# Performance Analysis of DCT and WDCT Algorithms in Image Steganography

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## Introduction

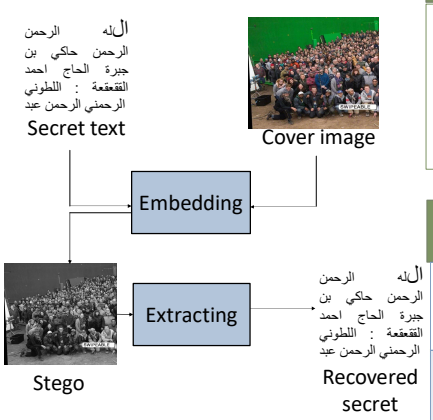
Steganography is the process of embedding covert message inside the cover to transfer the confidential messages from the sender to the receiver. Various steganography techniques have been developed to date, and they utilize various digital formats such as text, photos, audio, and video.

Common method used in image steganography is the Least significant bit method (LSB). Even though LSB has high capacity, they are not robust against compression and not secure against steganalysis [1].

To overcome this, image steganographic methods in frequency domain such as Discrete Cosine Transform (DCT) and the extended version of DCT i.e., Warped Discrete Cosine Transform (WDCT) [4] is introduced. These methods ensure high robustness and imperceptibility compared to LSB.

The main aim of this work is to evaluate the performance of DCT and WDCT on different public datasets.

## General Steps in Image Steganography




## Research Problem

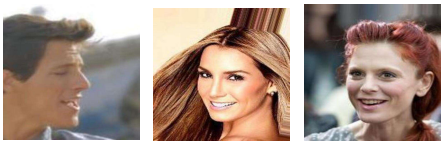
- To perform comparative analysis of DCT and WDCT algorithm in image steganography using various dataset.

## Methodology

In this methodology, the stego image is converted from spatial domain to frequency domain.

- **Embedding :** The cover image used for hiding the secret is divided into multiple 8×8 blocks of pixel. In each of the pixel, 2D DCT is applied. The DCT coefficient is quantized using the quantization matrix. The secret data is preprocessed to produce the secret bits and the secret is embedded inside the DCT coefficients. After embedding, the stego image is obtained.
- **Extraction :** Apply inverse 2D DCT to the modified block of pixels and generate the recovered secret.

## Sample images from CelebA face anti-spoofing dataset



## Sample images from NWPU-Crowd dataset

## Experimental Results

| Dataset | Method | PSNR (db) | Encode Time (s) | Decode Time (s) | Length (bytes) |
|---|---|---|---|---|---|
| NWPU-Crowd [2] | DCT | 38.59 | 1.75 | 0.77 | 349 |
| | WDCT | 40.55 | 0.53 | 0.24 | 349 |
| CelebA face anti-spoofing [3] | DCT | 40.37 | 0.24 | 0.11 | 349 |
| | WDCT | 48.52 | 0.51 | 0.24 | 349 |

## Image Results


**Resultant Images of CelebA face anti-spoofing dataset against DCT and WDCT algorithm**


**Resultant Images of NWPU-Crowd dataset against DCT and WDCT algorithm**

## Discussion and Conclusion

It is evident from the experimental results that the performance of the frequency domain methods such as DCT and WDCT on different public datasets has achieved higher accuracy. The PSNR value, encoding time and decoding time is calculated for each experiments.

The resultant images proves that the methods are very less prone to noise attack..

Among the algorithms, WDCT has high imperceptibility and robustness with minimal or no distortion with high PSNR metrics.

Therefore, these image steganographic technique produces high security compared to traditional method namely LSB.

The privacy of differential confidential data can be secured through image steganography.

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