RFID FOR LIBRARY MANAGEMET

S. Parameshwara[1], B. Anusha[2], M. R. Chandrika[2], J. Pavithra[2], RakshaMuralidhar Kodangal[2]

[1] Assistant Professor, Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru, India-570008

[2] Department of Electronics and Communication Engineering, The National Institute of Engineering, Mysuru, India-570008

Abstract

Operating a library involves keeping track large number of resources such as book and magazines. Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects like books, using radio waves. Searching and sorting misplaced books is a difficult task often carried out by the library personnel. Quite often, librarians are busy with searching misplaced books which left in wrong locations by library users.

It is quite essential for the proposed system to have a smooth motion for the RFID reader during the shelving operation; otherwise acquired data will have no value due to inconsistency in reading the tags. In this project the performance of RFID reader motion and tags data management such as retrieving information, matching with database and PC with embedded controller, two dc motors with drivers, RFID reader that is supported with antennas, books containing RFID transponders that are able to electronically store information that can be read / written even without the physical contact with the help of radio medium and belt drive mechanism on rack have been developed.

Keywords: RFID, Library Management, Readers, RFID tags.

1. Introduction

RFID technology is being implemented in a number of industries. Supply chain implementation is perhaps one of the most frequently mentioned applications of RFID tags and equipment. Retailers such as "Wal-Mart" and many grocery stores have begun to make it mandatory for their suppliers to tag merchandise destined for their store. In the warehouse and retail supply chain, goods come in and leave. Only occasionally they are returned. The retail sector is looking at RFID as a "throwaway" technology that hands an item to a customer which gets discarded. Yet the item wise unit cost of including an RFID tag is much more than the cost of printing a barcode on a package. In libraries, items are taken out and returned many times. The libraries across the globe started to use RFID to speed up the self-check in/out processes, to control the theft and to ease the inventory control in library. The barcode technology is slowly getting replaced by the RFID technology. The RFID tag does not have to be visible for detection.

RFID is a combination of radio frequency-based technology and microchip technology. The information contained on the microchip in the tag affixed to library materials is read using radio frequency technology regardless of item orientation or alignment (i.e. the technology does not require line-of-sight or a fixed plane to read tags) and distance from the item is not a critical factor.

RFID is an acronym for radio frequency identification which is a wireless communication technology that is used to uniquely identify tagged objects. RFID is a small electronic device that consists of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. Radio frequency identification is a system that felicitates the tracking of object, primarily for inventory tracking, via a three part

International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-1, January 2016
ISSN: 2395-3470
www.ijseas.com

technology comprised for a reader, a transceiver with decoder and a transponder (Radio Frequency-Tag)

2. Why RFID for library?

RFID is a non-line of sight technology. It is robust and a reliable in tough environments and can be used for bidirectional means of communication. Bulk amount of data can be read at a time. Using RFID technology reduces staff stress and increases management efficiency. It is a fastest easiest, most efficient way to track, locate and manage library materials that can be used to prevent theft also. It is an efficient book circulation and management. Library inventory tracking takes minutes instead of hours. Even multiple books can be read simultaneously. Unique ID of the RFID tag prevents counterfeiting. Hence vulnerability of damage is minimized..

2.1 Components of RFID system

The RFID system has three components

1. The RFID tags which are electronic programmed with the unique information
2. Readers or sensors to query the tags and
3. Computer system where the software that interfaces with the integrated library software is present.

2.2 Readers

Radio frequency identification readers or receivers are composed of a radio frequency module, a control unit and an antenna to interrogate electronic tags via radio frequency (RF) communication. The reader powers an antenna to generate an RF field. When a tag passes through the field, the information stored on the chip in the tag is interpreted by the reader and sent to the server which in turn, communicates with the integrated library system when the RFID system is interfaced with it.

2.1 RFID tags

The heart of the RFID system is a tag, which can be fixed inside a book's back cover or directly onto compact disc and videos. This tag is equipped with a programmable chip and an antenna. Each tag contains an engraved antenna and a microchip with a capacity of at least 64 bits. There are 3 types of tags

"read only", "WORM and read/write". Tags are "read only" if the identification is enclosed at the time of manufacture and not rewriteable. "WORM" tags are programmed by the using organization as per their requirements, but without the ability to rewrite them later. "Read/Write" tags which are chosen by most libraries, can have information changed or added. In libraries that use RFID, it is common to have part of the read/write tag secured against rewriting

The three basic types of tags are Passive tags, Active tags and Semi-Passive tags. They can also be read only or provide read-write capability.

2.3 Computer System

The computer is the heart of the comprehensive RFID system. RFID tags and reader never used independently; they form a part of a system, be it a supply chain, logistics, or library management system. The objectives of the computer system are to collect all-in-coming data obtained by RGID readers and generate some sort of useful information that helps decision making and business planning

3. Design and Implementation

This system is implemented as an inventory mechanism for the library. Below block diagram shows the how the system works. All the books in the library are attached with a RFID passive tag. The RFID reader is mounted on the horizontal belt drive which is inter connected with the vertical belt mechanism. The motion of the belt is controlled by horizontal motor (M1) and vertical motor (M2). Four limit switches are placed one each at top (LS1), bottom (LS2), left corner (LS3) and right corner (LS4). IR sensors IR1 and IR2 are used to determine the position of the book, the row and column number. Motor driver is used to configure the rotation of the motor to move the reader mounted on the belt to move up or down.

