Fingerprint-based attendance monitoring system / Mohd Adlisyah Mohd Ramli.

FINGERPRINT-BASED ATTENDANCE MONITORING SYSTEM

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Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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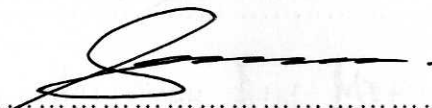Ayer Keroh, 75450 Melaka

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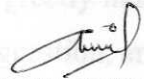
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ABSTRACT

This project is about to develop a portable attendance monitoring system based on fingerprint identification that can be used to monitor attendance of students. This project will utilize a portable fingerprint scanner as the input to acquire fingerprint images and a notebook personal computer as the mobile terminal to process the images and record the attendance. When fingerprint is scan on fingerprint scanner, the fingerprint images will be sent into personal computer and will be match with database that has been develop in the personal computer. This project is also need to develop a program that has fingerprint recognition and identification function as well as database to store student's information and attendance records. In the database there will be a lot of information about the fingerprint such as fingerprint pattern, fingerprint classification, fingerprint identification, fingerprint reference point and others. All of this is to match the input fingerprint images with the fingerprint images in the database. This project is using Visual Basic.net software. Then the develop system will be simulating before integrated with hardware/fingerprint scanner. After that, software and hardware will be simulating together to make sure the portable attendance monitoring system will fully functioning.

ABSTRAK

Projek ini adalah untuk mewujudkan sebuah sistem pemantauan kehadiran pelajar berdasarkan penggunaan cap jari sebagai input. Projek ini menggunakan pengimbas cap jari mudah alih untuk mengimbas imej cap jari dan komputer akan digunakan sebagai pengkalan untuk memproses dan menyimpan kehadiran pelajar sebagai rekod. Apabila cap jari diletakkan diatas pengimbas cap jari, imej cap jari akan diimbas oleh komputer dan dibuat perbandingan dengan imej cap jari yang terdapat di dalam pengkalan data. Projek ini juga dibangunkan bersama sistem yang berfungsi untuk mengenalpasti cap jari dan juga pengkalan data untuk menyimpan maklumat pelajar. Di dalam pengkalan data terdapat banyak maklumat tentang cap jari seperti corak cap jari, klasifikasi cap jari, pengenalpastian cap jari, titik rujukan cap jari dan lain-lain. Semua maklumat ini akan digunakan untuk membuat perbandingan antara imej daripada pengimbas cap jari dengan imej yang terdapat di dalam pengkalan data. Projek ini dibangunkan menggunakan perisian Visual Basic.Net. "Software" sistem ini ini akan di simulasi dengan "Hardware" supaya ianya dapat berfungsi dengan baik.

CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATION

UteM	-	Universiti Teknikal Malaysia Melaka
ATM	-	Auto Teller Machine
PIN	-	Personal Identification Number
IAFIS	-	Integrated Automated Fingerprint Identification System
DNA	-	Deoxyribonucleic Acid
NIST-4	-	National Institute of Standards and Technology
TRW	-	Thompson Ramo Wooldridge Inc
USB	-	Universal Serial Bus
DB	-	Database
ID	-	Identity

CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is about to develop a portable attendance monitoring system based on fingerprint identification that can be used to monitor attendance of students. This project will utilize a portable fingerprint scanner as the input to acquire fingerprint images and a notebook personal computer as the mobile terminal to process the images and record the attendance. When fingerprint is scan on fingerprint scanner, the fingerprint images will be sent into personal computer and will be match with database that has been develop in the personal computer. This project is also need to develop a program that has fingerprint recognition and identification function as well as database to store student's information and attendance records. This project will use Visual Basic.net to develop software.

1.2 Project Objectives

To develop software for fingerprint identification and database to store student's information and attendance records. This software will be use on attendance system in UTeM.

To develop a portable attendance monitoring system based on fingerprint identification. This system will be use to replaced an already attendance system in UTeM.

