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SUPPORT VECTOR MACHINE WITH ADAPTIVE PARAMETERS IN IMAGE CODING

Qingshan She[1,2], Hongye Su[1], Lida Dong[1] and Jian Chu[1]

[1]State Key Laboratory of Industrial Control Technology
Institute of Advanced Process Control
Zhejiang University
Yuquan Campus, Hangzhou 310027, P. R. China
qsshe@iipc.zju.edu.cn

[2]Institute of Intelligent Control and Robotics
Hangzhou Dianzi University
Hangzhou 310018, P. R. China
qsshe@hdu.edu.c

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Abstract. *In this paper, support vector machine (SVM) with adaptive parameters is proposed to improve the compression performance of standard SVMs for image coding. The basic idea is to assign different weight values to different discrete cosine transform (DCT) coefficients such that the SVM training algorithm learns the decision surface according to the relative importance of DCT coefficients in the training data set. The weight values used in SVM training are based on the energy distribution characteristic of each image subblock. Simulation results show it achieves better reconstruction quality than the standard JPEG and SVM-based compression algorithms.*
Keywords: Image compression, Support vector machine (SVM), Discrete cosine transform (DCT)

1. **Introduction.** Up to now, there has existed many famous compression methods, e.g. discrete cosine transform (DCT) coding [1], vector quantization [2], fractal coding [3], [4], morphological coding [5], discrete wavelet transform (DWT) coding [6], and other hybrid methods [7]. At the same time, some compression methods are proposed based on machine learning, such as back-propagation (BP) neural network [8]-[10], self-organizing feature map (SOFM) [11], [12] and their combined techniques [13], [14]. At present, a novel type of learning machine called support vector machine (SVM) has been receiving increasing interest in areas ranging from its original application in pattern recognition [15] to regression estimation [16], [17], by reason of its good generalization performance, absence of local minima and sparse representation of solutions [18].

Due to its remarkable characteristics, SVM has been proposed for image coding. The sparseness is exploited to achieve the effect of compression [19], [20]. Furthermore, SVM and DCT are combined to perform the image compression (the RK_{i-1} algorithm [21]), then only a few DCT coefficients are preserved to reconstruct the image, and its compression performance is superior to the JPEG compression algorithm [1]. However, it can also introduce annoying artifacts in blocks with sharp edges because it neglects high frequency coefficients during the SVM training process. Recently, perceptual adaptive insensitivity SVM has been used for image compression [22]. Though it can improve the RK_{i-1} algorithm's rate-distortion performance, this method has to compute the visual insensitivity for every DCT coefficient from the corresponding slope of an appropriate vision