

RADIO FREQUENCY IDENTIFICATION (RFID) ENABLED DOOR ACCESS
CONTROL SYSTEM

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN
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PROJEK SARJANA MUDA II

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To My Beloved Father and Mother

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ABSTRACT

Radio Frequency Identification (RFID) Enable Door Control System is a system that can control open and close a door. This system is using RFID technology that is an automatic identification method. This method is relying on storing and remotely retrieving data using devices called RFID tags. The system is build to increase safety level in a building includes our home. The system involved two parts there are hardware and software. For hardware, RFID reader and RFID tag are used. Besides, microcontroller is used as control centre for entire system. Software part is how to build a command to control the system. One programming is built by using C language. From this project, we see how a RFID control to lock and unlock a door by using microcontroller as control centre.

ABSTRAK

Sistem kawalan pintu dengan aplikasi Pengenalan Frekuensi Radio (RFID) adalah satu sistem yang berkebolehan untuk mengawal pembukaan dan penutupan pintu. Sistem ini menggunakan teknologi RFID yang merupakan kaedah pengenalan automatik. Kaedah ini berasaskan penyimpanan pengawalan data yang diterima daripada alat yang dikenali sebagai tag RFID. Maka sistem ini direka untuk meningkatkan tahap keselamatan di bangunan termasuk di rumah. Sistem ini mengandungi dua bahagian iaitu perkakasan dan perisian. Untuk perkakasan, pembaca RFID dan tag akan digunakan. Selain itu ialah pengawal mikro yang bertindak sebagai pusat kawalan untuk seluruh sistem. Satu arahan akan dibangunkan dengan menggunakan bahasa C. Pada projek ini kita akan dapat melihat bagaimana RFID mengawal pembukaan dan penutupan sesebuah pintu.

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CHAPTER I

PROJECT INTRODUCTION

Automatic Identification and Data Capture (AIDC) are methods of automatically identifying objects, collecting data about them, and entering that data directly into computer systems. Technologies typically considered as part of AIDC include bar codes, Radio Frequency Identification, biometrics, magnetic stripes, Optical Character Recognition, smart cards, and voice recognition. Radio Frequency Identification (RFID) is a generic term for non-contacting technologies that use radiowaves to automatically identify people or objects. There are several methods of identification, but the most common is to store a unique serial number that identifies a person or object on a microchip that is attached to an antenna.

1.1 Introduction

The combined antenna and microchip are called an RFID transponder or RFID tag and work in combination with an RFID reader. An RFID system consists of a reader and one or more tags. The reader's antenna is used to transmit radio frequency (RF) energy. Depending on the tag type, the energy is absorbed by the tag's antenna and used to power up the internal circuitry of the tag. The tag will then modulate the

electromagnetic waves generated by the reader in order to transmit its data back to the reader. The reader receives the modulated waves and converts them into digital data. In the case of the Parallax RFID Reader Module, correctly received digital data is sent serially through the SOUT pin.

As for the practical usage in this project, a prototype will be developing by using RFID technology. RFID Enable Door Control System use radio frequency as transmission medium to communicate between the RFID reader and the transponder. RFID tag has a unique ID to be detected by RFID reader. Radio frequencies which transmit data will provide power to the tag and send back the data in it to reader. This prototype hopes will be replacing the conventional and physical door lock and unlock.

1.2 Problem Statement

Door access system today has several problems and impractical to secure a building or house:

- i) The key can duplicate and the door can open even without the key by using several methods.
- ii) The door knob is easy to break. This type of door also low of usability.
- iii) The door knob is not simplicity to the user and very low to authentication.

1.3 Project Objectives

The aims of this project are:

- i) To build a control access system to control close and open of a door by using RFID technology.

- ii) This project also attempts to do a detailed research about the RFID technology. The research will consist of various topics such as the concept and theory of RFID, components in RFID and etc.
- iii) To develop a C programming to control process in microcontroller.

1.4 Project Scope

This project is divided into two parts; hardware and software development. Hardware device is consisting of RFID reader as a main element while the software is to build a C programming to be installed in a Peripheral Interface User (PIC). This coding acts as command to a circuit which control open and close of the door.

