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Analysis of soil images applying Laplacian Pyramidal techniques

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The Laplacian pyramid is a technique for image encoding in which local operators of many scales but identical shape are the basis functions. Our work describes some properties of the filters of the Laplacian pyramid. Specially, we pay attention to Gaussian and fractal behaviour of these filters, and we determine the normal and fractal ranges in the case of single parameter filters, while studying the influence of these filters in soil image processing.

One usual property of any image is that neighboring pixels are highly correlated. This property makes inefficient to represent the image directly in terms of the pixel values, because most of the encoded information would be redundant. Burt and Adelson designed a technique, named Laplacian pyramid, for removing image correlation which combines features of predictive and transform methods. This technique is non causal, and its computations are simple and local. The predicted value for each pixel is computed as a local weighted average, using a unimodal weighting function centred on the pixel itself.

Pyramid construction is equivalent to convolving the original image with a set of weighting functions determined by a parameter that defines the filter. According to the parameter values, these filters have a behaviour that goes from the Gaussian shape to the fractal. Previous works only analyze Gaussian filters, but we determine the Gaussian and fractal intervals and study the energy of the Laplacian pyramid images according to the filter types. The different behaviour, qualitatively, involves a significant change in statistical characteristics at different levels of iteration, especially the fractal case, which can highlight specific information from the images.

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