(1)

Optimal Pole shifting controller for interconnected power system

Ali M. Yousef, Ahmed M. Kassem

Abstract:

Power system stabilizer based on optimal pole shifting is proposed. An approach for shifting the real parts of the open-loop poles to any desired positions while preserving the imaginary parts is presented. In each step of this approach, it is required to solve a first-order or a second-order linear matrix Lyapunov equation for shifting one real pole or two complex conjugate poles, respectively. This presented method yields a solution, which is optimal with respect to a quadratic performance index. The attractive feature of this method is that it enables solutions of the complex problem to be easily found without solving any non-linear algebraic Riccati equation. The present power system stabilizer is based on Riccati equation approach. The control law depends on finding the feedback gain matrix, and then the control signal is synthesized by multiplying the state variables of the power system with determined gain matrix. The gain matrix is calculated one time only, and it works over wide range of operating conditions. To validate the power of the proposed PSS, a linearized model of a simple power system consisted of a single synchronous machine connected to infinite bus bar through transmission line is simulated. The studied power system is subjected to various operating points and power system parameters changes.

Keywords:

Optimal pole shifting controller; Power system stabilizer; Pole placement control

Published In:

Energy Conversion and Management , Vol. 52, Issue 5 , PP. 2227-2234

(2)

Robust control of an isolated hybrid wind-diesel power system using Linrar Quadratic Gaussian appoach

Ahmed M. Kassem, , Ali M. Yousef

Abstract:

This paper presents the application of the Linear Quadratic Gaussian (LQG) controller for voltage and frequency regulation of an isolated hybrid wind–diesel scheme. The scheme essentially consists of a vertical axis wind turbine driving a self-excited induction generator connected via an asynchronous (AC–DC–AC) link to a synchronous generator driven by a diesel engine. The synchronous generator is equipped with a voltage regulator and a static exciter. The wind generator and the synchronous generator together cater for the local load and power requirement. However, the load bus voltage and frequency are governed by the synchronous generator. The control objective aims to regulate the load voltage and frequency. This is accomplished via controlling the field voltage and rotational speed of the synchronous generator. The complete nonlinear dynamic model of the system has been described and linearized around an operating point. The standard Kalman filter technique has been employed to estimate the full states of the system. The computational burden has been minimized to a great extent by computing the optimal state feedback gains and the Kalman state space model off-line. The proposed controller has the advantages of robustness, fast response and good performance. The hybrid wind diesel energy scheme with the proposed controller has been tested through a step change in both wind speed and load impedance. Simulation results show that accurate tracking performance of the proposed hybrid wind diesel energy system has been achieved.

Keywords:

Wind turbine; Induction generator; Synchronous generator; Robust control and LQG control

Published In:

Electrical Power & Energy Systems , Vol. 33, Issue 4 , PP. 1092-1100

(3)

Fuzzy logic controller for a photovoltaic array system to AC grid connected

Ali M. Yousef, Gaber El-Saady, Farag K. Abu-Elyouser

Abstract:

NULL

Keywords:

NULL

Published In:

IEEE smart grid international conference SASG , NULL , DOI: 10.1109/SASG.2016.7849676

(4)

Model Predictive Control Approach Based Load Frequency Controller

ALI MOHAMED YOUSEF

Abstract:

The present paper investigates the design of Load-Frequency Control (LFC) system for improving power system dynamic performance over a wide range of operating conditions based on model predtictive control MPC technique. The objectives of load frequency control (LFC) are to minimize the transient deviations in area frequency and tie-line power interchange variables . Also steady state error of the above variaables forced to be zeros. The two control schems namely Fuzzy logic control and proposed model predictive control are designed. Both the two controllers empoly the local frequency deviation signal as input signal. The dynamic model of two-area power system under study is estabilished . To validate the effectiveness of the proposed MPC controller, two-area power system is simulated over a wide range of operating conditions. Further, comparative studies between the fuzzy logic controller (FLC), and the proposed MPC load frequency control are evaluated.

Keywords:

Model predictive control - Fuzzy logic controller, Load Frequency Control, Two area power system.

