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RFID Based Automated Library Management System

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Abstract: Historically, libraries have employed barcode-based book management systems for book identification, self-check-in, anti-theft, inventory control, and book classification. The process is manual. We suggest an RFID-based library management system that allows for quick transaction processing and streamlines the borrowing and returning of books from libraries with minimal manual labour. The suggested system has the ability to store data electronically that can be read by a reader. Using RFID tags, the system can issue and receive books. It can also use library databases to compute relevant factors like due dates, renewal dates, and fines.

Keywords: RFID, Library, RFID tag, Books.

I. INTRODUCTION

RFID is a cutting-edge automated method for quickly classifying, arranging, and tracking a wide range of commodities. Today's RFID applications include automatic sorting, theft detection, and inventory tracking. In the near future, data gathering, identification, and analysis will be crucial for certain library activities. Radio frequency identification (RFID) technology is the dynamic link between people, things, etc. RFID-enabled automated libraries are transformed into "self-service stations" that require little assistance from library workers. By implementing self-service "check-in" and "check-out," major delivery delays for library resources are eliminated, and operational effectiveness is increased. It is mostly utilised in libraries to automate procedures for managing books, including circulation, inventory control, check-in, shelf management, and anti-theft. Combined with machinery for computer-assisted sorting. Sorting books is facilitated and accelerated using RFID. The material handling procedure at the library can be automated so that librarians can spend more time interacting with users, hence increasing "user interaction and satisfaction."

II. LITERATURE REVIEW

1) Fotis Lazarinis and others The goal is to assess open source software (OSS) for managing digital libraries and collections and to offer several usage scenarios depending on the tool's features. Design, methodology, and approach - Tools are assessed based on their technical capabilities, the sorts of content they are intended to handle, support for routine library tasks like cataloguing and distribution, search functionality, and interoperability possibilities. Following user evaluation, a collection of usage scenarios is next examined in light of the evaluation findings. Findings - The fundamental conclusion of this study is that opensource digital library and collection management software provide sophisticated operations, support a variety of metadata standards, and provide straightforward, user-friendly user interfaces. The majority of the equipment is already commonly utilised in a variety of settings and locations. More languages should be supported via the interface's language support. For practical usage, several tools with limited capability should be enhanced. Practical ramifications - The findings of this study might be applied to help different institutions choose certain opensource solutions. Originality/Value - This study examines the traits of a few OSS for managing digital libraries and collections and analyses their specific advantages and disadvantages. Additionally, it offers a number of plausible situations and recommends using particular tools in accordance with time, technological, and human resource limitations.

2) Ayodeji Iwaemi and others The manual process of handling library activities involves wasted time and unnecessary stress. In view of the above, a computerized system for handling library activities most effectively utilizes the library's existing personnel and resources for the benefit of its patrons. This design is intended to provide a solution to a variety of challenges faced by manual library systems. It does not eliminate existing manual systems and works alongside existing systems. This system was developed using the waterfall model. PHP, HTML, and CSS were used for the front-end design, and MySQL was used as the back-end database technology. This robust design includes a library management system and an online library system. This is a website that enables easy access to the library for students and staff while automating library processes by capturing and automatically allocating library resources.

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3) Bao Zhong Yuan et al Digital libraries promise new social benefits, especially for e-learning in the digital or mobile era, starting with removing the time and space constraints of traditional fixed libraries. Libraries are one of the service professions most impacted by IT, so library and information professionals need to acquire such knowledge and skills. This paper provides an overview of current trends in electronic library research, consisting of features, strengths, weaknesses, and functions of electronic libraries. The white paper also highlights the impact of information technology on traditional libraries

4) Mr. S. Krishna Murthy et al. The Extended Library Management System (ELMS) is a project used to develop a computerized system for maintaining all the day-to-day library activities. This is a Windows application. Get complete information about the library. This project has many features that are different from regular library management systems, such as: For example, student login options, librarian login options, administrator login options, and so on. ELM is designed to efficiently manage day-to-day book transactions and properly manage member and book records. It was developed using the Eclipse IDE tools. Helps improve book asset management in libraries. This system is primarily used by librarians and library administrators. You can enter new book records and get details about the book records available in your library. Librarians can issue books to students and keep records. He can also see how many books have been published and what inventory is available in the library This project has three modules: students, librarians, and administrators. In a manual system, librarians can usually manage the membership management module, the book management module, and the book trading module, which is the most important module in the library. . This advanced library management system also allows users to manage publishers and return book details. All of these are managed by a librarian.

