Faculty of Information Technology and Communication

NEIGHBOUR PIXEL COLOR CORRELATIVITY ON IMAGE STEGANALYSIS

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Doctor of Philosophy

2015

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A thesis submitted
in fulfillment of the requirements for the degree of Doctor of Philosophy

Faculty of Information Technology and Communication

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2015

DECLARATION

I declare that this thesis entitled "Neighbour Pixel Color Correlativity on Image Steganalysis" 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 :
Name : Alaa Abdulhussein Jabbar
Date :

APPROVAL

I hereby declare that I have read this thesis and in my opinion, this thesis is sufficient in terms of scope and quality for the award of Doctor of Philosophy.

Signature :
Supervisor Name : SHAHRIN BIN SAHIB @ SAHIBUDDIN
Date :

DEDICATION

To my beloved family: Mother, Father, Wife and Brothers.

ABSTRACT

Steganalysis is science of discovering presence of secretively embedded data within the potential carriers. Since images are one of the most commonly used digital media on networks, they grab less attention than other digital media types. As a result, images are very appropriate cover for concealing presence of secret data transmission. Insertion of external data degrades the natural color correlativity among the pixels. Statistical steganalysis is an effective approach for discovering the generated anamolies through embedding process in content of images. Various statistical steganalysis techniques have been designed to discover presence of embedding artifacts and anomalies. However, the current practices are not efficient enough for detection of steganography. To overcome the problem, this research proposes a novel statistical steganalysis technique which efficienctly detects data embedding. Since this method statistically examines the suspicious carriers then it has more capability in distinguishing effects of new steganographic techniques. Color correlativity among image pixels varies based on image content and data embedding degrades this natural correlativity. This research classifies images in four image themes and then studies their behaviors after data embedding in different embedding ratios. The proposed method examines color correlativity of pixels of the given image with the neighbor pixels and then compares the results with the extracted color correlativity behavioral patterns. The most similar color correlativity behavioral pattern determines image theme of the analyzed image and its embedding ratio. Efficiency evaluation of the designed color correlativity statistical steganalysis method shows outstanding efficiency ehancement in comparison with the current practices. The designed technique efficiently determines both image theme and embedding ratio. The efficiency dramatically increases in detecting either of image theme or estimating message length.

ABSTRAK

Steganalisis adalah suatu bidang sains dalam mengenal pasti data rahsia yang tersembunyi disebalik media tersurat. Memandangkan imej adalah digital media biasa digunakan dalam talian rangkaian, ianya mudah terlepas pandang berbanding media lain. Ini menjadikan imej sebagai media yang sesuai untuk menyembunyikan kehadiran saluran data rahsia. Kemasukan data luar secara amnya akan menjejaskan keaslian corak hubung-kait warna antara piksel imej. Steganalysis statistik merupakan kaedah yang berkesan bagi mengesan kehadiran data asing yang terhasil semasa proses penyembunyian data rahsia dalam isi kandungan imej. Pelbagai teknik steganalysis statistik telah dicipta bagi mengesan kehadiran data tersembunyi dan barangan asing dalam sesuatu imej. Namun, amalan masa kini masih lagi kurang efisien bagi mengesan data rahsia stegano. Bagi mengatasi masalah ini, penyelidikan ini mencadangkan teknik steganalysis statistik baru yang lebih berkesan dalam mengesan data rahsia stegano tersembunyi. Memandangkan kaedah ini memeriksa imej media pembawa yang diragui, maka ianya lebih berkeupayaan dalam mengenalpasti kesan biasan teknik stegano baru. Kesalinghubungan antara warna piksel imej adalah pelbagai bergantung kepada isi kandungan imej dan penyembunyian data merungkaikan lagi keaslian hubungkait antara warna piksel. Penyelidikan ini akan menkelaskan imej kepada empat(4) tema dan membuat kajian tentang kesan sampingan dari kehadiran data rahsia pada nisbah yang berbeza. Kaedah ini akan memeriksa hubungkait antara warna piksel dengan piksel berjiranan dan dibandingkan dengan hubungkait antara corak warna piksel asli. Corak hubungkait antara warna piksel yang terdekat akan menentukan tema imej dan nisbah penyembunyian yang sesuai. Penilaian keberkesanan kaedah steganalisis hubungkait statistik antara warna piksel yang direka akan menunjukkan peningkatan berbanding amalan semasa. Kaedah baru yang diperkenalkan dan dianjurkan akan menentukan tema imej dan nisbah penyembunyian data. Peningkatan keberkesanan dapat dilihat dalam mengenalpasti tema imej atau menjangka berapa panjangnya mesej.

ACKNOWLEDGEMENTS

First and foremost, I would like to take this opportunity to express my sincere acknowledgement to my supervisor Professor Dr. Shahrin Bin Sahib @ Sahibuddin Dean of ICT faculty of Universiti Teknikal Malaysia Melaka (UTeM) for his essential supervision, support and encouragement towards the completion of this thesis.

I would also like to express my greatest gratitude to Senior Lecturer Dr. Mazdak Zamani Senior Lecturer in Advanced Informatics School of Universiti of Teknology Malaysia (UTM AIS) , co-supervisor of this project for his advice and suggestions.

Special thanks to all my peers, beloved father, mother, wife, and siblings for their moral support in completing this degree. Lastly thank you to everyone who has been to the crucial parts of realization of this project.

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LIST OF ABBREVIATIONS

D/A	-	Digital to Analogue
A/D	-	Analogue to Digital
AES	-	Advanced Encryption System
ASCII	-	American Standard Code for Information Interchange
CA	-	Certificate Authority
CIA	-	Confidentiality, Integrity, Availability
DCT	-	Direct Cosine Transformation
DCT	-	Discrete Contourlet Transform
DES	-	Data Encryption Standard
ERR	-	Equal Error Rate
IQM	-	Image Quality Measures
KMA	-	Known Message Attack
KOA	-	Known Original Attack
LSB	-	Least Significant Bit
PC	-	Program Change
PDF	-	Probability Density Function
PRNG	-	Pseudo-Random Number Generator
PSNR	-	Peak Signal to Noise Ratio
QIM	-	Quantization Index Modulation
RGB	-	Red,Green,Blue
ROC	-	Receiver operating characteristics
SVM	-	Support Vector Machine
TMDE	-	Total Minimal Decision Error
WOA	-	Watermarked Only Attack
XML	-	Extensible Markup Language