

High performance predictor blending lossless image coder

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In the paper a highly efficient algorithm for lossless image coding is described. The algorithm is a predictor blending one, a sample estimate is computed as a weighted sum of estimates given by subpredictors, here 27 ones, hence the name Blend-27. The subpredictors varies from 15 based on 1-3 neighbouring pixels, to much more powerful even if working alone. The predictor blending formula is adaptive, and favors locally the best sub-predictors in a neighborhood. The algorithm is a cascade one: some sub-predictors are followed by two consecutive NLMS filters. Additionally, in the fourth cascade stage sub-predictor bias cancellation can be done. Update formulas on NLMS coefficients and description of twelve bias canceling methods can be found in [1]. Entropy coder is a highly sophisticated arithmetic one, it is described in [1].

Efficiency of Blend-27 is tested on a set of 10 usually used benchmark images [1], and compared to that of 8 currently the best lossless coding methods, Table 1. Except for 3 images the best results are obtained for Blend-27, in one case a slightly better result is obtained for GPR-BP, and for two images somewhat higher performance has PMO 2019 [2]. Blend-27 coding and decoding times of Lennagrey image (512×512 pixels) on Pentium i5 3.4 GHz are 292.2 and 254 seconds, respectively. For MRP 0.5 coding time is 420 s, which means that for its offspring it is even greater: xMRP, GPR-BP and MRP-SSP. For PMO 2019 the coding and decoding times on Xeon@2.6 GHz are 102 and 18 minutes (512×512 pixel image). The new algorithm appears to be currently the most efficient technique for lossless coding of natural images.

- [1] Grzegorz Ulacha, Ryszard Stasinski, and Cezary Wernik, “Extended multi WLS method for lossless image coding,” *Entropy*, vol. 22, no. 9, 2020.
- [2] K. Unno, Y. Kameda, I. Matsuda, S. Itoh, and S. Naito, “Lossless image coding exploiting local and non-local information via probability model optimization,” in *27th European Signal Processing Conference (EUSIPCO)*, 2019, pp. 1–5.

	xMRP	MRP 0.5	LA- OLS	BMF	GPR -BP	MRP -SSP	PMO 2019	EM- WLS	Blend-27
Average	3.958	3.950	3.948	3.927	3.917	3.910	3.903	3.893	3.869

Table 1: Average bit per pixel rates for images from [1], EM-WLS: Extended Multi WLS.