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IMPLEMENTATION OF RFID TECHNOLOGY IN LIBRARY – BOOK EXHAUSTING AND RETRIEVAL FOR READERS

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Abstract

Recently the wireless location systems become an important issue for all libraries. RFID is an innovative automated library system for automatic identification and pathway of library material. An automated library with the support of RFID technology would be a "self service center for library. Utilizing RFID-tagged book retrieval is a purpose advance for the library search system namely Library Book Exhausting Retrieval Supporting System. This paper presents the development of this utilizing RFID implementation flow and as well as the laboratory scale system structure. The book list mode offers a corresponding list of the bookshelves and the misplaced books regularly for a librarian to localize all misplaced books in the wrong bookshelves and will prove immediate and long term benefits to library in traceability and security.

Keywords:RFID Technology, Book Retrieval System, Sensing Network, library Security Systems

Introduction

RFID is used for library automation access control (check out, check in and renewal) and fee collection, security books and journals tracking. One of the more promising new RFID applications is RFID tags that contain sensors to measure temperature, humidity shock and other environmental conditions, sensor enabled RFID provides us the ability to remotely monitor a products condition in same vases even when the product is inside a sealed freight container. One growing use of sensor enabled RFID tags is for monitoring refrigerated book storage. Because these tags do not require wring, they can be placed in an optimal location, depending on the current need. And they can be easily moved to another location when needs change. The "Search system software program" component consists of a software program that performs the localization process of the localization system. The software program also acts as middleware software that interfaces between the RFID

reader and the system server. This allows user to control the RFID reader for various functions such as increase in the RFID reader output power level using only the software program graphical user interface which is host in the system server.

A library is a collection of information, sources, resources, books, and services, and the structure in which it is housed. Apart from books many libraries are now also repositories and access points for maps, prints, or other documents on various storage media such as microform (microfilm/microfiche), audio tapes, CDs, LPs, cassettes, videotapes, and DVDs. Libraries have materials arranged in a specified order according to a library classification system, so that items may be located quickly and collections may be browsed efficiently. Reference stacks are different which has only reference books and only selected members..

Among the many uses of RFID technology is its deployment in libraries. This technology has slowly begun to replace the traditional barcodes on library items (books, CDs, DVDs, etc.). The RFID tag can contain identifying information, such as a book's title or material type, without having to be pointed to a separate database (but this is rare in North America). The information is read by an RFID reader, which replaces the standard barcode reader commonly found at a library's circulation desk. The RFID tag found on library materials typically measures 50×50 mm in North America and 50×75 mm in Europe. It may replace or be added to the barcode, offering a different means of inventory management by the staff and self service by the borrowers. It can also act as a security device, taking the place of the more traditional electromagnetic security. Worldwide, in absolute numbers, RFID is used most in the United States (with its 300 million inhabitants), followed by the United Kingdom and Japan. It is estimated that over 30 million library items worldwide now contain RFID tags, including some in the Vatican Library in Rome. At the time of 2010, the largest RFID implementation in academic library is the University of Hong Kong Libraries which have over 1.20 million library items contain RFID tags; whereas the largest implementation for public institution has been installed in Seattle Public Library in the United States.

RFID taking a large burden off staff could also mean that fewer staff will be needed, resulting in some of them getting fired, but that has so far not happened in North America where recent surveys have not returned a single library that cut staff because of adding RFID. In fact, library budgets are being reduced for personnel and increased for infrastructure, making it necessary for libraries to add automation to compensate for the reduced staff size. Also, the tasks that RFID takes over are largely not the primary tasks of librarians. A finding in the Netherlands is that borrowers are pleased with the fact that staffs are now more available for answering questions. A concern surrounding RFID in libraries that has received considerable publicity is the issue of privacy. Because RFID tags can — depending on the RFID transmitter

&reader — be scanned and read from up to 350 feet or 100 m (eg Smart Label RFID's), and because RFID utilizes an assortment of frequencies (both depending on the type of tag, though), there is some concern over whether sensitive information could be collected from an unwilling source. However, library RFID tags do not contain any patron information, and the tags used in the majority of libraries use a frequency only readable from approximately ten feet.Also, libraries have always had to keep records of who has borrowed what, so in that sense there is nothing new. However, many libraries destroy these records once an item has been returned. RFID would complicate or nullify this respect of readers' privacy. Further, another non-library agency could potentially record the RFID tags of every person leaving the library without the library administrator's knowledge or consent. One simple option is to let the book transmit a code that has meaning only in conjunction with the library's database. Another step further is to give the book a new code every time it is returned. And if in the future readers become ubiquitous (and possibly networked), then stolen books could be traced even outside the library. Tag removal could be made difficult if the tags are so small that they fit invisibly inside a (random) page, possibly put there by the publisher.

Benefits of RFID in Library

Times saving, fast accessing of books and eliminating manual errors are the main benefits of the RFID in Library. Although RFID can be used in library anti-theft systems, this doesn't mean that it is a highly secure technology. RFID tags can easily be shielded by a thick layer of Mylar, a few sheets of aluminum foil, or even an aluminum gum wrapper, so that they won't be detected by the reading device. There is, however, some potential savings because a single tag serves many different functions. The library saves some time in processing new items because it only has to affix one technology to the item. It may also save some money due to the integration of circulation and security with a single vendor and into a single system.

