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Short-Time Fourier Transform with Optimum Window Type and Length: An Application for Sag, Swell and Transient

Abstract

The characteristics of power quality signals are non-stationary, where the behaviour confirms the negative consequence in sensitive equipment. Modern cross-term time-frequency distributions (TFDs) are able to characterize the power quality accurately but suffer from a delay in measurement since the power quality signals, in this case, sag, swell and transient, need to be analyzed in real-time. It is shown that one window shift (OWS) properties of linear time-frequency representation (TFR) results from short-time Fourier transform (STFT) satisfies accuracy, complexity and memory. By optimally selecting the window length of 512, the TFR is able to provide optimal time, and frequency localization, as well as the spectral leakage, can be reduced by the Hanning window. The proposed technique can accurately characterize the power quality signals averagely by 95%, as well as the complexity and memory usage is low. Finally, the paper is concluded by the recommendation of pre-setting for optimum window type and length for real-time power quality measurement.

Keywords

Hanning; Power quality; Short-time fourier transform; Window length