To upgrade the attendance system that use in UTeM to be more secure. An old system is using signature as the reference that is very easy to be cheated. This system is using fingerprint as the input that is very hard to cheat because everyone has their own unique fingerprint that will not same with others. So this is more secure than the signature system.

To learn about Visual Basic.net 2005 software from the basic to develop this project. This system is fully developed using Visual Basic.Net. So to develop this system, we must learn Visual Basic.Net from the beginning/basic.

1.3   Problem Statements

A fixed fingerprint system for student identification is expensive. So, this low-cost portable attendance monitoring system is more suitable to use.

Others fingerprint identification is uneasy to carry from one place to other because the size is quite big or it had been fixed. So, this portable attendance monitoring system is portable and easy to carry from one place to other. It is also suitable to use in the classroom.

The attendance system that now use in the classroom (signature system) is not too secure because some students can copy other student's signature. So that, an absent students can ask a help from other student to duplicate their signature on attendance sheet. So, this portable attendance monitoring system is more secure because it uses the fingerprint as attendance system. As all know, one person fingerprint is different from other person. So that it is almost impossible for students to help other students that are absent.

1.4   Scopes of Work

Firstly, identify the common problem that all always happen to the attendance system that is use in UTeM. Then, think a solution for that problem. There are a few method that can be use to upgrade the attendance system in UTeM. So that, choose the best solution to that problem considering on cost, effectively of the hardware and how easy to use the system.

After considering the entire factor, choose to use fingerprint method as a solution to the attendance system problem in UTeM. The main reason choosing this method because all people have their own unique fingerprint patents that cannot be copy or same with other people and fingerprint is always carried by people wherever they go. So that there are no season for someone to give excuse if there are any problem with their attendance records.

In overall, scopes of work is to develop a software for fingerprint recognition and identification as well as database to store student's information and attendance records using Visual Basic.net and the software will be integrated with portable fingerprint scanner to produce a portable attendance monitoring system.

Because fingerprint is the subject, so a lot of information for fingerprint to find as well as for Visual Basic.net. This includes of figures, calculation, example and others that are related to it.

1.5   Methodology

There are a few methods that be used to develop this project. The methods such as Literature Review, software development, software simulation/testing/troubleshooting, software and hardware integration and software and hardware simulation/testing/troubleshooting.

For literature review, information searching for this project from internet, books and journal and we also learn how to use Visual Basic.net software properly. In software development, using Visual Basic.Net 2005 to develop software to identify, capturing and classify the fingerprint. Developing the database using Microsoft access.

Then, in software simulation/testing/troubleshooting, simulating the software either it can perform as we expected. Next, for software and hardware integration, integrating hardware and software so that can make sure it can fully function.

In software and hardware simulation/testing/troubleshooting, make sure that the software and hardware can perform as expected. Also can detect if there is any problem occur after run this program.

1.6   Report Structure

In this report consist five chapters that will describe more clearly about things that will be considered in this project. Chapter one briefly state on project background. Besides that, this chapter also describe about project background, project objectives, problem statements, scope of work and methodology brief information.

Second chapter will describe about literature review of the project. In this literature review, it will describe about introduction and theory about this project. The third chapter will describe about project methodology. In this chapter, it will show the flow to develop and carry out the project. This includes project flowchart and system flowchart.

The forth chapter is results and discussion. This chapter will describe the result of the project. These include analysis of the system and also figure of the entire project including database. The fifth chapter is conclusion and suggestion. This chapter consist conclusion of the project and a few suggestions to improve this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to Fingerprint

The earliest reference to fingerprints can be found in clay tablets from the Babylonian era around 2000 B.C. consider the use of fingerprints by the British government to document workers in India during the 1870s.

From a corporate perspective, using fingerprints in this fashion provided a reliable means for determining whether a person had already been paid. From the perspective of the day laborer, this mechanism offered a great deal of protection by ensuring that no one else could be paid in his or her stead.

