2024 IEEE 3rd International Conference on Control, Instrumentation, Energy & Communication (CIEC) | 979-8-3503-1370-3/24/$31.00 ©2024 IEEE | DOI: 10.1109/CIEC59440.2024.10468211

2024 3rd International Conference on Control, Instrumentation, Energy & Communication (CIEC)

CONFERENCE PROCEEDINGS

ORGANIZERS

IEEE Joint CSS-IMS Kolkata Chapter

SPONSORS

ISBN: 979-8-3503-1370-3
PART NUMBER: CFP2497V-ART

2024 IEEE 3rd International Conference on Control, Instrumentation, Energy & Communication (CIEC) | 979-8-3503-1370-3/24/$31.00 ©2024 IEEE | DOI: 10.1109/CIEC59440.2024.10468184

Table of Contents

Fuzzy Fractional Order PID Controller Design for AVR System

Publisher: IEEE Cite This PDF

Susmit Chakraborty ; Arindam Mondal ; Chandan Das **All Authors**

Abstract:
An automated voltage regulator (AVR) is a feedback control system that examines the output voltage of generator, compares it to a predetermined value, and outputs an erro... **View more**

Metadata

Abstract:
An automated voltage regulator (AVR) is a feedback control system that examines the output voltage of generator, compares it to a predetermined value, and outputs an error signal that is used to modify excitation of the generator. In this manuscript, Fuzzy logic-based fractional order PID controller (Fuzzy-FOPID) is designed for the AVR problem. The parameters of the controller are tuned with a newly introduced metaheuristic optimization algorithm, known as Firebug Swarm optimization (FSO). When compared to other types of controllers described in the literature, the effectiveness of the FSO-tuned Fuzzy-FOPID controller performs the most effective control. The optimized gains of the proposed controller are evaluated on two different types of objective functions Integral Absolute Error (IAE) and Integral of time multiplied absolute error (ITAE). The output of the MATLAB simulation demonstrates the superiority of the suggested controller for the AVR system in terms of the per unit terminal voltage (TV) of the alternator.

Published in: 2024 IEEE 3rd International Conference on Control, Instrumentation, Energy & Communication (CIEC)

Date of Conference: 25-27 January 2024

DOI: 10.1109/CIEC59440.2024.10468513

Date Added to IEEE *Xplore*: 20 March 2024

Publisher: IEEE

ISBN Information:

Conference Location: Kolkata, India

Electronic ISBN:979-8-3503-1370-3
Print on Demand(PoD) ISBN:979-8-3503-1371-0

Susmit Chakraborty
Department of Computer Science and Engineering, Brainware University, Kolkata, India

Arindam Mondal
Department of Electrical Engineering, Dr. B. C. Roy Engineering College, Durgapur, India

Chandan Das
Department of Computer Science and Engineering, Dr. B. C. Roy Engineering College, Durgapur, India

Contents

The behavior of the generators and the output load supply voltages are highly affected by the electrical loads. Maintaining the generator's output voltage against dynamic load variation is crucial and has become a significant engineering challenge. Recently, more studies on this issue have been published in [1]–[6]. To manage the generator output voltage, several of these experiments use an automated voltage regulator (AVR). An AVR is a controller whose main job is to adjust the exciter voltage in order to maintain the optimal output voltage level in an electric generator. Drop in Generator output voltage can cause higher line losses, greater current requirements to provide the desired power, voltage variations, power outages, unstable transmission line states, and destruction to the loads. From a design perspective, damage to the systems brought on by such events results in costly issues [7]. According to Wang et al., the voltage decrease might result in financial losses of several hundred thousand dollars [8]. Therefore, it might result in significant losses for users in industrial sectors that rely on steady energy. To avoid substantial monetary expenses from voltage drop, the generator's nominal output voltage should be maintained constant. AVR adjusts the generator excitation voltage in response to fluctuating loads to maintain the output voltage at its nominal level. To do this, the researchers used a variety of control strategies to create an effective close-loop configuration for the AVR unit.

Authors

Susmit Chakraborty
Department of Computer Science and Engineering, Brainware University, Kolkata, India

Arindam Mondal
Department of Electrical Engineering, Dr. B. C. Roy Engineering College, Durgapur, India

Chandan Das
Department of Computer Science and Engineering, Dr. B. C. Roy Engineering College, Durgapur, India