Optimized Control of IoT-Monitored Microgrid Systems Using Genetic Algorithm

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Abstract:
Microgrid (MG) systems have become a good way to make power generation and distribution more efficient, especially when Distributed Energy Resources (DERs) are introduced. The inverter is a critical part of MGs since it regulates the voltage output to the grid. A unique method is proposed to tune the settings of a Proportional-Integral-Derivative (PID) controller for the inverter using Genetic Algorithm (GA). The main aim is to use GAs to improve the inverter control in an MG that is monitored by the Internet of Things (IoT). GA's are very useful for resolving difficult optimization issues. Optimization of voltage regulation, stability, and power transmission to the grid may be achieved by using GA-based tuning of PID controller settings. From the simulation results, the GA-based methodology provides better control performance than conventional tuning approaches, providing exact voltage regulation and improving the MG's stability and dependability.

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Contents

Green technologies are now very competitive with brown innovations due to the unexpected spike in the cost of fossil fuel, creating a favorable scenario for their incorporation into MG systems. This suggests that renewable energy sources (RES) have become a viable choice for resolving the issue of power outages in rural regions of certain nations where access to a stable power supply is restricted due to financial and technical limitations. Diesel generators, photovoltaic (PV), wind turbines, and electric storage systems (ESS) biomass combustion are just some of the sources used to meet load demands at any time or place. Methods, models, and indicators of performance, as well as optimization software and hardware, have all been used in MG's evaluation. This suggests that the MG system is becoming more important to researchers who investigate rural areas.