REAL TIME DYNAMICS SIGNATURE VERIFICATION

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor Degree Of Electronic Engineering (Industrial Electronic) With Honours

Faculty of Electronic and Computer Engineering
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Special dedication to my loving father Othman Bin Yusuf , my mother Siti Sareah Binti Japri, all my siblings, my kind hearted supervisor Pn Fauziyah Binti Salehuddin, and my dearest friends.

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ABSTRACT

Real Time Dynamics Signature Verification is a process of verifying the writer's identity by using signature verification. This project highlights the development of signature verification system using Microsoft Visual Basic 6 to recognize the input signature from the stored samples in a text file. Signature verification technology requires primarily a digitizing tablet and a special pen connected to the Universal Serial Bus Port (USB port) of a computer. An individual can sign on the digitizing tablet using the special pen regardless of his signature size and position. The signature is characterized as pen-strokes consisting x-y coordinates and the data on the signature are stored in a text file. The components of a digital signature verification consists of a data acquisition module, a pre processing module, a normalization and re sampling module, a feature extraction module, a classifier module and a decision module. In this project the classifier used is the Support Vector Machine (SVM) and a new extractor is proposed consisting of time and pressure data, which provides of several more meaningful features of the signature.

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ABSTRAK

Real Time Dynamics Signature Verification adalah satu proses mengenlapasti tandantangan penulis. Projek ini mengetengahkan pembangunan sistem pengesahan menggunakan Microsoft Visual Basic 6.0 untuk mengenalpasti tandatangan masukan daripada contoh-contoh tandatangan yang disimpan dalam *text file.* Data tandatangan akan direkodkan dengan menggunakan *digitizing tablet* dan pen khas yang disambungkan dengan *Universal Serial Bus Port (USB port)* pada computer. Antara ciri-ciri tandatangan seperti tekanan pen dalam koordinat x-y. Antara kandungan komponen penting dalam pengeasahan tandatangan ialah *data acquisition, pre processing, normalization and re sampling, a feature extraction, a classifier dan decision.* Pengelasan yang digunakan dalan projek ini ialah *Support Vector Machine (SVM)* yang mengandungi masa dan data pada tekanan, dimana melengkapkan *features* tandatangan.

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LIST OF ABBREVIATIONS

SVM	-	Support Vector Machine
FRR	-	False Rejection Rate
FAR	-	False Acceptance Rate
DSV	-	Dynamic Signature Verification
MLP	-	Multilayer Perceptrons
NN	-	Neural Network
HMM	-	Hidden Markov Model

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CHAPTER 1

INTRODUCTION

1.1 Introduction of the project

As we all know, each individual has his own special characteristics that no other have. These characteristics are indeed important in recognizing and authenticating individuals [2]. Since authentication of individuals has rapidly become an important issue nowadays, researchers have carried out a lot of research in this biometric field using those special characteristics of each individual for authentication.

Biometric field research includes hand geometry, face prints, fingerprints, voiceprints, signatures, and non-retinal blood vessel analysis [2]. Biometrics has been widely used in physical access control applications. Unlike personal identification number or pin, biometric features are something about the characteristics of a person [2]. Biometric features are used to provide an enhanced level of security and identification. Signatures are one of the most popular and reliable biometric features for verifying a person's identity.

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Real Time Dynamics Signature Verification is a process of verifying the user's identity by using signature verification. This project highlights the development of signature verification system using Microsoft Visual Basic 6.0. In this project, the real time input will be stored in a signature database. These inputs of signatures will be processed through data preprocessing involving size normalization and re-sampling of the data points that make up the whole signature. This data preprocessing has made work easier for feature extraction. In feature extraction, the feature of each data point in the signature will be extracted and these features will show the signature characteristics such as displacement, pressure, direction, directions of strokes and curvature of strokes. The features extracted on each data point are use an input to the Support Vector Machine to be trained so as to able to verify signature in the future [4].

1.2 Objective

To achieve the goal of this projects and objectives is defined as a guided.

i) To develop software that recognize signature for personnel identification by using Microsoft Visual Basic 6.0.

ii) To gain knowledge about the Microsoft Visual Basic 6.0 software.

iii) To study the comparison method in Support Vector Machine (SVM).

1.3 Scope Of The Project

The scope of this project is to developed software Microsoft Visual Basic 6 to recognize signature for personal identification. The signature data recorded with an electronic tablet or digitizer will be sent to a recognizer that will check the similarity of the customer's signature. After the input signature image has been recognized, all the information of that input image will be stored in database as the authorized user. In this project, it is able to verify user's identity by compare the information of the input images that is user's signature with stored images.

