Characterization of power quality disturbances using hybrid technique of linear Kalman filter and fuzzy-expert system

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This paper presents a hybrid technique for characterizing power quality (PQ) disturbances. The hybrid
technique is based on Kalman filter for extracting three parameters (amplitude, slope of amplitude,
harmonic indication) from the captured distorted waveform. Discrete wavelet transform (DWT) is used
to help Kalman filter to give a good performance; the captured distorted waveform is passed through the
DWT to determine the noise inside it and the covariance of this noise is fed together with the captured
voltage waveform to the Kalman filter. The three parameters are the inputs to fuzzy-expert system that
uses some rules on these inputs to characterize the PQ events in the captured waveform. This hybrid
technique can classify two simultaneous PQ events such as sag and harmonic or swell and harmonic.
Several simulation and experimental data are used to validate the proposed technique. The results depict
that the proposed technique has the ability to accurately identify and characterize PQ disturbances

Classification of power system disturbances using linear Kalman filterand fuzzy-expert system

a b s t r a c t

Identification and classification of voltage and current disturbances in power systems is an important
task in power system monitoring and protection. This paper presents a new approach for power system
disturbances identification and classification. The concept of linear Kalman filter together with discrete
wavelet transform (DWT) is used to extract two parameters; the amplitude and the slope from the captured
voltage or current waveform. DWT is used to help Kalman filter to give a good performance; the
captured distorted waveform is passed through the DWT to determine the noise inside it and the covariance
of this noise is fed together with the captured voltage waveform to the Kalman filter. The two parameters are the inputs to fuzzy-expert system that uses some rules on these inputs to identify the
class to which the waveform belongs. To prove the ability of the new approach for classifying power system
disturbances, detailed digital simulation and experimental results involving various types of power

quality events are presented. The results depict that the proposed technique has the ability to accurately
identify and classify PQ disturbances