FAST TRACK SHOPPING WITH FEATURE RICH, USE FRIENDLY INTELLIGENT CART POWERED BY GSM AND RFID RECOGNITION

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Abstract

This paper mainly focuses on the efficient checkout from a grocery store with reduced queuing with the help of intelligent cart (iTrolley). As the malls have increased so has increased the number of people visiting. Today people have to wait in queue for the billing of their purchased products. This can be really inconvenient as many people are in a hurry and it is a sheer waste of time. In this project we are making wireless billing system for markets and malls. The main object of the project is to reduce time taken during the billing (no queues) since the billing is done wirelessly and total amount will be sent to the authorized person through GSM Technology.

Keywords: RFID, Wireless Sensor Networks, Zigbee, GSM

1. Evolution of the concept of Intelligent Cart (iTrolley)

The concept of shopping started with the decline of Barter System where in people used to exchange commodities for their livelihood. Next came the era of shops and stores where a local shopkeeper would assemble one category of goods such as groceries, clothes, medicines, furnishing etc and sell them for his livelihood. The spirit of such stores was further dampened by long queues, waiting for billing and correctness of product delivery. Also, accompanied by long and exhausting working hours for the shopkeeper and limited selection range for the customer. Large grocery stores are nowadays used by millions of people for the acquisition of an enlarging number of products. Product acquisition represents a complex process that comprises time spent in corridors, product location and checkout queues, thus evolving the concept of intelligent cart (iTrolley).

2. Introduction

The trolleys are commonly used to carry the products from the racks to the billing counter. We can overcome the various congestions caused due to overflow of people in billing counters, also automatic detection and sensing of the products in the trolley. Wireless communication using Zigbee and control using PC techniques is adopted here. Continuous monitoring is possible because of PC interface. Thereby increased authentication of the products as well as the billing of the purchase. On demand by the customer the products are interfaced along with the database in the PC and the bills are issued. The e-bill will then be sent to the customer on his mobile using GSM Technology.

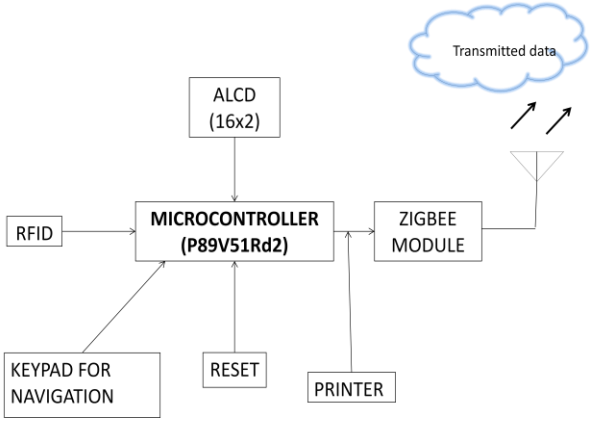

Figure 1: Block Diagram of Transmitter Section (Trolley Section)

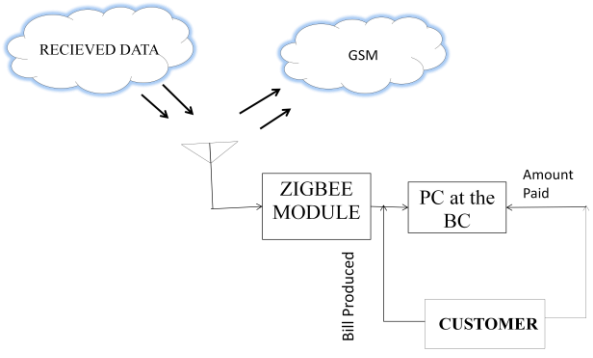

Figure 2: Block Diagram of Receiver Section (Master Billing Section)

3. Hardware and Software Design

The following modules are designed to accomplish our goal.

3.1 Microcontroller

The P89V51RD2 is a 80C51 microcontroller with 16 kB flash and 1024 B of data RAM. A key feature of the P89V51RD2 is its X2 mode option. The design engineer can choose to run the application with the conventional 80C51 clock rate select the X2 mode (six clocks per machine cycle) to achieve twice the throughput at the same clock frequency. Another way to benefit from this feature is to keep the same performance by reducing the clock frequency by half, thus dramatically reducing the EMI.
The flash program memory supports both parallel programming and in serial ISP. Parallel programming mode offers gang-programming at high speed, reducing programming costs and time to market. ISP allows a device to be reprogrammed in the end product under software control. The capability to field/update the application firmware makes a wide range of applications possible. The P89V51RD2 is also capable of IAP, allowing the flash program memory to be reconfigured even while the application is running.