Library Security For RFID Tags

Access to secure areas is already being controlled through the use of a variety of AIDS Technology. Bar codes, RFID, and biometrics are leading technologies used. Given recent lapses I security at U.S.A governmental facilities, one can expect greater use of AIDC for internal security and asset tracking, not just access control. Along with library or companies door openers, an early major use of RFID was books, journals and documents identification. Live stock could be tagged or collared, for example, to control access to feeding stations at feedlots.

Disk/Coin tags

One common format is the disk or coin tag with the disk or coin format, a round plastic casing, which usually contains a central hole for fastening, encloses the tag

Fig.1 Disk/Coin tags

Absorption

In physics, absorption of electromagnetic radiation is the way by which the energy of a photon is taken up by matter, typically the electrons of an atom. Thus, the electromagnetic energy is transformed to other forms of energy for example, to heat. The absorption of light during wave propagation is often called attenuation. Usually, the absorption of waves does not depend on their intensity (linear absorption), although in certain conditions (usually, in optics), the medium changes its transparency dependently on the intensity of waves going through, and the saturable absorption.

Active tags

Electronic article surveillance (EAS) is a technological method for preventing shoplifting from retail stores or pilferage of books from libraries. Special tags are fixed to merchandise or books. These tags are removed or deactivated by the clerks when the item is properly bought or checked out. At the exits of the store, a detection system sounds an alarm or otherwise alerts the staff when it senses active tags. For high-value goods that are to be manipulated by the patrons, wired alarm clips may be used instead of tags.

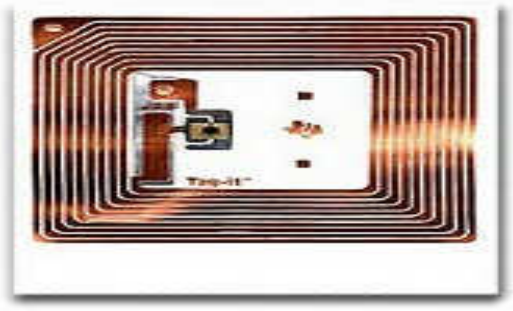


Fig.2 Active tags

Contact-less Smart card

A smart card label is a paper-thin tag with its antenna coil in the form of foil etched or printed onto the back of the plastic. After it is printed, a smart label is laminated and then coated with an adhesive.

Integrated circuit(IC)

In electronics, an integrated circuit (also known as IC, chip, or microchip) is a miniaturized electronic circuit (consisting mainly of semiconductor devices, as well as passive components) that has been manufactured in the surface of a thin substrate of semiconductor material. Integrated circuits are used in almost all electronic equipment in use today and have revolutionized the world of electronics. Computers, cellular phones, and other digital appliances are now inextricable parts of the structure of modern societies, made possible by the low cost of production of integrated circuits.

Passive tags

In an RFID system the transponder which contains the data to be transmitted is called an RF tag. Passive RF tags obtain operating power generated from the RF reader. They are smaller and lighter than active tags but have a shorter communication range and require a high powered reader. Passive tags are generally read-only and as such, once it is programmed with data, that data cannot be modified.

