DOOR ACCESS USING SMART CARD

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To my Beloved Family and Friends

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ABSTRACT

Smart Card has become the necessity in modern lifestyle. The main objective of this project is to access an electronically locked door, at the same time to create a log inside the database about the visitations done by the card users, for tracking purposes. The software used to run the project are Microsoft Access for the databases and the interface, and ZeitControl Professional IDE for the smart card. The program was designed in such a way it is available to both card customers and administrators.

ABSTRAK

Kad Pintar telah menjadi satu keperluan dalam kehidupan modern. Objektif utama projek ini ialah untuk membuka kunci pintu elektronik, pada masa yang sama menghasilkan log ke dalam pangkalan data mengenai lawatan-lawatan ke pintu yang dibuat oleh penguna kad, agar dapat disemak balik. Perisian yang digunakan untuk menjalankan projek ini ialah Microsoft Access untuk menghasilkan pangkalan data dan antara muka, serta ZeitControl Professional IDE untuk kad pintar. Program tersebut direkabentuk sebegitu supaya dapat digunakan oleh kedua-dua pihak yakni pengguna dan pentadbir

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CHAPTER 1

INTRODUCTION

1.1 Background

Smart Cards are known to be useful in providing data transfer and carrying business in a convenient way, but with security features. As a credit-card sized plastic card with an advance internal electronic circuits, smart cards find their use in variety of applications ranging from access and security to retailing.

The author's project is a smart card system used for door accessing. In order to unlock the door, the smart card user must insert the smart card for the reader to verify its identity (ID) code.

1.2 The Need for Security

Unauthorized access to a premise, room or information is happening everyday. Because of this, the demand for security to protect the concerned property is increasingly high. One way to meet the needs of security and to solve the problem of unauthorized access is using smart card door access system.

1.3 Objectives/ Purposes of Project

The main objective of the project is to develop a smart card door access system, to meet the basic demand for security today.

To do this, the author is to achieve the following requirements, which are derived as micro objectives of this project:

- Study and compare the smart card projects done by his senior students.
- Improve/modify the necessary part of the program of card reader that reads the information code from the smart card.
- Apply the implemented card reader program to a simulated door lock / apply the door access feature to the program to realize the project.

1.4 Project Overview

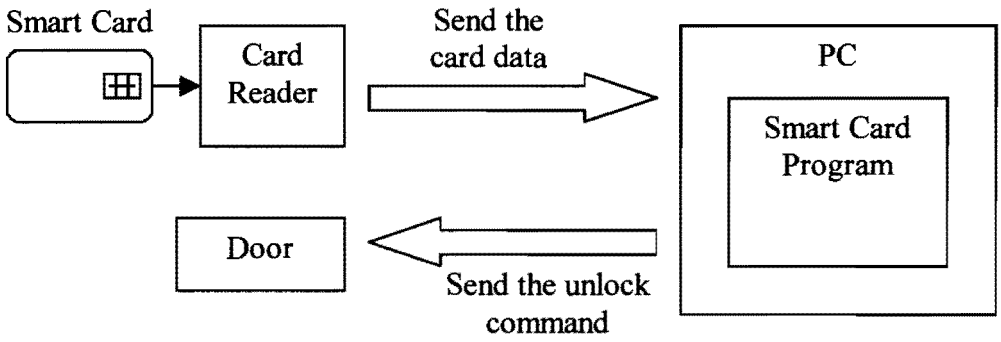

Figure 1.1 Outline of the Door Access using Smart Card System

Figure 1.1 shows the Outline of the Door Access using Smart Card System. The personal computer (PC) acts as a controller of the whole system, having smart card program running inside. It has the input port from the smart card reader, and output port to control the door lock.

When a card is inserted into the card reader, the PC will check the card to see if the card is a valid door access smart card. If it is not, the door remains locked.

