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A SECURE E-VOTING SYSTEM BASED ON FINGERPRINT

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A project report submitted in partial fulfillment of the
Requirements for the award of the degree of
Master of Computer Science (*Information Security*)

Advanced Information School (AIS)
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JUNE 2013

DECLARATION

I declare that this thesis entitled “A Secure E-Voting System Based On Fingerprint” 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: 30 May 2013

DEDICATION

To my beloved mother and father

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In preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my knowledge and thoughts. In particular, I want to express my sincere appreciation to my main thesis supervisor, Dr. Mohd Shahidan bin Abdullah, for encouragement, guidance, critics and friendship. Without his continued support and interest, this thesis would not have been the same as presented here.

ABSTRACT

In past few years, few countries have started using computerized methods and automated technology as a replacement for paper-based voting in their election. However, many countries such as Malaysia are still having their outdated and unsecure election process. So far, there are many methods which have been used to enhance the election processes, using sealed boxes, punch cards and optical scan system instead of manual counting are some of the examples. But still there are many cases of electoral fraud in history, for instance, presidential election of United States in 2000 and presidential election in Iran, 2009 are some of the most controversial cases in last few years. The purpose of this study is to investigate existing e-voting systems, to find out major security and reliability concerns and determine recommended practices related to security and reliability of e-voting systems. In this study, a secure e-voting system based on fingerprint proposed to increase the security and reliability of the current election process as well as reducing the cost, time and manpower. By enhancing fingerprint template generating and verification models, we can speed up the election process, especially on identification and authentication parts. Results compared between two existing e-voting machine; Smartmatic Machine and eSlating Machine. The results verified that, in all cases, the proposed system can guarantee the security and reliability and avoid possible electoral frauds.

ABSTRAK

Sejak beberapa tahun yang lalu, beberapa negara telah mula menggunakan kaedah berkomputer dan teknologi automatik sebagai gantian untuk mengundi berasaskan kertas dalam pilihan raya mereka. Walau bagaimanapun, banyak negara seperti Malaysia, masih mempunyai proses pilihan raya yang lapuk dan tidak terjamin. Setakat ini, terdapat banyak kaedah yang telah digunakan untuk mempertingkatkan proses pilihan raya, dengan menggunakan kaedah *sealed boxes*, kad perakam waktu dan sistem imbasan optik, dan bukannya menggunakan kaedah pengiraan secara manual adalah antara beberapa contoh yang digunakan di negara membangun. Tetapi masih terdapat banyak kes penipuan dalam sejarah pilihan raya, misalnya, pilihan raya presiden Amerika Syarikat pada tahun 2000 dan pilihan raya presiden di Iran, 2009 adalah sebahagian daripada kes-kes yang paling kontroversi dalam beberapa tahun kebelakangan ini. Tujuan kajian ini adalah untuk menyiasat sistem e-voting yang sedia ada dan untuk mengetahui keselamatan utama dan kadar kebolehpercayaan serta menentukan amalan-amalan disyorkan yang berkaitan dengan keselamatan dan kebolehpercayaan sistem e-voting. Satu sistem e-voting yang selamat berdasarkan cap jari telah dicadangkan dalam kajian ini untuk meningkatkan keselamatan dan kebolehpercayaan proses pilihan raya serta mengurangkan kos, masa dan tenaga kerja. Dengan meningkatkan penghasilan templat cap jari dan pengesahan model, sistem yang dicadangkan dapat mempercepatkan proses pilihan raya semasa mengundi, terutamanya di bahagian pengenalan dan pengesahan pengundi. Keputusan telah dibandingkan di antara kedua-dua mesin e-voting yang sedia ada, iaitu Mesin Smartmatic dan Mesin eSlating. Keputusan mengesahkan bahawa dalam semua kes, sistem yang dicadangkan dapat menjamin keselamatan, kebolehpercayaan dan mengelakkan kemungkinan dalam penipuan pilihan raya.

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LIST OF ABBREVIATIONS

DRE	-	Direct Recording Electronic
ERD	-	Entity Relationship Diagram
EVM	-	Electronic Voting Machine
E-Voting	-	Electronic Voting
HDD	-	Hard Disk Drive
RUP	-	Rational Unified Process
OS	-	Operating System

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CHAPTER 1

INTRODUCTION

1.1 Overview

In the digital age, democratic systems increasingly resort to technology to support, complement, or even transform political processes. The growing use of various electronic means in elections reflects the general tendency of increased modernization, greater outreach, and enhanced mobility in societies. Recent explosion of growth on networks and computers ability made it possible to communicate more information faster and cheaper is under a click of mouse.