1.5 Project Methodology

The project planning and development divided into three (3) parts which are research and finding, hardware implementation and software development. The research part will consist about what is RFID technology and microcontroller. In hardware part, it will involve the usage of RFID module component that contains the transmitter and passive tags. In this part also includes detail of RFID reader and RFID transponder. Last part is software development. C language will be used to develop a coding to be burn into the microcontroller. In this part, there are some details about C language.

1.6 Thesis Overview

In this part, it will discussed about the summary or overview for each chapter contained in this report. Chapter I will be discussed about about the introduction of this project. There are problem statements, objectives of the project, project scope and project methodology. In chapter I also consists the summary of this report.

Chapter II is discussing about literature research and review which contains of introduction of RFID technology. This is including history of RFID, how RFID works, RFID tags and etc. Chapter II will make us clear about RFID.

For chapter III, the methodology and development of the project will be discussed. Covering in this chapter are the flowchart of project methodology which will summarize the overall application of the system. The subtopics are also will be cover which are the hardware and software parts.

Result and discussion of the project is covering in chapter IV. All the findings and analysis will be discuss in this chapter to determine whether it has cover the overall objectives of the project.

Finally, in chapter V the conclusion for the project is made and suggestion and enhancement are discussed for further implementation and upgrading the system itself.

CHAPTER I

PROJECT INTRODUCTION

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CHAPTER II

LITERATURE RESEARCH AND REVIEW

Radio frequency identification (RFID) is one of the buzzwords receiving a lot of coverage in the IT world lately. An RFID system is an identification system that uses radio waves to retrieve data from a tag or a transponder. RFID is all around us in our daily lives-in the supermarkets, libraries, bookstores and so on. RFID provides a quick and efficient way to collect information, such as stocktaking in a warehouse or tracking of the whereabouts of items or attending class system. The purpose of an RFID system is to enable data to be transmitted by a tag which is read by an RRID reader and processed according to the needs of a particular application.

2.1 Door Access Control System

Door-access control system is a physical security system that assures the security of a room or building. In Malaysia, most popular door access control is door knob. This door access control is very ordinary and not ensures the safety of a building.

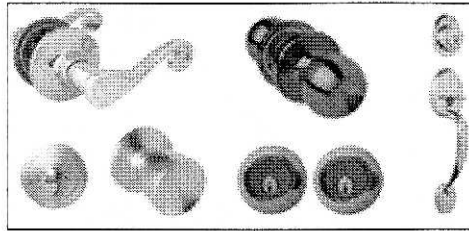


Figure 2.1: Door knob [5]

2.1.1 Smart Card System

Smart cards have been accepted as the credential of choice for securely controlling physical access in Malaysia. Smart identification (ID) cards can be used to easily authenticate a person's identity, determine the appropriate level of access and physically admit the cardholder to a facility. As Malaysian we have our own smart cards; My Card. Through the appropriate use of smart card technology in overall physical access system design, security professionals can implement the strongest possible security policies for any situation.

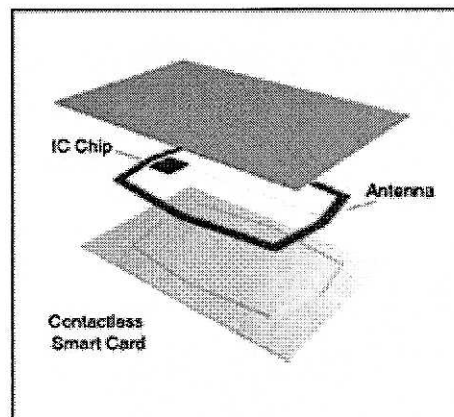


Figure 2.2: Smart card design [6]

Smart card can support for multiple applications. Smart cards not only secure access to physical or logical resources, they also can store data about the cardholder, certify transactions and track ID holder activities for audit purposes. Smart card

technology is based on mature standards (contact or contactless). Cards complying with these standards are developed commercially and have an established market presence.

