Abstract

Traditional fractal image compression based on the concepts of the iterated function system (IFS) works on only single frame images. In this paper, we describe an approach to image coding based on a fractal theory of iterated contractive transformations defined cubewise. The main characteristic of this approach is that it relies on the assumption that image redundancy can be efficiently captured and exploited through cubewise self-transformability on a cube-wise basis.

Fractal image coding exploits the piecewise self-similarity of the image. The basic idea is to construct a contractive operator \( W \) in the metric space \( X \) of digital images, for which the image to be encoded is the unique fixed point \( x^* \). However, these compression methods work only in single frame. In comparison with the conventional single frame image, a new set of transformation functions have to be derived for the multidimensional images. The transformation will no longer be limited by the grayscale manipulation (absorption, luminance shift, contrast scaling, and color reversal, etc.) or two-dimensional mappings (\( @^n \)-projection, 7-projection, row-column exchange, etc.). It has to be extended to multidimensional spatial mapping (Z-projection, X-Z, Y-Z projections, etc.) to exploit the partial self-transformability of the image in all X, Y, and Z dimensions, i.e., spatial and temporal domains. By incorporating spatial redundancy, temporal redundancy and multidimensional transformation processing, a higher compression ratio can be expected.