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RFID BASED LIBRARY MANAGEMENT SYSTEM

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ABSTRACT

Abstract—RFID systems are becoming very popular nowadays as they play a very vital role in reducing thefts with less human effort. Industries, shopping malls and departmental stores have started using RFID tags and readers inorder to reduce the theft. Nowadays RFID systems have become an integral part of day-to-day life. RFID in libraries are a developing technology and is being implemented in small in small and medium sized libraries. Implementation of RFID will help in reducing the work burden of the administrator as well as the user in arranging and searching the books respectively. In the present systems employed there are special methodologies for arrangement of books, journals, DVDs and so on. These techniques need to be strictly followed inorder to help the users find their book or their requisites. This paper helps in finding a solution to this tedious problem faced by most libraries in an easy way.

1.INTRODUCTION

The current library systems are employed with barcode technology which requires line of sight and is time consuming so we decided to use RFID which is a wireless technology and it does not need LOS. When a patron takes a book containing a tag from the library, it is read by the RFID reader. Keil software is used to interface the microcontroller with RFID reader.in the microcontroller the transmitted bits from tag is received. These bits are decrypted by the microcontroller and sent to the PC where encryption occurs. Visual basic software is used for creating a database. The database has information regarding the patron name, book name, due date, etc. Flash magic software is used to dump the embedded C program from Keil software into ARM7 LPC2148. Hyper terminal software is used to interface PC and Microcontroller. Once the PC has information about the tag that is read, it sends an SMS to the patron regarding the book that is issued and its due date. We have implemented some conditions

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when the buzzer will shriek such as when more than 2 books are issued by a patron or when a patron with unreturned book issues another book. Thus the RFID LibraryManagement System is less time consuming and useful for the patrons.

2.OUR PROPOSED SYSTEM

The Basic tasks in library management include patron borrowing of materials and developing and administering library computer systems. Among these, the proposed system will automate the following tasks,

- Accessing of two books for an individual patron .
- The due date will be sent to the patron well in advance.
- After issuing the book, patron's name along with the book's name is sent to his/her mobile.
- The buzzer will shriek when more than two books are issued by a patron or when a patron with un-returned book issues a new book.

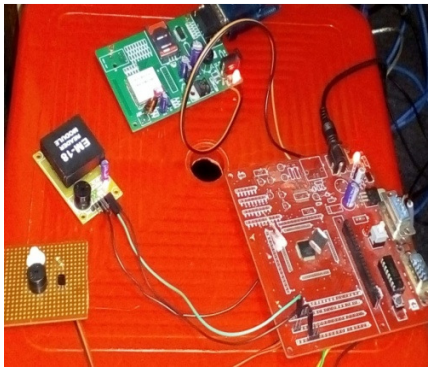

Figure 1: RFID BASED LIBRARY MANAGEMENT SYSTEM

3.BLOCK DIAGRAM

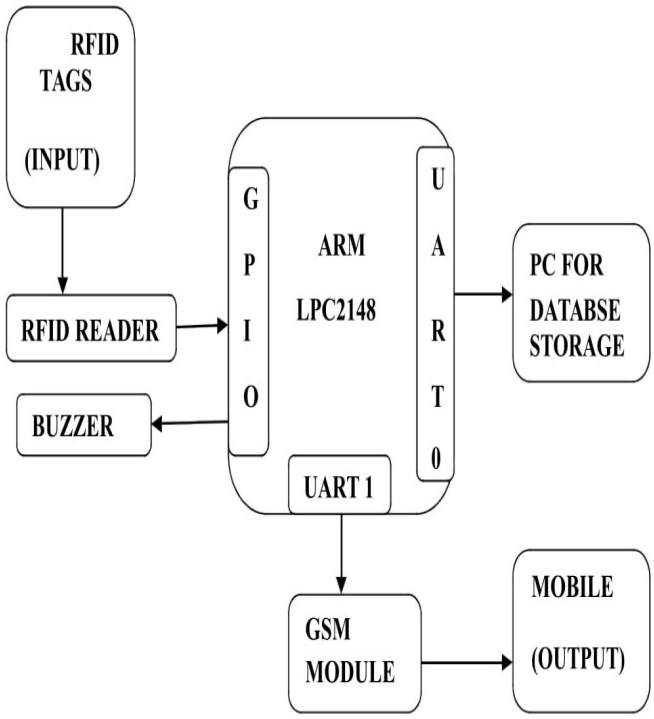

Figure 2: BLOCK DIAGRAM OF RFID BASED LIBRARY MANAGEMENT SYSTEM

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The RFID tags are placed on every book and on the ID card of the user. Attention is given while programming these tags as they consist of unique codes. A unique code is programmed such that it will vary from person to person. Similarly the books of the same category will have same code for the first seven digits and unique id for the next digits. As the user leaves the library after picking a book a SMS alert is given to the user regarding the book issued and the date of return. If failed to return within the due date, remainders are given . Two or three members shall be appointed in the library in order to arrange the books returned and to collect the fine amounts.

