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IMPROVING THE PERFORMANCE OF FRACTAL IMAGE CODING

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Abstract. *This paper presents a new fractal image coding (FIC) scheme to exploit the self-similarly at the same resolution scale in natural images. The new scheme can assure the convergence of FIC transforms without some limiting conditions like Zhao's, and we also give the convergence proof of our new scheme in this paper. Our scheme also uses a recursive scheme feeding the coding results back to update domain pools during the coding process to improve the decoded image quality. At the end of the coding process, the "climbing mountain" method is used to adjust the parameters to further improve the decoded image quality. Experimental results show our scheme can achieve a better rate-distortion curve than conventional FIC scheme.*
Keywords: Fractal image coding, Compound convergence

1. **Introduction.** Image compression is the process of encoding data so that it takes less storage space or less transmission time than it would if it were not compressed. This is possible because most real-world imaging is very redundant or not most concisely represented in its human-interpretable form.

There are many image compression schemes today, such as Vector Quantization, DCT, DWT, FIC, etc. In this paper, our scheme is a type of FIC. FIC was firstly introduced by Barnsley and Sloan [1]. Afterwards, Jacquin [2] devised the first practical fractal coder with block-based transformations. So far many fractal coders have been devised, among which Jacquin's method [2] and Fisher's conventional quadtree method [3] are well-known and successful approaches.

In Jacquin's scheme, the original image is partitioned into non-overlapped blocks so-called range blocks and overlapped blocks so-called domain blocks. The range blocks tile the whole image, and the arbitrarily located domain blocks are twice as large as range blocks. Each range is coded by a reference to a suitable domain block and by some transformation parameters. These parameters describe how the referenced image part has to be adjusted with respect to contrast and brightness in order to give a good approximation to the range blocks to be encoded. The decoding procedure is comparatively simple. All the affine transforms are decoded and are iteratively applied on an arbitrary initial image.

The mathematical principles of FIC are two mathematics theorems: the Fixed Point Theorem and the Collage Theorem.

Theorem 1.1. *(***Fixed Point Theorem***) Let (X, d) denote a metric space, where d is a given distortion metric. If a transformation T satisfies Equation (1), we call T contractive*