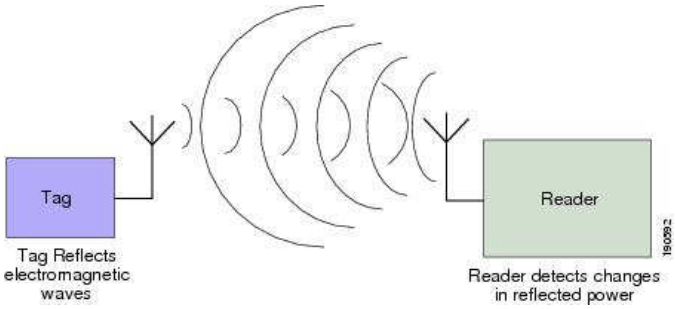


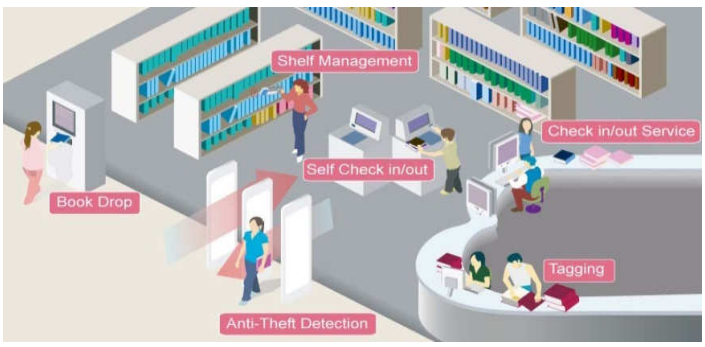
Fig.3 Passive tags

Supporter of self check-out / check-in

RFID has many library applications that can be highly beneficial, particularly for circulation staff. Since RFID tags can be read through an item, there is no need to open a book cover or DVD case to scan an item. This could reduce repetitive-motion injuries. Where the books have a barcode on the outside, there is still the advantage that borrowers can scan an entire pile of books in one go, instead of one at a time. Since RFID tags can also be read while an item is in motion, using RFID readers to check-in returned items while on a conveyor belt reduces staff time. But, as with barcode, this can all be done by the borrowers themselves, meaning they might never again need the assistance of staff. Next to these readers with a fixed location there are also portable ones (for librarians, but in the future possibly also for borrowers, possibly even their own general-purpose readers). With these, inventories could be done on a whole shelf of materials within seconds, without a book ever having to be taken off the shelf.[11] In Umeå, Sweden, RFID is being used to assist visually impaired people in borrowing audiobooks. In Malaysia, Smart Shelves are used to pinpoint the exact location of books in Multimedia University Library, Cyberjaya. In the

Netherlands, handheld readers are being introduced for this purpose. The Dutch Union of Public Libraries ('Vereniging van OpenbareBibliotheken') is working on the concept of an interactive 'context library', where borrowers get a reader/headphonesset, which leads them to the desired section of the library (using triangulation methods, rather like GPS) and which they can use to read information from books on the shelves with the desired level of detail (e.g. a section read out loud), coming from the book's tag itself or a database elsewhere, and get tips on alternatives, based on the borrowers' preferences, thus creating a more personalized version of the library. This may also lead them to sections of the library they might not otherwise visit. Borrowers could also use the system to exchange experiences (such as grading books). This is already done by children in the virtual realm at mijnstempel.nl, but the same could be done in physical form. Borrowers can grade the book at the check-in desk.The use of RFID reduces the amount of time required to perform circulation operations. The most significant time savings are attributable to the anti-collision RF algorithm that allows many tags to be read simultaneously with excellent accuracy.

The other time savings realized by circulation staff are enhanced if the RFID tags replace both the EM security strips or RF tags of older theft detection systems and the barcodes of the automated library system. There can be as much as a 50 percent increase in throughput.For library patrons using self-check-out, there is a marked improvement because they do not have to carefully place materials within a designated template and they can check-out multiple items simultaneously. Staff is relieved further when readers are installed in book-drops.



Currently bar codes have been used for libraries last few years to identify and track critical books, journals and documents. They also have been used to inventory the files in law offices and to identify and track library books issue, return, searching.

Fig.4 Library management Systems Retrieval for Library Books

Because paper is still so pervasive in today's society, identifying the location and use of important documentation has greatly assisted firms in effectively managing their sources for library. Another application of RFID technology is automated materials handling. This includes conveyer and sorting systems that can move library materials and sort them by category into separate bins or onto separate

carts. This significantly reduces the amount of staff time required to ready materials for re-shelving.Once a user has located a resource within the catalog, they must then utilize navigational guidance to retrieve the resource physically; a process that may be assisted through RFID tagging. Using RFID tags to track library books could increase security and ease laborious stock takes. The RFID tag attached with the books contains the book number. The books will be searched with the help of the RFID handheld reader using any of the parameters like book no, book name, author name and publisher name. If the book no. is directly given as a searching parameter, the client s/w will start locating the book immediately. The beep sound will be given as soon as the particular book is identified. If other parameters like book name, author name and publisher names are given as a searching condition, then the client s/w communicates with the server program to get the required book id from database by matching those parameters. If more than one book, are satisfying the search condition, then the librarian will be asked to select a particular book among those books.

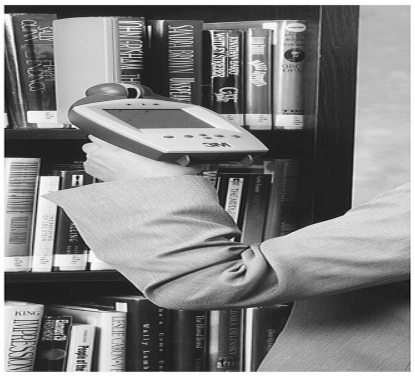


Fig.5 Books Retrieval System

The book list mode will produce a corresponding list of the bookshelves and the misplaced books through data detection and calculation by RFID readers. The list records the bookshelves that all books with tracking tags are most possibly placed in the localization area. The book list mode will be suitable for a librarian to find out all books that are misplaced during the off day each month or the off hours every day. All side readers and the center readers detect and record the new detected RFID tags while power level increases at first. The tags include the bookshelf tags and the boundary tags.

Fast and flexible locating increases productivity of staff and enhances the customer experience. UHF RFID tags to track the location of each book on the shelf, and items can be classified by genre, author, subject, or other characteristics much like you see to today's bookstores. The middleware that runs system can integrate with a library's ILS (Integrated Library System), allowing customers to search for books and identify which shelf in the library they are on, even if they are misplaced in a different section.

Conclusion

The **RFID** technology is found to be suitable to be use to implement intelligent roboticsystem with the ability to speeds up book borrowing, monitoring, books searching processes and thus frees staff to do more user-service tasks. The RFID tag using the proposed antenna has exhibited a very good exhausting retrieval pattern, which has shown great potential for item-level RFID applications in restaurants or libraries for tracking the items such as plates and books.

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