



(1)

SVR-based Wind Speed Estimation for Power Control of Wind Energy Generation System

Ahmed G. Abo-Khalil

Abstract:

This paper presents a new wind speed estimation method for a variable speed wind turbine system, where the theory of SVR (support vector regression) is applied. The turbine speed is controlled to capture the maximum power according to the optimal tip-speed ratio. The inputs of SVR estimator are the wind turbine power and the rotational speed. By off-line training, a specified function which relates the input with the output is obtained. Then, the wind speed is determined from this predicted off-line function and the instantaneous input. The simulation and experimental results have shown that the wind speed is estimated rapidly and accurately

Keywords:

wind turbine, wind speed Mppt

Published In:

Middle- East Power System Conference , ,



(2)

DC-Link Capacitance Estimation in AC/DC/AC PWM Converters Using Voltage Injection

Ahmed G. Abo-Khalil and Dong-Choon Lee

Abstract:

In this paper, a new online capacitance estimation method for dc-link capacitors in a three-phase ac/dc/ac pulsewidth-modulation converter is proposed. A controlled ac voltage with a lower frequency than the line frequency is injected into the dc-link voltage, which then causes ac power ripples at the dc output side. By extracting the ac power component on the dc output side using digital filters, the capacitance can then be calculated using a support vector regression method. A function that defines the relation between a given capacitor power and its corresponding capacitance is determined using a set of training data. This function is then used to predict the output for the given input which is not included in the training set. The proposed method can be simply implemented with only software and no additional hardware. Experimental results confirm that the estimation error is less than 0.15%.

Published In:

IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, SEPTEMBER/OCTOBER , Vol. 44, No.5 , PP. 1631-1637



(3)

Synchronization of DFIG output voltage to utility grid in wind power system

Ahmed G. Abo-Khalil

Abstract:

This paper presents a new synchronization algorithm for grid connection of a doubly fed induction generator (DFIG) in a variable speed wind generation system. Stator flux-oriented vector control for back-to-back PWM converters in the DFIG rotor circuit is used for synchronization process. By controlling the rotor d-axis current, the magnitude of the stator EMF is adjusted to be equal to the grid voltage. PLL circuit is used to compensate for the phase shift between the stator EMF and the grid voltage. By controlling the turbine pitch angle, the generator speed is determined to adjust the stator frequency to be equal to the grid. The experimental results show a smooth synchronization and fast dynamic responses. Compared to the existing DFIG synchronization algorithms, the proposed method gives fast starting and can take only 2 cycles to be performed and has satisfactory performance and better robustness than existing methods.

Keywords:

DFIG; Synchronization; Stator flux-oriented vector control; Grid-utility

Published In:

Elsevier Journal - Renewable Energy , vol.44,No.1 , 193-198



(4)

Current injection-based DC-link capacitance estimation using support vector regression

A.G. Abo-Khalil

Abstract:

A novel online capacitance estimation method for a DC-link capacitor in a three-phase back-to-back pulse width modulation (PWM) converter is proposed. A controlled AC current with a frequency lower than the line frequency is injected into the input side, which then causes AC voltage ripples at the DC output side. With this AC voltage component extracted by band-pass filters, the capacitance is estimated by the support vector regression method without measuring the DC-link current. A function that defines the relation between a given capacitor power and its corresponding capacitance is determined using a set of training data. This function is then used to predict the output for the given input which is not included in the training set. The proposed method can simply be implemented with only software and no additional hardware. Experimental results confirm that the estimation error is less than 0.146%.

Keywords:

PWM power convertors;band-pass filters;capacitance measurement;capacitors;electric current control;regression analysis;support vector machines;AC voltage component;AC voltage ripple;DC output side;DC-link capacitor power;DC-link current;PWM converter;band pass filter;controlled AC current;current injection-based DC-link capacitance estimation;estimation error;online capacitance estimation method;support vector regression method;three phase back-to-back pulse width modulation converter;training data set

Published In:

IET Power Electronics , Vol.5, No.1 , PP.53-58



(5)

Achieving cost minimization and fairness in multi-supplier smart grid environment

Malik, Amna; Ali, Zain; Awan, Ahmed Bilal; Abo-Khalil, Ahmed G.; Sidhu, Guftaar Ahmad Sardar

Abstract:

NULL

Keywords:

NULL

Published In:

Energies , v 11, n 6 , NULL



(6)

NPC based design optimization for a net zero office building in hot climates with pv panels as shading device

Zubair, Muhammad; Bilal Awan, Ahmed; Al-Ahmadi, Abdullah; Ahmed, G. Abo-Khalil

Abstract:

NULL

Keywords:

NULL

Published In:

Energies , v 11, n 6 , NULL