

Transformation Techniques for Denoising of XRD Signals

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ABSTRACT

Signal is anything that contains information. Voice of human, bird's chirping, signals of smoke and flower's fragrances, all are examples of signals. Any action that carries a message is said to be signal. Denoising refers to manipulation of signal for voice reduction. In this paper, different types of signal are discussed. Also various methods of signal transformation are studied. By using different signal transformation methods, XRD signals are denoised here. One of the transformation techniques is Fourier transformation. It is a mathematical operation that converts a time domain signal into frequency domain signal. It means Fourier transformation converts a time dependent complex valued function into oscillatory function. Another technique is Short Time Fourier Transformation. In this transformation, a non-stationary signal is divided into small segments which can be assumed as stationary signal. Then Fourier transform is operated on each narrow window separately, hence given the name, Short Time Fourier Transform (STFT).

As we all know, there is a problem regarding resolution of frequency and time at the same time explained by Heisenberg Uncertainty Principle. But we can analyze any signal by using a new method known as Multi-resolution Analysis (MRA). It analyzes the signal at various frequencies with different resolutions. It gives better frequency resolution but poor time resolution for low frequency signal and fine time resolution but poor frequency resolution at high frequencies of signal. Another method for denoising of signals is wavelet translation method. Wavelet means a "small wave" in which the length of wave is defined in terms of length of window function of signal under consideration. Wavelet premises analysis of both frequency and time at the same time. By the term 'Translation' we mean shifting of window function in the signal during wavelet transformation. It is related to location of the window function of the signal. By using above techniques, XRD signal is denoised.