Published In:

WSEAS TRANSACTIONS on SYSTEMS and CONTROL , Issue 7, Vol 6 , PP.265-275

(5)

Optimal Power System Stabilizer Based Enhancement of Synchronizing And Damping Torque Coefficients

ALI M. YOUSEF AND AHMED M. KASSEM

Abstract:

Design of power system stabilizer for enhancement power system stability is proposed. The effect of the proposed PSS on the synchronizing and damping torque coefficients is proved. To study the effectiveness of the proposed linear quadratic regulator (LQR) power system stabilizer, a sample power system in a linearized model is simulated and subjected to different operating conditions. The Linear Quadratic Gaussian (LQG) power system stabilizer is proposed. The power system dynamic responses after applying a variety of operating points with the proposed LQG-PSS stabilizer are plotted. The output of such stabilizer is fed directly to the automatic voltage regulator (AVR) of the synchronous machine. The input to such stabilizer are four state variables, two are accessible which are the deviation of the speed (□□) and rotor angle (□□). The other two inaccessible states that are the deviation of the Voltage proportional to q-axis flux linkage. (' q □E) and the Generator field voltage (fd □E). An observer has been designed to access the two inaccessible states. Further, the effect of connecting the proposed power system stabilizer on synchronizing and damping torque coefficients is tabulated. A comparison between the effect of the power system stabilizer based on either LQR approach, the proposed LQG stabilizer in terms of either power system responses or its eigenvalues due to different load condition is reported.

Keywords:

Power Systems, LQR Control, LQG Power System Stabilizer.

Published In:

WSEAS TRANSACTIONS on POWER SYSTEMS , Issue 2, Vol 7 ,

(6)

Neural Network Predictive Control Based Power System Stabilizer

Ali Mohamed Yousef

Abstract:

The present study investigates the power system stabilizer based on neural predictive control for improving power system dynamic performance over a wide range of operating conditions. In this study a design and application of the Neural Network Model Predictive Controller (NN-MPC) on a simple power system composed of a synchronous generator connected to an infinite bus through a transmission line is proposed. The synchronous machine is represented in detail, taking into account the effect of the machine saliency and the damper winding. Neural network model predictive control combines reliable prediction of neural network model with excellent performance of model predictive control using nonlinear Levenberg-Marquardt optimization. This control system is used the rotor speed deviation as a feedback signal. Furthermore, the using performance system of the proposed controller is compared with the system performance using conventional one (PID controller) through simulation studies. Digital simulation has been carried out in order to validate the effectiveness proposed NN-MPC power system stabilizer for achieving excellent performance. The results demonstrate that the effectiveness and superiority of the proposed controller in terms of fast response and small settling time.

Keywords:

NN_MPC control, power system stabilizer, single synchronous machine infinite bus systems

Published In:

Research Journal of Applied Sciences, Engineering and Technology , Vol.4, No.8 , PP.995-1003

(7)

Experimental Setup and Robust Servo DC Motor Position Control Based on Gain Schedule Sliding Mode Controller

Ahmed M. Kassem and Ali Mohamed Yousef

Abstract:

A position control of DC motor servo drive based on the Sliding Mode (SM) approach is presented. The modeling and analysis of the servo DC motor are obtained. The Sliding Mode Controller (SMC) design changes such that its performance is substantially improved. To improve the controller performance in steady stat (zero error) the Integral Sliding Mode Controller (ISMC) is used. Since the main drawback of SMC is a phenomenon, the so-called chattering, resulting from discontinuous controllers. A ISMC with switched gains is used for chattering reduction and controller robustness. For comparison, the proposed ISM with switched gains is compared with that of a PID controller. Experiments and simulations have been carried out in order to validate the effectiveness of the proposed scheme. The proposed controller offers very good tracking; it is highly robust, reaches the final position very fast. Furthermore the application of the SM ensures reduction of the system order by one. Also, quick recovery from matched disturbance in addition to good tracking ability. Moreover, this scheme is robust against the parameters variations and eliminate the influence of modeling.

Keywords:

Gain schedule sliding mode control, PID control, robust control, servo DC motor, sliding mode control

Published In:

Research Journal of Applied Sciences, Engineering and Technology , Vol.4,No.10 , PP.1320-1327

(8)

Power System Stabilizer Based on Robust H4 Controller for Low Frequency Operating Range

Ali Mohamed Yousef and Ahmed M. Kassem

Abstract:

The aim of study is designed of Power System Stabilizer (PSS) based on H4 approach for power system stabilization. The uncertainties in power system modeling and operations are considered at designing of H4 PSS. The bounds of power system parameters are determined over a wide range of low frequency operating conditions. These bounds are used to design a robust H4 PSS. A sample power system composed a synchronous generator connected to infinite bus through transmission line is simulated. The digital H4 PSS can achieve good performance over a wide range of operating conditions. A comparison between power system responses at variety of operating conditions using the proposed H4 PSS and Linear Quadratic Regulator LQR control have been done. H2 PSS is designed and compared with the proposed controller.

