



SCHOLARLY PUBLICATIONS

School of Electrical Engineering

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Journal Name: Applied Energy

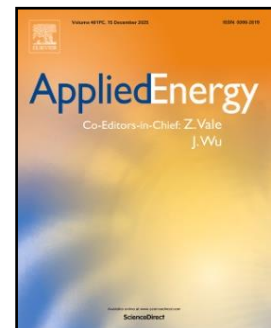
IF: 11.0

Title: Collaborative participation of wind power producer and charging station aggregator in electricity markets

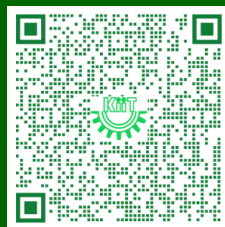
Author: Abbasi, M.H.; Mishra, D.K.; Arjmandzadeh, Z.; Zhang, J.; Xu, B.; Krovi, V.

Details: Vol. 401, December 2025

Abstract: The widespread adoption of electric vehicles (EVs) is hindered by two major challenges: limited fast-charging infrastructure and reliance on fossil-fuel-based electricity. Expanding fast-charging stations (FCSs) requires optimal scheduling, which is complicated by the stochastic behavior of EV users. Additionally, rapid fluctuations in renewable power availability, typically mitigated by fossil-fuel generation, can limit EVs' environmental benefits. This paper addresses these challenges through the coordinated operation of a wind power producer (WPP) and an FCS aggregator, aiming to optimize the revenue of both parties while considering EV battery degradation and FCS charging limits. The problem is formulated as a bi-level optimization problem: the WPP and FCS aggregator maximize their own profits, linked via a peer-to-peer (P2P) energy trading agreement. It is then cast within a Lyapunov optimization framework, decomposing the problem into single-step subproblems, which reduces the impact of EV charging uncertainty. Collaboration with the aggregator decreases WPP's imbalance by an average of 45.77 % in a case study, while the P2P energy trading increases the renewable share of power delivered to EVs by 11.17 % on average. Furthermore, a reinforcement learning agent is trained to improve FCS energy storage utilization. Simulation results show that the proposed approach can reduce daily FCS operating costs by up to 58 % and increase daily WPP profit by up to 31 %.



URL: <https://www.sciencedirect.com/science/article/pii/S0306261925015120?via%3Dihub>





SCHOLARLY PUBLICATIONS

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Journal Name: Results in Engineering

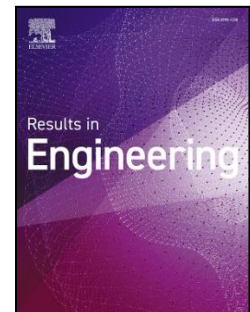
IF: 7.9

Title: Design and assessment of fuzzy controllers for LFC of multisource electrical system: A novel Sinh-Cosh (ShCh) technique

Author: S.C., Swain, Sarat Chandra; B.K., Mahala, Biranchi Kumar; P.C., Sahu, Prakash Chandra; S.K., Bhatta, Sunil Kumar; G.G., Tejani, Ghanshyam G.; S.J., Mousavirad, Seyed Jalaaladdin

