Optimization Based Extreme Learning Machine for Watermarking of an Image in DWT Domain

Authors : RAM PAL SINGH, VIKASH CHAUDHARY, MONIKA VERMA

Abstract : In this paper, we proposed the implementation of optimization based Extreme Learning Machine (ELM) for watermarking of B-channel of color image in discrete wavelet transform (DWT) domain. ELM, a regularization algorithm, works based on generalized single-hidden-layer feed-forward neural networks (SLFNs). However, hidden layer parameters, generally called feature mapping in context of ELM need not to be tuned every time. This paper shows the embedding and extraction processes of watermark with the help of ELM and results are compared with already used machine learning models for watermarking.Here, a cover image is divide into suitable numbers of non-overlapping blocks of required size and DWT is applied to each block to be transformed in low frequency sub-band domain. Basically, ELM gives a unified leaning platform with a feature mapping, that is, mapping between hidden layer and output layer of SLFNs, is tried for watermark embedding and extraction purpose in a cover image. Although ELM has widespread application right from binary classification, multiclass classification to regression and function estimation etc. Unlike SVM based algorithm which achieve suboptimal solution with high computational complexity, ELM can provide better generalization performance results with very small complexity. Efficacy of optimization method based ELM algorithm is measured by using quantitative and qualitative parameters on a watermarked image even though image is subjected to different types of geometrical and conventional attacks.

Keywords : BER, DWT, extreme leaning machine (ELM), PSNR
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