5) The manual library management system used by Muhammad Ramadan Fitryan and some other private schools in Surakarta City has the following drawbacks: A computer information system based on QR codes has been proposed to solve these problems. This paper describes the development process of the system, followed by the tests and observations performed. It is intended to record the process of borrowing, renewal and returning, and to generate reports using a QR code-based library management system. The information system was created in a web-based environment using the Bootstrap framework and the data was managed using the MySQL database management system. I used a camera attached to my computer to read the QR code. Tests show that the optimal distance between the book tagged with the QR code and the camera is 15-30 cm. Black box testing showed that all features of the information system worked as expected. User acceptance test results showed that the system was well received among the respondents. As such, the information system can be characterized as easy to use, the features and functions provided meet the requirements and can improve the service to the students. Finally, respondents suggested that they would like to implement the system in their school's library.

6) Mrs. Monica Sharma Barcodes have proven useful in speeding up transactions for other libraries and more and more computerized libraries in our country are using this technology. The application of barcode technology in libraries and information technology circulation systems is most successful due to its speed, accuracy and reliability. Barcode technology is a relatively old technology, but it is one of the key steps in library automation and is not yet widely used in libraries. This article discusses various aspects of barcode technology and its application in libraries.

7) Gerhard Bissels and others This document's goal is to outline the selection criteria and process that led to the Complementary and Alternative Medicine Library and Information Service's adoption of the Koha 3.0 Library Management System (LMS) (CAMLIS). Royal London Hospital for Homeopathy. Approach, methodology, and design This report was produced using internal records. Koha 3.0 was selected because the GNU (open source) licence was regarded as more progressive than that of proprietary goods and as being more adaptable to fulfil the unique requirements of the library. limits and conclusions of the study. The implementation of an LMS at the library is still in its early phases. Only after using the Koha LMS implementation for at least a year will it be clear how well it satisfies the demands of the library.

III. METHODOLOGY

A. *Existing System*

The systems used by libraries nowadays use barcode technology. There is a barcode on every book in the library. The barcode's uniqueness changes according to the line thickness. This kind of library administration necessitates manual management. The library's primary operations, including the lending, renewing, and returning of books, must all be manually monitored and managed. Due to the barcode readers' limited capacity to read more than one code at once, there is typically a long line at the issue and return counters. The barcodes must be encoded during manufacturing, and they can only be programmed once. The attributes of the codes cannot be changed once specified. On a sheet of paper, the codes are printed and adhered to the books. The bar-code reader should be in close proximity to the bar code while both loaning out and returning the books.

The creation of the operating manual is necessary to make this feasible. Even with manual operation, it takes a lot of time and effort since the reader must always be put extremely close to the barcode tag for the book to be correctly read. The read range of the bar-code readers is relatively limited, only a few millimetres or so.

B. Proposed System

An RFID system is made up of several transponders, portable or fixed readers, data input devices, and system software, among other things. The technology's core component, transponders or ID tags, exist in a variety of forms, sizes, and read ranges. The following essential elements make up a complete RFID system:

1) RFID tags that have been electronically customised with particular data.

