

Replacing E- Passport Using Bio-Chip



Computer Science

KEYWORDS : Passport, Biochip, RFID.

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ABSTRACT

The main aim of this paper is to replace the travel document (passport) using bio-chip which is provided with unique id. To combat international crime and protect against forgery, countries around the world need to use biochip which consists of complete information of a person. The biochip implant system is actually a fairly simple device. Today's, biochip implant is basically a small (micro) computer chip, inserted under the skin, for identification purposes. The biochip system is radio frequency identification (RFID) system, using low-frequency radio signals to communicate between the biochip and reader. Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger.

INTRODUCTION OF BIO CHIP:

The biochip implant system is actually a fairly simple device. Today's, biochip implant is basically a small (micro) computer chip, inserted under the skin, for identification purposes. The biochip system is radio frequency identification (RFID) system, using low-frequency radio signals to communicate between the biochip and reader. Biochips are any microprocessor chips that can be used in Biology. The biochip technology was originally developed in 1983 for monitoring fisheries, it's use now includes, over 300 zoos, over 80 government agencies in at least 20 countries, pets (everything from lizards to dogs), electronic "branding" of horses, monitoring lab animals, fisheries, endangered wildlife, automobiles, garment tracking, hazardous waste, and humans. Biochips are "silently" inching into humans. For instance, at least 6 million medical devices, such as artificial body parts (prosthetic devices), breast implants, chin implants, etc., are implanted in people each year. And most of these medical devices are carrying a "surprise" guest a biochip. In 1993, the Food and Drug Administration passed the Safe Medical Devices Registration Act of 1993, requiring all artificial body implants to have "implanted" identification the biochip. So, the yearly, 6 million recipients of prosthetic devices and breast implants are "bio chipped". To date, over 7 million animals have been "chipped". The major biochip companies are A.V.I.D. (American Veterinary Identification Devices), Traven Identification Systems, and Destroy-Fearing Corporation. Furthermore, if they are flexibly designed these solutions could offer extremely reliable and convenient enrolment for any application, where people need to register in order to subsequently prove their identity.

RFID TECHNOLOGY:

RFID stands for radio-frequency identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip typically is capable of carrying 2,000 bytes of data or less. A basic RFID system consists of three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically
- Programmed with unique information
- The antenna emits radio signals to activate the tag and to read and write data to it.

The reader emits radio waves in ranges of anywhere from one inch to 100 feet or more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal.

The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing. A reader typically contains a high frequency-module (transmitter and receiver), a control unit and a coupling element to the transponder. In addition, many readers are fitted

with an additional interface (RS 232, RS 485...) to enable it to forward the data received to another system (PC, robot control system ...). The transponder, which represents the actual data carrying device of an RFID system, normally consists of a coupling element and an electronic microchip. When the transponder, which does not usually possess its own voltage supply (battery), is not within the response range of a reader it is totally passive. The transponder is only activated when it is within the response range of a reader. The power required to activate the transponder is supplied to the transponder through the coupling unit (contactless) as is the timing pulse and data.

Types of RFID tags:

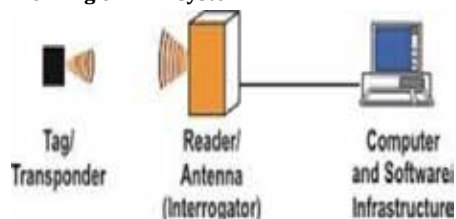
RFID tags come in three general varieties: passive, active or semi-passive (also known as battery-assisted). Passive tags require no internal power source (they are only active when a reader is nearby to power them), whereas semi-passive and active tags require a power source, usually a small battery.

(i) Passive tags: Passive RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the complementary metal-oxide-semiconductor (CMOS) integrated circuit in the tag to power up and transmit a response. Most passive tags signal by backscattering the carrier wave from the reader. This means that the antenna has to be designed both to collect power from the incoming signal and also to transmit the outbound backscatter signal.

(ii) Active tags: Unlike passive RFID tags, active RFID tags have their own internal power source, which is used to power the integrated circuits and to broadcast the response signal to the reader. Communications from active tags to readers is typically much more reliable (i.e. fewer errors) than from passive tags due to the ability for active tags to conduct a "session" with a reader.