Keywords:

H4 power system stabilizer, H2! PSS, synchronous machine

Published In:

Research Journal of Applied Sciences, Engineering and Technology , Vol.4,No.10 , PP.1376-1385

(9)

Steam-Hydraulic Turbines Load Frequency Controller Based on Fuzzy Logic Control

Ali M. Yousef, Jabril A. Khamaj and Ahmad Said Oshaba

Abstract:

This study investigates an application of the fuzzy logic technique for designing the load-frequency control system to damp the frequency and tie line power oscillations due to different load disturbances under the governor deadzones and GRC non-linearity. Integral controller are designed and compared with the proposed fuzzy logic controller. To validate the effectiveness of the proposed controller, two-area load frequency power system is simulated over a wide range of operating conditions and system parameter changes. Further, comparative studies between the conventional PID control and proposed efficient fuzzy logic load frequency control are included on the simulation results. Programs Matlab software are developed for simulation. The digital results prove the power of the present fuzzy load-frequency controller over the conventional. PID controller in terms of fast response with less overshoot and small settling time.

Keywords:

Fuzzy logic controller, PID controller, steam-hydraulic turbines

Published In:

Research Journal of Applied Sciences, Engineering and Technology , Vol.4 , No.15 , PP.2375-2381

(10)

Multi Area Hydrothermal Interconnected Load Frequency Control with Double Fed Induction Generator Based Wind Turbine via Improved Harmony Algorithm

Farag K. Abo-Elyousr, Ali M. Youssef, Almoataz Y. Abdelaziz

Abstract:

NULL

Keywords:

NULL

Published In:

EPCS international journal , NULL , NULL

(11)
OPTIMAL SHIFTING OF EIGENVALUES FOR LOAD FREQUENCY CONTROL SYSTEMS

Ali M. Yousef

Abstract:

This paper presents the robust optimal shifting of eigen values control design and application for load frequency control. A method for shifting the real parts of the open-loop poles to any desired positions while preserving the imaginary parts is constant. In each step of this approach, it is required to solve a first-order or a second-order linear matrix Lyapunov equation for shifting one real pole or two complex conjugate poles respectively. This presented method yields a solution, which is optimal with respect to a quadratic performance index. Load-frequency control (LFC) of a single and two area power systems is evaluated. The objective is to minimize transient deviation in frequency and tie-line power control and to achieve zero steady-state errors in these quantities. The attractive feature of this method is that it enables solutions to complex problem to be easily found without solving any non-linear algebraic Riccati equation. The control law depends on finding the feedback gain matrix and then the control signal is synthesized by multiplying the state variables of the power system with determined gain matrix. The gain matrix is calculated one time only and it works over wide range of operating conditions. To validate the powerful of the proposed optimal pole shifting control, a linearized model of a single and two interconnected area load frequency control is simulated.

Keywords:

Optimal pole shifting controller; Load frequency control; Pole placement control.

Published In:

Journal of Engineering Sciences, Assiut University, Faculty of Engineering , 41-5 , 1857 - 1876

(12)

POWER SYSTEM CONTROLLER DESIGN BASED ON ROBUST THEORY

Ali M. Yousef

Abstract:

This paper proposes a robust H2 feedback controller design for damping power system oscillations over a wide range of operating conditions. Robust H2 control technique based power system controller is developed for both excitation system and speed governor control. The effectiveness of the proposed power system controller is validated by a simple power system composed of a synchronous generator connected to an infinite bus through a transmission line. A comparison between power system responses at variety of operating conditions using the proposed H2 controller and Linear Quadratic Regulator LQR control is obtained. The digital simulation results prove the powerful of the proposed power system controller based on H2theory in terms of fast power system mechanical oscillation damping over a wide range of operating conditions with system uncertainty and parameters change.

