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**Title: PERTURB-AND-OBSERVE MAXIMUM POWER POINT TRACKING BASED PASSIVITY APPROACH FOR THERMOELECTRIC GENERATOR**

**Authors:** Asma Toualbia, Mohamed Tadjine, Elhadj Bounadja,.....**pp. 686-694**

**Abstract:** Thermoelectric energy has nowadays an increased importance in electrical power applications, since it is considered as an essentially inexhaustible and broadly available energy resource. Thermoelectric module can convert heat energy to electrical power directly. An important characteristic of thermoelectric module is that the available maximum power is provided only in a single operating point given by a localized voltage and current known, called Maximum Power Point. However the thermoelectric power generation has some problems, such as the position of this point is not fixed but it moves according to the temperature and load. Many classic methods and controllers have been widely developed and implemented to track the maximum power point. The Perturb and Observe algorithm was chosen, due to its simplicity and convergent capacities. A drawback of The Perturb and Observe happens when the Maximum Power Point is reached; the output power oscillates around the maximum, which results in a power loss in the power. The new in this paper, passivity theory were employed in the thermoelectric system chain conversion to improve the stability. Simulation results lead that Perturb and Observe based passivity improves all classical Perturb and Observe drawbacks and improves considerably thermoelectric system efficiency and stability.

**Keywords:** Thermoelectric Generator, Perturb and Observe (P&O), Passivity Based Control (PBC), Euleur- Lagrange.

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**Title: SLIDING MODE BASED ON SPACE VECTOR MODULATION CONTROL OF THE UNIFIED POWER QUALITY CONDITIONER**

**Authors:** Dahdouh Adel, Barkat Said, Chouder Aissa,.....**pp.695-701**

**Abstract:** This paper presents the compensation principle using PI and sliding mode control strategies of the unified power quality conditioner in detail. The UPQC is an active filter and it compensates the reactive power, harmonics in both the voltage and current caused by loads. The UPQC makes use of two back to back connected IGBT based voltage source inverters (VSIs) with a common dc bus. One inverter is connected in series and the other one is placed in shunt with the load. The shunt inverter works as a current source and it compensates the current harmonics. The series inverter works as a voltage source and it helps in compensating the voltage harmonics. In order to improve the performances of UPQC, a control method based on a sliding mode controller combined with space vector modulation (SVM) is proposed. The purposes are to deliver compensation signals more quickly and accurately at varied load conditions and to eliminate voltage as well as current harmonics with good dynamic response. Extensive simulation results obtained by Matlab/Simulink for a passive load connected through an uncontrolled bridge rectifier validate the performance of the suggested control scheme. The comparison of these results with those obtained with a PI controller demonstrates the superiority of the proposed controller.

**Keywords:** Harmonic extraction, Power active filter, UPQC, Sliding mode controller, Space vector modulation (SVM).

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**Title: ADAPTIVE FUZZY SLIDING MODE CONTROLLER USING NONLINEAR SLIDING SURFACES APPLIED TO THE TWIN ROTOR MULTI-INPUT– MULTI-OUTPUT SYSTEM**

**Authors:** BENYETTOU Loutfi, ZEGHLACHE Samir, .....**pp. 702-719**

**Abstract:** In this paper fuzzy a sliding modes control (FSMC) using non linear sliding surfaces is designed to position the yaw and pitch angles of a Twin Rotor Multi-Input–Multi-Output system (TRMS). With the coupling effects, which are considered as the uncertainties, the highly coupled nonlinear TRMS is pseudo decomposed into a horizontal subsystem and a vertical subsystem. The chattering phenomenon is one of the current problems in the sliding mode control theory the main purpose is to eliminate this phenomenon. For this proposed we have used a fuzzy logic control to generate the hitting control signal. Moreover the output gain of the fuzzy sliding is tuned on-line by supervisory fuzzy system (adaptive fuzzy sliding mode control), so the chattering is avoided, the simulation results that are compared of conventional sliding mode control (SMC) with nonlinear sliding surface indicate that the control performance of the TRMS is satisfactory and the proposed AFSMC can achieve favorable tracking performance.

**Keywords:** Fuzzy logic control, Sliding mode controller, Non linear system, Stability, TRMS System.

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**Title: HARMONICS MITIGATION IN DC ELECTRIFIED RAILWAY SYSTEM USING HYBRID POWER FILTER**

**Authors:** Yacine Djeghader, Laid Zellouma,.....**pp. 720-727**

**Abstract:** The railway is a way that meets the country's economy, particularly in the agricultural and industrial sectors same as in the transport of people. Direct current (DC) electrified railway systems show power quality problems such as harmonic current pollution. In this article we made a model in Matlab/Simulink of a real DC traction substation which is located in the mineral line Tebessa - Annaba (in Algeria). Our study focused on the propagation of currents harmonic in the electric network and their filtering solution. In this paper, we presents for mitigation of harmonic currents a new configuration of hybrid power filter based an combination of a shunt active power filter based on fuzzy logic controller (FLC), and Instantaneous active-reactive power theory (PQ) installed at the secondary of the transformer (medium voltage), with two passives filtering (tuned at frequencies 11 and 13) installed at transformer primary (high voltage). The simulation result with this new combination gives us the best results with minimum values of total harmonic distortion (THD).

**Keywords:** Electrification, Harmonics, Hybrid Filter, Power Quality, Railway System, Traction Substation..

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**Title: MULTIVARIABLE FUZZY ADAPTIVE SLIDING MODE CONTROL OF VSC-HVDC FOR POWER FLOW REFERENCE TRACKING**

**Authors:** Amar HAMACHE, Mohand Outahar BENSIDHOUM, Hachemi CHEKIREB, Achour OUSLIMANI,.....**pp. 728-737**

**Abstract:** This paper presents a Multivariable Fuzzy Adaptive Sliding Mode Control (MFASMC) as an effective control method for systems with uncertain dynamics and unpredictable disturbances. The MAFSMC method is applied in the case of power flow reference tracking of a Voltage Source Converter High Voltage Direct Current (VSC-HVDC) transmission system. Based on Kirchhoff's equations and synchronous (d-q) transformation, a state space dynamic model of VSC-HVDC interconnecting two asynchronous electrical grids is developed. The control algorithm uses a Fuzzy Adaptive Disturbance Estimator (FADE) method with to estimate terms referring to uncertain dynamics and disturbances in the system. Through the stability analysis, stable design gains are found to insure robustness and better performance while keeping the control at an appropriate level. For the VSC-

HVDC system, the FADE method with the switching term is shown to provide a very satisfactory performance.

**Keywords:** Sliding Mode Control, Fuzzy Adaptive Disturbance Estimator, Voltage Source Converter, High Voltage Direct Current System, Power Flow, Asynchronous electrical grids, Lyapunov Function.