Semi-passive tags Semi-passive tags, also called semi-active tags, are similar to active tags in that they have their own power source, but the battery only powers the microchip and does not power the broadcasting of a signal.

Working of RFID system:



The main component of this technology is the transponder which in most cases comprises of a chip and antenna mounted onto a substrate or an enclosure. The chip consists of a processor, memory and radio transmitter. These transponders communicate via radio frequency to a reader, which has its own antennas. The readers can interface through wired or wireless medium to a main computer. Transponders are also known as smart or radio tags. The memory will vary, depending on the manufacturer, from just a few characters to kilobytes.

Transponders can either be Read Only (R/O) which are pre-programmed with a unique identification or they can be Read Write (R/W) for applications that require data to be stored in the transponder and can be updated dynamically. Another form of transponder is Write Once Read Many times (WORM). This will allow for an identification number to be written to the transponder once. The information is stored in the memory, it cannot be changed but the transponder can be read many times.

The two most common types of RFID technologies are Active and Passive. Active RFID transponders are self powered and tend to be more expensive than Passive. Having power on board allows the tag to have greater communication distance and usually larger memory capacity. The most common application for Active RFID is for highway tolls such as the Highway 407 in Toronto. As for Passive RFID transponders, which are available with chips and without chips, they have no internal power source therefore require external power to operate. The transponder is powered by an electromagnetic signal that is transmitted from a reader. The signal received will charge an internal capacitor on the transponder, which in turn will then supply the power required to communicate with the reader. Some of the most common uses of Passive RFID today are for animal identification, waste management, security and access control, work-in-process, asset tracking and electronic commerce. The following details some of the benefits:

Transponders can be read from a distance and from any orientation, thus they do not require line of sight to be read.

- Transponders have read and write capabilities, which allow for data to be changed dynamically at any time.
- Multiple transponders can be read at once and in bulk very quickly.
- RF-Tags can easily be embedded into any non-metallic product. This benefit allows the tag to work in harsh environments providing permanent identification for the life of the product.

It is important to take the environment into consideration when implementing RFID. For example metal, electrical noise, extreme temperatures, liquids and physical stress can create a challenge and may affect performance, for seamless integration RFID Canada highly recommends that a site survey and testing be done. Today, most implementations involve passive technology. For this reason, this document is based solely on passive RFID.

There are different frequency bands which passive technology operates within. Low and High RFID operate on the inductive coupling principle. That is, the energy is transferred from the reader to the tag through shared magnetic field. The amount of transferred energy is proportional to the size of the transmitting and receiving antennas as well as the tag ability to operate at the resonance frequency. The resonant frequency is a state in which the impedance is at its minimum, allowing for maximum current flow in the circuit. The resonance frequency is a function of the inductance and capacitance of the tag circuit. The quality of a resonant circuit is measured by Q factor. The higher the Q factor, the higher the amount of energy transfer. Although higher energy transfer is desirable, the higher Q factor results in reduced bandwidth. UHF RFID tags communicate with the reader using the backscatter principle. This is the same technique used in radar technology. The term backscatter refers to the portion of the transmitted signal that is reflected back 180 degrees opposite the direction of the incident signal, as opposed

to random scattering that is lost in the space. The tag will send back data by means of varying the load of the received signal. The reader senses the varying field and demodulates the signal to retrieve tag data. Of all the various frequency bands RFID operates within, there isn't one that can address all applications. In essence, there is no super RFID frequency band in other words "one frequency does not fit all".

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Active RFID transponders:

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Passive RFID transponders:

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It is an automatic identification and data collection technology utilizing electronic programmable tags for tracking, tracing and identification of objects. Some of the most common uses of Passive RFID today are for animal identification, waste management, security and access control, work-in-process, asset tracking and electronic commerce.