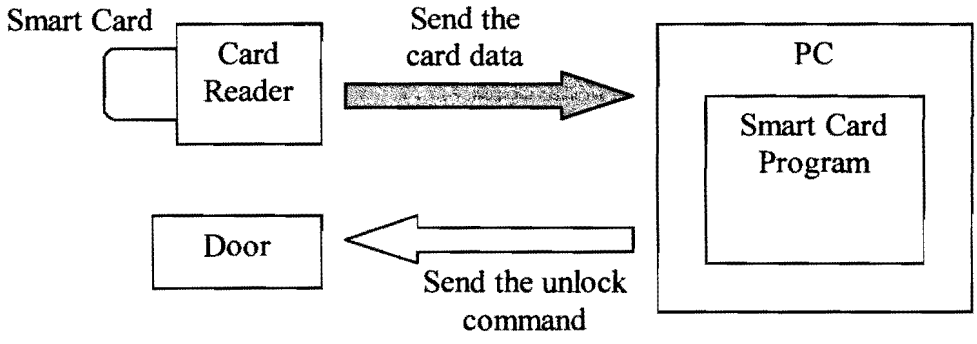

Figure 1.2 The reader inputs card's data to PC. The process stops there and does not proceed further if the card is found fake.

But if the card is found true, PC will send a signal to the output port to unlock the door (Figure 1.3). The user then will be able to open the door.

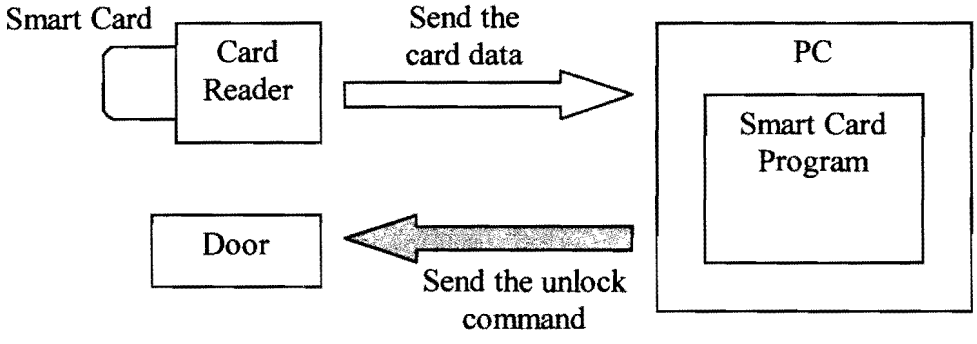

Figure 1.3 If the card is valid, then the PC sends signal to unlock the door.

After certain duration, The PC will output again a signal to relock the door, so that other unauthorized person could not open the door.

In the next few chapters, the author reviews on what he has learnt from literature about the components involved in the system, and intends to apply what he knows about the components to make the system work.

CHAPTER 2

THE SMART CARD AND READER

2.1 Overview of Smart Card

The term *Smart Card* is not new anymore to Malaysians than to other people from developed countries since the introduction of Government Multi-purpose Card (GMPC) in the Project of Multimedia Super Corridor (MSC). People has learnt of the use of this particular application of smart card as the integrated functions of traditional identity card (IC), phone card, credit card, bank card, and others.

Though smart card's existence has changed the way we live as much as any data communication networks [2-1], only few people got to know what a smart card is really defined as. In general, a smart card is in fact a plastic card, with the size same as of a credit card, but also with an embedded computer chip. The chip is either a microprocessor with internal memory or just a memory chip with non-programmable logic. The chip connection is either via direct physical contact or via contactless radio link (RF) [2-2]

2.2 Brief History of Smart Card

Smart Cards started off by their structure layout just patented in the seventies by Germany, Japan and France. The immaturity of semiconductor technology, as well as other minor factors caused the work on smart cards being confined at the research and development level at that time [2-3]. The beginning of eighties, in which semiconductor technology was becoming more advanced, allowed the smart

cards to be tested and verified to be high in performance and useful especially in applications like banking transactions and telephone prepaid business. Since then until now, massive production and intense improvement of smart cards have been carried on over the years.

2.3 Types of Smart Card

There are several ways to classify the types of smart card, depending on the particulars or the aspects to distinguish between them.

2.3.1 Classification 1: Internal Chip

Basing on the internal chip classification, Smart Cards can be divided into two types: memory cards and microprocessor cards.

