

STUDENT ATTENDANCE USING RFID SYSTEM

MOHD FIRDAUS BIN MAHYIDIN

UNIVERSITI MALAYSIA PAHANG

MOHD FIRDAUS BIN MAHYIDIN

BORANG PENGESAHAN STATUS TESIS♦

JUDUL: **STUDENT ATTENDANCE USING RFID SYSTEM**

SESI PENGAJIAN: 2007/2008

Saya MOHD FIRDAUS BIN MAHYIDIN (850928-11-5675)
(HURUF BESAR)

mengaku membenarkan tesis (Sarjana Muda/~~Sarjana~~ /~~Doktor Falsafah~~)* ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Tesis adalah hakmilik Kolej Universiti Kejuruteraan & Teknologi Malaysia.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (√)

SULIT

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD

Disahkan oleh:

(TANDATANGAN PENULIS)

(TANDATANGAN PENYELIA)

Alamat Tetap:

**23A, KAMPUNG PASIR AKAR,
22000 JERTEH, BESUT,
TERENGGANU DARUL IMAN**

ROSMADI BIN ABDULLAH
(Nama Penyelia)

Tarikh: **06 MEI 2008**

Tarikh: **06 MEI 2008**

- CATATAN:
- * Potong yang tidak berkenaan.
 - ** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh tesis ini perlu dikelaskan sebagai atau TERHAD.
 - ♦ Tesis dimaksudkan sebagai tesis bagi Ijazah doktor Falsafah dan Sarjana secara Penyelidikan, atau disertasi bagi pengajian secara kerja kursus dan penyelidikan, atau Laporan Projek Sarjana Muda (PSM).

“I hereby acknowledge that the scope and quality of this thesis is qualified for the award of the degree of Bachelor of Electrical Engineering (Hons) (Power Systems)”

Signature : _____

Name : ROSMADI BIN ABDULLAH

Date : _____

STUDENT ATTENDANCE USING RFID SYSTEM

MOHD FIRDAUS BIN MAHYIDIN

This thesis is submitted as partial fulfillment of the requirements for the award of the degree of Bachelor of Electrical Engineering (Power Systems)

Faculty of Electrical & Electronics Engineering
University Malaysia Pahang

MAY, 2008

I declare that this thesis entitled “Student Attendance Using RFID System “is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : _____

Author : MOHD FIRDAUS BIN MAHYIDIN

Date : _____

*Specially dedicated to
My beloved father, mother, my family and those people who have guided and
inspired me throughout my journey of education*

ACKNOWLEDGEMENT

In the name of Allah S.W.T, the Most Gracious, the Ever Merciful. Praise is to Allah, Lord of the Universe and Peace and Prayers be upon His final Prophet and Messenger Muhammad s.a.w.

In preparing this thesis, I was in contact with many people, researchers, academicians and practitioners. Thanks a lot to my entire friend especially Ahmad Danial Bin Rastam and Siti Hajar Binti Mustapa. They have contributed towards my understanding and thoughts.

In particular, I wish to express my sincere appreciation to my supervisor, Mr Rosmadi Bin Abdullah for encouragement, guidance, critics, friendship, advice, information and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Universiti Malaysia Pahang (UMP) for funding my degree study. Librarians at UMP also deserve special thanks for their assistance in supplying the relevant literatures and guiding me in using e-journal.

My sincere appreciation also extends to all my colleagues, ex-schoolmate and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

Finally, special thanks extended to my beloved family who had given me moral support and prayed for my success.

Thank you.

