Review of Reactive Power Optimization Using Soft Computing Techniques

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Abstract

The main purpose of reactive power optimization is the optimal placement of reactive power source which is proper location and correct size of var. Generally proper location for new var sources were either simply calculated or directly assumed. Present research works have represented some useful optimization-based methods in RPP. In this paper a review study for reactive power optimization using Soft Computation Techniques is presented. To solve the reactive power optimization problem so many optimization techniques have been used in the given literature. review paper shows various optimization techniques for solving the reactive power optimization problem. this paper puts in front a new reactive power interpreter method in the area of power grid, Then, the paper summarizes the methods of reactive power optimization for voltage stability improvement of network and power loss minimization of reconfiguration.

Keywords: Reactive power optimization, Soft Computing Techniques

DOI Number: 10.48047/nq.2022.20.19.NQ99047 **NeuroQuantology2022; 20(19):513-523**

Introduction

Optimal allocation of Var resources such as capacitor banks, (SVCs) and STATIC COMPENSATORS (STATCOMs) is a critical part of reactive power planning (RPP). Traditionally, locations for new Var sources were either simply estimated or directly assumed. Recent research has presented some rigorous optimization-based methods for solving RPPs. Due to complicated objective functions, constraints and solution algorithms, RPP is identified as one of the most challenging problems in power systems.

After a detailed study of a large amount of previous works, we believe that an informative and concise review of the literature in RPP should summarize the objective function model, the constraint model, and the mathematical algorithms. These three components are briefly discussed below. The RPP objective function can be cost-based, which means minimizing the possible costs associated with the RPP, such as variable and fixed installation costs Var, actual energy loss costs, and/or fuel costs. Other possible objectives may be to minimize the deviation from a given plan of a control variable (such as voltage) or to maximize the voltage stability marginand power. It is also reasonable to use a multi-objective (MO) model as the target of the RPP formulation.No equations are used in this article. The reactive power optimization problem is then decomposed into a real power (P) and reactive power (Q) optimization problem. P-optimization is intended to minimize operating costs by adjusting the actual energy production; while (Q)-optimization is to adjust the growth of reactive power, the setting of the transformer taps and the amount of investment in the source Var.A number of interpretation techniques have been proposed in the literature for solving reactive power optimization problems. This article reviews various optimization techniques for solving the reactive power optimization problem

Soft Computing Techniques

LianLian et al. (2022) In this study, an adaptive multi-objective artificial immunity optimization algorithm is presented for reactive power optimization. In the proposed algorithm, a non-inferior solution evaluation method based on the Pareto coefficient for antibody evaluation is proposed. A fitness evaluation mechanism based on individual neighborhood selection and an adaptive cloning operator ensures the convergence of the algorithm, and a chaotic random sequence is added to the mutation operator to improve the diversity of the antibody population. Considering the minimum active power loss, the maximum static voltage stability reserve and the best voltage level, a multi-objective reactive power optimization model is created by introducing the static voltage stability index. The IEEE-30 bus system is chosen as a research object. Combined with the technique of order prioritization by the method of similarity to the ideal solution, after multi-attribute decision-making of the Pareto solution set, the optimal solution will not only ensure the economic operation of the system, but also increase the voltage stability of the power grid. The proposed reactive power optimization algorithm is effective [1]

Yu Zhou et al. (2021) This paper proposes the use of the range of reactive power embedded in wind farms to improve safety and optimality during the reactive power optimization process of the power system. First, three typical reactive power range approaches are analyzed, and a two-stage robust reactive power range evaluation method based on linear optimization is proposed. This method provides a range of reactive power that can be used by the upstream system operator while ensuring the operational security of the wind farm against wind farm uncertainty. Simplified DistFlowequations are used to balance calculation accuracy and cost. Next, an uncertain reactive power optimization problem is presented, which includes the range of wind farm reactive power through which system operators ensure the safety and optimality of the whole system in the base case and against any possible deviation caused by the uncertainty of the whole system load and the uncertain production of renewable energy sources. . Stable models of automatic production control and local voltage control against deviations are captured. This uncertain reactive power optimization problem is recast as a deterministic optimization problem that is easy to solve. Case studies confirm that, even with considerable uncertainty, wind farms are competent sources of reactive power, providing a significant range of reactive power [2].