Frequency:

The optimal choice of frequency depends on several factors, such as:

a.) Transmission mode:

RFID tags basically use two kinds of data transmission, depending on the behavior of electromagnetic fields at the frequency used. In lower frequencies (such as 125–134kHz in the LF band or 13.56MHz in the HF band), inductive coupling is used, while in frequency bands above (UHF with typical frequency ranges of 433MHz, 865–956MHz and 2.45GHz), wave backscattering is the main means of transmission. This also affects the safe reading range, as it is easier to build direction-selective devices with a longer read range in higher frequencies. This may restrict design freedom if either reading range or spatial selectivity is an important issue.

b.) Behavior of tagged goods and environment:

Properties of some materials may be an obstacle to RFID application at a given frequency, as they may corrupt data transmission either by absorption or by ambient reflection of the signals. Typically, conductive materials such as goods containing water, or metal surfaces may be the source of problems. However, absorption and reflection being frequency-dependent, failure at

one frequency does not rule out applicability at other frequencies. Electromagnetic disturbance can also have external sources, which is also a common though also frequency-dependent problem in an industrial environment.

INTRODUCTION OF BIO CHIP:

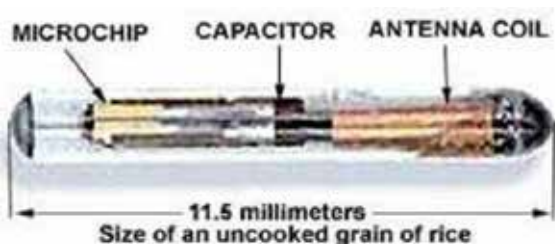
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BIOCHIP IMPLANT SYSTEM COMPONENTS:

The bio chip implant system consists of two components.

(1) Transponder:

The transponder is the actual biochip implant. It is a passive transponder, meaning it contains no battery or energy of its own. In comparison, an active transponder would provide its own energy source, normally a small battery. Because the passive biochip contains no battery, or nothing to wear out, it has a very long life, up to 99 years, and no maintenance. Being passive, it's inactive until the reader activates it by sending it a low-power electrical charge. The reader "reads" or "scans" the implanted biochip and receives back data (in this case an identification number) from the biochip. The communication between biochip and reader is via low-frequency radio waves.



The biochip transponder consists of four parts:

a. Microchip:

The microchip stores a unique identification number (ADHAAR ID) from 10 to 15 digits long. The storage capacity of the current microchips is limited, capable of storing only a single ID number. AVID (American Veterinary Identification Devices), claims their chips, using an nnn-xxx-xxx format, has the capability of over 70 trillion unique numbers. The unique ID number is "etched" or encoded via a laser onto the surface of the microchip before assembly. Once the number is encoded it is impossible to alter. The microchip also contains the electronic circuitry necessary to transmit the ID number to the "reader".

a. Antenna Coil:

This is normally a simple, coil of copper wire around a ferrite or iron core. This is tiny primitive radio antenna "receives and send signals from the reader or scanner."

b. Tuning Capacitor:

The capacitor stores the small electrical charge (less than 1/1000 of a watt) sent by the reader or scanner, which activates the transponder. This "activation" allows the transponder to send back the ID number encoded in the computer chip. Because "radio waves" are utilized to communicate between the transponder and reader, the capacitor is "tuned" to the same frequency as the reader.

c. Glass Capsule:

The glass capsule "houses" the microchip, antenna coil and capacitor. It is a small capsule, the smallest measuring 11 mm in length and 2 mm in diameter, about the size of an uncooked grain of rice. The capsule is made of biocompatible material such as lime glass. After assembly, the capsule is hermetically (air-tight) sealed, so no bodily fluids can touch the electronics inside. Because the glass is very smooth and susceptible to movement, a material such as a polypropylene polymer sheath is attached to one end of the capsule. This sheath provides a compatible surface which the bodily tissue fibers bond or interconnect, resulting in a permanent placement of the biochip.

