Control multi-machine power systems

Massive growth in global electrical energy demand has necessitated a genuine exploration and integration of solar and wind energy into the electrical power mix. This incorporation goes a long way in improving the cumulative generated power capacity of the power system. However, wind and solar photovoltaic (PV) are intermittent in nature, making the ...

Nowadays PID regulator, power system stabilizer (PSS) and nonlinear control were widely used in multi-machine power system excitation control. This paper will use the nonlinear robust control ...

A robust algorithm for control of multi-machine power systems under parametric uncertainty is proposed. The method of auxiliary loop is used for synthesis of the control algorithm. Proposed algorithm ensures synchronizing power systems with a given accuracy in the normal mode and under symmetrical 3-phase short circuit faults which occur on ...

To verify the proposed NOPC excitation controller, simulations of a three-machine six-bus power system shown in Fig. 1 are studied. The detailed parameters of the three-machine test system are given in [2], [8].This test system has been widely investigated for damping of multimode low frequency oscillations.

In this paper, a nonlinear model of multi-machine power systems integrated with PVs is established to reveal the multi-timescale transient synchronization characteristics using the singular perturbation technique. The fast subsystem containing the dynamics of the DC voltage control, terminal voltage control, and phase-locked loop, and the slow ...

This brief considers a decentralized control problem of interconnected multi-machine power systems with asymmetric input constraints. Initially, such an input-constrained decentralized control problem is converted into a group of unconstrained optimal control problems via preassigning modified nonquadratic cost functions for nominal subsystems. Then, under the ...

This paper is organized as follows. The state-of-the-art is reviewed in Section 2.The multi-scale modeling of the machine in the dq0 domain and the related network integration are dealt with in Section 3.The alternate approach of multi-scale modeling of the machine in the phase domain without dq0 transformation is introduced in Section 4 Section 5, a single machine is ...

In this paper, a new robust linear decentralized controller is proposed to enhance the transient stability of nonlinear multimachine power systems. Only local measurements are required in ...

The effective operation of model-based control strategies in modern energy systems, characterized by significant complexity, is contingent upon highly accurate large-scale models. However, achieving such

precision becomes challenging in complex energy systems rife with uncertainties and disturbances. Controlling different parts of the energy system poses a ...

The impact on the stability of power systems is rising as the penetration level of renewable energy with sporadic natures rises rapidly on the grid. However, the impact of different types of renewable energy sources (wind, solar) and their combination on system stability varies even with the same penetration level. This paper concentrates mainly on the stability analysis ...

this makes the control design more complicated for multi-agent sys tems like multi-machine power systems. Differently from 16,17, in 19 the noise filtering and the derivative estimation are tw ...

An observer-based decentralized excitation control for multi-machine power systems has been introduced. The main goal of the control strategy is to increase the transient stability and to obtain a good post-fault voltage regulation in spite of large disturbances and network changes.

In this paper the dynamic interactions between mechanical and reactive modes of machines in a multi-machine power system are investigated. The dynamic interactions are expressed in terms of machine angles, transient voltages, and coefficients which are functions of system parameters and operation conditions. The effect of the dynamic interaction can be examined by the electric ...

The present research focuses on transient stability of multi-machine power systems in a full consideration regarding the performances of the Takagi-Sugeno fuzzy-based sliding mode control approach in association with the conventional sliding mode and also the optimal control approaches to improve the last finding outcomes in this area. Hereinafter, ...

Nonlinear excitation controller design of multi-machine power system with structure preserving models3.1. System modelIn order to apply the proposed method mentioned above to the power system, we use the electric power-transmission system of multi-machine with excitation control and loads [16] as a benchmark analysis

The elimination of forced oscillations arising from disturbances in multi-machine power system is explained by Ye et al. in . ... for estimating the transfer limit of a critical line for a given fault with stochastic wind generation and active control devices in a multi-machine system.

Finally, the effectiveness of the proposed equivalent homogeneous system and the metric is validated using two test systems: a modified 4-machine 2-area power system and the 5-area 68-bus system. Numerical simulation study reveals that the proposed method can effectively reflect the inertia spatial distribution characteristics.

A multi-machine power system excitation predictive control method using balanced reduced model is presented. First, the theory of empirical Gramians balanced reduction was used to reduce the orders of power system non-linear dynamic model to save the time-solving of open-loop optimisation in model predictive

control.

The system under study is a three area multi-machine power system as shown in Fig. 1.Area-1 consists of thermal power generator synchronized with wind and solar power generators which are connected to load center as shown in Fig. 2.Area-2 and Area-3 consists of thermal power generators connected to load centers.

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In this paper, an improved version of the particle swarm optimization algorithm is proposed for the online tuning of power system stabilizers in a standard four-machine two-area power system to mitigate local ...

In this paper, we use the PCH system to investigate adaptive L 2 disturbance attenuation control of multi-machine power systems with SMES units, and propose an energy-based control design method for the systems (note: it should be pointed out that the model of multi-machine systems used in the paper is not the general one, but it is a standard model.

In the power systems, there are many new researches on the power systems control [21,22,23,24,25], but the influence of random factors was not considered. ... In this paper, an excitation controlled multi-machine power system model is introduced firstly, and the Gauss white noise is added into the model as the stochastic disturbances. By ...

In order to increase the accuracy and improve the performance of the power system stabilizer (PSS) controller compared to the methods presented in other studies, this paper presents a new method for tuning sliding mode control (SMC) parameters for a PSS using a deep neural network. This controller requires fast switching which can create unwanted signals. To ...

The decentralized control of such systems divides the overall system into almost independent subsystems and designs several local controllers which treat the coupling terms as uncertainties ... A practical application to multi-machine power systems with governor controllers is provided to show the effectiveness of the developed algorithm.

In the power systems, there are many new researches on the power systems control [21,22,23,24,25], but the influence of random factors was not considered. ... In this paper, an excitation controlled multi-machine power ...

Primary frequency control of large-scale PV-connected multi-machine power system using battery energy storage system September 2021 International Journal of Power Electronics and Drive Systems ...

4 days ago· The multi-area multi-source power system (MAMSPS), which uses a variety of power

sources including gas, hydro, thermal, and renewable energy, has recently been implemented ...

Multi-machine power system modelling and small-signal stability studies have been a topic of much research activity in power systems for the last few ... Such a representation is suitable for analysis and control system design. The general multi-machine model presented in this paper is based on synchronous generators with high-order ...

In this article, a discrete-time adaptive decentralized control scheme is developed to deal with the stability of multi-machine power systems. An external disturbance and subsystem interconnection are considered.

Nowadays PID regulator, power system stabilizer (PSS) and nonlinear control were widely used in multi-machine power system excitation control. This paper will use the nonlinear robust control theory to design the excitation controller, in order to realize the decentralized robust control and improve stability of the system.

This paper presented a novel wide-area nonlinear excitation control strategy for multi-machine power systems. A simple and effective model transformation method was proposed for the system"s mathematical model in the COI (center of inertia) coordinate system. The system was transformed to an uncertain linear one where deviation of generator terminal voltage ...

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