

Instant Book Issue-An application of passive RFID

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Abstract - This paper focuses on instant book issue in library using radio frequency identification (RFID) technology. The proposed RFID system uses passive tags that are affixed inside cover of each book, and tag attached inside wristband worn by person through which info embedded on the tags are read by RFID readers. The proposed system eliminates the need for human interaction needed for issuing of books. Data info exchanged between the librarian and borrowers. It enables more efficient issuing of books in library.

Keywords: tags, reader, antenna, barcode, radio frequency

I INTRODUCTION

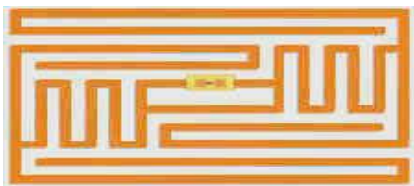
A. What is RFID

Radio Frequency Identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag which is also called as RFID tag or label attached to an object through a reader for the purpose of identifying and tracking the object .Some RFID tags can be read from several meters away and beyond the line of sight of the reader. RFID can be used in many applications. A tag can be affixed to any object and used to track and manage inventory, assets, people, etc. For example, it can be affixed to cars, computer equipment, books, mobile phones, etc. The Healthcare industry has used RFID to reduce counting, looking for things and auditing items. Many financial institutions use RFID to track key assets and automate compliance.

B. RFID tags

RFID tags can be either passive, active or battery assisted passive. Passive RFID does not use a battery, while an active has an on-board battery that always broadcasts its signal. A battery assisted passive (BAP) has a small battery on board that is activated when in the presence of a RFID reader.

Fig.1 Passive Tag



RFID technology is grouped under the term Automatic Identification(Auto ID).AutoID technologies are a way of controlling information and material flow .The RFID technology is a means of gathering data about a certain item without the need of touching or seeing the data carrier through the use of electromagnetic waves.

II. RFID and Barcode

A high level comparison :

RFID technology is similar to the bar code identification system that we see in the retail stores every day; however one big difference between RFID and barcode is that RFID does not rely on the line-of-sight reading that bar code scanning requires.RFID eliminates the need for line-of-sight reading that bar coding depends on. Also, RFID scanning can be done at greater distances than bar code scanning. High frequency RFID systems (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) offer transmission ranges of more than 90 feet, although wavelengths in the 2.4 GHz range are absorbed by water (the human body) and therefore has limitations. RFID is used in the retail industry for product tags, and will soon join, and perhaps replace, bar coding as a way to track, control, and manage the flow of goods across their life cycle.

The primary benefits of RFID technology over standard bar-coding are:

- Information stored on the tag can be updated on demand
- Huge data storage capacity
- Instantaneous data identification
- Data collection from multiple items (hundreds of tags per second)
- Small surface area requirement
- Longer read range; line-of-sight not required

Fig.2 Difference between Barcode and RFID



TABLE 1

The difference between RFID and BarCode

	BarCode	RFID
Line of sight requirement	Required	Not required
Number of items that can be scanned	One	Many
Automation and accuracy	Manual read errors	Fully automate And highly accurate
Identification	Only series and type	Unique item level
Data storage	Limited codes	Up to several KB data

III Why RFID is important?

It is believed that RFID technology will play two major roles. It will provide a means of unique object identification at low cost, which will enable it to transform supply chains and reduce their costs dramatically. Secondly, it will be used in combination with other sensing and network technologies to track objects and physical environments for purposes beyond supply-chain management, resulting in an electronic infrastructure that is intelligent and aware of its physical environment. Such an infrastructure can help increase visibility and control over physical world events that plague business decision making today. It is superior to barcode scanning in terms of speed, parallel processing and simplicity and not human intervention is required.

A. Applications of RFID :

1) Asset tracking

RFID is useful in static or in-motion asset tracking. User can instantly determine the general location of tagged assets.