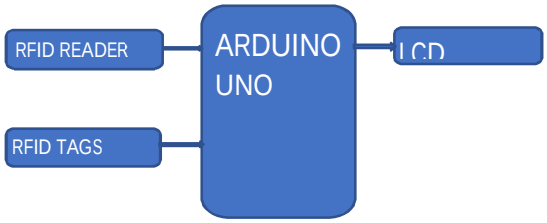
2) A server to receive and decode the information and communicate with the automated library system. • A reader connected to the Library Information System. • An antenna attached to the reader.

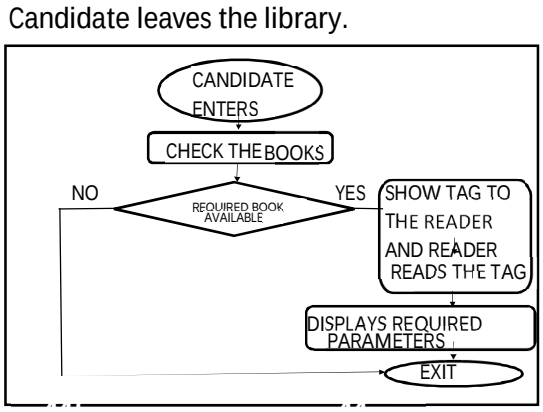
Tags, often referred to as transponders, are electronic chips made up of an integrated circuit and an antenna coil that exchange radio frequency signals with readers. To track out thefts, they use a feature called EAS (Electronic Article Surveillance). It has a variety of sizes and forms. Three memory elements are present in tags:

a) Identification of the item (code no.

b) Security feature that turns on and off when objects are checked in and out.

c) A variable memory that helps with item sorting.





C. Hardware Specifications

1) Arduino UNO: The ATmega328P microprocessor serves as the basis for the Arduino UNO. The ATmega328P microprocessor is the foundation of the Arduino UNO. Compared to other boards like the Arduino Mega Board, it is simple to use. Input/output (I/O) pins for both digital and analogue signals, shields, and other hardware make up the board. Six analogue inputs, 14 digital pins, a USB header, a power header, and an ICSP (In-Circuit Serial Programming) header are all included on the Arduino UNO. An IDE, or integrated development environment, is used to programme it. Both offline and internet platforms are compatible with it.

2) RFID TAG: An intelligent barcode is used to identify goods in an RFID tag, a sort of tracking device. Radio frequency technology is used by RFID tags, which stands for "Radio Frequency Identification." The reader receives the data from the tag through these radio waves, which then pass it on to her RFID computer software. RFID tags, which are often used on goods, may be used to track animals, automobiles, and even people with Alzheimer's disease. RFID chips are another name for RFID tags.

3) *RFID Reader:* A radio frequency identification (RFID) reader is a tool used to gather data from RFID tags that are used to monitor certain things. Data is sent from the tag to the reader using radio waves. Interrogators are another name for RFID scanners. RFID scanners transform radio waves into data that is easier to use. An antenna, a transceiver, and a decoder are the components of this gadget.
4) *LCD Display:* A liquid crystal display (LCD) is a flat panel display or other electronically controlled optical device that utilises polarizers together with the light modulation capabilities of liquid crystals. Liquid crystals produce a colour or monochromatic image by using a backlight or reflector as opposed to producing light directly. Like a general-purpose computer display, LCDs may show random pictures as well as static graphics with limited information that can be seen or concealed as follows: B. A digital clock-like display with pre-programmed text, numbers, and segments. Other displays employ the same fundamental technology, but any image is built from a matrix of tiny pixels whereas those used in other displays have bigger components.
5) *ARDUINO IDE Compiler:* Arduino is an open-source electronics platform built largely on user-friendly hardware and software tools. A motor, an LED, or other component can be driven by an Arduino board by observing input (such as a light touch to a sensor, a finger touch to a button, or a tweet). Online publication is an option. To do this, we employ the Arduino software (IDE), which is based on Processing and the Wiring programming language. After gaining a sizable following, Arduino boards started evolving from complex 8-bit boards to items for Internet of Things (IoT) applications, wearables, 3D printing, and embedded settings. All of these Arduino boards are open-source, allowing consumers to build them themselves and ultimately tailor them to their own visions. The software is also freely accessible, and donations from users all around the world increase its mileage. The Arduino IDE utility has the following benefits:

a) Quite affordable
b) An organised and efficient programming environment
c) Scalable hardware and software applications.

