

# Comparison of Simple Hybrid and Modified Hybrid of Audio in Image Steganography

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**Abstract**—This paper presents a comparison between the simple hybrid and modified hybrid in digital image. The simple hybrid embeds the secret audio in the alternation of LSB and MSB. The embedding modified hybrid depends on the value of secret audio in the LSB or MSB. The difference between the simple hybrid and the modified hybrid is shown in this paper. The audio file format (mp3) is embedded and carried by the cover image. Using modified hybrid techniques increase the level of security. Thus, attackers cannot easily, extract the secret audio from the stego image. To hide audio in an image is smaller than size of cover image. Comparisons were made based on MSE and PSNR between the simple hybrid and the modified hybrid.

**Keywords**—Simple Hybrid, Modified Hybrid, MSE and PSNR.

## I. INTRODUCTION

Steganography is another term for convert communication. It works by hiding data in inconspicuous objects that are then sent to the intended recipient. The steganography has been derived from two Greek words Steganos and graphia, where “steganos” means covered and “graphic” means writing. Using steganography, information can be hidden in carriers such as images, audio files, text files, videos etc. Steganography is comprised of two algorithms, one for embedding and one for extracting.

In this paper, the embedding process is concerned with hiding a secret audio within a cover image. The extracting process is revealed the secret audio. The steganography system usually requires a key and this key would also be used at the extracting process.

## II. METHOD OF STEGANOGRAPHY

### A. Simple Hybrid Technique

- Simple hybrid (Combined LSB & MSB) techniques embed secret image bits into the least significant bit and most significant bit of the cover image.
- First secret audio bit in the least significant bit of the cover image byte.
- The second secret audio bit in the most significant bit of the cover image byte.
- The output of the process is a stego image.
- The retrieving stage is just the inverse of the embedding stage.

### B. Modified Hybrid Technique

- Firstly, the most significant bit of cover image is the same to the most significant bit of secret audio, the former does not change, after the last two bit of cover image was inserted ‘00’.
- If the most significant bit of cover image is different to the most significant bit of secret audio then go to the least significant bit and then secret image is ‘1’, insert ‘01’ into the last two bit of each byte at cover image or if secret audio is ‘0’, insert ‘10’ into the last two bit of each byte at cover image.
- Finally, the output of the process is a stego image.
- At retrieving stage, the last two bit of each byte at stego image equal to ‘00’, extract from the value of MSB. If the last two bit of each byte at stego image equal to ‘01’, extract from the value of ‘1’ from LSB otherwise, ‘10’ extract from the value of ‘0’ from LSB.

## III. PERFORMANCE OF THE RESULT

To compare the image quality of the two algorithm i.e the simple hybrid, the modified hybrid algorithms were used, which are the Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR).

The MSE represents error between the cover image and stego image. The equation is as follows:

$$MSE = \frac{1}{n} \sum_{i=1}^n (Y_i - \hat{Y}_i)^2$$

The PSNR is used to compare image compression quality of original image and stego image. The equation is as follows:

$$PSNR = 10 \log_{10} \frac{(255)^2}{MSE}$$

The MSE value is lower and the PSNR value is higher then the quality of the image is better otherwise the image quality is not good.

We tested the system using different cover image size and the same format (jpg). The secret audio file size of 120 kilo byte (mp3) was used as the secret message audio for each cover image.

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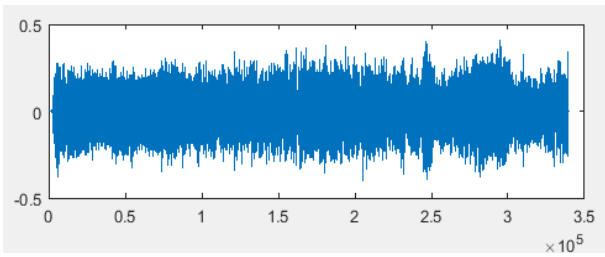


Figure. (1) Secret Audio Message (mp3) 120KB

A. Simple Hybrid Steganography



Original image (750x536)      Stego image

MSE: 3474.97    PSNR: 12.72

Figure. (2) Man.jpg



Original image (1024x767)      Stego image

MSE: 1753.73    PSNR: 15.69

Figure. (3) Lady.jpg

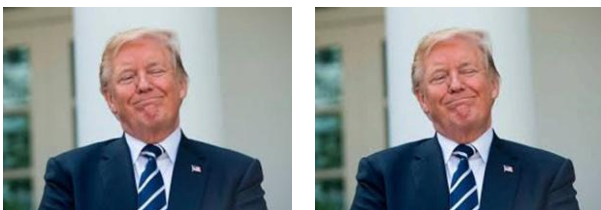


Original image (1535x1023)      Stego image

MSE: 833.43    PSNR: 18.92

Figure. (4) Bird.jpg

B. Modified Hybrid Steganography



Original image (750x536)      Stego image

MSE: 2.02    PSNR: 45.08

Figure. (5) Man.jpg



Original image (1024x767)      Stego image

MSE: 1.05    PSNR: 47.94

Figure. (6) Lady.jpg



Original image (1535x1023)      Stego image

MSE: 0.53    PSNR: 50.86

Figure. (7) Bird.jpg

Table.1 Result of Stego image for Simple Hybrid and Modified Hybrid

SN	Image Dimension	File Size	Algorithm	Secret Audio (mp3) (120 KB)		Stego Image Quality
				MSE	PSNR (dB)	
1.	Man.jpg (750x536) Figure (2), (5)	53.4 KB	Simple Hybrid	3474.97	12.72	Bad
			Modified Hybrid	2.02	45.08	Good
2.	Lady.jpg (1024x767) Figure (3), (6)	81.9 KB	Simple Hybrid	1753.73	15.69	Bad
			Modified Hybrid	1.05	47.94	Good
3.	Bird.jpg (1535x 1023) Figure (4), (7)	166 KB	Simple Hybrid	833.45	18.92	Bad
			Modified Hybrid	0.53	50.86	Good

IV. CONCLUSION

This paper compares the results of simple hybrid and the modified hybrid steganography by calculating Mean Square Error and Peak Signal to Noise Ratio. Overall, the modified hybrid gives a better performance in terms of MSE and PSNR than a simple hybrid. With the increase in cover image size also PSNR value is very high and MSE is quite low which show stego quality is very good. Moreover, the modified hybrid system is better security than the simple hybrid because the simple hybrid system is not as complex as the modified hybrid.

For suggestion, it should experiment that other audio format will be embed into the cover image with this modified hybrid algorithm.

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