

Abstract

Digital watermarking on medical image can have multiple purposes, such as ownership authentication and authenticity of the image detection. *Signature watermark* can be used to embed some ownership information that is resistant to attack. While *reference watermark* can be used to detect modifications in digital medical images, so it should be vulnerable to attack. Since both watermarks have different purposes, we can say that *multiple watermarking* can be a solution to embed more than one type of watermark that has a different purpose.

Before the embedding process, *signature watermark* pass through encoding phase using *error correcting codes, Reed Muller*. Then, *watermark* is embedded in RONI area using *spread spectrum* techniques in wavelet domain. The transformation on RONI area into wavelet domain by using *Integer Wavelet Transform (IWT)*. While *reference watermark* embedded in ROI area by using the *Hash Block Chaining (HBC)* with MD5 as the hash function. Parameters to assess the system performance objectively are the *Peak Signal-to-Noise Ratio (PSNR)* and *Bit Error Rate (BER)*.

Based on the test results, the combination of *Reed Muller* and *spread spectrum* on embedding process can improve the robustness of *signature watermark* from attacks. While embedding *reference watermark* using HBC can detect some attacks.

Keywords: *multiple watermarking, RM, spread spectrum, HBC*