

## ABSTRACT

Development of Internet technology in the digital age provides convenience to exchange information whenever and wherever. However, this convenience also have a negative impact such as piracy and illegal deployment of the digital data. Therefore, a solution is needed to give ownership marks of an audio data, one of solution by using *watermarking* technique. In terms of data security, this technique has the major criteria, some of which are transparency, *robustness*, imperceptibility and security.

This study was designed a scheme to protect copyright and originality of audio data. *Watermarking* technique use based on DWT (*Discrete Wavelet Transform*) and QRD (*QR Decomposition*) than watermark inserted with QIM (*Quantization Index Modulation*). After all the *watermarking* process is completed, the next will be optimized with *Particle Swarm Optimization* method to each type of *host audio* that has the worst BER value. .

The hosts used are guitar, drum, piano, *Vocals* and bass with the .wav format. The result of audio *watermarking* system after the optimization with *Particle Swarm Optimization* is better than before optimizing. Optimal parameter after optimizing which was most resistant to attack is Drums audio (Compression MP4 32 k) with DWT level 4, *nFrame* 2, *nbit* 3, threshold 0,0179 and insert position on all R matrices which produces the value of ODG -2.5174, SNR 22.5417, BER 0, *Capacity* 5.3833.

**Keywords** : *audio watermarking, watermark, DWT, QRD, QIM, Particle Swarm Optimization*