3.2 RFID

Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. The frequency ranges mostly tell the RF ranges of the tags from low frequency tag ranging from 3m to 5m, mid-frequency ranging from 5m to 17m and high frequency ranging from 5ft to 90ft. The cost of the system is based according to their ranges with low-frequency system ranging from a few hundred dollars to a high-frequency system ranging somewhere near 5000 dollars.

3.3 Zigbee

ZigBee is a specification for a suite of high level communication protocols using small, low power digital radios based on an IEEE 802 standard for personal area networks. ZigBee devices are often used in mesh network form to transmit data over longer distances, passing data through intermediate devices to reach more distant ones. This allows ZigBee networks to be formed ad-hoc, with no centralized control or high-power transmitter/receiver able to reach all of the devices. Any ZigBee device can be tasked with running the network. ZigBee is targeted at applications that require a low data rate, long battery life, and secure networking. ZigBee has a defined rate of 250 kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device.The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi. ZigBee is a low-cost, low-power, wireless mesh_network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive range

3.4 Master Billing Section

Personal Computer supporting Windows Xp and Dotnet(SQL Server 2008) is used as the bill generator as well as to send the e-bill to the customer cell phone and the trolley section using GSM Technology.

3.5 KEIL Development Tool

Keil software provides the ease of writing the code in either C or ASSEMBLY. U-VISION 2, the new IDE from Keil Software combines Project management, Source Code Editing and Program Debugging in one powerful environment. It acts as a CROSS-COMPILER.

3.6 Dotnet (SQL Server 2008)

The .NET Framework (pronounced *dot net*) is a software framework developed by Microsoft that runs primarily on Microsoft Windows. It includes a large library and provides language interoperability (each language can use code written in other languages) across several programming languages. The .NET Framework's Base Class Library provides user interface, data access, database connectivity, cryptography, web application development, numeric algorithms, and network communications. Programmers produce software by combining their own source code with the .NET Framework and other libraries. The .NET Framework is intended to be used by most new applications created for the Windows platform. Microsoft also produces an integrated development environment largely for .NET software called Visual Studio.

3.7 Embedded C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. Embedded C use most of the syntax and semantics of standard C, e.g: main() function, variable definition, data type declaration, conditional statements (if, switch. case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, unions etc.

4. Applications

The concept of iTrolley can be applied in various fields like:

- Electronic gadgets like Television, Air Conditioners, Refrigerators, geysers, microwave ovens, Smart phones etc
- Pharmaceuticals stores.
- Furniture stores.
- Books and Stationery stores.
- Toy shops.
- Sanitary ware and ceramics stores.
- Home furnishing stores.

5. Advantages

1. User friendly as the customer is addressed about the product details such as cost, expiry date, discounts (if any) as soon as the product is dropped in the trolley.
2. Cost effective for the shopkeeper as the entire set up is one time investment followed by only purchasing RFID tags for the future, thereby reducing the man power required.
3. Accuracy is guaranteed as the e-bill is generated and sent to both shopkeeper as well as the customer for double verification.
4. Reduction in human efforts for tedious and calculative billing procedures is a great boon for the shopkeeper, thereby ensuring a fast-track billing process.
5. The thermal printer installed at the trolley section generates a bill of purchases made in real time.
6. As and when products are dropped in the trolley the details of the product are displayed on the LCD which helps the customer to keep a check on his purchasing budget, thereby guaranteeing customer satisfaction.
7. Alerts the customer for a product nearing expiry date, thereby ensuring correctness in the product delivery by cancelling the transaction.
8. The e-bill sent to the customer on his mobile phone serves as future reference for the next purchase.

9. Conclusions and Future Scope

The Intelligent Cart explores emerging mobile technologies and automatic identification technologies (such as RFID) as a way to improve the quality of services provided by retailers and to augment the consumer value thus allowing to save time and money. The future work can be visioned as: Increasing the range Zigbee, Navigation enabled for the entire store including parking area and food courts using GPS Technology. Also, the entire set up at the trolley section can be configured as an Android application.

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