

**AN ENHANCED METHOD BASED ON INTERMEDIATE
SIGNIFICANT BIT TECHNIQUE FOR WATERMARK IMAGES**

GHASSAN NASHAT MOHAMMED

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Abstrak

Digital Watermarking Intermediate Significant Bit (ISB) adalah satu teknik baru penerapan *watermark* dengan menggantikan piksel imej asal dengan piksel yang baru. Ini dilakukan dengan cara memastikan persamaan yang nyata antara piksel baru dengan piksel asal dan pada masa yang sama, data *watermark* di dalam piksel baru tidak di ubahsuai. Salah satu teknik yang popular dalam *watermarking* adalah menggunakan *Least Significant Bit (LSB)*. Ia menggunakan spatial domain yang diselitkan dalam imej LSB. Masalah yang biasa dihadapi dengan kaedah ini ialah imej tersebut mudah di ubahsuai dan, kemungkinan berlaku gangguan pada imej setelah *watermark* diterapkan. LSB boleh digunakan dengan menggantikan satu, dua, atau tiga bit; ini dilakukan dengan menukar bit tertentu tanpa apa-apa perubahan lain dalam bit piksel tersebut. Objektif tesis ini adalah untuk merangka algoritma baru bagi meningkatkan kualiti dan *robustness* imej digital *watermarking* dengan menerapkan dua bit imej *watermark* ke dalam setiap piksel. Ini dapat meningkatkan *robustness* kedua-dua imej tersebut di samping meningkatkan keupayaan *watermark* berasaskan pada teknik ISB. Walau bagaimanapun, *tradeoff* antara kualiti dan *robustness* perlu dilakukan untuk mendapatkan keseimbangan kedudukan yang terbaik untuk kedua-dua bit *watermark* yang di ubahsuai. Teknik *Dual Intermediate Significant Bits (DISB)* telah dicadangkan dalam kajian ini untuk mengatasi masalah dalam LSB. Keputusan ujian yang diperolehi daripada teknik yang dicadangkan adalah lebih baik berbanding dengan LSB dari segi *Peak Signal to Noise Ratio (PSNR)* dan *Normalized Cross Correlation (NCC)*. Kajian ini juga menyumbang pada pembinaan persamaan matematik yang baru bagi tujuan untuk mengubah enam bit piksel *watermark* selepas menerapkan dua bit yang baru.

Kata kunci: Watermark, Intermediate Significant Bit, Kualiti, Robustness, Least Significant Bit.

Abstract

Intermediate Significant Bit digital watermarking technique (ISB) is a new approved technique of embedding a watermark by replacing the original image pixels with new pixels. This is done by ensuring a close connection between the new pixels and the original, and at the same time, the watermark data can be protected against possible damage. One of the most popular methods used in watermarking is the Least Significant Bit (LSB). It uses a spatial domain that includes the insertion of the watermark in the LSB of the image. The problem with this method is it is not resilient to common damage, and there is the possibility of image distortion after embedding a watermark. LSB may be used through replacing one bit, two bits, or three bits; this is done by changing the specific bits without any change in the other bits in the pixel. The objective of this thesis is to formulate new algorithms for digital image watermarking with enhanced image quality and robustness by embedding two bits of watermark data into each pixel of the original image based on ISB technique. However, to understand the opposite relationship between the image quality and robustness, a tradeoff between them has been done to create a balance and to acquire the best position for the two embedding bits. Dual Intermediate Significant Bits (DISB) technique has been proposed to solve the existing LSB problem. Trial results obtained from this technique are better compared with the LSB based on the Peak Signal to Noise Ratio (PSNR) and Normalized Cross Correlation (NCC). The work in this study also contributes new mathematical equations that can study the change on the other six bits in the pixel after embedding two bits.

Keywords: Watermarking, Intermediate Significant Bit, Quality, Robustness, Least Significant Bit.

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CHAPTER ONE

INTRODUCTION

1.1 Background

Currently, digital watermarking and information hiding have become important topics of computer science due to the increasing popularity of the Internet and the critical need of data security (Chin et al, 2004).

Digital watermarking is a special case of general information hiding problem. It inserts a perceptually transparent pattern known as a watermark into an image called original or cover using an embedding algorithm in which it is undetectable to human eyes, but visible to computer processes for data declaration (Modagheh et al, 2009).

In other words, digital watermark is a signal which is permanently embedded into digital data (audio, images, videos, and text) which can be detected or extracted later by means of computing operation to make assertion of the data. The watermark is hidden in the original data, in such a way that it is inseparable from the data and so that it is resistant to many operations which do not degrade the original data. Thus, by means of watermarking, the work is still accessible but permanently marked (Lu, 2005). This method successfully shields the copyright of the originality for media which is organization mark, for instance, in the original media. The image quality has not been corrupted through the watermarking system, and the inserted watermark should recover dependably. It is also essential for the embedded watermark to be resilient against noise and other typical image processing attacks. These attacks may be blurred

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