SCHOLARLY PUBLICATIONS
School of Electrical Engineering
KIIT Deemed to be University

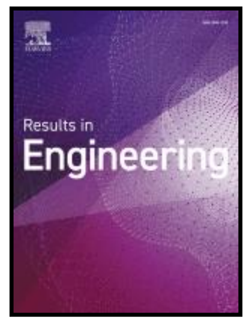
Journal Name: Results in Engineering **IF: 6**

Title: Fractional order PID controller for load frequency control in a deregulated hybrid power system using Aquila Optimization

Author: Gupta, DK; Dei, G; Soni, AK; Jha, AV; Appasani, B; Bizon, N; Srinivasulu, A; Nsengiyumva, P

Details: Volume 23, September 2024, Article number 102442

Abstract: This paper presents an innovative approach for automatic generation control for power system under a deregulated setting. The main objective of this work is to optimally tune the parameters of the fractional-order controller using the newly developed Aquila Optimizer (AO) to enhance system performance. A test system comprising a thermal power plant, a hydroelectric system, a gas turbine-based power plant, and wind energy sources is examined under deregulated environment. The study emphasizes the minimization of frequency variations, tie line deviations, and area control errors during diverse operational shifts. The proposed control strategy explores the response of generators in a hybrid deregulated power system, emphasizing the critical role of properly tuned Fractional Order Proportional-Integral-Derivative (FOPID) controllers in ensuring system stability. The potential and effectiveness of the proposed algorithm are compared with particle swarm optimization (PSO) and whale optimization algorithm (WOA) based controller performance for the same test system. The objective function for optimization is set as the minimization of the integral time and absolute error (ITAE) performance index. Furthermore, the efficacy of the proposed technique is compared with the Unified Power Flow Controller (UPFC) and its superiority is validated. Performance evaluation of the hybrid power system is conducted under Poolco agreement, bilateral agreement, and varying operating conditions. Comparative assessments reveal the superiority of the AO-driven FOPID over other techniques, demonstrating improved system metrics, including frequencies across different areas, tie-line power variations, and generator outputs.



URL: https://www.sciencedirect.com/science/article/pii/S2590123024006972?via%3Dihub

SCHOLARLY PUBLICATIONS

School of Electrical Engineering

KIIT Deemed to be University

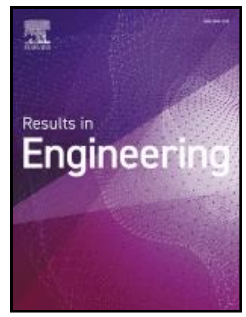
Journal Name: **Results in Engineering** **IF: 6**

Title: Improved fault detection and classification in PV arrays using stockwell transform and data mining techniques

Author: Saiprakash, C; Joga, SRK; Mohapatra, A; Nayak, B

Details: Volume 23, September 2024 , Article number 102808

Abstract: The growing integration of photovoltaic (PV) systems into the power grid necessitates reliable fault detection and classification mechanisms to ensure operational efficiency and safety. Fault detection in photovoltaic (PV) arrays is crucial for maintaining optimal system performance and ensuring the reliability of solar power generation. This paper proposes a novel approach for fault detection in PV arrays by employing the Stockwell transform in combination with various data mining techniques. The Stockwell transform is an advanced time-frequency analysis tool that allows for enhanced feature extraction from time-series data. By applying the Stockwell transform to the PV array's operational data, valuable frequency-domain information is extracted, enabling the identification of subtle fault signatures. To effectively detect and classify various faults, different data mining techniques, such as support vector machines, decision trees, random forests, and k-nearest neighbours, are applied to the transformed data. Each technique's effectiveness in identifying faults is evaluated and compared, enabling the selection of the most suitable algorithm for the specific application. Experimental results demonstrate the effectiveness of the proposed fault detection approach, exhibiting high accuracy, sensitivity, and specificity in identifying various types of faults in PV arrays. Extensive simulations and experimental validations were conducted on various fault conditions, including partial shading, open-circuit faults, and degradation. The results demonstrate the proposed method's superior performance, achieving an accuracy of 99.61 %, precision of 99.75 % and F1 score of 98.73 %. These metrics significantly surpass traditional fault detection techniques, highlighting the method's potential for real-world deployment. The approach not only enhances the reliability of PV systems but also contributes to reducing maintenance costs and improving system efficiency. The combination of the Stockwell transforms with data mining techniques proposed here provides a robust and efficient framework for early detection of faults, enabling timely maintenance and minimizing energy losses.



URL: https://www.sciencedirect.com/science/article/pii/S2590123024010636?via%3Dihub