer Science, University of California*, 2001.

[11] Rafidah Ahmad, Othman Sidek, Wan Md. Hafizi Wan Hassin, Shukri Korakkottil Kunhi Mohd, and Abdullah Sanusi Husain, "Verilog-Based design and implementation of Design Transmitter for Zigbee Applications", *International Journal of Emerging Sciences*, 723-724, December 2011, ISSN: 2222-4254.

[12] Rahmani.E, "Zigbee/IEEE 802.15.4", *University of Tehran*, 2005.

[13] Shuaib.K, Alnuaimi.M, Boulmalf.M, Jawhar.I, Sallabi.F and Lakas.A, "Performance evaluation of IEEE 802.15.4: Experimental and simulation results", *Journal of Communications*, pp. 29-37.

[14] David Gay, Phil Levis, Rob von Bebren, Man Welsh, Eric Brewer, and David Culler, "The nesC Language: A

Holistic Approach to Networked Embedded Systems", *Proceedings of Programming Language Design and Implementation (PLDI), San Diego*, June 2003.

[15] IAR System. *http://www.iar.com*

[16] Keunho Yun, Daijin Kim, "Robust location tracking using a dual layer particle filter", *Pervasive and Mobile Computing* 3 (2007) 209-232.

[17] C. Buragohain, D. Agrawal, and S. Suri, "Distributed navigation algorithms for sensor networks", *IEEE INFOCOM*, 2006.

[18] P. Corke, R. Peterson, and D. Rus, "Localization and navigation assisted by cooperating networked sensors and robots", *Int. Journal of Robotics Research*, 24(9): 771-786.

[19] *http://www.ti.com/zigbee*

[20] Charles Blilie, "Pattern in Scientific Software: An Introduction", *IEEE Computing in Science and Engineering*, Volume 4, Issue 3, pp.48-53, May 2002.

[21] L. Prechelt, M. Philippsen, B.U. Lamprecht, and W.F. Tichy, "Two Controlled Experiments Assessing the Usefulness of Design Pattern Documentation in Program Maintenance", IEEE Transaction on Software Engineering, 28(6), June 2002.