2) People Tracking:

People tracking system are used just as asset tracking system. Hospitals and jails are most general tracking required places. Hospital uses RFID tags for tracking their special patients. In emergency patient and other essential equipment can easily track. It will be mainly very useful in mental care hospitals where doctors can track each and every activity of the patient. Hospitals also use these RFID tags for locating and tracking all the activities of the newly born babies.

3) Document tracking:

This is most common problem. Availability of large amount of data and documents brings lots of problem in document management system. An RFID document-tracking system saves time and money by substantially reducing:

- Time spent searching for lost document
- The financial and legal impact associated with losing documents.

4) Government Library:

Many government libraries use barcode and electromagnetic strips to track various assets. RFID technology uses for reading these barcodes unlike the self-barcode reader RFID powered barcode reader can read multiple items simultaneously. This reduces queues and increases the number of customers using self-check, which in turn will reduce the staff necessary at the circulation desks.

5) Manufacturing & Aerospace:

RFID technology provides an easy way to manage a huge and laborious manufacturing process. It offers all the benefits of small production parts to batch, processes and manufacturing. This type of process helps in better analysis, reduce and eliminate bottlenecks, reduced time in locating parts and products and production process based sensors can be installed to alert any anomalies. Aerospace industry and Department of Defense have a lot to gain from RFID integration into their production and process lines. Boeing and airbus, according to the direction of US Federal Aviation Administration, make Mandatory to put an appropriate tracking mechanism to track the aircraft parts.

IV. How tags communicate

The communication process between the reader and the tag is by wireless. The major differences between the different types of waves are the distances covered by one cycle of the wave and the number of waves that pass a certain point during a set time period. The wavelength is the distance covered by one cycle of a wave. The frequency is the number of waves passing a given point in one second. For any electromagnetic wave, the wavelength multiplied by the frequency equals the speed of light. The frequency of an RF signal is usually expressed in units called hertz (Hz). One Hz equals one wave per second. Basically what happens is that when the reader is switched on it starts emitting a signal at the selected frequency band (**in library HF is used with 13.56 MHz**). Any corresponding tag in the vicinity of the reader will detect the signal and use the energy from it, to wake up and supply operating power to its internal circuits. Once the tag has decoded the signal as valid, it replies to the reader and indicates its presence by modulating (affecting) the reader field.

IV. The proposed system



While issuing the books in the library human interaction is required which sometimes leads to long queues in library.

We can avoid these long queues using Radio frequency Identifier. Person has to pay some amount to librarian to get membership of the library. Immediately after that he gets wristband where passive tag is attached. A person has to wear wristband whenever he wants to borrow the books. There are two doors in library, entry gate and exit gate where RFID readers are attached. When a person wants to enter inside the library, reader at the entry gate checks whether the tag is valid or barred. If the tag is valid then only person is allowed to enter. Once he will enter inside the library he has to select the desired books. The passive tags are also affixed inside cover of each book. When a person wants to leave the library he has to go the exit gate where RFID reader will calculate the return date of books and transfer the details of all the books along with the return date to the person's account. After this person gets a message regarding number of books he has borrowed and Return date of those books and he is allowed to leave the library. If the borrower is failed to return the book on the specified date the fine

will be deducted from his account and the tag will be barred.

Here we make the use of passive tags because the communication distance between RFID reader and wristband and the number of books is about 4-5 meters.

Anti-collision

If many tags are present (when person borrows more than one book) then they will all reply at the same time, which at the reader end is seen as a signal collision and an indication of multiple tags. The reader manages this problem by using an anti-collision algorithm designed to allow tags to be sorted and individually selected. The number of tags that can be identified depends on the frequency and protocol used, and typically ranges from **50 tags/s for HF and up to 200 tags/s for UHF**. Once a tag is selected the reader is able to perform a number of operations such as read the tags identifier number, or in the case of a read/write tag write information to it. After finishing dialoging with the tag the reader can then either remove it from the list, or put it on the stand by until a later time. This process continues under the control of anti-collision algorithm until all tags have been selected.