2.1.2 Biometric Control System

Biometrics is a process of identifying a person by their unique and measurable human characteristics. Biometrics authentication uses information specific to a person's body in order to assure a high level of security that makes it difficult for a stranger to impersonate that person. Biometric methods used for personal authentication utilize such features as the face, the voice, the hand shape, the fingerprints, and the iris. Each method has particular characteristics and can be categorized in terms of usability and security. The main parameters for assessing usability can be summed up as follows [7]:

- i) Simplicity for the user
- ii) Feeling of resistance
- iii) Speed of authentication
- iv) Level of false-rejection rate

And the main parameters for assessing security can be summed up as follows [8]:

- i) Difficulty of acquiring biological data
- ii) Difficulty of forgery
- iii) Level of false-acceptance rate

There are 4 types of biometric access control system:

- i) Hand geometry
- ii) Fingerprint
- iii) Finger vein
- iv) Iris

The physical dimensions of a human hand contain information that is capable of authenticating the identity of an individual. This information has been popularly known as hand or palm geometry; the hand geometry based identity verification systems are being widely used in a number of access control, time and attendance, and point-of-sale applications.



Figure 2.3: Hand geometric biometrics for access control [9]

The first applications for hand scanners were as access control components. The availability of low cost, high speed processors and solid state electronics made it possible to produce hand scanners at a cost that made them affordable in the commercial access control market. At first, systems providers installed hand scanners in the stand-alone mode. The products contained basic access control functions such as time zones, alarm inputs and outputs, duress, and request for exit functions.

The second of biometric access system is fingerprint authentication. When a person places their finger on a special semiconductor pad, their fingerprint is extracted and its image is analyzed. The analysis result is then checked against that person's previously registered fingerprint for authentication. Being easy to operate by means of a compact device, this method is widely used as a replacement for PC passwords.

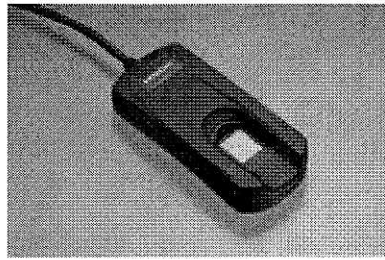


Figure 2.4: Fingerprint sensor [10]

Other biometric access control system is finger-vein. The basic principle on which the finger-vein authentication system is based is shown in Figure 2.5. Near infrared rays generated from a bank of LED penetrate the finger and are absorbed by the hemoglobin in the blood. The areas in which the rays are absorbed thus appear as dark areas in an image taken by a CCD camera located on the opposite side of the finger. Image processing can then construct a finger-vein pattern from the camera image. This pattern is then compressed and digitized so that it can be registered as a template of a person's biometric authentication data. The finger-vein pattern and the template can be authenticated by means of a pattern-matching technique.

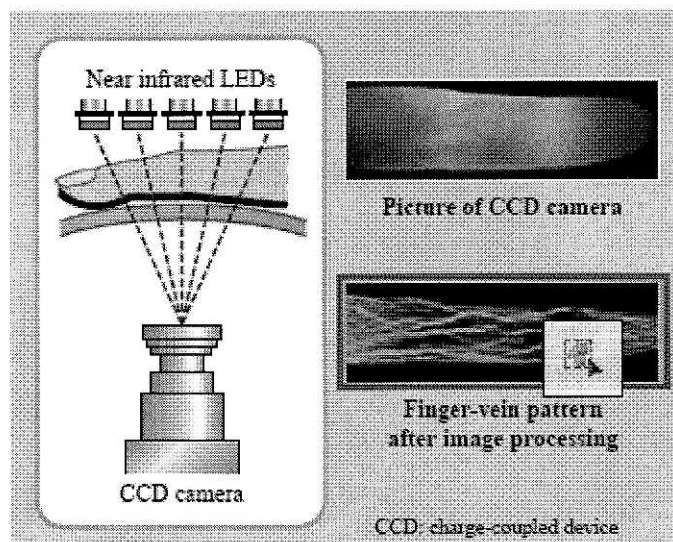


Figure 2.5: Theory of finger vein authentication [11]