IV. WORKING

An external power source typically powers an RFID reader, which is always switched on. The oscillator inside of it produces a signal with the desired frequency when it is turned on, but because the signal strength will be very low (which could cause the signal to fade off if it is transmitted directly), it needs to be amplified, which can be done using an amplifier circuit. We also need to modulate the signal in order to propagate it over a greater distance, which is accomplished by a modulator. Now that the signal has undergone all these enhancements, it is ready to be broadcast. An antenna can do this by converting the electrical signal into an electromagnetic signal. The closeness of an RFID reader allows it to detect tags everywhere it receives signal. When an RFID tag approaches an RFID reader, the tag detects the reader's signal using a built-in coil that turns the RF signal it receives into an electrical signal. The microprocessor within the tag can be powered up with just this converted signal. The microchip's job is to communicate the data (unique ID) that is stored in it once it is switched on. The signal is sent into the air through the same coil it was received through. A transceiver is also a part of the RFID reader. The original data may be collected once the signal from the tag is received by the RFID reader through its antenna, and it is then processed further by a microcontroller or a microprocessor to complete a particular task.

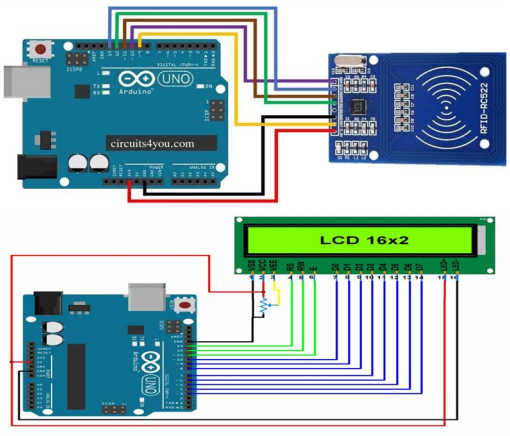
Remember that the description given above refers to a passive RFID tag. Since active RFID tags have a built-in power supply, they simply need to detect the signal from the reader to activate the circuit and prepare the tag to transmit data to the reader.

A. Interfacing

A RC522 based reader linked via the Serial Peripheral Interface (SPI) interface, as illustrated in fig, is used by the library to read and write several types of Radio-Frequency Identification (RFID) cards on the Arduino UNO platform.

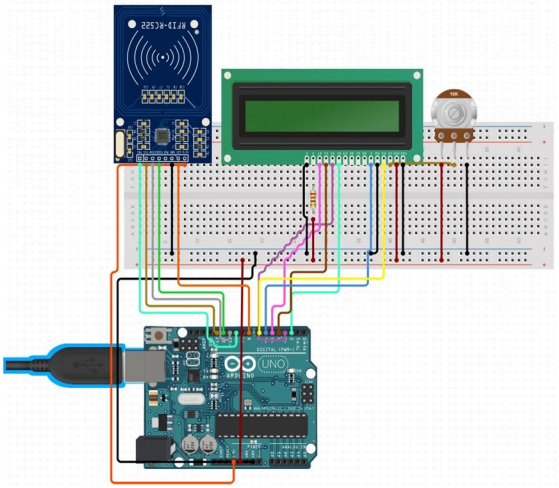
The Arduino is connected to the RFID reader in the manner described below:

1) The Arduino's 3.3v pin receives 3.3V.
2) The digital pin is supplied RST 9.
3) The Arduino's ground pin is provided GND.
4) IRQ is not connected.
5) MSO is connected to pin 12 of the digital interface.
6) MOSI is linked to pin 11.
7) SCK is connected to pin 10 of the digital interface.
8) SDA is connected to pin 9 of the digital interface.



