Particle Swarm Optimization Algorithm vs. Genetic Algorithm for Image Watermarking Based Discrete Wavelet Transform

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Abstract : Over communication networks, images can be easily copied and distributed in an illegal way. The copyright protection for authors and owners is necessary. Therefore, the digital watermarking techniques play an important role as a valid solution for authority problems. Digital image watermarking techniques are used to hide watermarks into images to achieve copyright protection and prevent its illegal copy. Watermarks need to be robust to attacks and maintain data quality. Therefore, we discussed in this paper two approaches for image watermarking, first is based on Particle Swarm Optimization (PSO) and the second approach is based on Genetic Algorithm (GA). Discrete wavelet transformation (DWT) is used with the two approaches separately for embedding process to cover image transformation. Each of PSO and GA is based on co-relation coefficient to detect the high energy coefficient watermark bit in the original image and then hide the watermark in original image. Many experiments were conducted for the two approaches with different values of PSO and GA parameters. From experiments, PSO approach got better results with PSNR equal 53, MSE equal 0.0039. Whereas GA approach got PSNR equal 50.5 and MSE equal 0.0048 when using population size equal to 100, number of iterations equal to 150 and 3×3 block. According to the results, we can note that small block size can affect the quality of image watermarking based PSO/GA because small block size can increase the search area of the watermarking image. Better PSO results were obtained when using swarm size equal to 100.

Keywords : image watermarking, genetic algorithm, particle swarm optimization, discrete wavelet transform
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