SINGLE IMAGE SUPERRESOLUTION INTERPOLATION BY WAVELET SUPPORT VECTOR REGRESSION

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ABSTRACT

Image interpolation is an inverse problem of image reduction that deals with (re-)increasing the image resolution. It can be classified into image resizing, resampling, digital zooming, magnification or resolution enhancement; and is ill-posed due to the information loss during image reduction. Single Image Superresolution (SSR) tries to produce a higher-resolution image from one image only, rather than multiple images such as a video sequence. This paper contributes with a new image interpolation method by wavelet (WT) reconstruction, utilizing Support Vector Machine (SVM) Regression for the induction of coefficient nodules. Thus, anisotropic interpolation of these nodules yields the higher resolution WT coefficients.

1. METHOD

Interpolation methods [1] are trying to estimate the higher resolution image by firstly interleaving the actual image pixels with zeros, and secondly filling these gaps by interpolating (i.e. bilinear or bicubic) missing pixels. Alternative methods are based on Fractal Interpolation, Partial Differential Equations, or preservation of image regularity [2], etc. In contrast to the work in [2], the proposed method utilizes subband intercorrelation within the WT coefficients for the induction of higher resolution coefficient nodules by SVM regression. The anisotropic interpolation of these nodules generates the higher resolution subband. Considering the original image to be the lowpass output of a WT analysis stage, it is then (bicubic) interpolated (Fig. 1) in order to be used together with the higher resolution subband for the SSR reconstruction (Fig. 2). The method was tested on 20 common test images and showed improvement of details on the test set over the work in [2].

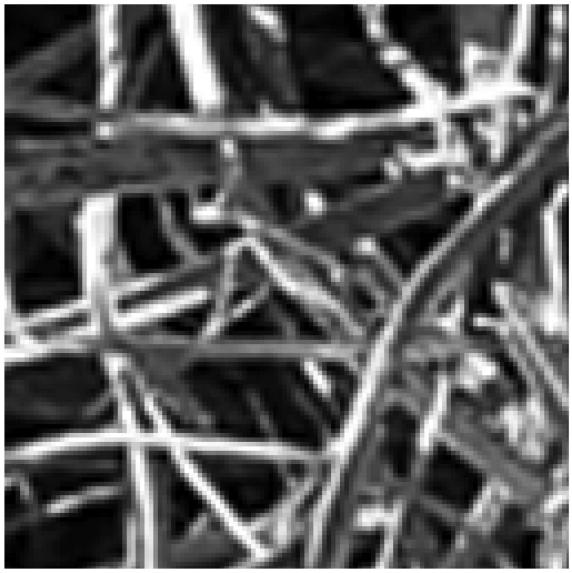

Fig. 1. BiCubic Interpolated x2 ”straw” image.

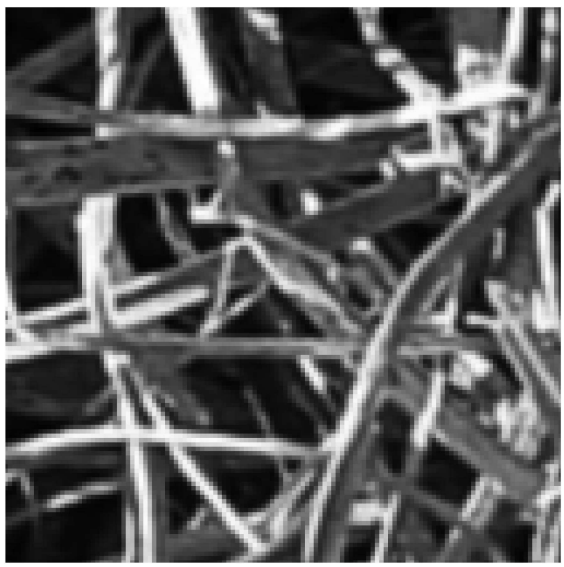

Fig. 2. SVM Regression SSR Interpolated x2 image.

2. REFERENCES

[1] P. Thévenaz, T. Blu, and M. Unser, “Image interpolation and resampling.,” *Handbook of Medical Imaging, Processing and Analysis*, pp. 393–420, 2000.

[2] W. Knox, D. Chuang, and S. Hemani, “Regularity preserving image interpolation.,” *IEEE Trans. on Image Proc.*, vol. 8, no. 9, pp. 1293–1297, 1999.