Details: Volume 27, September 2025

Abstract: This research manuscript comprehensively evaluates various fuzzy controllers and optimization methodologies aimed at enhancing load-frequency control (LFC) within an electrical grid system subjected to diverse electrical disturbances. Given that the interconnected grid is inherently dynamic and nonlinear, it necessitates continuous regulation of power generation by the newly established demand schedules. The mechanism that promptly manages electricity generation in alignment with the updated demand schedules is designated as LFC. The implementation of LFC predominantly hinges upon an array of robust controllers designed to establish additional control loop within the scheme. These control loops detect fault indications from the power network and conduct corrective operations instantly to ensure system stability. Area control error (ACE) refers to variations in grid frequency (ΔF) and power flow oscillation (ΔP_{tie}). The fundamental cause of ACE in the power system is an imbalance amid total electricity production and time-varying load demand. Various control approaches like conventional PID, Fuzzy-PID, Fuzzy-TID, fractional order fuzzy PID (FO-FPID), Fuzzy assessed sliding mode control (Fuzzy-SMC) schemes, type-II Fuzzy PID (TII-FPID), and the suggested type-II fuzzy adaptive exponent (TII-FAEC) controllers are shown to enhance LFC in the electrical grids. The suggested controllers provide enhanced efforts when operating in the ideal conditions. So, this work has incorporated an ideal Sinh Cosh technique (ShChT) in the LFC function for providing desired gains of the implemented controllers. Finally, it is examined from the outcomes that recommended ShChT: TII-FAEC outperforms the settling time of area1 frequency (ΔF_1) response by 64.28%, 107.14%, 164.24%, 214.28%, 321.38%, and 346.42% in comparison to the TII-FPID, Fuzzy-SMC, FO-FPID, Fuzzy-TID, Fuzzy-PID and standard PID controllers correspondingly.



URL: https://www.sciencedirect.com/science/article/pii/S2590123025030245?pes=vor&utm_source=scopus&getft_integrator=scopus





SCHOLARLY PUBLICATIONS

School of Electrical Engineering

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Journal Name: IEEE Journal of Emerging and Selected Topics in Industrial Electronics **IF:** 4.0

Title: Simplified Prediction-Based AI-IoT Model for Energy Management Scheme in Standalone PV Powered Greenhouse

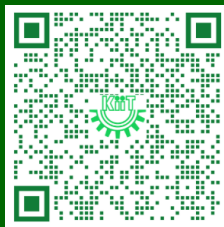
Author: Biswal, S.R.; Roy Choudhury, T.; Santra, S.B.; Panda, B.; Mishra, S.; Padmanaban, S.

Details: Vol. 6, Issue 1, 2025

Abstract: Automated greenhouse is essential for sustainable development and food security. Photovoltaic (PV) power with physical sensors-based control using Internet of Things needs high initial investment and operational cost. This also needs significant installed storage capacity. In the proposed solution, the dependency on physical sensors like temperature, humidity, soil moisture sensors, etc., are eliminated due to the application of eXtreme Gradient Boosting-based machine learning (ML) algorithm. The training and testing of ML algorithm are performed with one-year physical data (approx. 50k @10 min interval) from greenhouse which provides accurate mapping (Temperature MAPE: 1.51%, R^2 : 0.9785 and Humidity MAPE: 1.68%, R^2 : 0.9867) between predicted and sensor data. Also, a novel priority-based demand side management scheme is implemented which includes load shifting which reduces the requirement of installed PV and storage capacity. A reduction of 63.27% storage capacity is possible with proposed control approach. ML algorithm is programmed using Python language and implemented in Raspberry Pi-3B+ SBC. For physical verification of the proposed control unit, a laboratory-based prototype is developed with PV emulator (1.5 kW), programmable electronic load box, and relay unit controlled through Arduino UNO, Raspberry Pi-3B+ SBC, ESP-32 Combo unit.



URL: <https://ieeexplore.ieee.org/document/10591339>





SCHOLARLY PUBLICATIONS

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Journal Name: Scientific Reports

IF: 3.9

Title: Hybrid manta ray foraging and sine cosine algorithm for managing power transmission congestion influenced by wind energy

Author: S., Dutta, Susovan; B., Paul, Bishaljit; B., Kundu, Barnali; C.K., Chanda, Chandan Kumar; K., Paul, Kaushik; P., Sinha, Pampa; H.A., Shuaibu, Hassan Abdurrahman; T.S., Ustun, Taha Selim