Mohd Firdaus Bin Mahyidin

ABSTRACT

This project is developed by using *Radio Frequency Identification* (RFID) system and student card to get student attendance. Before this lecturer needs to use the paper to get the student attendance. There were a lot of problems when using the paper as student attendance such as cheating. This project can help lecturer to reduce the problem like that by design automatic attendance using RFID and student card. The project system was running by get the code of card student to compare with the database in *Access*. *Graphical User Interface* (GUI) was developed using *Visual Basic 6.0* to make the database easier to access. Firstly, lecturer needs to fill forms in an interface like lecturer name, subject and code subject. This part is important because we need the information in this part to use in the next interface. In the next interface, lecturer needs to choose port and speed to make connection with RFID reader. After the reader was ready, process to get attendant will started. Students need to swap their card on the reader and the code from the card will use to compare with database in *Access*. When the code is match with database, the student information like name and ID number will show on interface and that information will trigger into a list. This list will use as a student attendance. In that list, all information like student name and ID number will attached including the lecturer name and subject. If the code were not match with database, it means that student was in the wrong class or not registers yet in that subject. When this happen, lecturer can register that student by using registering form and the information of that student will be update into database. This project will help lecturer taking the student attendance more easily and automatically. As the conclusion, RFID technology can be used in student attendance application.

ABSTRAK

Projek ini dibangunkan dengan menggunakan sistem *Radio Frequency Identification* (RFID) dan kad pelajar untuk mendapatkan rekod kehadiran pelajar. Sebelum ini, pensyarah perlu menggunakan kertas untuk mendapatkan rekod kehadiran pelajar. Terdapat banyak masalah yang timbul apabila pensyarah menggunakan kertas sebagai rekod kehadiran pelajar seperti penipuan. Projek ini boleh membantu pensyarah untuk mengurangkan masalah seperti itu dengan mereka bentuk satu rekod kehadiran automatik menggunakan sistem RFID dan kad pelajar. Sistem projek ini berfungsi dengan mendapatkan kod pada setiap kad pelajar untuk dibandingkan dengan pengkalan data dalam *Access. Graphical User Interface* (GUI) direka menggunakan *Visual Basic 6.0* untuk membolehkan pengkalan data mudah untuk dicapai. Pertama sekali, pensyarah perlu mengisi beberapa petak kosong pada antaramuka seperti nama pensyarah, matapelajaran dan kod matapelajaran. Bahagian ini sangat penting kerana kita memerlukan maklumat pada bahagian ini untuk digunakan pada antaramuka seterusnya. Pada antaramuka yang berikutnya, pensyarah perlu memilih 'port' dan 'speed' untuk membuat sambungan antara pengimbas RFID (antena) dengan antaramuka pada Visual Basic 6.0. Apabila pengimbas sudah bersedia, proses mendapatkan rekod kehadiran bermula. Pelajar-pelajar perlu melalukan kad pelajar mereka pada pengimbas dan kod yang dibaca daripada kad akan dibandingkan dengan maklumat pada pengkalan data dalam Access. Jika kod adalah sama dengan maklumat dalam pengkalan data, maklumat pelajar seperti nama dan nombor matrik akan dipaparkan pada antaramuka dan maklumat tersebut akan dimasukkan pada satu senarai. Jika maklumat pelajar tidak dipaparkan, ini bermakna pelajar itu berada pada kelas yang salah atau belum mendaftarkan diri. Pensyarah boleh mendaftarkan pelajar tersebut ke dalam pengkalan data dengan menggunakan antaramuka pendaftaran. Projek ini membantu pensyarah mendapatkan rekod kehadiran dengan lebih senang. Sebagai penutup, teknologi RFID boleh digunakan dalam aplikasi rekod kehadiran pelajar.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENT	vii
	LIST OF TABLES	x
	LIST OF FIGURES	xi
	LIST OF ABBREVIATIONS	xiii
	LIST OF APPENDICES	xiv
1	INTRODUCTION	1
	1.1 Background	1
	1.2 Objectives	3
	1.2.1 To study on data transfer between RFID system and Visual Basic 6	3
	1.2.2 To develop graphical user interface (GUI) using Visual Basic 6 that will integrate with RFID system to capture and record student attendance	3

