FINGERPRINT TEMPLATE SECURITY: A PROPOSED FRAMEWORK FOR ENHANCING FINGERPRINT AUTHENTICATION SYSTEM USING FRAGILE IMAGE WATERMARKING TECHNIQUE

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UNIVERSITI UTARA MALAYSIA
2007

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This dissertation is submitted to the Centre for Graduate Studies

To fulfill the requirement of

Master of Science (Information Technology)

Universiti Utara Malaysia

By

Iman Hazwam Bin Abd. Halim

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ABSTRAK

Pada masa sekarang, penggunaan media digital yang semakin meluas telah menyebabkan bertambahnya aktiviti peniruan digital dan pemusnahan data terutama sekali kepada sistem biometrik. Penyelidikan ini akan mempersembahkan sebuah konsep iaitu teknik penyembunyian maklumat dan di mana salah satu daripada sub kawasannya dikenali sebagai "fragile image watermarking". Sementara teknik di dalam sistem biometrik menawarkan kaedah yang boleh dipercayai untuk mengenali identiti seseorang individu, penyelidikan terhadap keselamatan dan kejituan data biometrik telah dikaji. Penyelidikan ini telah menyarankan sebuah rangka kerja yang akan mangaplikasikan teknik penyembunyian maklumat ke dalam sistem biometrik. Sebuah teknik penanaman maklumat ke dalam data cap jari telah digunakan untuk menyembunyikan data maklumat tambahan ke dalam imej cap jari. Maklumat yang telah disembunyikan tersebut boleh diekstrak semula tanpa merujuk kepada imej yang asal. Carta dan jadual telah dipersembahkan di dalam penyelidikan ini dimana ia menunjukkan perbezaan kualiti imej yang telah ditanam dengan maklumat tambahan berbanding dengan imej cap jari asal. Perbandingan keputusan prestasi sistem biometrik menggunakan kedua-dua jenis imej juga dipersembahkan. Penyelidikan ini boleh digunakan untuk proses pengenalpastian imej terutama sekali untuk mengesan sama ada imej telah diubah dengan manggunakan pelbagai jenis pemprosesan imej seperti penambahan 'noise' dan juga pengkaburan imej.

ABSTRACT

The wide use of digital media in these recent days has led to an increase of digital piracy and tampering especially for biometric identification system. This research presents the concept of information hiding and one of its sub areas is called fragile image watermarking. While the biometrics techniques offer a reliable method for personal identification, the problem of security and integrity of the biometrics data is studied. This research had proposed an architectural framework that will apply information hiding method into biometric identification system. A fingerprint watermarking method has been used to hide additional information into fingerprint images by changing the least significant bit value of a random chosen pixel of the image. The embedded information can be extracted without referencing to the original image. Table and charts are presented to show the image quality of the watermarked fingerprint images comparing to the unwatermarked (original) images. The performance of the biometric identification system when using both kinds of images is also presented. The watermark payload that can be embedded into one image is then analyzed. This study can be use for image authentication especially to detect whether the image has been tampered by image processing intention such as noise addition and blurring.

ACKNOWLEDGEMENTS

In the name of ALLAH, the most merciful and grateful,
My fullest gratitude goes to:

Ministry of Science, Technology and Innovation (MOSTI), for the financial support given to carry out the research.

Universiti Utara Malaysia for all the resources and facilities provided.

My supervisors, Dr. Azman Bin Yasin and Mr. Roshidi Bin Din for their support and guidance.

My beloved parents, Mr. Abd. Halim Bin Othman and Pn. Siti Hawa Binti Sarman for their love and support since the beginning of my studies and all of my siblings for their encouragement.

My dearly and lovely wife, Norita Binti Romli, for her love, patience, and understanding.

My beautiful little daughter, Nur Hawani Haifa.

My research colleagues who gave me all the support in one-way to another during the research process.

Finally to the people who are keen to knowledge, perhaps this thesis contributes to the body of knowledge and enriches the information hereto.

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LIST OF ABBREVIATIONS

*.BMP	- File Extension for Bitmap Images
*.GIF	- File Extension For Graphic Interchange Format
*.JPEG	- File Extension for Joint Photographic Expert Group
*.TIFF	- File Extension For Tagged Image File Format
dB	- Decibels
DCT	- Discrete-Cosine Transform
dpi	- Dot Per Inch
ID	- Identification Card
LSB	- Least Significant Bit
MRI	- Magnetic Resonance Imaging
MSE	- Mean Squared Error
NRD	- National Registration Department of Malaysia
PSNR	- Peak Signal to Noise Ratio
RGB	- Red, Green and Blue Pixels
WSQ	- Wavelet Scalar Quantization

CHAPTER 1

INTRODUCTION

The digital information revolution has brought about great changes in our society and our lives. The development of digital information has also generated new challenges and new opportunities for innovation. These come along with powerful software, new devices, such as digital camera and camcorder, high quality scanners and printers, and biometric recognition devices.

The era has reached the limit where consumers worldwide are able to create, manipulate and enjoy the multimedia data without any restriction. Internet and wireless network offer universal channels to deliver and to exchange various types of digital information. The gap between the information and the users nowadays are ranged for only about one click.

Despite the rapid growth of the digital information domain, the security and fair use of the multimedia data, as well as the fast delivery of multimedia content to a variety of end users or devices are important and yet challenging topics.

The contents of the thesis is for internal user only

4. Conclusions

A fragile image watermarking method for fingerprint images, in which we entered additional information into fingerprints, is described. The watermark data, which consist of the identification number, can be used in authenticating the host fingerprint image. The results show that the image quality if the fingerprint images are not being affected when proposed watermarking method is implemented. The performance on the recognition or retrieval accuracy of a personal identification system is also not affected when watermarked fingerprint images are used in the system. This proposed method hopefully can be used for image authentication to identify whether the image has been tampered by various image processing attacks such as noise addition and cropping.

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