Details: Volume 15, Issue1, September 2025

Abstract: This research work proposes a hybrid Manta ray Forging Optimization- Sine Cosine Algorithm (MRFO-SCA) for Congestion Management (CM) that addresses the power system transmission line congestion cost challenges with the integration of Wind Energy System (WES). The proposed method focuses on two key objectives: first, identifying the most influential bus within the power system using the Bus Sensitivity Factor (BSF) to optimally place a wind power source, thereby impacting the power flow in overloaded lines. Second, MRFO-SCA has been developed for optimal power rescheduling of the generators to alleviate congestion while minimizing the congestion cost. The hybrid MRFO-SCA has been formulated by integrating SCA into the MRFO that enhances the exploration and exploitation phases in MRFO leading to the rapid discovery of the global optima. MRFO-SCA has been verified on benchmark functions that have delivered appreciable results. The effectiveness of the proposed approach has been assessed and validated using the IEEE-30 bus system. Simulation results indicate that incorporating WES with MRFO-SCA has led to a reduction in congestion costs by 18.45%, 15.68%, 10.34%, 9.72%, 5.46%, and 1.57% as compared to several recent optimization techniques. A comparative evaluation demonstrates that MRFO-SCA outperforms other methods in terms of congestion cost reduction, system loss minimization, bus voltage improvement, faster convergence, and reduced computational time, making it a more efficient and accurate solution for CM.



URL: <https://www.nature.com/articles/s41598-025-13988-z>





SCHOLARLY PUBLICATIONS

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Journal Name: Scientific Reports

IF: 3.9

Title: Multiscale detection of power quality disturbances and cyber intrusions in smart grids using NSCT and frequency band scalograms

Author: P., Sinha, Pampa; K., Paul, Kaushik; S., Snehalika, Snehalika; I., Kasireddy, Idamakanti; A.B., Krishna, Ardhala Bala; D.S.M., Rao, D. S.Naga Malleswara; H.A., Shuaibu, Hassan Abdurrahman; T.S., Ustun, Taha Selim

Details: Volume 15, Issue1, September 2025

Abstract: This paper presents a novel multiscale signal processing framework for power quality disturbance (PQD) and cyber intrusion detection in smart grids, combining Non-Subsampled Contourlet Transform (NSCT), Split Augmented Lagrangian Shrinkage Algorithm (SALSA), and Morphological Component Analysis (MCA). A key innovation lies in an adaptive weighting mechanism within NSCT's directional sub bands, enabling dynamic energy redistribution and enhanced representation of both low-frequency anomalies (e.g., voltage sags/swells) and high-frequency distortions (e.g., harmonics, transients). SALSA-based sparse optimization achieves an average signal-to-noise ratio (SNR) improvement of 12.8 dB, preserving essential transient structures, while MCA isolates fault-relevant morphological components for better interpretability. Extensive simulations on both synthetic signals and the IEEE 14-bus test system demonstrate detection accuracies of 98.6% for PQDs and 97.2% for cyber intrusions, including False Data Injection (FDI), Denial of Service (DoS), and Command Injection attacks. Each intrusion exhibits unique time-frequency scalogram signatures, which are effectively visualized using high-resolution, denoised 2D/3D spectrograms generated via adaptive Q-Factor Wavelet Transform (AQWT) and Short-Time Fourier Transform (STFT). Compared to baseline methods like STFT-only and DWT-SVM pipelines, the proposed NSCT-SALSA-MCA framework improves detection precision by 14–18%, reduces false positives by 22%, and remains robust under 30 dB noise and 20% data loss. Incorporating AI-driven anomaly detection and resilient state estimation further enables early flagging of compromised measurements, securing applications such as Economic Dispatch and Optimal Power Flow (OPF). The resulting scalograms provide interpretable visual insights, marking a significant advancement in smart grid monitoring with potential for real-time deployment at the edge.