1.3	Project Scope	4
1.3.1	Use appropriate RFID Tag & Reader for this application	4
1.3.2	Design and implement a system in student attendance using RFID	4
1.4	Thesis Overview	5
2	LITERATURE REVIEW	6
2.1	Introduction	6
2.2	RFID MODULE	8
2.1.1	History of RFID	8
2.1.2	RFID Reader	10
2.1.3	RFID Tag	11
2.1.3.1	Passive Tag	12
2.3	VISUAL BASIC 6 MODULE	13
3	HARDWARE DESIGN	15
3.1	RFID DEVICE DESCRIPTION	16
3.1.1	RFID Reader	16
3.1.2	RFID Tags	18
3.2	LINE DRIVER: RS232	19
4	SOFTWARE DEVELOPMENT	21
4.1	MICROSOFT VISUAL BASIC 6.0	21
4.2	GRAPHICAL USER INTERFACE (GUI)	22
4.2.1	Interface “FormLecturer”	23
4.2.2	Interface “FormInformation”	25
4.2.3	Interface “FormRegister”	28
4.3	MICROSOFT OFFICE ACCESS 2003 (DATABASE)	30
4.4	ACTIVE X DATA OBJECT (ADO)	33

5	RESULT AND DISCUSSION	38
	5.1 RESULTS ON ENTIRE SYSTEM	39
	5.2 Analysis on RFID tag	41
6	CONCLUSION AND FUTURE DEVELOPMENT	45
	6.1 CONCLUSION	45
	6.2 FUTURE DEVELOPMENT	46
	6.2.1 Costing and Commercialization	46
	REFERENCES	47

LIST OF TABLES

TABLE NO.	TITLE	PAGE
3.0	Data Structure MF7 for Serial ACII	17
3.1	Output Format MF7 for Serial ASCII (RS232)	17
4.0	Form Name and Function	23
4.1	<i>Data Combo 2</i> Properties	36
5.0	Frequency ranges used for RFID-systems	43

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE
2.0	Overall System of Student Attendance Using RFID System and Student Card	7
2.1	Example interface design by <i>Visual Basic 6</i>	14
3.0	Actual Hardware	15
3.1	MF7 can be used directly to any application.	16
3.2	Student card with build in RFID chip	18
3.3	Internal architecture of RFID tag	18
3.4	Pin and description for DB-9.	20
3.5	DB-9 female connector	20
4.0	<i>Window</i> for the new project	22
4.1	<i>FormLecturer</i> interface	24
4.2	Sample code program of <i>FormLecturer</i> interface	24
4.3	Flow chart for <i>FormInformation</i> interface	26
4.4	Location of <i>MSCoom1</i> , <i>Timer received</i> and <i>Timer Clear</i>	27
4.5	Sample code program of <i>FormInformation</i> interface	28
4.6	<i>FormRegister</i> Interface	29
4.7	Sample code program of <i>FormRegister</i> Interface	29
4.8	Example of table in <i>Microsoft Access</i>	30
4.9	<i>Tools Menu</i> to convert the file	31
4.10	Location of the converted files	31
4.11	<i>Message Box</i> after converting process is done	32
4.12	<i>Project Menu</i> to select components	33
4.13	<i>Window</i> to select the ADO	34
4.14	<i>Project1</i> with ADO data control	34
4.15	<i>FormLecturer</i> interface with label	35

4.16	<i>ConnectionString</i> Property	36
4.17	<i>RecordSource</i> Property	37
4.18	Sample code program for <i>Adodc 2</i> and <i>Data Combo 2</i>	37
5.0	An example for student attendance record	39
5.1	<i>FormCheAttend</i> interface with all information	40
5.2	An example for complete checking attendance	40
5.3	Frequency-ranges used for RFID-systems shown with the corresponding field strength and power levels.	41
5.4	Actual waveform before card was swap on reader	42
5.5	Actual waveform when card was swap on reader	43

LIST OF ABBREVIATIONS

Component	The description
AC	Alternate Current
ADO	ActiveX Data Object
DC	Direct Current
DCE	Data Communications Equipment
DTE	Data Terminal Equipment
EPC	Electronic Product Code
GUI	Graphical User Interface
I.C	Identification Card
ID	Identification
ISM	Industrial-Scientific-Medical
RF	Radio Frequency
RFID	Radio Frequency Identification
UHF	Ultra-High Frequency
VB	Visual Basic