3.1 Tables and Figures

Block diagram

International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-2, Issue-1, January 2016
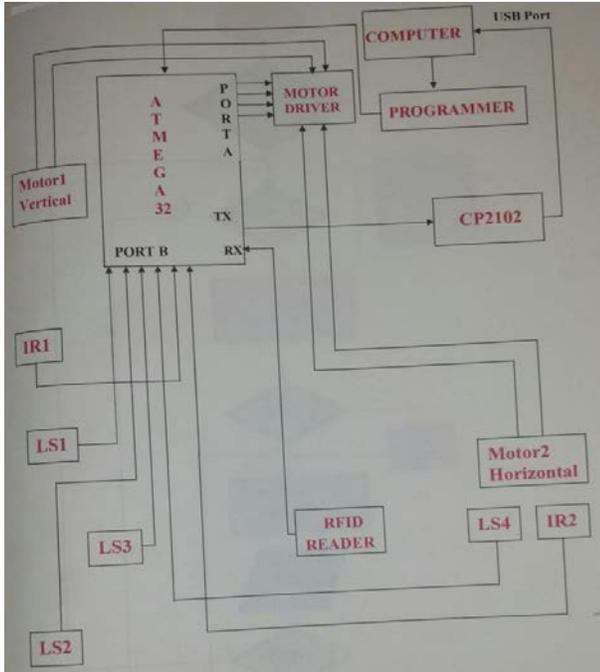*ISSN: 2395-3470*
www.ijseas.com

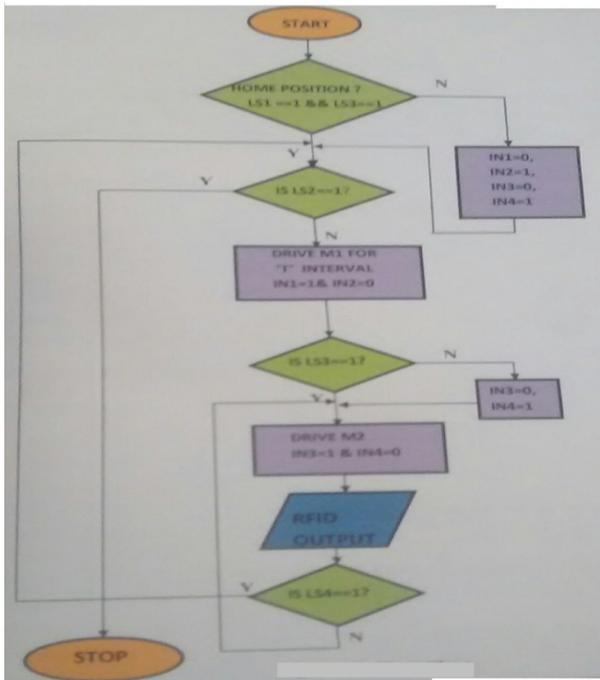Fig 1 Block Diagram of RFID Implementation

Flow chart

Fig 2 Flow Chart

When system is switched on, RFID reader comes to the home position which is top left corner of the shelf. This is checked when a top and left limit switch are hit i.e. LS1 and LS3. Now the vertical motor pins are configured for moving down by configuring it to rotate clockwise. The code determines the motor to rotate for a specific interval for specific number rotation that is determined by the IR sensors. The IR sensor detects number of rotation by detecting the marking of the encoder wheel. This output of the sensor determines the position of the book. The vertical motor rotates clockwise and the reader moves down and stops at first row of the shelf. The RFID output is given to the microcontroller and this is displayed on the CuteCom tool. The RGID tag number and the position of the books are displayed on the monitor screen. The monitor is stopped when it hits the right limit switch, LS4. Now again the vertical motor is enabled again for the reader to move down to the next row. When the reader reaches next row, the reader comes to left corner by rotating the horizontal motor clockwise until the left limit switch is hit (LS3). The scanned data is displayed only when the reader is moving towards the right and not in the other direction. In this manner RFID reader scans all the books present in the shelf which are present within the 4 limits.

4. Conclusions

RFID in libraries can serve so many applications like tracking, inventory, theft detection and automatic issues and return of the books, without the presence of a librarian. There are hand held RFID readers available for the same purpose as mentioned in the project, but not cost effective. Hence this RFID system, which uses belt driven mechanism, is easy to install and maintain. The RFID readers are also reliable and are known for longitivity. It not only reduces time to search the book, but also updates the record regularly. Just a simple command or a click will start the inventory process, and in very less time the position of every book in the library will be fed to the server and database will be updated.

5.Future Enhancement

Following are some of the enhancements:

1. By using HF readers we can track the books and hence find the misplaced books.
2. By placing RF sensors the exit gateways theft detection is possible. The alarm will ring if a person is carrying away a book that is not in the barrowed list.
3. You can even implement auto borrow and return of the books which eliminates the need of staff at these two sections

References

I. References

- Belt drive mechanism –
   http://encyclopedia2.thefreedictionary.com
- Implementation of RFID technology in library system case study: Turku City Library-
   http://www.theseus.fi/bitstream/handle/10024/28534/Dai.Yu.Pdf
- Information and datasheet of ATMEGA Microcontroller
   http://www.atmel.in/products/microcontrollers/Avr/

First Author:Currently working as a lecturer in NIE Mysuru.

Other Authors: Students of NIE