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Besides that, this project on improving the classifier and classification module using SVM to classify signature genuine or forgery signature. Implementing SVM in this project requires a specific program for it to work properly on verifying signature. SVM is actually a supervised training algorithm in which has to be trained first before it can be used for verifying signatures. In order to see the performance of SVM in the verification module, an experiment to test the SVM with real data captured through digitizing tablet will be carried out to acquire the False Rejection Rate (FRR) and False Acceptance Rate (FAR). Experimental result has to be as low as possible and within an acceptable range.

1.4 Problem Statement

Many of the applications for identity authentication use a password or a pin code. Other types of authentication such as signature, face and eye recognition are more complicated. The modern society has come to rely heavily on cards, passwords and PIN's when it comes to the safe guarding of resources and privacy, but as we all know these can sometimes be lost, stolen, cracked or simply forgotten. These are the why world is moving towards the wide adoption of biometrics. The particular biometrics system we are developed is based on Dynamic Signature Verification (DSV) [6].

DSV is one biometric strategy. The technique is far sophisticated than a simple analysis of a finished signature. As a persons signs on a pressure-sensitive tablet, the software records the character shape, writing speed, stroke holder, off tablet motion, pen pressure and timing. These characteristics uniquely identify a person and cannot be mimicked or stolen.

Real Time Dynamic Signature Verification is chosen to overcome this problem. This project will apply signatures on the tablets by using pen also called stylus. The signature is then processed by the SVM in the Microsoft Visual Basic 6.0 software to recognize the user signature whether it s genuine or forgery.

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1.5 Thesis Outline

This thesis represent by five chapters. The following is the outline of the real time dynamics signature verification project in chapter by chapter.

Chapter 1 of this report about the brief overview the project such as introduction, objectives, problem statement and scope of the project.

Chapter 2 describes about the research and information about the project. Every facts and information which found through journals or other references will be compared and the better methods have been chosen for the project. The literature review and the software development of the project which is Microsoft Visual Basic 6.0 based on support vector machine.

Chapter 3 discuss about the project methodology used in this project such as data acquisition module, a pre processing module, a normalization and re sampling module, a feature extraction module, a classifier module and a decision module. All these methodology should be followed for a better performance.

Chapter 4 basically will focus about the project findings such as result and analysis of the real time dynamics signature verification. From here, it can be seen the performance of this project in verifying signatures.

Chapter 5 briefly state overview of this project, also suggestion for future work and conclusion achieved in this project.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Signature verification is becoming better liked in the industry, and the dynamics identification of handwriting speeds and pressures has significantly improved the accuracy of this biometric type. For smaller budget, signature verification can be a cost-effective solution for analyzing and authenticating signature dynamics [5].

The increasing demand for reliable human large-scale identification in governmental and civil applications has boosted interest in testing of biometric systems. Biometrics is an emerging technology that is used to identify people by their physical and/or behavioral characteristics that inherently requires that one to be identified is physically present at the point of identification. Signature verification is one of the most used and important biometrics. Signature verification offer advantages when compared with other biometrics.

There are some advantages for using signature verification. Firstly is user acceptance. Signature verification resides in the middle to upper region of user acceptance primarily for being a noninvasive technology. Individuals need to not worry

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because signing is not threatening nor does it invade one's privacy. Secondly is ease of use. Creating a signature is a natural and simple process for a user. Besides that is flexibility. Signatures don't have to be exactly the same as what's stored in the master template, and the template can be easily updated in this biometrics system. Another advantage of the use signature verification is advancements. That means some systems also calculate pen pressure for improved identification [5]. At the same time there is very few signature verification solutions that can provide sufficiently high verification rates are reasonable level of efficiency. However, this area of research is vastly growing and has a promising future [5].

Basically this chapter will reveal the knowledge pertaining this field of project in which is gained through a lot of resources such as reference book, papers, journal, articles, conference articles and documentations regarding applications and research work.

2.2 Brief History of Signature Verification

Signature verification has been developing since the 1960 year and has been receiving intensive interest since the 1980 year. In 1677 England passed an act to prevent frauds and perjuries by requiring documents to be signed by the participating parties [4]. In 1997 the first studies of both off-line and on-line signature verification algorithms were published. Nagel and Rosenfeld research especially in off-line system. Liu and Herbs more research about on-line system [4]. Until now there are a lot of methods to verify the signature verification that have been developed by human.

There are ranges of ways to identify signature verification. Signature verification is generally be divided into two vast areas namely static methods or sometimes called off-line that assume no time relayed information and dynamics methods sometimes called on-line with time related information available in the form of p dimensional function of time, where p represents the number of features of the signature [5].

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Literature Review

Statements below will talk the types of forgery signatures over. Besides that, these statements also discuss about the most widely and use of signature verification methods. All this technique which are proposed by author will be discussed detail abut the steps and methods each.