LIST OF APPENDIXES

APPENDIX	TITLE	PAGE
A	Program of “Student Attendance Using RFID System” Project	48
B	Interface of “Student Attendance Using RFID System” Project	60
C	Database of “Student Attendance Using RFID System” Project	65
D	MF7 Datasheet	68
E	Project Costing	70

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

RFID (radio frequency identification) is a new technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person. RFID tags are not an "improved bar code" as the proponents of the technology would like you to believe. An RFID system consists of three components: an antenna and transceiver (often combined into one reader) and a transponder (the tag). The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. RFID technology differs from bar codes. RFID can read the tag using RF, meaning that the RFID reader can be read from a distance, right through your clothes, wallet, backpack or purse. Besides the RFID tag consist of unique ID for each tag. The technology used in RFID has been around since the early 1920s. In our country, this technology already been used for several years in certain place such as in Highway using card 'Touch N Go' and our government also apply this technology by using RFID as I.C (identification card). Some places, they prefer to used Barcode which is cheaper than RFID. Technology spread very fast. In few years later, there is not impossible if RFID will replace the barcode system in today's life.

Nowadays, there are lots of universities around our country and each of the university consists of student up to 10 thousand. To handle a large amount of student may be problem especially to get the attendance. Now, process to get attendance in majority universities still used the manual process. The manual process means that when start the class/lecture, lecturer will give a piece of attendance paper and students will check their name and then will sign on it. At the end of class, lecturer will take back the attendance paper and keep it as a record.

Normally, the attendance paper need much time to sign by all students especially for class with a lot of student. Students also forget to sign that attendance and they were assuming absent that class. The problem also will happen when lecturer forget to bring the attendance paper to class. Students need to write their name on a piece of paper and sometimes student will take change to cheat in process getting the attendance. The suitable solution for this problem is by design a system that will record attendance automatically.

In this project, RFID system used to record student attendance automatically. This project will used student ID card as RFID tag and a RFID reader. This RFID system will be integrate with software. This method is more effective to prevent problem in process getting attendance manually.

1.2 OBJECTIVES

1.2.1 To study on data transfer between RFID system and Visual Basic 6

The data that was read by RFID reader will communicate with interface on Visual Basic 6 for display and to compare with database.

1.2.2 To develop graphical user interface (GUI) using Visual Basic 6 that will integrate with RFID system to capture and record student attendance

The main objective is to developed student attendance with RFID system. We need to build interface that will integrate with RFID system and will show the card code. Another interface also need to capture and record student attendance.

1.3 PROJECT SCOPE

The main goal of this project is develop a student attendance using RFID technology. There is 2 scope will be cover in this project. Firstly is to use appropriate RFID Tag & Reader for this application. Secondly is to design GUI to integrate with RFID technology.

1.3.1 Use appropriate RFID Tag & Reader for this application

There are lots of RFID reader and tag sold at market. Not only brand, but also frequencies of the RFID itself need to be considered. Since this system will be applied to a university, the RFID reader must used same frequencies as university student ID card. For Univesiti Malaysia Pahang, the type of tag/student card is MIFARE type and its frequency is 13.65MHz.

1.3.2 Design and implement a system in student attendance using RFID

The RFID reader will use to detect the student ID card code. The code will use to compare with Access database and the information in database will be display and store by using interface on Visual Basic 6.

1.4 THESIS OVERVIEW

This “Student Attendance Using RFID System” final thesis is a combination of 6 chapters that contains and elaborates specific topics such as the Introduction, Literature Review, Hardware Design, Software Development, Result, Discussion, Conclusion and Further Development that can be applied in this project.

Chapter 1 basically is an introduction of the project. In this chapter, the discussion is all about the background and objectives of the project. The overall overview of the entire project also will be discussed in this chapter.

Chapter 2 will be discussed about the literature review for the development of the Student Attendance Using RFID System. Everything related to the project will be describe generally in this chapter.

Chapter 3 will be focused on hardware design of the Student Attendance Using RFID System. This chapter included seven subtopics. The entire hardware used in this project will be discussed briefly.