2.3.1.1 Memory card

Memory card is basically an information storing card, which only store data and has no or little data processing capabilities [2-4]. The storage can be Erasable Programmable Read-Only Memory (EPROM), Electronically Erasable Programmable Read-Only Memory (EEPROM), or Flash memory (A faster read-write version of EEPROM).

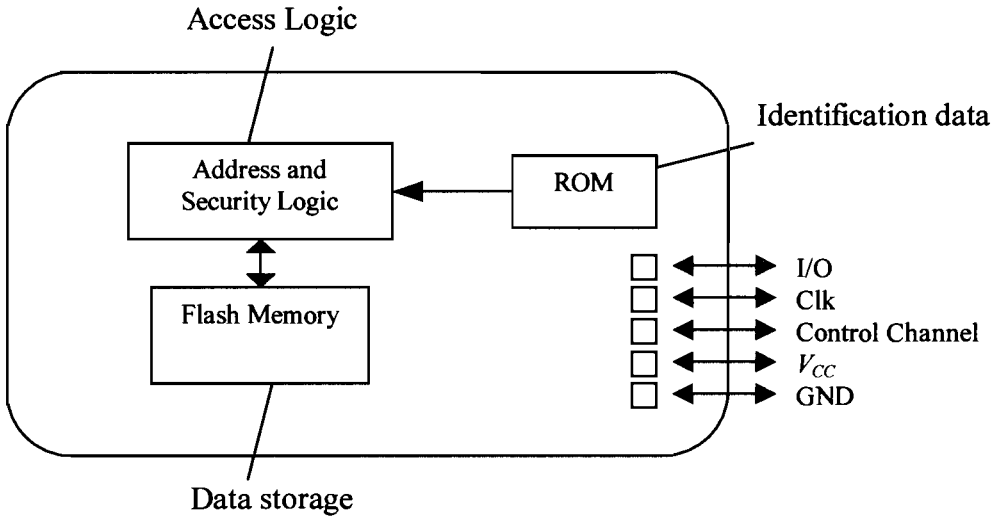

Figure 2.1 Typical architecture of a memory card with security logic [2-4]

Access to memory is controlled by security logic via the synchronous transmission protocol, a simple protocol consisting of only write or erase protection for the memory. The data is transmitted to and from the card via the I/O port. With low manufacturing cost, memory card finds its useful application in pre-paid phone service, health insurance and electronic payment, where the card will cease its function if all the internal memory units are used up, and can be reloaded by resetting the data with security code.

2.3.1.2 Microprocessor Card

Unlike memory card, which uses address and security logic to do nothing more than accessing data, a *microprocessor card* has a processor inside it to process data as well as manage data storage. It has also other functional blocks like Flash memory, I/O port, mask-ROM and RAM.

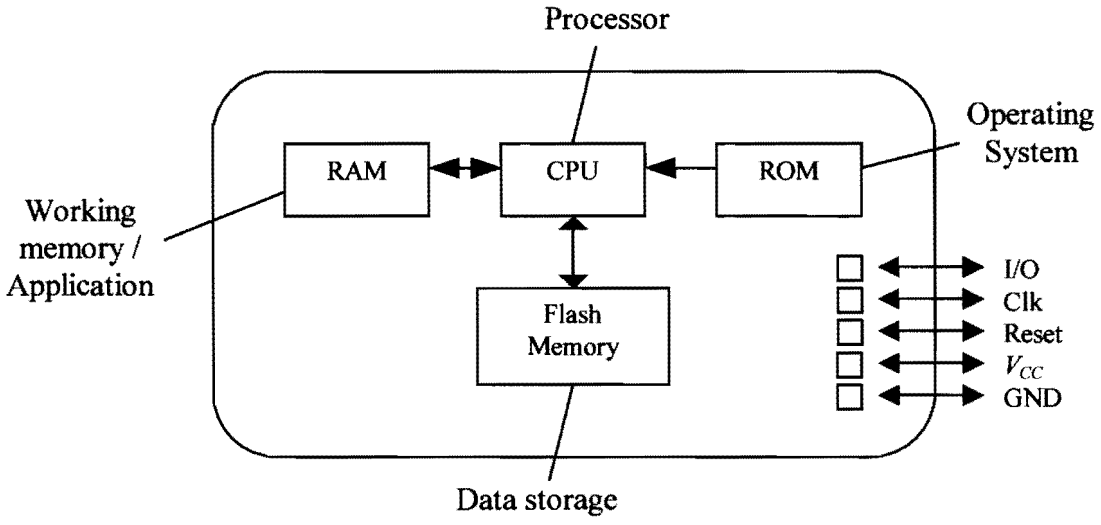

Figure 2.2 Typical architecture of microprocessor card [2-5]