Figures below illustrate the flow of the proposed system

Figure 2: Library Entrance Flowchart

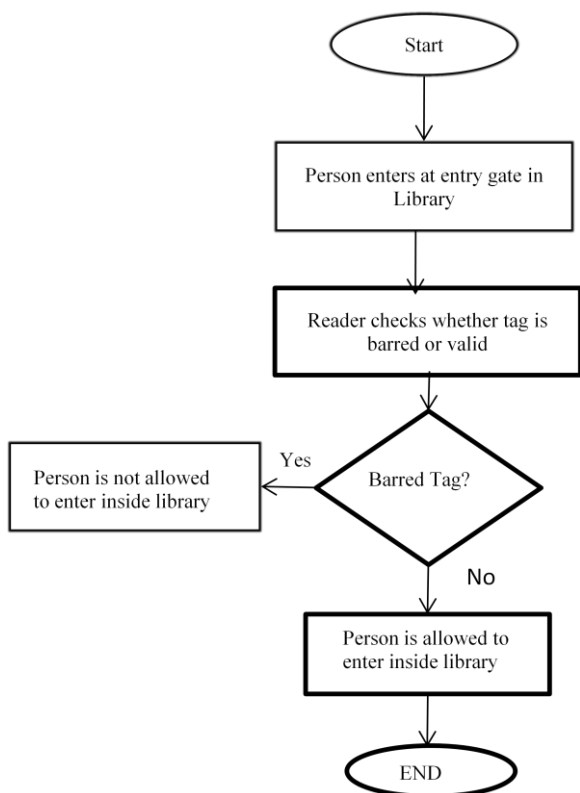
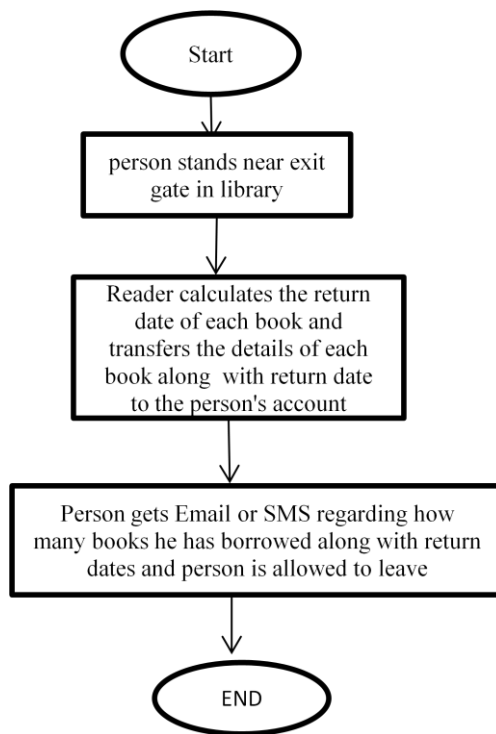


Figure 3 :Library Exit Flowchart



Entering information about person into database:

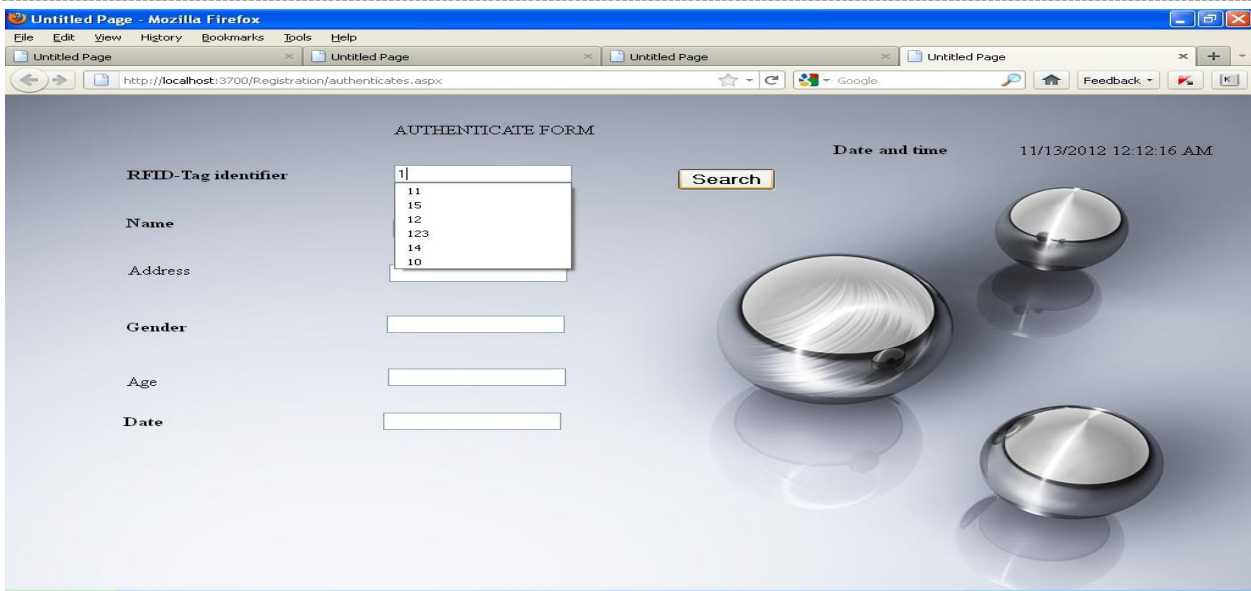
The screenshot shows a web browser window with a 'New User Form'. The form contains the following fields and values:

- RFID-Tag identifier: 16
- Name: Rohini Setty
- Address: Bangalore
- Gender: female
- Age: 26
- Date: 11/13/2012 12:09:56 AM

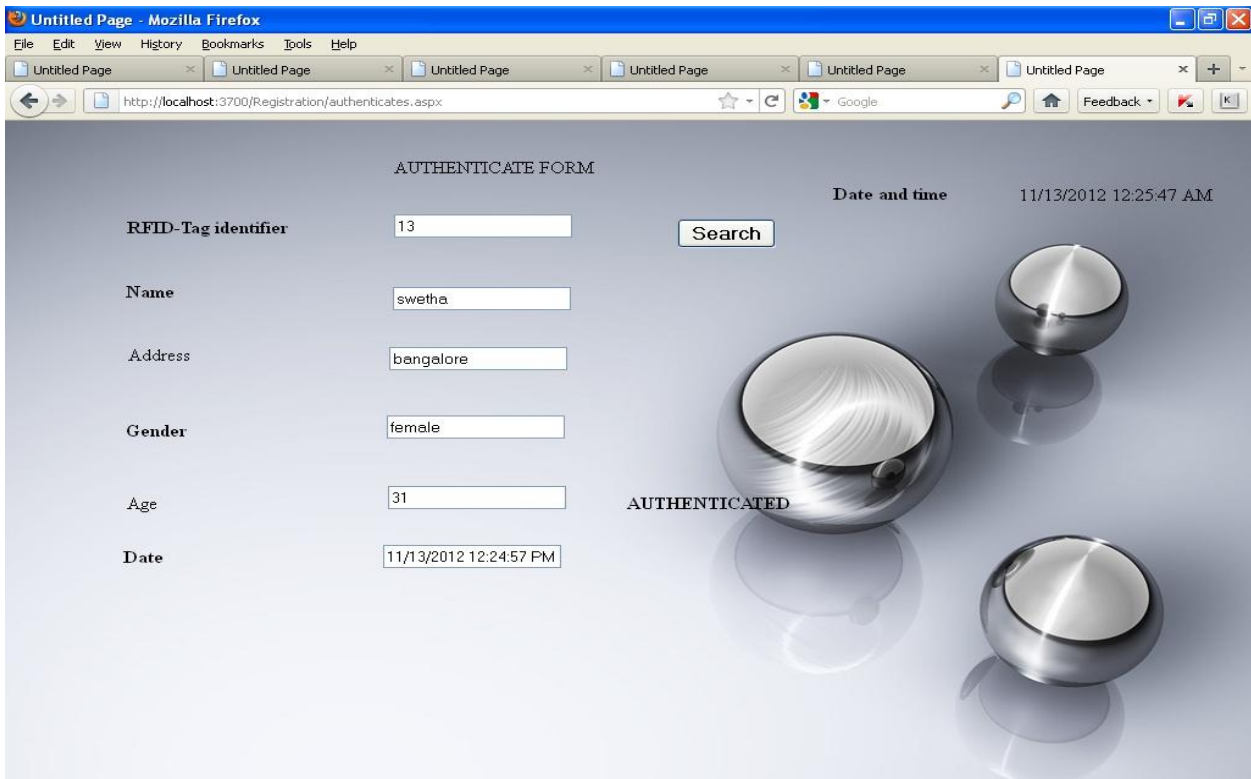
Below the form is a table with the following data:

id	Name	Address	Gender	Age	date
11	pavan	mysore	male	32	12:04:08.0937500
12	Rajesh	Bellary	male	32	12:09:41.6250000
13	swetha	bangalore	female	31	11/13/2012 12:24:57 PM
14	seema	vijaynagar	female	26	11/13/2012 12:33:06 PM
15	Rohini	koramangala	female	30	11/13/2012 12:00:00 AM

2. Searching the database for tag-id:



Authentication form:



CODING

Default.aspx.cs
using System;

```

using System.Configuration;
using System.Data;
using System.Linq;
using System.Web;
using System.Web.Security;
using System.Web.UI;
using System.Web.UI.HtmlControls;
using System.Web.UI.WebControls;
using System.Web.UI.WebControls.WebParts;
using System.Xml.Linq;
using System.Data.SqlClient;
using System.Windows;
using System.Windows.Forms;

public partial class _Default : System.Web.UI.Page
{
    SqlConnection con = new SqlConnection("Data Source=ROHINI\\SQLEXPRESS;Initial Catalog=Presentation;Integrated
Security=True;Pooling=False");
    SqlCommand cmd;
    protected void Page_Load(object sender, EventArgs e)
    {
        Label11.Text = System.DateTime.Now.ToString();// DateTime.Now.Date.ToString();
    }
    protected void Button1_Click(object sender, EventArgs e)
    {
        con.Open();
        cmd = new SqlCommand("insert into Register2 values (@id,@Name,@Address,@Gender,@Age,@date)", con);
        cmd.Parameters.AddWithValue("@id", rfid.Text);
        cmd.Parameters.AddWithValue("@Name", name.Text);
        cmd.Parameters.AddWithValue("@Address", address.Text);
        cmd.Parameters.AddWithValue("@Gender", gender.SelectedItem.Value);
        cmd.Parameters.AddWithValue("@Age", age.Text);
        cmd.Parameters.AddWithValue("@date", Label11.Text);
        cmd.ExecuteNonQuery();
        con.Close();
        clearall();
    }
    public void clearall()
    {
        rfid.Text = "";
        name.Text = "";
        address.Text = "";
        gender.Text = "";
        age.Text = "";
    }
    protected void Button2_Click(object sender, EventArgs e)
    {
        rfid.Text = "";
        name.Text = "";
        address.Text = "";
        gender.Text = "";
        age.Text = "";
    }
    protected void view_Click(object sender, EventArgs e)
    {
        Response.Redirect("Register.aspx");
    }
}

```

V. CONCLUSION

In this paper we have discussed about the use of RFID in book issue in library. The proposed issuing

system applies passive RFID technology. By doing so increased efficiency will be guaranteed since RFID is known as highly stable technology. This system, consists of smart RFID labels, hardware and software, provides libraries with more effective way of managing their collections while providing greater customer service to their patrons.

VI. REFERENCES

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AUTHOR



Shilpa Abhang was born in 1980. She received MCA degree from Pune university. She has completed M.Phil. in computer science from The Global Open University in 2010. Presently she is pursuing her Ph.D. in Computer Science from CMJ University. She

Has presented 3 papers in National Conferences and published 2 papers in International Journals. Currently she is working as Assistant Professor in Jyoti Nivas College, Bangalore.