Chapter 4 will be discussed about the software development of the *Graphical User Interface* (GUI) and *Microsoft Access*. In this section, all basic programming will be explained with a sample programming.

Chapter 5 discusses all the results obtained and discussion of the project. The main flow chart for this project will be explained briefly under this topic.

Chapter 6 discusses the conclusion and further development of the project. This chapter also discusses about total costing involved and potential of this project for commercialization.

CHAPTER 2

LITERATURE REVIEW

INTRODUCTION

Student Attendance Using RFID System is automatic record of student attendance develops especially for university. This system consists of two modules which are **RFID module and Visual Basic 6 module**. Both modules will be combined together in order for this system fully functioning. Each module carries own function and special features which will be discussed in detail in this chapter. Figure 2.0 show overall block diagram of the system.

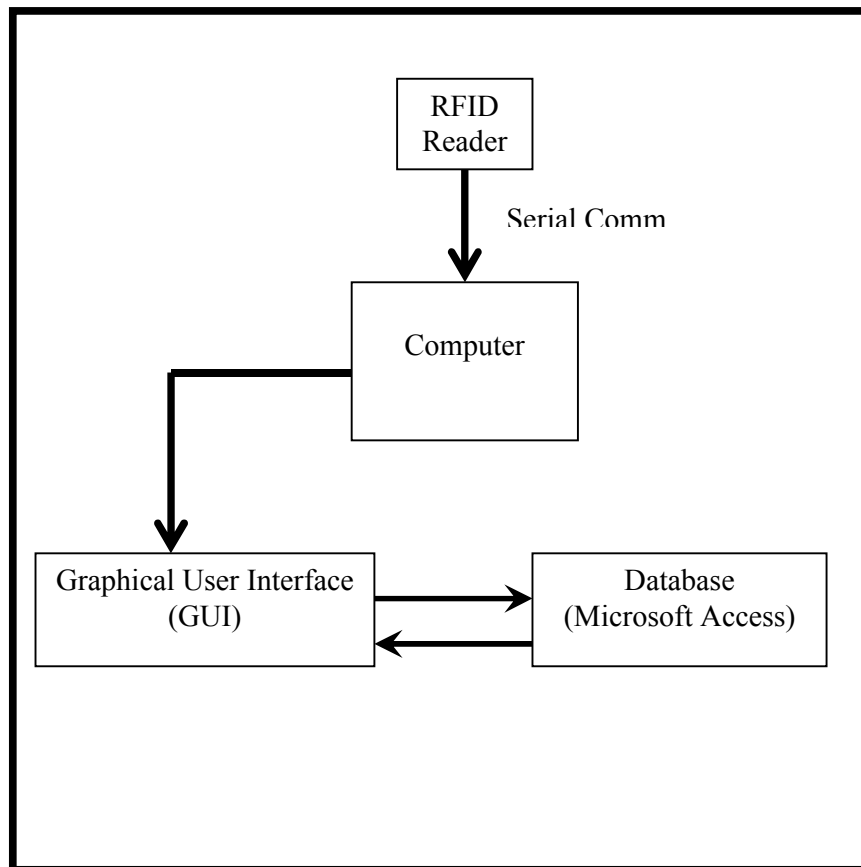


Figure 2.0: Overall System of Student Attendance Using RFID System and Student Card

2.1 RFID MODULE

2.1.1 History of RFID

It's generally said that the roots of radio frequency identification technology can be traced back to World War II. The Germans, Japanese, Americans and British were all using radar which had been discovered in 1935 by Scottish physicist Sir Robert Alexander Watson-Watt to warn of approaching planes while they were still miles away. The problem was there was no way to identify which planes belonged to the enemy and which were a country's own pilots returning from a mission.

Radio Frequency Identification (RFID) research and discovery began in earnest in the 1970s. RFID is commonly used to transmit and receive information without wires. RFID readers and tags communicate through a distance using radio waves. There are a lot of advantages in RFID system, included their price, size, memory capacity and their capability. The pure memory-based RFID chip without a co-processor is cheap, and its footprint is small and usually use in car immobilizer applications where the IC has to fit in a tiny glass tube buried in the key. RFID fast processing speed is also essential.