V. IMPLEMENTATION

By using the Proteus software, the interfacing of the LCD, RFID reader etc is shown in below in fig.



VI. RESULT

To handle books automatically and effectively, libraries must deploy the RFID-based library management system, which is a special system. Utilizing RFID readers, efficiently identify and handle books. Key advantages of RFID in libraries are time savings, rapid access to books, and the elimination of human mistakes. The website or the Android app are only two examples of interfaces where private transactions may be observed. Utilizing a user interface designed for librarians, you may manage your data. As a result, automation and control have both been used.

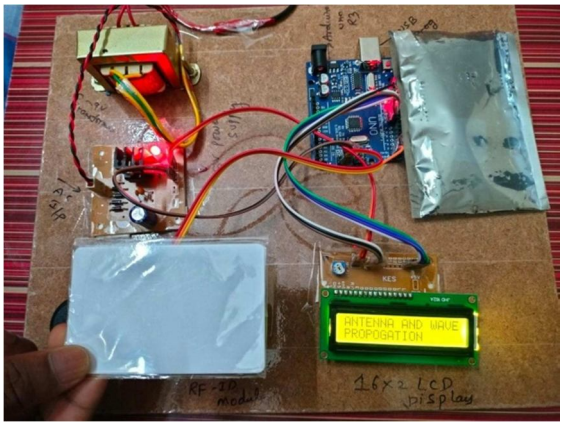


Fig1.Valid Tag

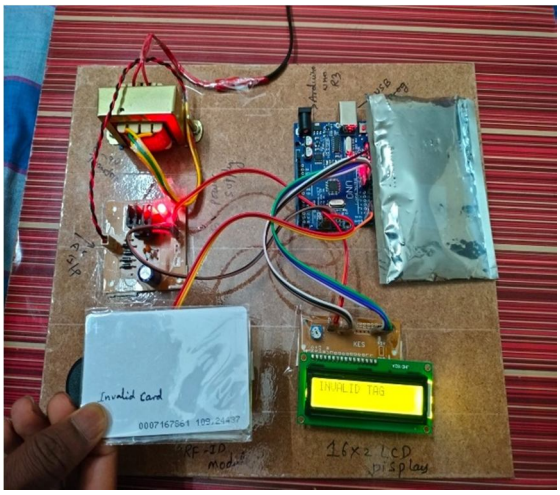


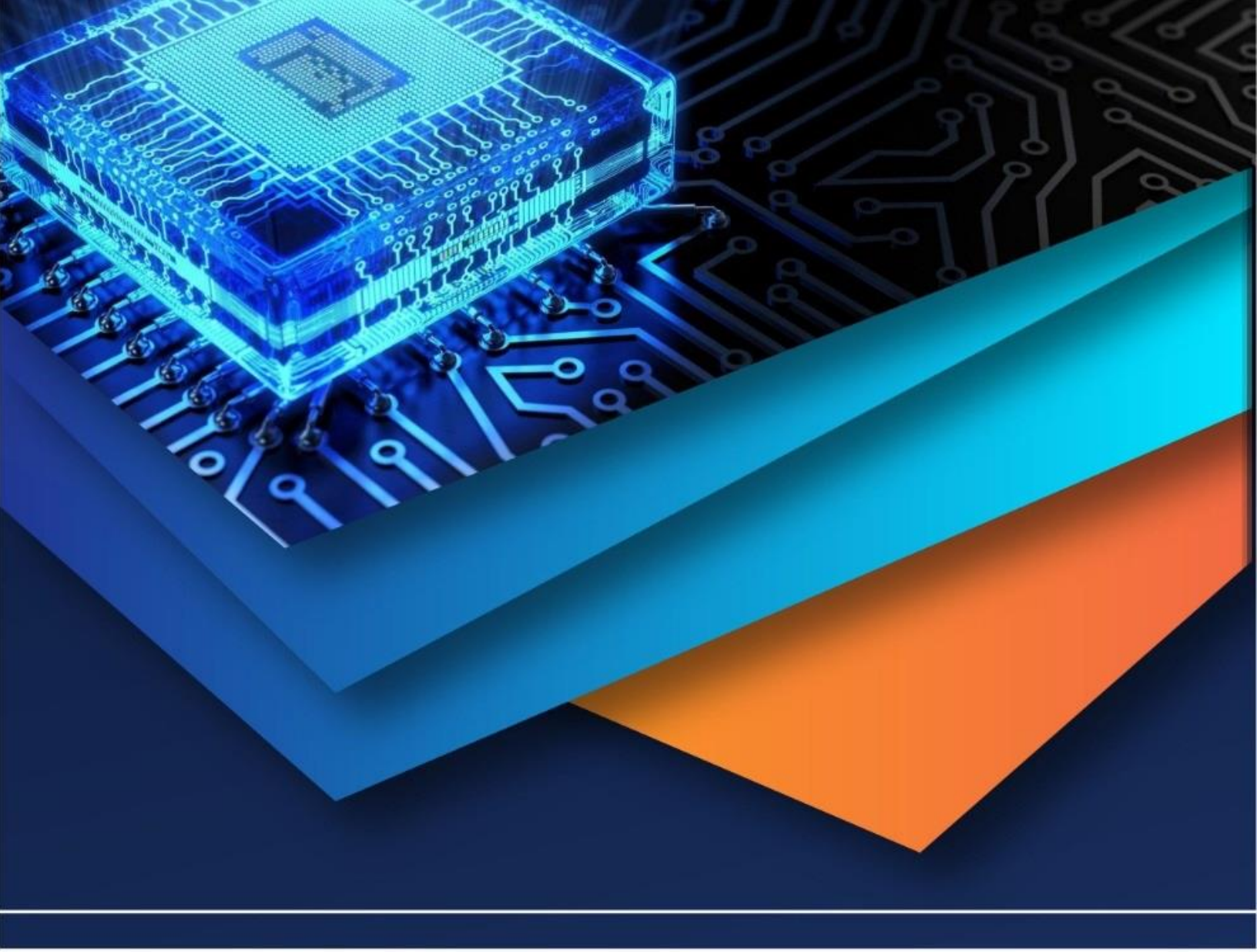
Fig2.Invalid Tag

VII. CONCLUSION

The usage of RFID in libraries speeds up the procedures for borrowing, monitoring, and searching books, freeing up personnel to focus on providing better user-service. RFID tags and readers must be of high quality to produce the optimum performance. The information that has to be expressed in tags is another factor in how