Beside data processing and storage management, the Central Processing Unit (CPU), or processor, makes decisions by the needs of card issuer's specific applications. With the ability to add, delete and otherwise manipulate information in its memory, microprocessor cards can be added with new applications or reinstall certain applications to increase its functionality, provided that the processing capacity (RAM) and storage capacity (Flash memory) is large enough. Because of these, microprocessor card is more flexible in use and high in security, but with the expanse of its cost. Today's uses of microprocessor card include bank card with advance security feature, multi-purpose card, and smart antenna card.

2.3.2 Classification 2: Physical Characteristics

Smart card can also be classified into three distinctive groups according to its physical characteristics: contact, contactless, and combination of both.

2.3.2.1 Contact Smart Card

Contact smart card requires insertion into a smart card reader in order to make a direct physical connection to a conductive micro-module on the surface of the card, which is typically gold platted. After the connection between the contacts of the card and the reader is made, data transfer to and from the chip is able to take place.

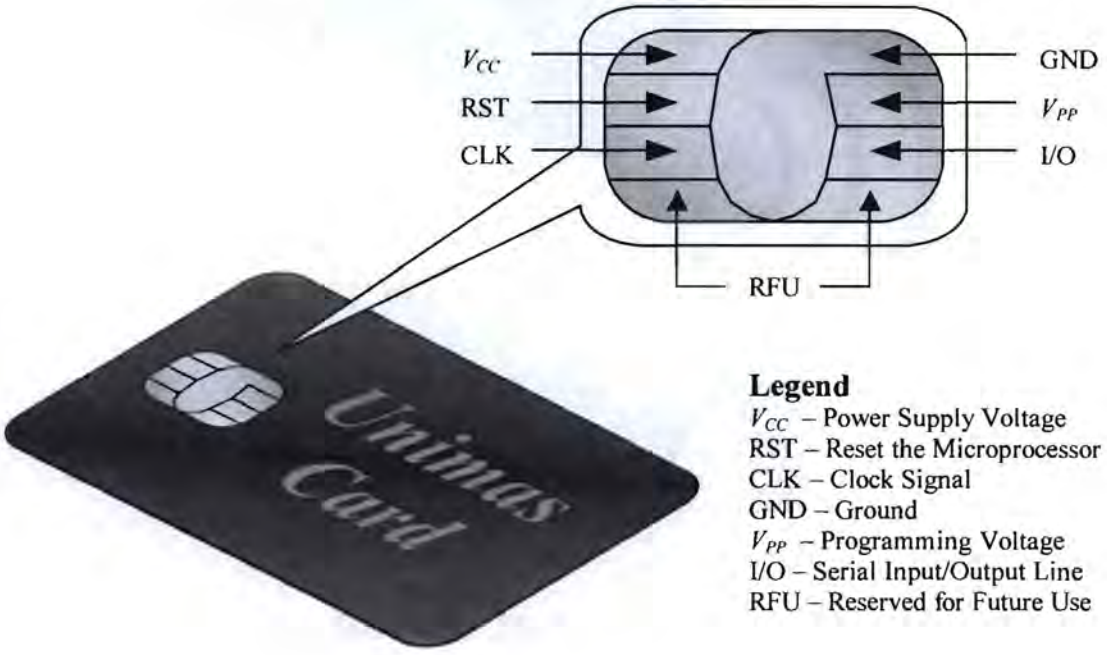

Figure 2.3 Contact Smart Card and its Micro-module contact points [2-6]

2.3.2.2 Contactless Smart Card

Instead of making direct physical connection with card reader, the *contactless smart card* communicates with the reader via radio link. Therefore a contactless smart card requires an antenna connected to its chip, sandwiched by top and bottom layers of the card. To be read by the reader, the card must be placed in close