URL: <https://www.nature.com/articles/s41598-025-18127-2>





SCHOLARLY PUBLICATIONS

School of Electrical Engineering

KIIT Deemed to be University

Journal Name: Scientific Reports

IF: 3.9

Title: Dynamic Lissajous patterns for real time identification and localization of power quality disturbance

Author: P., Sinha, Pampa; S., Snehalika, Snehalika; R.K., Gatla, Ranjith Kumar; P., Shashavali, Palthur; D.G., Kumar, Devineni Gireesh; I., Kasireddy, Idamakanti; D.S.M., Rao, D. S.Naga Malleswara; H.A., Shuaibu, Hassan Abdurrahman; T.S., Ustun, Taha Selim

Details: Volume 15, Issue1, September 2025

Abstract: This study proposes a novel and computationally efficient method for real-time identification and localization of power quality (PQ) disturbances in microgrids using dynamic Lissajous patterns formed by voltage and current waveforms. Each power disturbance—such as sag, swell, harmonic distortion, and transients—induces a unique geometric deformation in the Lissajous figure, which serves as a visual signature of the event. Key geometric and statistical features, including area, skewness, kurtosis, and centroid deviation, are extracted from these dynamic patterns to construct robust indices for classification. Adaptive thresholds for each feature are determined dynamically, enabling accurate event detection without prior knowledge of the microgrid configuration. Numerical analysis demonstrates that the proposed method achieves high precision in detecting and distinguishing PQ disturbances, even under overlapping or noisy conditions. For instance, the method records Euclidean distance values of 0.7071 for swell and 0.5657 for harmonic distortion, while maintaining zero deviation for pure signals, validating its classification accuracy. The system exhibits strong resilience to unstable grid conditions and is computationally lightweight, making it suitable for real-time deployment in embedded devices within microgrids. Comparative evaluation reveals superior performance in terms of speed, accuracy, and false positive minimization, highlighting the potential of dynamic Lissajous patterns as a powerful tool for advanced PQ monitoring in smart grid infrastructures.



URL: <https://www.nature.com/articles/s41598-025-10218-4>





SCHOLARLY PUBLICATIONS

School of Electrical Engineering

KIIT Deemed to be University

Journal Name: Scientific Reports

IF: 3.8

Title: A novel TID + IDN controller tuned with coatis optimization algorithm under deregulated hybrid power system

Author: Dei G.; Gupta D.K.; Sahu B.K.; Bajaj M.; Blazek V.; Prokop L.

Details: Volume 15, Issue 1, December, 2025

Abstract: Implementing a suitable load frequency controller to maintain the power balance equation for a multi-area system with many power generating units poses a challenge to a power system engineer. Incorporation of renewable energy sources along with non-renewable units is another challenge while maintaining the stability of the system. Hence a robust intelligent controller is an essential requirement to achieve the objective of automatic load frequency control. This article introduces a novel and efficient controller designed for a three-control area within a deregulated multi-source energy system. The three areas include diverse power generation sources: Area 1 integrates thermal units, hydro units, and solar thermal power plants. In Area 2, there is a combination of distributed solar technology (DST) with thermal and hydro units. Area 3 incorporates a geothermal power plant alongside thermal and hydro unit. The proposed controller is a parallel combination of the tilted integral derivative controller (TID) and the integral derivative with a first-order filter effect (IDN). The controller's parameters are optimized using an advanced Coatis Optimization Algorithm (COA). High effective efficiency and absence of control parameters are the key advantages of Coatis Optimization Algorithm. In summary, this paper presents an innovative TID + IDN controller optimized using a novel Coatis Optimization Algorithm within a three-area hybrid system operating in a deregulated context. Considering the poolco transaction and implementing the COA optimized TID + IDN controller with an error margin of 0.02%, the value of the objective function, ITAE for the transient responses is 0.1233. This value is less than the value obtained in other controllers optimized with different optimization techniques. In case of poolco transaction, the settling time of deviation of frequency in area-1, deviation of frequency in area-2, and deviation of frequency in area-3 are 8.129, 3.72, and 2.254 respectively. As compared to other controllers, the transient parameters are better in case of this proposed controller.



URL: <https://www.nature.com/articles/s41598-025-89237-0>