4. HARDWARE DESCRIPTIONS

4.1 ARM7 LPC2148

Advanced RISC Machine (**ARM**) is a processor architecture based on a 32-bit reduced instruction set (RISC) computer. Licensed worldwide, the **ARM** architecture is the most commonly implemented 32-bit instruction set architecture.RISC stands for Reduced Instruction Set Computer which is the type of microprocessor we design.

4.1.1 DESCRIPTION

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine the microcontroller with embedded high-speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and a unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. Due to their tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

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4.1.2 FEATURES

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400 ms and programming of 256 B in 1 ms.
- EmbeddedICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip RealMonitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM. In addition, the LPC2146/48 provides 8 kB of on-chip RAM accessible to USB by DMA.
- One or two (LPC2141/42 vs. LPC2144/46/48) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 µs per channel.
- Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only).
- Two 32-bit timers/external event counters (with four capture and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.

4.2 RFID TAGS AND READER

RFID tags, or simply "tags", are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. They are heavily used to track items in production environments and to label items in supermarkets. They are usually thought of as an advanced barcode. However, their possible area of use is much larger. This project presents a new application that is possible using RFID technology such as identifying the books using RFID reader. RFID tags are expected to proliferate into the billions over the next few years and yet they are simply treated the same way as barcodes without considering the impact that this advanced technology has on privacy.

4.3 GSM

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European

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mobile cellular radio system operating at 900 MHz.

4.3.1 FEATURE

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management
- High-quality speech
- Uses encryption to make phone calls more secure
- Short message service (SMS)

4.3.2 SIM900 MODULE

SIM900A Modem is built with Dual Band GSM/GPRS based SIM900A modem from SIMCOM. It works on frequencies 900/ 1800 MHz. SIM900A can search these two bands automatically. The frequency bands can also be set by AT Commands. The baud rate is configurable from 1200-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS.

SIM900A is an ultra compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single-chip processor integrating AMR926EJ-S core, allowing you to benefit from small dimensions and cost-effective solutions.

4.3.3 FEATURES

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- Dual-Band 900/ 1900 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA(sleep mode)
- Operation temperature: -40°C to +85 °C

5. SOFTWARES

5.1 KEIL SOFTWARE

The Software we are using in our project is KEIL µVISION 5.14.1. This tool is used to develop the source code needed for the design.The tool helps us not only to develop but also compile the code and simulate the code.Thekeil tool is also used to convert the compiled Embedded C code to its equivalent hex code.

5.2 FLASH PROGRAMMER

This ISP Programmer can be used either for in-system programming or as a stand-alone

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SPI programmer for Atmel ISP programmable devices. The programming interface is compatible to STK200 ISP programmer hardware so the users of STK200 can also use the software which can program both the 8051 and AVR series devices.

5.3 VISUAL BASIC

VISUAL BASIC is a VISUAL Programming Language because programming is done in a graphical environment. In VB6, you just need to drag and drop any graphical object anywhere on the form and click on the object to enter the code window and start programming.

In addition, Visual Basic 6 is Event-driven because we need to write code that performs some tasks to response to certain events. The events usually comprises but not limited to the user's inputs. Some of the events are load, click, double click, drag and drop, pressing the keys and more. Besides that, a VB6 Program is made up of many subprograms or modules, each has its own program code, and each can be executed independently; they can also be linked together in one way or another.

6. WORKING PRINCIPLE

In principle an RFID tag works as follows: the reading unit generates an electro-magnetic field which induces a current into the tag's antenna. The current is used to power the chip. In passive tags the current also charges a condenser which assures uninterrupted power for the chip. In active tags a battery replaces the condenser.

The difference between active and passive tags is explained shortly. Once activated the tag receives commands from the reading unit and replies bysending its serial number or the requested information. In general the tag does not have enough energy to create its own electro-magnetic field, instead it uses back scattering to modulate (reflect/absorb) the field sent by the reading unit. Because most fluids absorb electro-magnetic fields and most metal reflect those fields the reading of tags in presence of those materials is complicated.

During a reading cycle, the reader has to continuously power the tag. The created field is called continuous wave, and

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because the strength of the field decreases with the square of the distance the readers have to use a rather large power.

That field overpowers any response a tag could give, so therefore tags reply on side-channels which are located directly below and above the frequency of the continuous wave.

