Time-Frequency Signal Processing Methods for Automated Power Line Signal Analysis

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Abstract—This work presents a methodology for developing computational methods in Signal Processing for automated power line signal analysis. A set of tools is presented for time-frequency analysis of power line signals. An operator approach is taken where finite discrete signals are viewed as approximate representations of continuous time epochs on the power line. These finite discrete signals are then treated as elements in finite dimensional linear signal spaces. Special attention is given to the use of the discrete-time, discrete-frequency short-time Fourier transform and the ambiguity function. The methodology is evaluated on simulated data used in modeling identified power line conditions appearing in harsh scenarios in certain residential and industrial complexes in developing countries such as the Dominican Republic. All computational methods are developed using the scientific computation and visualization software language-tool MATLAB.

Index Terms—Signal Processing, Power Line Monitoring, Power Quality, Time-frequency Analysis