LirenZouet al. (2021) Due to the low accuracy and premature tendency of traditional particle swarm optimization, a reactive power optimization control of an electromechanical system based on a fuzzy particle swarm optimization algorithm was proposed. The precondition is that the operating conditions are met. The loss of the active network was reduced and a mathematical model was built to optimize the static reactive power of the electromechanical system by changing the voltage distribution and reactive power of the system. Meanwhile, the voltage did not exceed the limit and the discrete control variables were limited by the maximum allowed action times, so a mathematical model for optimizing the dynamic reactive power of the electromechanical system was built by minimizing the sum of network losses in twenty-four hours per day. The particle swarm algorithm was optimized by an adaptive matching strategy, and then the particle position of the particle swarm optimization algorithm was updated. Furthermore, the mathematical model of the optimization of the static and dynamic reactive power of the electromechanical system was solved. Finally, the reactive power optimization control of the electromechanical system is implemented. The experimental results show that the proposed method has a high convergence performance, so it is able to realize accurate reactive power optimization control for the electromechanical system and eliminate the voltage exceeding the specified limits of the electromechanical system. In this way, the voltage of the node can always be within the specified range [3].

Yichen Liu et al. (2022) Large uncertainties in wind power generation will bring great challenges for optimal reactive power distribution (ORPD) analysis. This paper deals with a multi-objective ORPD strategy solved by a heuristic search algorithm that combines an elitist non-dominated sorting genetic algorithm with heredity (i-NSGA-II) and roulette wheel selection to optimize the operation of integrated wind power systems. The proposed ORPD strategy uses day-ahead predicted wind energy and load demand data to optimally set the following control variables: i) optimal tap locations of on-load tap changer (OLTC), ii)reactive demand setting

on reactive power compensator, and iii) outputs of active and of reactive power of wind farms (WF) in order to minimize: a) voltage deviations, b) active power losses, c) harmonic distortion of wind turbines and d) number of OLTC switching operations. Due to uncertainties in wind power and load demand, hourly modifications of the daily optimum results are also formulated to determine the optimum reactive power distribution in real time. The proposed new ORPD strategy has been rigorously tested using an IEEE 33-bus test system, a PG&E 69-bus test system, and a modified real GB network. The obtained results confirmed the effectiveness and applicability of the proposed strategy in both distribution and transmission networks [4].

ManoochehrBabanezhadet al. (2022) Allocation of capacitors is one of the most important topics in distribution network operation. In this paper, the reactive power based on the allocation of capacitors in an electrical distribution network using the mathematical Remora Optimization Algorithm (ROA) is presented as a powerful optimization method to identify the optimal placement and size of capacitors in networks. The objective function is defined as the minimization of loss costs, acquisition and installation costs, as well as capacitor operation costs under various load conditions. The variables for the optimization problem include the optimal location and size of the capacitors in the network, which are found with respect to the objective function, operating conditions, and reactive size of the capacitors using ROA. The ROA-based method is studied on IEEE 33 and 69 bus networks. Simulations are evaluated in different scenarios including capacitor assignments with and without PLNLI and also under different loads. The simulation results show the capability of the proposed methodology compared to previous studies in reducing losses, improving the voltage profile, reducing annual costs and increasing net savings. The results also show that the PLNLI consideration offers less losses, better voltage profiles and of course higher annual costs than the no-consideration conditions. In addition, the results clearly show that reducing the load level of the power grid leads to a reduction in the cost of losses, voltage fluctuations and also the annual cost of the network [5].

Cong Zhang et al. (2021) With the integration of renewable energy generation with high penetration, the voltage security of power systems is at risk. Reactive Power Optimization Including Interval Uncertainty (RPOIU) is used to develop a voltage control strategy to ensure that the power grid state variables are within their safe operating limits under the uncertainties of renewable energy generation and load demand input data. However, the RPOIU model is currently not properly solved in terms of solution efficiency and optimization effect. This paper proposes a new method for solving the RPOIU model, which is referred to as the Safety Limits Method (SLM). The proposed SLM first calculates the safety limits of the state variables of the

