



**RESEARCH ARTICLE**

## **A COMPARATIVE STUDY OF IMAGE STEGANOGRAPHY IN WAVELET DOMAIN**

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*Abstract— In this paper we present a comparative study of four different image steganography algorithms based on orthogonal Haar Wavelet Transform and biorthogonal CDF9/7 Transform. One can divide the steganography techniques into two categories: Reversible techniques and Irreversible techniques. There are applications such as medical image system and law enforcement where it is desirable to recover the original cover image with no distortion. In this paper we shall discuss the four different embedding techniques: three are irreversible, namely, Modified (or Randomized) LSB method, LSB varying mode method and Fusion method and one is reversible, known as distortionless (or reversible or lossless) thresholding technique. The four basic requirements of Steganography are Imperceptibility, Security, Embedding payload and robustness to common statistical attacks and image processing operations. For measuring the robustness against common statistical attacks we present the histogram analysis between the original and stego-image. We apply self-synchronization variable length code, namely T-codes in place of Huffman codes for source encoding to provide security and better compression of original message. The Modified LSB method is simple, high payload, fast and most popular steganography embedding technique but fails to be robust against common channel noise such as Gaussian, Salt-n-peppers and others. The LSB Varying mode technique based on Haar transform is proposed by chen and lin [6]. The authors have shown that their method provides acceptable PSNR value, though one require extra space for key-matrix along with stego-image in the transmission. We modify this technique using T-code as source encoder and compare the results with cdf9/7 transform. The Wavelet-based Fusion method is proposed by Tolba and Ghonemy [17]. This is a high capacity cover-screw algorithm with the results of high invisibility. From the experimental results we observe that Fusion method is best for high capacity, high invisibility and robustness to common attacks in compare to other techniques and the reversible thresholding technique gives better imperceptibility in Haar domain than cdf9/7 domain.*

*Indexed Terms: - Image Steganography, Haar wavelet, cdf9/7, PSNR.*

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