



## Performance Evaluation of Blind Image Steganalysis Features using Self-organizing Map Network

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**Abstract**—In this paper, comparison is shown between DWT 72 feature with DCT 274 feature and DCT 161 features on the basis of parameter time. Three steganography tools outguess, nsF5 and PQ are taken. Extracted features are then provided to nc clustering tool to form clusters. Experimental results show that irrespective of steganography tool used we get equivalent result in all of the steganography tools used. Time taken to form clusters for 72 features is less as compared to other two features set and as the no of features increase time taken to form clusters also increase.

**Keywords**—DCT, DWT, Steganlaysis, Outguess, nsF5, PQ

### I. INTRODUCTION

Steganography[1] is the process to hide the message in medium with the help of steganography tools. Where steganalysis is the reverse part of steganography to discover the hidden message inside the medium. Steganalysis [2] method are broadly classified into two categories. Blind or Universal Steganalysis is the type of steganlaysis method, where the specific type of steganography tool which used to hide the message is not known prior to hide the message. As nowadays wide availability of steganography tools are available online to hide the message. So there is importance of steganalysis technique. Hence Steganalysis plays a vital role in digital forensic to overcome threats. In Steganography technique data hiding takes place[1][3] in Spatial Domain and Transform Domain. Main difference between spatial and transform domain is that in spatial domain data embedding directly inside the pixels where in transform domain images are first converted to DCT (Discrete cosine transform) or DWT (Discrete Fourier transform) domain and then afterwards message is embedded inside the image.

The Rest of this paper is organised as Section 2 includes steganography tool used Section 3 discusses about feature extracted Section 4 nc tool is discussed . Experimental Result and Analysis is given in Section 5. Finally in section 6 Conclusion is shown.

### II. STEGANOGRAPHY ALGORITHMS

#### A. Outguess

Outguess [4] is a universal steganographic tool that allows the calculation of hidden evidence into the redundant bits of data sources. Outguess, was designed by Niels provos. Outguess is an advanced variant of Jsteg that uses PRNG-based scattering. The embedding and extraction functions therefore each require a seed as additional parameter to initialize the PRNG. Choice of good random seed is vital.

#### B. nsF5

nsF5 (no shrinkage F5 [5]) is upgraded form of F5, suggested in 2007. This algorithm was established to improve the shrinkage problem in F5 algorithm by combining F5 algorithm with wet paper codes (WPC).

#### C. PQ

In Perturbed Quantization (PQ) algorithm [6], quantization is perturbed according to a random key for data embedding. In this procedure prior to embedding the data inside the cover-medium an information-reducing process is applied that includes quantization such as lossy compression, resizing, or A/D conversion. PQ does not leave any traces in the form that the existing Steganalysis method can grab.

### III. FEATURES EXTRACTED

#### A. DCT feature (penvy and fridrich 274 and 165)

Jessica Fridrich and Tomas Pevny proposed [7] 274 features by combining 193 extended DCT features along with 81 calibrated Markov features from DCT (Discrete Cosine Transform) domain. Feature extracted by Jessica fridrich are Global histogram, AC histograms, Dual histograms, Variation, Blockiness, Co-occurrence matrix and Markov. Where 165 features are separated from 274 features obtained after combining 11 Global histogram features along with 5 AC histogram and 11 dual histogram features.

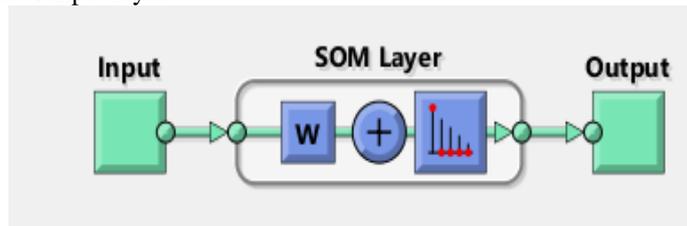
Functional	Dimensionality
Global Histogram	11
5 AC histogram	5X11
11 Dual Histogram	11X9
Variation	1
Blockiness	2
Co-occurrence matrix	25

**B. DWT feature (farid 72)**

Farid proposed 72 feature set [8], [9], 4 features that are extracted from subbands are mean, variance, skewness and kurtosis. The image decomposition used by Farid, is based on separable quadrature mirror filters (QMFs). Decomposition contain vertical, horizontal and diagonal subbands.

**IV. NC TOOL (SELF-ORGANIZING MAP NETWORK)**

Nc tool use Self-organizing map network [10]. Where Self-organizing map (SOM) network is commonly used network for clustering have competitive layer consist of neurons which group similar kind of data into classes. Features extracted are provided as input to input layer.



**V. EXPERIMENT RESULT AND ANALYSIS**

Image dataset is prepared consisting of 4000 images (cover and stego). Various embedding capacities have been used to generate the dataset.

Table I Various Embedding Capacities

Outguess	nsF5	PQ
16X 16	10 %	10%
32X32	25 %	25%
48X48	50%	50%

Features are extracted from both cover and stego images are provided to nc tool in MATLAB. Time taken is noted down to form clusters in case of 3 steganography tools.

The Comparisons between DWT (274 feature) and DWT (72 feature) and DWT(165 features) on the basis of parameters time, in case of three steganography tool Outguess, are listed in Table 2. When we increase the size of 2D map from 10 to 20 time taken also increases, In Table 3. Comparison difference between DCT and DWT in case of PQ steganography tool is shown. Finally comparison difference between various extracted features is shown in case of nsF5 steganography tool is shown in Table 4.

Table II Experimental Result In Outguess Steganography Algorithm

Outguess			
Size of 2D map=10			
	72(DWT) Features	165(DCT) Features	274 (DCT) Features
Time	00:01:15	00:02:38	00:04:16
Size of 2D map=20			
Time	00:06:26	00:10:38	00:16:56

Table III Experimental Result in Pq Steganography Algorithm

PQ			
Size of 2D map=10			
	72(DWT) Features	165(DCT) Features	274 (DCT) Features
Time	00:01:15	00:02:38	00:04:15
Size of 2D map=20			
Time	00:05:13	00:10:50	00:18:08

Table IV Experimental Result in Nsf5 Steganography Algorithm

<b>nsF5</b>			
	<b>Size of 2D map=10</b>		
	<b>72 (DWT) Features</b>	<b>165 (DCT) Features</b>	<b>274 (DCT) Features</b>
Time	00:01:15	00:02:38	00:04:16
<b>Size of 2D map=20</b>			
Time	00:05:04	00:10:18	00:18:08

## VI. CONCLUSION

Image dataset (cover and stego images) is prepared, where stego images are obtained after applying three steganography tool Outguess, nsF5 and PQ. From each image of the dataset DWT (72 features), DCT (274 features) and DWT (165 features) are extracted. Then extracted features are given to nc tool. Time taken to form cluster is noted down for all the features extracted. Experimental results illustrate i) equivalent result is obtained in case of 3 steganography tools used. ii) As we increase the no of features from 72 features to 274 features time taken to form clusters also increase. iii) On increasing size of 2D map from 10 to 20 then time also increases. Future work shall be to expand the work on extracting different set of features and applying different types of clustering algorithms in WEKA and MATLAB.

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