Keywords:

H2 control Theory, LQR control, synchronous generator

Published In:

Journal of Engineering Sciences, Assiut University, Faculty of Engineering , 41- 4 , 1660 - 1674

(13)

Improvement of Voltage Sag and Dynamic Stability For Different Load arrangements by Using Multi-Pulse STATCOM

Ali M. Yousef ,Ahmed A. Hafez

Abstract:

A power system is frequently exposed to overloading. This may introduces a number of unavoidable consequences as voltage sag, voltage dip and or power instability. This article advises remedy for such problems in a power system which is loaded by heavy static and dynamic loading levels. A multi-pulse D-STATCOM is to be incorporated in the power system under concern. The STATCOM generally enjoys the merits of fast response and reduced volumetric dimension. Moreover, it was investigated for boosting power system stability under different disturbance scenarios. However, a less is reported regarding stability under heavy loading condition. This article investigates design and analysis of application of multi-pulse D-STATCOM for improving voltage sag and power system stability under different loading types/levels. A simple and robust controller is advised for fulfilling the operation requirements. PSCAD software is used as platform for investigating the dynamic behavior of the system under concern. Comprehensive analysis and results are provided to validate the applicability and functionality of the D-STATCOM . The simulation results prove the capability of the D-STATCOM in mitigating voltage sag and enhancing power system stability while improving power quality of the distribution system.

Keywords:

Voltage sag; power stability; D-STATCOM; PSCAD; Dynamic performance; Static/Dynamic Load levels.

Published In:

NULL , NULL , إربد الهندسى الدولى الثانى

(14)

Various Advanced Control Techniques for Enhancing Stand Alone Three-Phase PV Energy System Performance

Ali. M. Yousef,Hamed. A. Ibrahem ,Farag k. Abo-elyousr,Moayed Mohamed2, 3

Abstract:

In this research, artificial neural networks (ANN) and sliding mode (SM) controllers are designed for islanded PV energy generation system in order to improve the dynamic PV energy production performance. Time domain simulation results of the PV system subjected to major disturbances are provided and investigated. To prove the superiority of the proposed controllers, the obtained results of the developed ANN and SM controllers are compared to conventional PI controller. From the simulated results, ANN controller shows better performance in comparison to SM and conventional PI controllers.

Keywords:

Photovoltaic system, Stand-alone, neural network, sliding mode control, power flow control, robust control.

Published In:

NULL , NULL , إربد الهندسى الدولى الثانى

(15)

Voltage Sag Improvement of Dynamic and Static Load Distrbution Network by Using D-STATCOM

Ali M. Yousef1, Farag K. Aboelyousr1,2

Abstract:

The main target of this research is to allow the DSTATCOM using 6-pulse inverter to participate effectively in mitigating voltage sags. The basic idea of the voltage sag reduction using a D-STATCOM, which is connected in shunt with the system, is to dynamically inject a reactive power into the utility grid. In this study, 6-pulse inverter operation is conducted using the sinusoidal PWM. The voltage magnitude as well as phase angle are taken as a base to convert the DC link voltage (Vdc) on the capacitor to a voltage source using the developed D- STATCOM. This method offers structural simplicity and less calculation complexity by using Power System Computer Aided Design (PSCAD) software. Simulation results indicate that this method is effective and D-STATCOM has good performance and capable of mitigating voltage sag as well as improving power quality of a distribution system. Static and dynamic loads are used to deem the effectiveness of the developed DSTATCOM.

Keywords:

NULL

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Nineteenth International Middle East Power Systems Conference (MEPCON), Menoufia University, Egypt , NULL , NULL

(16)

A GA-based Method for Performance Improvement of Distribution Systems Using DG Sources

M. Abdel-Salam, M. Th. El-Mohandes, Ali M. Yousef, Alaa E. Abdel-Hakim and R. Ramadan*

Abstract:

This paper presents a Genetic Algorithm (GA)- based method to determine the location and size of DG sources in distribution systems using single DG placement algorithm for determining the locations at first. Then, the GA is utilized to determine the global sizes of DG sources which minimize single- or multi-objective function related to these systems. The influence of active- and reactive-power injection on the sizing and placement of DG sources is investigated. The predictions of the proposed method as regards the sizing and placement of DG sources are compared with those obtained before using particle swarm optimization at steady weather conditions.