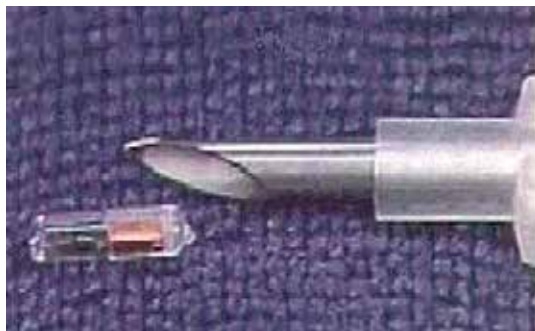
(2) Reader:

The reader consists of an "exciter" coil which creates an electromagnetic field that, via radio signals, provides the necessary energy (less than 1/1000 of a watt) to "excite" or "activate" the implanted biochip. The reader also carries a receiving coil that receives the transmitted code or ID number sent back from the "activated" implanted biochip. This all takes place very fast, in milliseconds. The reader also contains the software and components to decode the received code and display the result in an LCD display. The reader can include a RS-232 port to attach a computer.

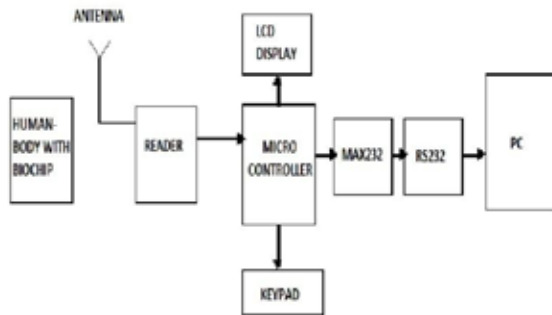
WORKING OF A BIOCHIP:

The reader generates a low-power, electromagnetic field, in this case via radio signals, which "activates" the implanted biochip. This "activation" enables the biochip to send the ID code back to the reader via radio signals. The reader amplifies the received code, converts it to digital format, decodes and displays the ID number on the reader's LCD display. The reader must normally be between 2 and 12 inches near the biochip to communicate. The reader and biochip can communicate through most materials, except metal.

IMPLANTATION OF BIOCHIP INTO HUMAN BODY



The biochip is inserted into the subject with a hypodermic syringe. Injection is safe and simple, comparable to common vaccines. Anesthesia is not required nor recommended. In dogs and cats, the biochip is usually injected behind the neck between the shoulder blades. Trovan, Ltd., markets an implant, featuring a patented "zip quill", which you simply press in, no syringe is needed. According to AVID "Once implanted, the identity tag is virtually impossible to retrieve. The number can never be altered."

PROPOSED SYSTEM DESIGN:

The detail of the passport holder is stored in biochip, when the person enters into the airport the data of the holder is read by the reader by using RFID technology. Whenever the human comes near the Reader the information present in the biochip is read by the Reader module and this data read from the Reader is given to the micro controller. In the micro controller already the information is stored of all the people. The micro controller compares both the pre dumped information and the information present in the Reader. And the LCD display system displays the information of passport system.

Keypad display is used for security system and using this keypad display we enter the password and this also displays in LCD display system. MAX 232 is used for voltage converter. And RS 232 is used for serial port communication. Actually in MC the voltage levels are (0-5) v and for PC we need more voltage levels. In PC we store the digital photograph of the persons. In this we are using passive RFID tag which has no internal power supply. And for converting the CMOS family to TTL family we are using the voltage converters. And LCD display is used for displays the information regarding the passport system. And keypad is used to enter the password of the system and whether it is correct then it displays in LCD display system.

SOFTWARES:

The softwares used in this project are as follows:

VISUAL BASIC .NET:

Visual Basic .NET (VB.NET) is an object-oriented computer programming language that can be viewed as an evolution of the classic Visual Basic (VB), which is implemented on the .NET Framework. First version of Visual Basic .NET, which run on .NET framework 1.0. The most important feature is Managed code, which contrasts with Visual Basic 6.0 and before. Visual Basic .NET 2003 was released with version 1.1 of the .NET Framework. New features included support for the .NET Compact Framework and a better VB upgrade wizard. Improvements were also made to the performance and reliability of the .NET IDE (particularly the background compiler) and runtime. In addition, Visual Basic .NET 2003 was available in the Visual Studio.NET Academic Edition(VS03AE). VS03AE is distributed to a certain number of scholars from each country without cost.

VISUAL STUDIO:

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop console and graphical user interface applications along with Windows Forms applications, web sites, web applications, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight.