2.3.1 Types of signature forgery

The main task of any signature verification task is to detect whether the signature is genuine or forged. The instruments and the results of the verification depend upon the type of forgery. Three main types of forgery are shown in Figure 2.1

Figure 2.1: Types of forgery [9]

The first type of a forgery is a random forgery, can normally be represented by a signature sample that belongs to a different writer. Second type is simple forgery, signature with the same shape of the genuine writer's name. Lastly is skilled forgery, which is a suitable imitation of the genuine signature [9].

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2.3.2 Fuzzy Neural Network Method

W.N.Lim et al have been proposed a widely use method that is Fuzzy Neural Network [21]. This approach could be divided to 4 parts, which are data acquisition, preprocessing, features extraction and verification process. The experimental results are used to prove the accuracy of the verification module.

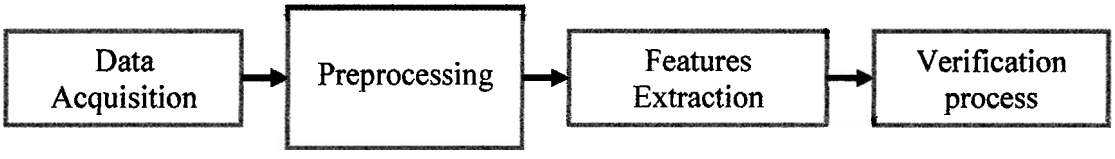

Figure 2.2: Flow Chart of Fuzzy Neural Network Techniques [22]

First stage is required Data Acquisition. It is required the signature of the user which can be based on a variety of input tools. Basically two processes are required namely training and testing.

The next stage is Preprocessing. This stage will reduce the noise and enhance the image quality [21]. The steps in this stage are shown at below:

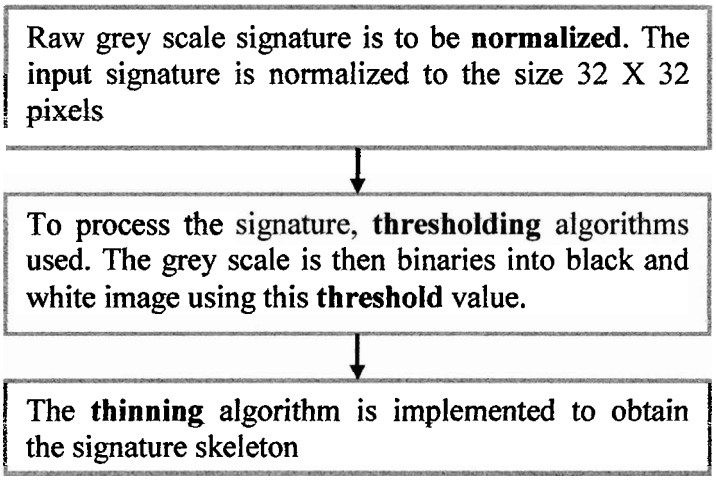

Figure 2.3: The steps of Preprocessing [22]

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The third stage is Feature Extraction namely Geometrical and Topological Feature Analysis. This stage is to reduce the dimensionality of the feature vector for input into the signature verification classifier, while keeping the important information of the input signatures [21]. The steps in Feature Extraction can divided by 10 will be shown below:

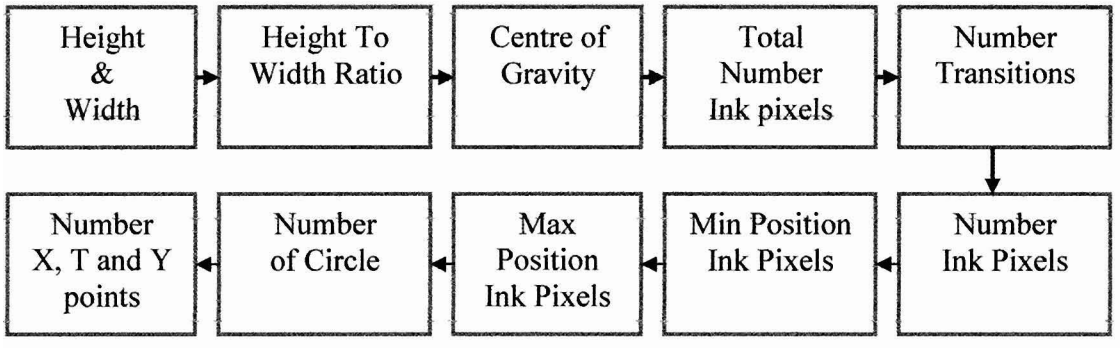

Figure 2.4: The steps of Feature Extraction [22]

Last stage of this method is verification process using character recognition classifier known as Fuzzy ARTMAP [21]. ARTMAP performs incremental supervised learning of recognition and multidimensional maps in response to binary input vectors presented arbitrarily. In turn, the Fuzzy ARTMAP extends the ARTMAP by integrating fuzzy logic into the system, which allows it to accept input vector values between 0 and 1 [22].

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