Abstract

Digital medical images has two important things, there are authority of ownership and authenticity of image. Ownership of image must be stated correctly and modifications to image must be detected. Solution for both problems is multiple watermarking. There are two types of watermarks are used, namely signature watermark and reference watermark. Signature watermark to claim ownership of medical images. While reference watermark to detect authenticity of image.

These watermarks are embedded in two different areas in image. Signature watermark embedded in RONI image using Reed-Muller Code based on Wavelet transformation while reference watermark is embedded in ROI image using Hash Block Chaining. Performance parameters used are Peak Signal to Noise Ratio (PSNR), Bit Error Rate (BER), Character Error Rate (CER), as objective assessment parameters and Mean Opinion Score (MOS) as a subjective assessment parameter. Testing is done by analyzing quality of watermarked image and reference watermark extracted after given an attack. Attacks tested are sharpening, blur, gaussian noise and JPEG compression.

Test results showed Reed-Muller Code can improve robustness of signature watermark to sharpening, blur, gaussian noise and JPEG compression attacks although not significantly. While reference watermark is able to detect attacks that occur despite these minor attacks.

Keywords: *multiple watermarking, wavelet, hash block chaining.*