STUDENT ATTENDANCE USING RFID SYSTEM

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"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)"

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

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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 : _____

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Date : _____

Specially dedicated to

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

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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 pansyarah 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 bersedai, 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.

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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

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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.

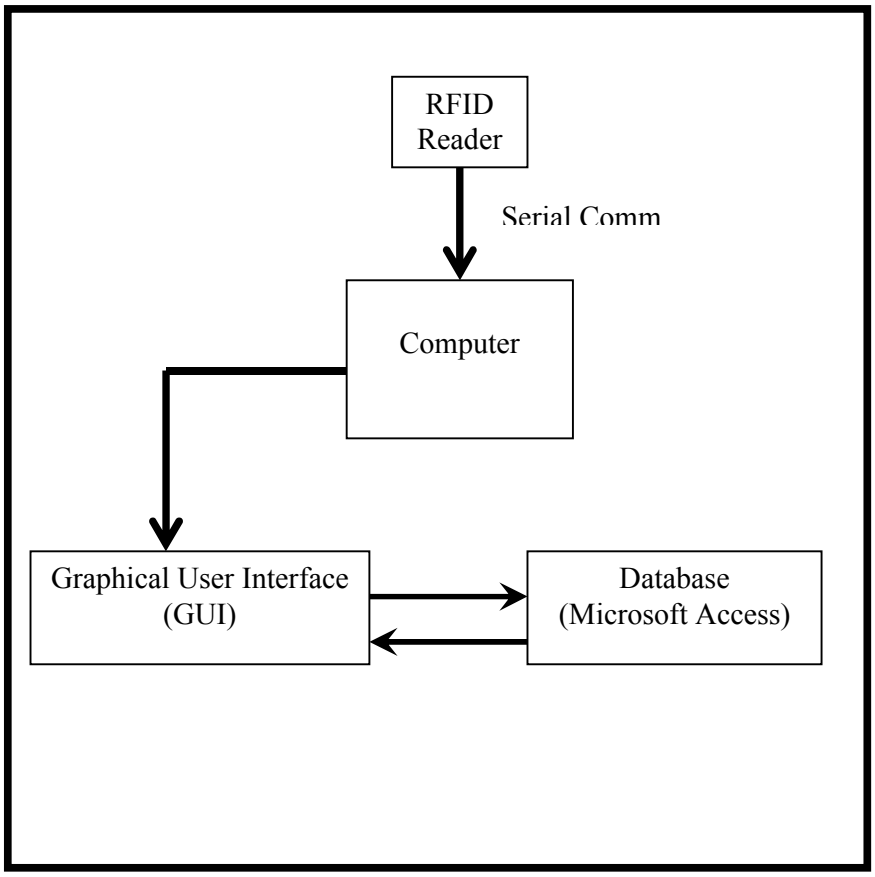

Figure 2.0: Overall System of Student Attendance Using RFID System and Student Card

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 reader were designed to read only a particular king 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 the only when the trigger is pulled.

Like the tag themselves, RFID readers come in many size. 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.