But fingerprint is expected to be the most widely deployed method in years to come because of its ease of use, field-proven accuracy and cost of implementation.

The digitization of biometrics started in the 1970s. Before this time, government agencies, such as law enforcement, used paper and ink to capture fingerprints and transparent slides to compare different fingerprints.

Another prominent application, time and attendance, links access to payroll systems to prevent individuals from buddy punching time clocks. While some people

lost the ability to cheat on their time cards, others gained the ability to more reliably register their work.

Today, more than 1,300 primary schools in the United Kingdom use fingerprint technology in their libraries, replacing old password-based systems. In several sites from Philadelphia to Sweden, schools are using fingerprint scanning anywhere from controlling computer access to protecting children's lunch money by linking lunch expenses to the child's fingerprint. The state of Texas uses biometrics to prevent welfare recipients from double-dipping with multiple identities. Grocery stores are now conducting trials to allow users to enroll their credit or debit card with their fingerprint so that they can self-check and self-pay. An added benefit is that users can now buy groceries without a wallet or purse.

Imagine how convenient it would be to activate the security alarm at your home with the touch of a finger, or to enter your home by just placing your hand on the door handle. How would you like to walk up to a nearby ATM which will scan your iris so you can withdraw money without ever inserting a card or entering a PIN. You will basically be able to gain access to everything you are authorized to, by presenting yourself as your identity.

This scenario might not be as far off as we might expect. In the near future, we may no longer use passwords and PIN numbers to authenticate ourselves. These methods have proven to be insecure and unsafe time and time again.

2.2   What is Fingerprint?

A fingerprint is an impression of the friction ridges of all or any part of the finger. A friction ridge is a raised portion of the epidermis on the palmar (palm and fingers) or plantar (sole and toes) skin, consisting of one or more connected ridge units of friction ridge skin. These ridges are sometimes known as "dermal ridges" or "dermal papillae". Fingerprints may be deposited in natural secretions from the eccrine glands present in friction ridge skin (secretions consisting primarily of water) or they may be made by ink or other contaminants transferred from the peaks of

friction skin ridges to a relatively smooth surface such as a fingerprint card. The term fingerprint normally refers to impressions transferred from the pad on the last joint of fingers and thumbs, though fingerprint cards also typically record portions of lower joint areas of the fingers (which are also used to make identifications).

A fingerprint is an impression normally made by ink or contaminants transferred from the peaks of friction skin ridges to a relatively smooth surface such as a fingerprint card. These ridges are sometimes known as "dermal ridges" or "dermal papillae". The term fingerprint normally refers to impressions transferred from the pad on the last joint of fingers and thumbs, though fingerprint cards also typically record portions of lower joint areas of the fingers (which are also used to effect identifications). Friction skin ridges are not unique to humans, however, and some species of primate also have friction skin ridges on "fingers" and paws in configurations sometimes similar to human friction ridge skin. Some New World monkeys also have friction ridge skin on their tails, possibly associated with use of their tails for gripping during climbing, and the knuckle-walking great apes have friction ridge skin on the dorsal surfaces of their fingers. Friction skin ridges on humans are commonly believed to provide traction for grasping objects. In the over 100 years that fingerprints have been examined and compared, no two areas of friction ridge skin on any two fingers or palms (including between identical twins) have been found to have the same friction ridge characteristics.

A fingerprint is an impression of the friction ridges found on the inner surface of a finger or a thumb. The science of fingerprinting constitutes the only unchangeable and infallible means of positive identification known to man. The reasons why fingerprints are used for identification purposes are outlined below. These premises are supported by scientific research in areas such as biology, embryology, anatomy and histology to name a few. Ridge patterns and the details in small areas of friction ridges are unique and never repeated. Friction ridges develop on the fetus in their definitive form before birth. Ridges are persistent throughout life except for permanent scarring. Friction ridge patterns vary within limits which allow for classification.

