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The Application of Support Vector Machines to Compression of Digital Images

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Abstract

Methods exploring the application of neural networks to still image compression are detailed in both the spatial and frequency domains. In particular the sparse properties of Support Vector Machine (SVM) learning are exploited in the compression algorithms.

A classic radial basis function (RBF) neural network requires that the topology of the network be defined before training. An SVM has the property that it will choose the minimum number of training points to use as centres of the Gaussian kernel functions. It is this property that is exploited as the basis for image compression algorithms presented in this thesis.

Several novel algorithms are developed applying SVM learning to both directly model the colour surface and model transform coefficients after the surface has been transformed into the frequency domain. It is demonstrated that compression is more efficient in frequency space.

The Discrete Cosine Transform (DCT) is used to transform the colour surface into the frequency domain. A counter-intuitive result is shown where mapping the DCT coefficients to a 1-dimensional function for SVM modelling produces better results than SVM modelling of the 2-dimensional transform surface.

Results are presented in comparison to the JPEG image compression algorithm. In the frequency domain, results are superior to that of JPEG. For example, the quality of the 'Lena' image compressed 63:1 for JPEG is slightly worse quality than the same image compressed 192:1 with the RKi-1 algorithm presented in this thesis. Due to the commercial value of the algorithms detailed in this thesis, a patent has been filed.

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