

## **ABSTRACT**

*The rapid development of audio watermarking system makes it easier for humans to get good watermarking audio criteria to maintain authenticity and secure the audio host that watermark has been inserted, where watermarking audio criteria include imperceptibility and robustness. However, the greater the potential damage to the host audio. The right solution to overcome the existing problems is to design an audio watermarking system using several combined methods on the host audio that can provide security and have a better imperceptibility.*

*In this research, we designed an audio watermarking system using Fast Fourier Transform (FFT) - Quantization Index Modulation (QIM) hybrid method based on Discrete Wavelet Transform (DWT) - Cepstrum - Statistical Mean Manipulation (SMM). The insertion of the watermark bit is performed on the audio host using the QIM method, while the insertion of the sync bit is performed using the SMM method.*

*The result of this research shows that bit synchronization can determine the correct insertion position so as to produce good watermarking audio resistance on LPF attack, resampling, speed change, mp3 compression and delay. The optimum parameter is also able to improve the quality of watermarking audio by having an average value of SNR of 25.22, the average value of ODG is -3.89 and the average value of BER is 0.25.*

**Keywords:** *Audio Watermarking, Synchronization, Discrete Wavelet Transform (DWT), Statistical Mean Manipulation (SMM), Fast Fourier Transform (FFT), Quantization Index Modulation (QIM).*