

## ABSTRACT

Information is easy to manipulate, duplicate, or even access by unauthorized parties. The easier exchange of information makes data or information cannot be guaranteed confidentiality or ownership. To overcome this, the information needed digital watermarking, which will embed hidden information such as images, video, and text to identify ownership of information, exchange information confidentially, and safeguarding information to manipulation by parties who do not have authority over the information.

This Final Project proposes a watermarking scheme using hybrid transformation techniques using Discrete Wavelet Transform (DWT), Discrete Cosine Transform (DCT), *Hessenberg* Decomposition (HD), and Singular Value Decomposition (SVD). The proposed watermarking technique consists of two process: embedding process and extraction process. The watermarking scheme will be optimized using Genetic Algorithms, which will determine the best alpha parameter values, sub-bands, and decomposition levels to improve the watermarking scheme's performance results.

After the optimization process using genetic algorithms, the results showed Peak Signal to Noise Ratio (PSNR) average value 66.2329 dB, structural similarity index (SSIM) averaged 1, Normalized Correlation (NC) 1 and Bit Error Rate (BER) 0. The test results also showed that adding DCT to develop previous research also affected better results, especially in geometry attack. The results of the optimized watermarking scheme also show that the watermarking scheme is robust to filter attacks, noise attacks, geometry attacks, signal processing attacks, and hybrid attacks. The results of the watermarking scheme on this Final Project showed good results in imperceptibility and *robustness* in tests without attacks and with attacks before optimization.

**Keywords:** *Watermark, Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Hessenberg Decomposition (HD), Singular Value Decomposition (SVD)*