In past few years, few countries have started using computerized methods and automated technology as a replacement for paper-based voting in their election however many countries such as Malaysia, are still having their outdated and unsecure election process. So far, there are many methods which have been used to enhance the election processes, using sealed boxes, punch cards and optical scan system instead of manual counting are some of the examples (Felchner and Morgan, 2008).

There are many cases of electoral fraud in history, for instance, presidential election of United States in 2000 and presidential election in Iran, 2009 are some of the most controversial cases in last few years. Millions of people believed that their votes were not counted and sadly so many people got killed in Iran after protesting election results (Addis, 2009).

In Palm Beach County (United State), a flaw in the design caused many voters to vote for the wrong candidate. As Palm Beach's election official concerned

about the eyesight of many senior citizens in her region, she decides to use large print punch card ballot which showed the candidates on either side of punch holes for voting, known as “butterfly ballot.” The punch holes and name of candidate was not well designed and arranged properly and it caused many people to vote for wrong candidate. Moreover, because of registration issues, another 1.5 to 3 million voters were not able to cast their vote, as their names could not be found on the registration list. Also because of long queue at polling station and lack of time, more than one million voters were not able to cast their vote (Basseti et al., 2012).

Recent studies have shown that a well designed e-voting system can help to enhance election confidentiality and security, save lots of cost as well as manpower, also speed up the election process specially on counting part. A well designed voting system also can improve accuracy of election results and guarantee the valid votes by checking the eligible voters to cast one vote only. Therefore, using this technology can help to solve many of current problems and challenges in election process (Decker, 2012).

1.2 Background of Problem

Security problems in E-voting systems are significantly challenging issue as they can simply undermine any election process confidence and reliability. Thus it cannot be underestimated. It is believed that democracy, freedom and future of a country are dependent on the accuracy and reliability of its election. Furthermore it is the most basic right of people to be assured that they are the one who vote for their own government. Therefore any failure or process that threatens the accuracy or integrity of an E-voting system should be considered as caution (Wolf et al., 2011)

As Schneier (2008) says, any E-voting machines have potential to affect the accuracy and reliability of the election. He also claims the possibility of swinging by either deliberately or accidentally actions as the system are based on computer. Thus this system is not eligible to be verified. We actually need to design such E-voting system that cannot be falsified by any of parties.

According to Volkamer (2009) the main problem is that neither government nor people can be assured that everything goes well and not single error, failure or falsifying have happened in any steps of the process. This is because everything is happening behind the scene of both people and government. It should be considered that if anything goes wrong or any error happens during the process it could bring violence or people anger as a result. It should be mentioned that voting machines could encounter some problematic errors themselves without being threaten or falsified. There are millions of votes to be casted so any of the following problems could happens during the process: swapping the votes, losing votes, registration of more or less votes, not registering votes at all, or etc.

1.3 Problem Statement

The major issues of electronic voting systems are lack of reliability and security and costly to build up and maintain. Beside these issues, poor security controls and management, system design flaws and making it easy and fast to use are also concerned (Agresta, 2012).

1.4 Project Aim

The aim of this project is to increase the security and reduce the cost of current electronic voting system and validate the effectiveness of proposed model.

1.5 Research Questions

- (i). What are the differences and limitations of current E-voting methods?
- (ii). How the proposed system can improve the voting process?
- (iii). How to validate the effectiveness of proposed model?

1.6 Objectives

The objectives are as follows:

- (i). To compare existing e-voting systems and to find out major security and reliability concerns
- (ii). To design and implement database for electronic voting system
- (iii). To enhance and evaluate an electronic voting system to provide better security and reliability.

1.7 Scope

The scopes for this project are:

- (i). Focus of the study to increase security and reduce cost
- (ii). Visual Studio 2012 and MSSQL 2010 will be using as software tools
- (iii). U.are.U 4000 fingerprint reader will being using as the device to scan fingerprints
- (iv). Malaysia has been chosen as location of project

1.8 Summary

As discussed in the introductory section of this chapter there are some major concerns for current voting systems worldwide which are mostly about security and reliability of election process. The objective of proposed system is to solve these identified issues by not only increasing the security, reliability, privacy but also reduce the cost of current election method.

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