RPOIU model using the power flow interval method, i.e., the optimization scenario method, and then transforms the RPOIU model into a deterministic model whose constraints correspond to the determined safety limits. The deterministic model is then efficiently solved using the interior point method. We verify that the voltage control strategy obtained by solving the deterministic model is able to ensure that the values of the state control variables satisfy the constraints of the original RPOIU model, but with more conservative safety limits. This problem is solved by adjusting the SLM safety limits by defining an interval ratio and using an iterative predictor-corrector procedure. The results obtained by the proposed SLM and the modified SLM based on numerical simulations are compared with the results obtained by the previously proposed method to effectively solve the RPOIU model, and the analysis of the results shows the advantages, efficiency and good applicability of the proposed SLM [6].

Xi Zenget al. (2022) Within optimization frameworks with multiple time scales at daily, hourly, and minute levels, centralized optimization requires real-time communication and prediction technology. In a non-built-up area distribution network, minute-level optimization does not work due to the lack of accurate prediction and real-time communication. The practical reactive power originally obtained from minute-level optimization does not exist, and the uncertainty should be accounted for in hourly-level optimization. In this study, a two-stage robust optimization at the hourly level is proposed to minimize network losses without optimization at the minute level. A simple data-based multiple uncertainty modeling method is proposed that directly uses historical data with minimal mathematical knowledge. The multiple uncertainty set contains the interval constraint and the convex hull of the ellipsoidal constraint. The convex hull of the ellipsoidal constraint is formed by the tangents of the ellipse. Moreover, practical reactive power cannot be obtained by the conventional robust inverter dispatching strategy, which sets the maximum available active power as an uncertain variable. A pseudo-decoupling dispatch strategy is proposed to approximate the decoupling of reactive power and uncertainty and obtain practical reactive power. A Bender decomposition framework is used to solve the two-stage robust optimization, and a feasible linear constraint generated from the subproblem is added to the master problem. The simulation results demonstrate the effectiveness of the proposed method [7]

RuanHebinet al. (2018) The main objective of this paper is to assess the feasibility of using the heat demand - outdoor temperature function for heat demand forecasting. The Alvalade district, located in Lisbon (Portugal), was used as a case study. The district consists of 665 buildings that differ both in terms of construction time and typology. Three weather scenarios (low, medium, high) and three district recovery scenarios (shallow, medium, deep) were developed. To estimate the error, the obtained heat demand values were compared with the results from a dynamic heat demand model, previously developed and verified by the authors. The results showed that when only weather variation is considered, the margin of error may be acceptable for some applications [8].

RonghengLinet Co., Ltd. (2019) Hydrogen and photovoltaics (PV) are two typical new energies that are important for sustainable development. Introducing hydrogen or photovoltaics into the smart grid as distributed generation (DG) is becoming a promising approach. These kinds of energy generation will help the grid collect more energy and introduce new possibilities for grid management. In this article, we will present the application of hydrogen and PV in reactive power management. PV is used for obtaining hydrogen and PV is variable and dependent on weather conditions compared to a conventional generator that produces stable power. A photovoltaic hydrogen fuel cell (PV-H2-FC) is introduced as a grid-connected DG. The addition of hydrogen-based DG would help improve the quality of power supply. A genetic algorithm for DG site selection supporting DG cost optimization is proposed. Reactive Power Optimization (RPO) is an important function in future planning and day-to-day operation of a smart grid system. An implementation of reactive power optimization based on historical solution comparison is also proposed, taking into account PV-H2-FC properties and historical network data, which uses cosine distance to measure similarity. The proposed RPO algorithm has a great advantage in calculation speed compared to traditional algorithms. Historical load data with the highest similarity are extracted and their historical RPO scheme is used to simulate the current RPO scheme. The results show that this method could help find the RPO solution efficiently. The proposed solution would provide information processing purposes on energy companies and further explore the supporting role of information resources in network operation, which has broad social benefits [9].

