HARMONIC ESTIMATION BASED SUPPORT VECTOR MACHINE FOR TYPICAL POWER SYSTEMS

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Abstract: The power quality in electrical energy systems is very important and harmonic is the vital criterion. Traditionally Fast Fourier Transform (FFT) and Discrete Fourier Transform (DFT) have been used for the harmonic distortion analysis and in the literature harmonic estimations have been made using different methods. As an alternative method, this paper suggested using Support Vector Machine (SVM) for harmonic estimation. The real power energy distribution system has been examined and the estimation results have been compared with measured real data. The proposed solution approach was comparatively evaluated with the ANN and LR estimation methods. Comparison results show that THD estimation values that were obtained by the SVM method are close to the THD estimation values obtained from ANN (Artificial Neural Network) and LR (Linear regression) methods. The numerical results clearly showed that the SVM method is valid for THD estimation in the power system.

Key words: *power distribution system, Support Vector Machine, harmonic, power quality, THD, ANN, LR*

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Nomenclature: THD_I – Total current harmonic distortion, I_L – Load current, I_i – i-th input pattern, I_j – j-th input pattern, x – Input space, $\mathbf{z}$ – Feature space vector, y_i – Target value, ξ_i – Slack variable, b – Bias, ε – Intensive loss function, L – Lagrange function, $f(I)$ – Estimation function, $\alpha_i, \alpha_i^*, n_i, n_i^*$ – Lagrange multipliers, C – Constant, w – Weight factor

1. Introduction

With the development of industry and technology, energy users now pay more attention to the quality of power. Non-linear loads, such as television, computer, air conditioning, UPS, speed control devices and welding machines, generate power

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