well technology is used. These programmes can improve customer service, reduce book theft, reduce labour expenses significantly, and continuously update records of new book collections.

REFERENCES

[1] K. Finkelzeller, The RFID Handbook, 2nd ed., John Wiley & Sons, 2003.
[2] R. Want et al., Connecting the Real and Virtual Worlds with Electronic Tags, Proc. ACM SIGCHI, ACM 프레스.
[3] M. Weiser, 21st Century Computers, Scientific Am., vol. 265, no. 3, 1991
[4] Vol. Kindberg et al., People, Places, and Things: Web Presence in the Real World, ACM Mobile Networks & Applications J, 2002.
[5] R. Vant, "Implementation of Ubiquitous Sensing with RFID", Computer, vol. 37, no. April 2004.
[6] E. Batista, "A Regression in Radio IdentificationTechnology?" Wired News, April 8, 2003;www.wired.com/news/wireless/0.1382.58385, 00.html.
[7] d. Singel, "U.S. Passport for Chipping", Wired News,19Oct.2004;www.wiredcom/news/privacy/0.1848.v65412.00.html.
[8] A. Jewels, R. L. Rivest, and M. Schiedlo, "ThevBlocker Tags: Selective Blocking of the RFIDvTag for Consumer Privacy", Proc. 8thvACM conf. communication with the computer. Security, ACM Press, 2003.



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