Abstract

In networks the content distribution through genuine channels needs the use of digital watermarks. The digital watermark is to make the content self-identifying i.e. to place the information within the content itself. Digital images are the significant vector for network communication. As 2D-image signals are non-stationary signal wavelet transform is more suitable to analyze this signal. This paper presents a blind digital image watermark embedding technique based on random Arnold scrambling i.e. highly secure and its comparative performance analysis based on 3-level Discrete Wavelet Transform (DWT) domain for hiding the watermark information in cover image. It is seen that using 3-level DWT, watermarked image quality is improved compared to 1-level DWT and 2-level DWT. This technique also improves the security of image more effectively. This approach uses two frequency sub-bands HL and HH of DWT to embed watermark image to confirm the human perception characteristics. Here to achieve better robustness, better perceptual quality and efficient security watermark image is first scrambled randomly using Arnold transform and the watermark bits are distributed to the wavelet coefficients of the image edges in HLHHHH & HHHHLH
sub-bands. Here for DWT decomposition `Haar’ wavelet is used. Here gain factor $K=0.55$ is
selected for testing the performance under several attacks. In 3-level DWT domain good
perceptual quality is achieved with PSNR value 41.5848, SSIM value 0.953 and NC value
0.663. The Proposed method is also found more robust by experimenting with different attacks.
The experimental results proved that proposed technique i.e. 3-level DWT is faster with
compared to 2-level DWT, 1-level DWT.

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**Index Terms**

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**Keywords**

Digital watermarking, 3-level Discrete Wavelet Transform, Arnold Transform, Information Hiding in Image, Robustness.