Advances in radar and RF communications systems continued through the 1950s and 1960s. Scientists and academics in the United States, Europe and Japan did research and presented papers explaining how RF energy could be used to identify objects remotely. Companies began commercializing anti-theft systems that used radio waves to determine whether an item had been paid for or not. Electronic article surveillance tags, which are still used in packaging today, have a 1-bit tag. The bit is either on or off. If someone pays for the item, the bit is turned off, and a person can leave the store. But if the person doesn't pay and tries to walk out of the store, readers at the door detect the tag and sound an alarm.

The First RFID Patents Mario W. Cardullo claims to have received the first U.S. patent for an active RFID tag with rewritable memory on January 23, 1973. That same year, Charles Walton, a California entrepreneur, received a patent for a passive transponder used to unlock a door without a key. A card with an embedded

transponder communicated a signal to a reader near the door. When the reader detected a valid identity number stored within the RFID tag, the reader unlocked the door. Walton licensed the technology to Schlage Lock of San Francisco, a lock maker, and other companies.

Later, companies developed a low-frequency (125 kHz) system, featuring smaller transponders. A transponder encapsulated in glass could be injected under the cows' skin. This system is still used in cows around the world today. Low-frequency transponders were also put in cards and used to control the access to buildings.

Over time, companies commercialized 125 kHz systems and then moved up the radio spectrum to high frequency (13.56 MHz), which was unregulated and unused in most parts of the world. High frequency offered greater range and faster data transfer rates. Companies, particularly those in Europe, began using it to track reusable containers and other assets. Today, 13.56 MHz RFID systems are used for access control, payment systems (Mobile Speedpass) and contactless smart cards. They're also used as an anti-theft device in cars. A reader in the steering column reads the passive RFID tag in the plastic housing around the key. If it doesn't get the ID number it is programmed to look for, the car won't start.

In the early 1990s, IBM engineers developed and patented an ultra-high frequency (UHF) RFID system. UHF offered longer read range (up to 20 feet under good conditions) and faster data transfer. IBM did some early pilots with Wal-Mart, but never commercialized this technology. When it ran into financial trouble in the mid-1990s, IBM sold its patents to Intermec, a bar code systems provider. Intermec RFID systems have been installed in numerous different applications, from warehouse tracking to farming. But the technology was expensive at the time due to the low volume of sales and the lack of open, international standards.[3]

2.1.2 RFID Reader

The RFID reader sends a pulse of radio energy to the tag and listens for the tag's response. The tag detects this energy and sends back a response that contains the tag's serial number and possibly other information as well.

In simple RFID systems, the reader's pulse of energy functioned as an on-off switch; in more sophisticated systems, the reader's RF signal can contain commands to the tag, instructions to read or write memory that the tag contains, and even passwords.

Historically, RFID readers were designed to read only a particular kind of tag, but so-called *multimode readers* that can read many different kinds of tags are becoming increasingly popular.

RFID readers are usually on, continually transmitting radio energy and awaiting any tags that enter their field of operation. However, for some applications, this is unnecessary and could be undesirable in battery-powered devices that need to conserve energy. Thus, it is possible to configure an RFID reader so that it sends the radio pulse only in response to an external event. For example, most electronic toll collection systems have the reader constantly powered up so that every passing car will be recorded. On the other hand, RFID scanners used in veterinarian's offices are frequently equipped with triggers and power up only when the trigger is pulled.

Like the tags themselves, RFID readers come in many sizes. The largest readers might consist of a desktop personal computer with a special card through shielded cable. Such a reader would typically have a network connection as well so that it could report tags that it reads to other computers. The smallest readers are the size of a postage stamp and are designed to be embedded in mobile telephones. [4]

Nowadays lot of RFID reader sold with multiple brands such as Mifare, Hitachi, and Philip. Because of the major application used in worldwide, many systems require the simultaneous use of more than one operating frequency. Most systems available on the world market at present operate at one of the following frequencies or frequency ranges: below 135 kHz (125 kHz, 134.2kHz for example), 13.56MHz, UHF (860/960 MHz), 2.45GHz and 5.8GHz. The operating and control characteristics are different for each of these frequencies, and therefore each of them is more appropriate for certain types of application or certain countries.

