

Comparative Study of Some Wavelets of the First and the Second Generations

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Wavelet analysis is, among others, one of the most effective method of experimental data processing. Unlike traditional Fourier transform it is more informative in various applications because it provides for analysis one extra degree of freedom.

There are known many methods of data analysis developed on the basis of continuous and discrete wavelets, such like wavelets suggested by Daubechies, Mallat, Meyer etc (see, for example [1]). Besides a whole family of fast-calculated wavelets named as wavelets of the second generations appeared recently [2]. Therefore, experimentalists are inevitable faced with the problem of choosing of the type of wavelets and the algorithm of their implementation that must be the most suitable for a concrete application. It imposes the need in developing a basic set of benchmark problems, of tests, on which one could compare capabilities of different types of wavelets.

In this paper the authors propose fast algorithms for continuous and discrete wavelets of the vanishing momenta type [3] as well as the second generation wavelets constructed on the basis of the lifting scheme [2]. In order to compare their efficiency a comprehensive set of benchmarking tests is developed. It is based on processing of various types of pure and contaminated harmonic signals, delta-functions, study of the signal phase dependence and the gain-frequency characteristic. Results of a comparative multiscale analysis allow to reveal earnestly advantages and flaws of considered type of wavelets.

References

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