

A GRAY-SCALE IMAGE STEGANOGRAPHY TECHNIQUE USING
FIBONACCI 12-BITPLANE DECOMPOSITION AND LSB APPROACH

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A dissertation submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Computer Science)

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FEBRUARY 2013

This dissertation is dedicated to my family for their endless support and encouragement.

ACKNOWLEDGEMENT

First and foremost, I would like to express heartfelt gratitude to my supervisor **Prof. Dr. Ghazali Bin Sulong** for his constant support during my study at UTM. He inspired me greatly to work in this project. His willingness to motivate me contributed tremendously to our project. I have learned a lot from him and I am fortunate to have him as my mentor and supervisor

Besides, I would like to thank the authority of Universiti Teknologi Malaysia (UTM) for providing me with a good environment and facilities such as Computer laboratory to complete this project with software which I need during process.

ABSTRACT

After the great expansion of internet, communications tends to be lifeblood, at the same time data protection became more critical issue, so the need to secure transfer channel is being more urgent, this goal achieved by applying one or more of data protection techniques. Steganography one of the most suitable solution for this problem, due to the good specification of concealing secret file inside cover image, in such way there is nobody even suspects the existence of transferred file. The main challenge in steganography methods is how to make balance between the quality of file that will be used to conceal the secret and the size of the secret file. Also there are another factors should be considered, which are, robustness and security against attacks. In this study Fibonacci numbers have been exploited to achieve these goals. Fibonacci numbers used to decompose the cover file into 12-bitplanes instead of 8-bitplanes produced by binary decomposition, the four extra layers will increase the capacity of cover image. The resulted 12-bitplanes, has special statistical nature in terms of distribution of black regions (zero values) and white regions (one values). This statistical nature has been exploited by modifying the binary representation of secret message to make matching between the representation of secret message and cover image to reduce the impact of embedding process on the resulted file (stego-image). By applying Fibonacci decomposition to the cover image, better results have been achieved in terms of Peak Signal to Noise Ratio(PSNR) which indicates the ability of embed more secret size with maintaining the quality of stego-image, also the security and robustness has been evaluated by applying chi-square attack, the result for this attacks show that Fibonacci LSB method is withstanding for such attack.

ABSTRAK

Selepas internet berkembang dengan pesatnya, komunikasi telah menjadi nadi, dalam masa yang sama perlindungan data menjadi isu yang lebih kritikal, jadi keperluan untuk mendapatkan saluran pemindahan menjadi lebih penting, matlamat ini dicapai dengan menggunakan satu atau lebih teknik perlindungan data. Steganografi adalah salah satu penyelesaian yang paling sesuai untuk masalah ini, disebabkan oleh penyembunyian fail rahsia yang baik di dalam fail biasa (fail pelindung), dengan cara itu tiada siapa yang akan mengesyaki walaupun fail dipindahkan. Cabaran utama dalam kaedah steganografi adalah bagaimana untuk membuat keseimbangan antara kualiti fail yang akan digunakan untuk menyembunyikan rahsia dan saiz fail rahsia tersebut. Juga terdapat faktor-faktor lain yang perlu dipertimbangkan apabila teknik steganografi digunakan, faktor ini adalah kekukuhan rahsia tersembunyi dan keselamatan penerapan teknik serangan yang dijangka terhadap musuh. Untuk mencapai matlamat ini, nombor Fibonacci telah dikaji. Nombor Fibonacci digunakan untuk menguraikan fail perlindungan ke 12-bitplanes bukannya 8-bitplanes yang dihasilkan oleh penguraian binari, empat lapisan tambahan akan membawa kepada peningkatan kapasiti fail perlindungan. Kesimpulan untuk 12-bitplanes, mempunyai sifat statistik khas dari segi bentuk kawasan hitam (nilai sifar) dan kawasan-kawasan putih (satu nilai). Sifat khas ini telah disalah guna dengan mengubah sifat fail rahsia khas tersebut untuk membuat padanan antara sifat khusus fail rahsia dan fail perlindungan dan untuk mengurangkan kesan proses penerapan pada fail akhir (stego fail). Dengan menggunakan penguraian Fibonacci kepada imej penutup, keputusan yang lebih baik telah dicapai dari segi Isyarat Puncak kepada Nisbah Bunyi (PSNR).