As the user leaves the library after picking a book a SMS alert is given to the user regarding the book issued and the date of return. If failed to return within the due date, remainders are given . Two or three members shall be appointed in the library in order to arrange the books returned and to collect the fine amounts.

7. RESULTS OBTAINED

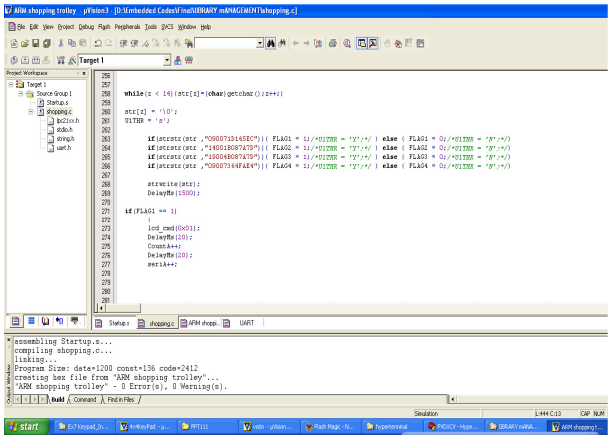

Figure 7.1: Output from Keilsoftware

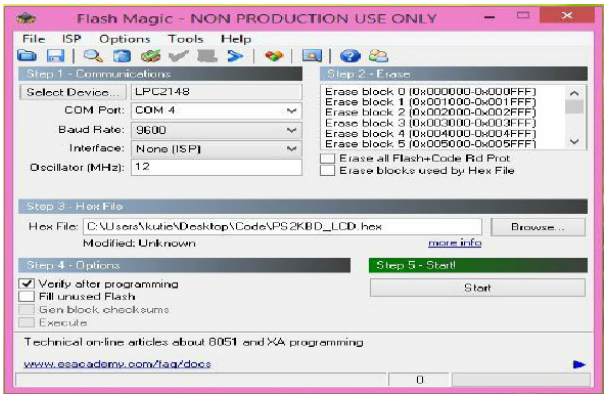

Figure 7.2: Flash Magic output

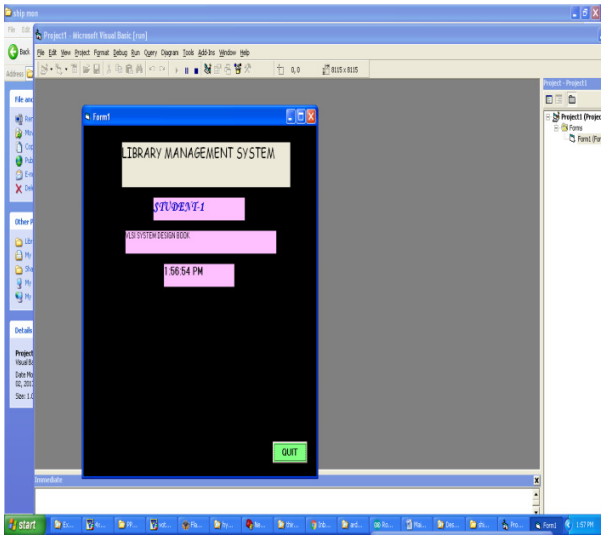

Figure 7.3: Output of Visual Basic

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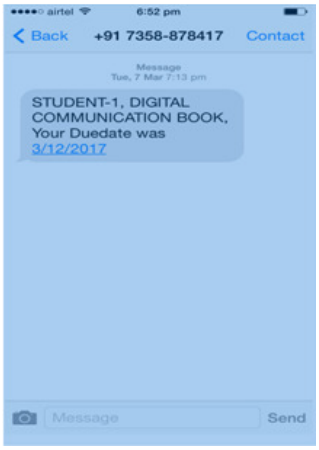

Figure 7.4: SMS output

8. CONCLUSION

RFID in the library speeds up book borrowing, monitoring, books searching processes and thus frees staff to do more user-service tasks. But the performance varies with respect to the vendors of RFID readers and tags. The efficient utilization of the technology also depends upon the information to be written in tag. Experimental results with respect to effectiveness of RFID reader position, tag position are presented in the paper. The work is in progress to setup the same in CDAC library. Developments in RFID technology continue to yield larger memory capacities, wider reading ranges, and faster processing. For huge Libraries this project will be useful. For higher efficiency, active tags can be used for quick reading of tags.

FUTURE SCOPE

- Connection to PC and development of PC side software to read from microcontroller
- Implementing the security systems with different levels by using different types of mifare cards.
- Cryptanalysis of the link between the card and reader.
- Study of other RFID techniques for better service and security.

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