

PAPER TITLE

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Abstract

Signal and image transforms represent an efficient tool for observed data analysis and further processing. The paper is devoted to the description of selected properties of Wavelet transform based upon the application of dilated and translated time limited functions enabling multiresolution signal analysis.

1 Principles of Signal Wavelet Decomposition

Wavelet functions [1] used for signal analysis are derived from the initial function $W(t)$ forming basis for the set of functions

$$W_{m,k}(t) = \frac{1}{\sqrt{a}} W\left(\frac{1}{a}(t-b)\right) = \frac{1}{\sqrt{2^m}} W(2^{-m}t - k) \quad (1)$$

for discrete parameters $a = 2^m$ and $b = k 2^m$. Wavelet dilation defined by Eq. (1) is closely related to its spectrum compression allowing local and global signal analysis according to Fig. 1.

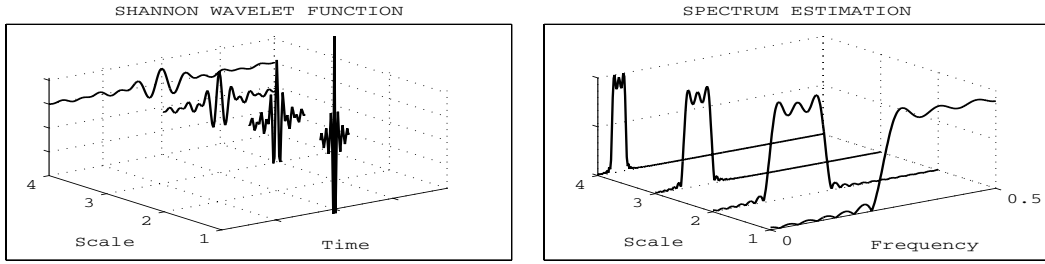


Figure 1: Shannon Wavelet function $W(t) = \sin(\pi t/2) \cos(3 \pi t/2)/(\pi t/2)$ and its analysis

2 Results

Selected results of wavelet transform use in environmental engineering are given in Table 1.

Table 1: COMPARISON OF OBSERVED VALUES OF AEROSOL PARTICLES CONCENTRATION

	<i>Observed and Estimated Values</i>				$C_{g,r}$
	<i>Urban Station</i>		<i>Rural Station</i>		
	<i>Ground</i>	<i>Remote</i>	<i>Ground</i>	<i>Remote</i>	
Set 1	0.186	0.919	0.086	0.328	0.204
Set 2	0.380	0.633	0.129	0.250	0.203

References

- [1] D. E. Newland. *An Introduction to Random Vibrations, Spectral and Wavelet Analysis*. Longman Scientific & Technical, Essex, U.K., third edition, 1994.

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