

## Abstract

In this final task will be designed and implemented watermarking at digital image by combining wavelet transform (DWT) and *feature detection* (JND). In general embedding process can be described as follows. *Carrier* image, 256x256, at each layer (layer Red, layer Green, layer Blue) will be done 2 process. Firstly, layer will be made into 8x8 block so we got 32x32 blocks. For each block calculated its JND value and then 64 blocks which is has high JND value selected. Secondly, layer decomposed using DWT with *Haar* wavelet technique so can get LL,LH,HL,HH subbands which is each of them has size 128x128. *High frequency* subbands (HH,HL,LH) that were chosen will be made into 4x4 block so we get 32x32 blocks. Embedding will be done at 4x4 blocks which is corresponding with 64 blocks from the first process. *Watermark* image that is used binary image (black and white), 32x32. If the value of bit of watermark image is 1 and the value of wavelet coefficient is zero or negative then the value of wavelet coefficient will be changed into positive. If the value of bit of watermark image is 0 and the value of wavelet coefficient is zero or positive then the value of wavelet coefficient will be changed into negative.

Testing will be done at three different subbands which is HH,HL, and LH, on ten carrier image that is embedded with the same one watermark image. Watermarking image from the result of embedding will be tested its robustness with JPG compression attack (quality 60,70,80,90), noise attack (density 0.05,0.1,0.15,0.2), rescaling attack (ratio 0.25,0.5,0.75,1.25), and rotation attack (15°,30°,45°, 60°).

Test and analysis result show that at HH,HL,LH subbands watermarking using DWT and JND *robust* against noise attack at density 0.05 and 0.1. If the purpose is to get a better *imperceptibility* than its better using subband HH. Other hand if the purpose is to get a better *robustness* than its better using subband LH.

**Keywords :** *DWT, JND, carrier, watermark, robustness, imperceptibility.*