Keywords:

NULL

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Nineteenth International Middle East Power Systems Conference (MEPCON), Menoufia University, Egypt, , NULL , NULL

(17)

Multi-Area Hydrothermal Interconnected Load Frequency Control with Double-Fed InductionGenerator-Based Wind Turbine via Improved Harmony Algorithm

Farag K. Abo-Elyousr, Ali M. Youssef & Almoataz Y. Abdelaziz

Abstract:

The main purpose of this research is to allow doubly fed induction generator (DFIG) to participate effectively in interconnected power systems load frequency control via improved harmony algorithm (IHA). In order to tune the parameters of the PI controllers without considering the complexity associated with the modeling of the power system, the corresponding optimization problem is formulated in terms of an objective function, which represents the norm of the closed-loop area control error signal. A three-area interconnected power system subjected to major disturbances is investigated to verify the effectiveness of the developed algorithm of DFIG wind turbine participation in load frequency regulation. Time domain simulation results are presented to prove the improved performance of the developed IHA-based controller compared with genetic algorithm, simulated annealing, and a conventional integral controller. The results show that the developed IHA controller has better behavior over other algorithms in terms of settling times and other indices

Keywords:

improved harmony algorithm, load frequency control (LFC), doubly fed induction generator (DFIG) based wind turbine, PI controller, hydrothermal multi-area power systems

Published In:

Electric Power Components and Systems , Vol. 46 - No. 6 , pp. 615628

(18)
-Machine Topology for Integral Starter-Generator in More Electric Aircraft

Ahmed. A. AbdElhafez , Ali M. Yousef

Abstract:

This paper highlights the basic concepts and advantages of More/All Electric Aircraft (MEA/AEA) in the area of aircraft industry. MEA is anticipated to optimize the aircraft performance, reduce the total cost and increase safety, reliability and robustness. The Combined Starter/Generator (CS/G) system is advised as a key technology to enable MEA/AEA. A detailed analysis for the performance requirements of CS/G system is carried out. A comparative study for different machine candidates for CS/G is proposed, while focusing on Fault-tolerance, reliability and robustness.

Keywords:

more-electric aircraft; combined starter/generator; fault-tolerant; permanent magnet; switched reluctance; induction generator, homopolar.

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2019 International Conference on Innovative Trends in Computer Engineering (ITCE2019), Aswan, Egypt , NULL , NULL

(19)

Fuzzy facts voltage regulator for isolated wind energy conversion systems under different wind speed and loading conditions.

Ali M. Yousef, Gaber El-Saady, Farag K. Abu-Elyouser

Abstract:

NULL

Keywords:

NULL

Published In:

IEEE smart grid international conference SASG, Saudi Arabia , NULL , DOI: 10.1109/SASG.2016.7849677

(20)

Sliding Mode Control for Three Phase PV Grid Connected Energy System Using LCL Filter

Ali M. Yousef, Hamed. A. Ibrahem, Farag k. Abo-elyousr, Moayed Mohamed

Abstract:

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Keywords:

NULL

Published In:

Minia Journal of Engineering & Technology (MJET) , Vol. 36, No. 2 , NULL

(21)

Fuzzy Logic Speed Control for Three-Phase Induction Motor Supplied by Photovoltaic System with a Robust MPPT

Ali M. Yousef, Farag K. Abo-Elyousr

Abstract:

NULL

Keywords:

NULL

Published In:

Journal of Electrical Engineering, JEE, , Vol 17, Issue 4 , pp. 148:162

(22)

Direct Power Control of PV-grid connected using Artificial Neural Network

Ali M. Yousef, Hamed. A. Ibrahem, Farag k. Abo-elyousr, Moayed Mohamed

Abstract:

NULL

Keywords:

NULL

Published In:

Journal of Engineering science , NULL , NULL

(23)

Multi-Pulse Diode Rectifier for More-Electric Aircraft Applications : Parallel versus Series Operation

Ali M. Yousef, Ahmed Hafez

Abstract:

NULL

Keywords:

NULL

Published In:

Published in Iraq J. Electrical and Electronic Engineering, JEE , Vol.13, No.1 , pp. 138-144

Optimal Pole Shifting Technique Design Based on Single Area Load Frequency control

Ali M. Yousef, Abdulrahman Alrebdi

Abstract:

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Keywords:

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Published In:

Journal of Power and Energy Engineering (JPEE) , Vol. 4 , pp. 45 - 55