2.3   Fingerprint History

In 1686, Marcello Malpighi, a professor of anatomy at the University of Bologna, noted in his treatise; ridges, spirals and loops in fingerprints. He made no mention of their value as a tool for individual identification. A layer of skin was named after him; "Malpighi" layer, which is approximately 1.8mm thick.

In 1823, John Evangelist Purkinji, a professor of anatomy at the University of Breslau, published his thesis discussing 9 fingerprint patterns, but he too made no mention of the value of fingerprints for personal identification.

The English first began using fingerprints in July of 1858, when Sir William Herschel, Chief Magistrate of the Hooghly district in Jungipoor, India, first used fingerprints on native contracts. On a whim, and with no thought toward personal identification, Herschel had Rajyadhar Konai, a local businessman; impress his hand print on the back of a contract. The idea was merely ". . . to frighten [him] out of all thought of repudiating his signature." The native was suitably impressed, and Herschel made a habit of requiring palm prints--and later, simply the prints of the right Index and Middle fingers--on every contract made with the locals. Personal contact with the document, they believed, made the contract more binding than if they simply signed it. Thus, the first wide-scale, modern-day use of fingerprints was predicated, not upon scientific evidence, but upon superstitious beliefs. As his fingerprint collection grew, however, Herschel began to note that the inked impressions could, indeed, prove or disprove identity. While his experience with fingerprinting was admittedly limited, Sir Herschel's private conviction that all fingerprints were unique to the individual, as well as permanent throughout that individual's life, inspired him to expand their use.

During the 1870's, Dr. Henry Faulds, the British Surgeon-Superintendent of Tsukiji Hospital in Tokyo, Japan, took up the study of "skin-furrows" after noticing finger marks on specimens of "prehistoric" pottery. A learned and industrious man, Dr. Faulds not only recognized the importance of fingerprints as a means of identification, but devised a method of classification as well. In 1880, Faulds forwarded an explanation of his classification system and a sample of the forms he had designed for recording inked impressions, to Sir Charles Darwin. Darwin, in

advanced age and ill health, informed Dr. Faulds that he could be of no assistance to him, but promised to pass the materials on to his cousin, Francis Galton. Also in 1880, Dr. Faulds published an article in the Scientific Journal, "Nautre" (nature). He discussed fingerprints as a means of personal identification, and the use of printers ink as a method for obtaining such fingerprints. He is also credited with the first fingerprint identification of a greasy fingerprint left on an alcohol bottle.

In 1882, Gilbert Thompson of the U.S. Geological Survey in New Mexico used his own fingerprints on a document to prevent forgery. This is the first known use of fingerprints in the United States.

In Mark Twain's book, "Life on the Mississippi", a murderer was identified by the use of fingerprint identification. In a later book by Mark Twain, "Pudd'n Head Wilson", there was a dramatic court trial on fingerprint identification. A more recent movie was made from this book.

Sir Francis Galton, a British anthropologist and a cousin of Charles Darwin, began his observations of fingerprints as a means of identification in the 1880's. In 1892, he published his book, "Fingerprints", establishing the individuality and permanence of fingerprints. The book included the first classification system for fingerprints. Galton's primary interest in fingerprints was as an aid in determining heredity and racial background. While he soon discovered that fingerprints offered no firm clues to an individual's intelligence or genetic history, he was able to scientifically prove what Herschel and Faulds already suspected: that fingerprints do not change over the course of an individual's lifetime, and that no two fingerprints are exactly the same. According to his calculations, the odds of two individual fingerprints being the same were 1 in 64 billion. Galton identified the characteristics by which fingerprints can be identified. These same characteristics (minutia) are basically still in use today, and are often referred to as Galton's Details.

In 1891, Juan Vucetich, an Argentine Police Official, began the first fingerprint files based on Galton pattern types. At first, Vucetich included the Bertillon system with the files. In 1892, Juan Vucetich made the first criminal fingerprint identification. He was able to identify a woman by the name of Rojas, who had murdered her two sons, and cut her own throat in an attempt to place blame