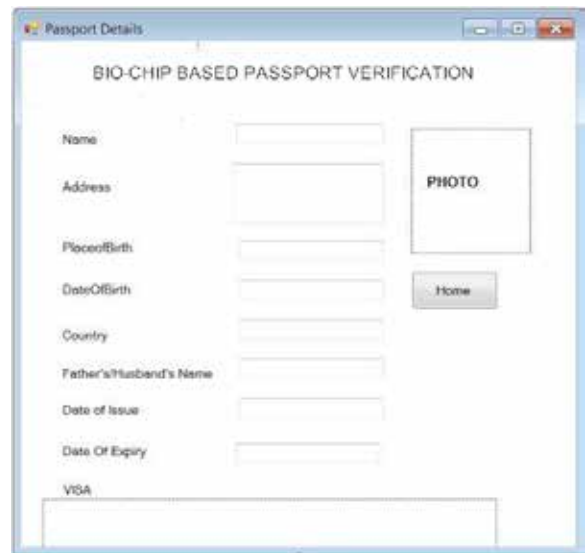
Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger.

In future it must be implemented using the advanced J2EE &

J2ME codings.

PASSPORT:

The passport module of the chip can be demonstrated with the help of the program below:

**PASSPORT**

```
Imports System.Data.OleDb
Public Class Form2
    Dim rfcode As String
    Dim cn As OleDbConnection
    Dim cmd As OleDbCommand
    Dim dr As OleDbDataReader
```

```
Private Sub TextBox1_TextChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles TextBox1.TextChanged
End Sub
Private Sub Label1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles Label1.Click
End Sub
```

```
Private Sub Form2_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Load
    Console.WriteLine(Application.StartupPath)
    Try
        cn = New OleDbConnection("Provider=Microsoft.Jet.OLEDB.4.0;Data Source=" & Application.StartupPath & "\Database5.mdb;")
        'provider to be used when working with access database
        cn.Open()
        cmd = New OleDbCommand("select * from Passport where rfidcode=" & rfcode & "", cn)
        dr = cmd.ExecuteReader
        While dr.Read()
            TextBox1.Text = dr.Item("Name")
            TextBox2.Text = dr.Item("Address")
            TextBox3.Text = dr.Item("PlaceofBirth")
            TextBox4.Text = dr.Item("DateofBirth")
            TextBox5.Text = dr.Item("Country")
            TextBox6.Text = dr.Item("Father/HusbandName")
            TextBox7.Text = dr.Item("DateofIssue")
            TextBox8.Text = dr.Item("DateofExpiry")
            ' loading data into TextBoxes by column index
        End While
    Catch
    End Try
    dr.Close()
    cn.Close()
End Sub
Public
```

```
Private Sub Button1_Click(ByVal sender As System.Object, By-  
Val e As System.EventArgs) Handles Button1.Click  
Me.Hide()  
End Sub  
End Class
```

This form will appear when we click to the passport button in the main form and if we are able to give the correct password or PIN. As we click the passport button, it will first ask for the password. If the password matches then only this form will appear.

As we can see it has Name, Address, Place of Birth and all necessary details required for the passport. There will be date of issue and expiry so as to see whether the passport is valid or not. On right hand side we have photo which will be helpful in case of identification of the particular card holder. In the lower portion there is a table which tell about the VISA issued currently as well as in the past.

CONCLUSION:

This project has been documented to bring a substantial difference in the Indian Government, by the help of AADHAR. Our current & future objectives are to:

- To make the procedure for applying for passport and driving licence easy and quick.
- In case of emergency/ accident this card will help to get the details about the patient and his medical history.
- This card will also improve the classical parking system by making the parking charges payment automated which will make the process faster and problems related to exchanges will be solved.
- This card will help the traffic police/department to easily check the validity and other related issues of a driving licence.
- Only Administrator can make the changes in the Database.
- It will also act as identity card which will also have the permanent address and other required information in it.

The few coop able limitations of this project are:

- All the government offices, hospitals and the parking spaces need to be installed with RFID readers and Computers.
- This system might not be very suitable for villages. .
- The database should be properly maintained.
- Every citizen will have a unique card so number of cards will be huge and database will also be large.

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