ATTACHMENTS
In order to complete your application, please include and label (e.g., A1, A2, etc.) the following required attachments:

A: Submission Materials
   1. Copy of the call for papers/performers/exhibitors (if necessary, contact the conference organizers to obtain this)
   2. Copy of materials submitted to the sponsoring organization for selection
   3. Letter of invitation from the sponsoring organization to present/perform/exhibit

B: Description of Presentation/Performance/Exhibition (4 pages maximum)
   1. An abstract, program notes, or other concise description of your presentation, performance, or exhibition.*
   2. A background statement that places your project in context within your discipline, including a summary of relevant works by others in the field and bibliographical references if appropriate (please provide references for all works cited).

*Your description should not simply replicate attachment A2. Instead, please target your description to a general scholarly audience rather than a specialist in your field. The research and travel grants selection committee is composed of faculty representing each of the University colleges, the Dean of the Graduate College or designee, and a student representative from the Graduate Student Advisory Committee. While the committee's collective wisdom is extensive, it is not comprehensive regarding each of the disciplines represented in the University. Thus, the committee relies upon the information contained in your description in making its funding determinations. Attachments B1 & 2, including the bibliographical page, should not exceed 4 pages.

Advisor Evaluation

Please have your advisor complete the evaluation form and either give it to you or send it to the Graduate College by the application deadline date. Make sure your name is filled in at the top of the form.
Dynamic Harmonic Identification in XXXX Waveforms Using XXXXXXX Networks and XXXXXXX Power Theory
B (1) Abstracts

Paper 1:
On-Line Harmonic estimation in power system based on Sequential Training Radial Basis Function Neural Network

Abstract: Harmonic pollution becomes a serious problem that affects the power quality in both transmission and distribution systems. Harmonic estimation is considered the most crucial part in harmonic mitigation process in power system. Artificial intelligent based on pattern recognition techniques is considered one of dependable methods that can effectively realize highly nonlinear functions. In this paper, a radial basis function neural network (RBFNN) is used to dynamically identify and estimate the fundamental, fifth harmonic, and seventh harmonic components in converter waveforms. The fast training algorithm and the small size of the resulted networks, without hindering the performance criteria, prove effectiveness of the proposed method.

Paper 2:
Dynamic Harmonic Identification in Converter Waveforms Using Radial Basis Function Neural Networks (RBFNN) and p-q Power Theory

Abstract: Radial basis function neural networks (RBFNN) are used to dynamically identify harmonics content in converter waveforms based on p-q (real power-imaginary power) theory. The converter waveforms are analyzed and the harmonic contents are identified over a wide operating range. The proposed RBFNN filtering training algorithm are based on systematic and computationally efficient training method called hybrid learning method. The small size and the robustness of the resulted network reflect the effectiveness of the proposed algorithm. The analysis is verified using MATLAB simulation.
B (2) A Background

Recently, power quality term had received more attention from both electric utility and electrical power customers. Several factors have brought power quality problems to the attention of utilities and customers; the more sensitive load equipment to power variation, the increasing harmonics level in power system, the increased awareness of customers about power quality issues, and the network interconnection that magnify the impact of the failure of any network components. A suitable definition of power quality problem could be any deviation of voltage, current, and/or frequency that cause failure or misoperation of electrical equipments [1]. Harmonic pollution has become a serious problem that affects the quality of power in both transmission and distribution of power systems because the proliferation of nonlinear loads. The problems caused by harmonics include malfunctioning of fuses or circuit breaker relays, heating of conductors and motors, insulation degradation, and communication interference [2-4]. Because of these problems, harmonics mitigation in power system has become one of the most challenging problems in power system.

The most common power filters compensate for harmonic voltages and currents are Passive filters. Even though passive filters are cheap and easy to operate, they have low harmonic bandwidth (need several filters to compensate for a wide spectrum harmonics), can be subjected to resonance (series or parallel resonance with power system reactance), have large size (big capacitor banks or bulky inductors), and are affected by source impedance [5, 6].

Active power filters (APF), which are more dynamics, have been introduced as an effective means to overcome the problems associated with passive filters. The objective of an APF is to ensure that the power source will feed only active and harmonic-free power to the load. A nonlinear load draws reactive power and harmonic components. The basic principle of APF is to measure the system parameters (current or/and voltage), calculate the reference signal, realize this reference signal by power converter, and inject a signal that meets the compensation objectives.

The most crucial part for the success of the compensating process by APF is the harmonic extraction technique used in APF. Different techniques have been applied for harmonic extraction since APF was introduced. The majority of these techniques fall into two main categories - parametric and non-parametric techniques [7]. The fast Fourier transform (FFT) and
wavelet transform (WT) are examples of non-parametric techniques. In non-parametric techniques the harmonic components of a waveform or a signal can be precisely separated. However, leakage problem cannot be avoided when dealing with short time data record and is inefficient for real time systems [8]. The Artificial intelligent techniques are examples of parametric techniques. They have been introduced to overcome the disadvantages of non-parametric techniques. The three main techniques used in artificial intelligent techniques are (i) the adaptive linear neuron (ADALINE), (ii) the popular back propagation neural networks (BPNN), and (iii) the radial basis neural networks (RBFNN). The ADALINE is used as online harmonics identifier and its performance depends on the number of harmonics included in its structure. The convergence of the ADALINE slows as the number of harmonics included increases and is also subjected to fall in local minima [9, 10]. The BPNN On the other hand deals with harmonics detection problem as a pattern recognition problem. It uses offline supervised training to identify selected harmonics. The long training time required in BPNN and the chance of falling in local minima is always present [11, 12]. The RBFNN has several advantages over ADALINE and BPNN; capable of approximating highly nonlinear functions, its structure nature facilitate the training process because the training can be done in a sequential manner, and the use of local approximation can give better generalization capabilities[11, 12]. Even though RBFNN has been used for harmonic detection, the number of hidden neurons is still large and still uses algorithm similar to that of BPNN. This makes RBFNN networks subjected to the same problems found in BPN [9].

In these Papers the RBFNN has been used for two types of harmonic extraction; total harmonic extraction and selective harmonic extraction. The novelty of this works is based on the separated and sequential training method for the RBFNN. The centers of RBFNN were selected based on clustering method, and the weights of the networks were found based on direct inversion method. The results show the effectiveness of this method in terms of the size of the network and speed of training. The organization of this paper is as follows.
References