2.1.3 RFID Tag

The tag, also known as the transponder (derived from the terms transmitter and responder), holds the data that is transmitted to the reader when the tag is interrogated by the reader. The most common tags today consist of an Integrated Circuit with memory, essentially a microprocessor chip. Other tags are chipless and have no onboard Integrated circuit. Chipless tags are more effective in applications where simpler range of functions is all that is required; although they can help achieve more accuracy and better detection range, at potentially lower cost than their Integrated Circuit-based counterparts. From here on out, we will use the term tag to mean Integrated Circuit-based tag. We will refer to chipless tags explicitly, when needed. [5]

RFID tags come in two general varieties which are passive and active tag. Passive tags require no internal power source, thus being pure passive devices (they are only active when a reader is nearby to power them), whereas active tags require a power source, usually a small battery.

2.1.3.1 Passive Tag

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 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 to both collect power from the incoming signal and also to transmit the outbound backscatter signal. The response of a passive RFID tag is not necessarily just an ID number; the tag chip can contain non-volatile EEPROM for storing data.

Passive tags have practical read distances ranging from about 10 cm (4 in.) (ISO 14443) up to a few meters (Electronic Product Code (EPC) and ISO 18000-6), depending on the chosen radio frequency and antenna design/size. Due to their simplicity in design they are also suitable for manufacture with a printing process for the antennas. The lack of an onboard power supply means that the device can be quite small: commercially available products exist that can be embedded in a sticker, or under the skin in the case of low frequency RFID tags. [2]

The major disadvantages of a passive RFID tag are:

- a) The tag can be read only at very short distances, typically a few feet at most. This greatly limits the device for certain applications.
- b) It may not be possible to include sensors that can use electricity for power.
- c) The tag remains readable for a very long time, even after the product to which the tag is attached has been sold and is no longer being tracked.

The advantages of a passive tag are:

- a) The tag functions without a battery; these tags have a useful life of twenty years or more.
- b) The tag is typically much less expensive to manufacture
- c) The tag is much smaller (some tags are the size of a grain of rice).
These tags have almost unlimited applications in consumer goods and other areas.

2.2 VISUAL BASIC 6 MODULE

In this module, *Visual Basic 6* is used to design the project interface and receive data from the RFID reader. The RFID reader will scan the code from the RFID card and will send the code to the visual basic. Then, *Visual Basic 6* will display the data on an interface. The Figure 2.1 shows an example interface designed using *Visual Basic 6*.

With visual programming, the programmer has the ability to create Graphical User Interface (GUI) by pointing and clicking with the mouse. Visual programming eliminates the need for the programmer to write code that generates the form, code for all the form's properties, code for form placement on the screen, code to create and place a Label on the form, code to change foreground and background colors, etc. All of this code provided as part of the project. The programmer does not need to be an expert Windows programmer to create functional Windows programs. The programmer create the GUI and writes code to describe what happen when the user interacts (clicks, press a key, double-click, etc) with the GUI. These notifications, called *events*, are passed into the program by Microsoft's Windows operating system.[1]

The screenshot shows a Windows-style application window titled "Book Titles - ADO Application". The window has a blue title bar with standard minimize, maximize, and close buttons. The main area is a light beige form. At the top center of the form is a label "Book Titles" in a bold, black font. To the right of this label is a list box labeled "Books" with four navigation arrows (back, forward, first, last) on either side. Below the list box is a large text box labeled "Title:" containing the text "dBASEIV : A Practical Guide". Below this is a horizontal line. Underneath the line are four text boxes: "Year Published" with the value "1985", "ISBN:" with the value "0-0038307-6-4", "Publisher's ID" with the value "469", and "Subject:" with the value "N/A". At the bottom of the form is a row of buttons: "Save", "Add", "Delete", "Cancel", two navigation arrows (less than and greater than), and "Exit".

Figure 2.1: Example interface design by *Visual Basic 6*