Jinbo Huang et al. (2019) Reactive power optimization is essentially finding the optimal power flow to optimize the steady state voltage and power flow profile. Since the operation of the equipment is limited by its lifetime and regulations, dynamic reactive power optimization (DRPO) is formulated as a mixed-integer nonlinear programming problem with respect to the practical regulatory constraints of the equipment. In order to preserve the control independence and information privacy of distributed sub-grids, a three-stage programming approach is proposed to achieve a fully decentralized solution to the multi-site power system DRPO problem. In addition to incorporating the decomposition of optimality conditions, the decentralized DRPO method includes three stages to solve the difficulty of handling discrete variables, and can achieve a fully distributed solution for the multi-domain DRPO problem with the exchange of only small marginal information. A forward-backward dynamic programming approach with polynomial order computational complexity is used to solve the stepwise adaptation problem. Simulation results for three test systems show that the proposed decentralized method can obtain high-quality solutions in a decentralized manner with promising computing performance considering the limitations in practice [10].

Mostafa NasouriGilvaeiet al. (2020) This paper proposes a novel, reliable, and efficient hybrid approach based on the integration of the Firefly Algorithm (FA) and the Adaptive Particularly Tunable Fuzzy Particle Swarm Optimization (APT-FPSO) method to solve the reactive power dispatch (RPD) problem. , a fundamental optimization problem in the operation of energy systems. Like many other original metaheuristic optimization techniques, standard FA suffers from some serious drawbacks, the most important of which is the ease of being trapped in a locally optimal solution. In order to solve these difficulties, in the current study, an improved version of fuzzy-based particle swarm optimization is used in the internal structure of the original FA. The developed hybrid approach, capable of preventing premature convergence of the original FA by improving exploration and exploitation procedures, is used to determine the optimal control variables (i.e., generation bus voltages, tap-changer transformer tap positions, and shunt compensator reactive output power) through the optimization of three different objective functions consisting of total real power loss during transmission, voltage magnitude deviations and voltage stability index. To verify the accuracy and capability of the proposed hybrid approach, it is first used to solve several benchmark optimization functions and then applied to three test systems at different scales, consisting of IEEE 30-bus, IEEE 57-bus, and IEEE 118-bus power. systems for solving the RPD problem. Finally, the results of the presented hybrid method will be compared with those obtained by other implemented approaches based on swarm intelligence. The statistical analysis of this research demonstrates the robustness and effectiveness of the developed algorithm for solving sophisticated optimization problems, especially the RPD problem [11].

Mohamed A.M. Shaheenet al. (2020) This paper provides an application of a hybrid method of Gray Wolf Optimization and Particle Swarm Optimization (GWO-PSO) to achieve a solution to the Optimal Reactive Power Dispatch (ORPD) problem within electrical networks. PSO is a swarm-based meta-heuristic optimization algorithm that aims to find the best solution to a problem by moving particles in a specific survey field. On the other hand, GWO is a meta-heuristic optimization technique inspired by gray wolves. In this paper, GWO is hybridized with the PSO method to improve the GWO procedure. In this research study, two objectives are minimized to improve the power grid performance. They are: 1) power losses in transmission systems and 2) voltage deviation on load buses. The ORPD problem has many limitations on networks that must be considered in the solution. Hybrid GWO-PSO has proven to be an effective optimization technique in finding the global best solution to an optimization problem. The success of the introduced hybrid technique is verified using more than one standard IEEE test system. The evaluation of the established technique is carried out by comparing it with other optimization techniques mentioned in the literature. The simulation results confirm that the use of hybrid GWO-PSO techniques causes an observable improvement in a wide range of electrical network behavior [12].

AmlakAbazaet al. (2021) This study deals with solving the optimal reactive power dispatch (ORPD) problem considering the existence of renewable energy sources (RER). The sensitivity analysis focuses on studying the effect of incorporating reactive power sources and wind units on solving the ORPD problem. An improved coyote optimization algorithm (ECOA) is developed to solve the ORPD problem. ECOA combines the advantages of fuzzy logic principles and conventional COA in order to obtain the best performance of the ORPD solution. ECOA's capability is tested on IEEE 30-bus, 118-bus test systems, while its scalability is tested for IEEE 300-bus standard test system. The impact of different levels of wind energy penetration on the achievement of ORPD is assessed. Statistical analyzes are performed to demonstrate the robustness of the proposed ECOA. Therefore, ECOA leads to more competitive solutions for single and multi-objective cases compared to methods reported in the literature [13].

Biplab Bhattacharyya et al. (2016) Reactive power planning is one of the most challenging problems for the efficient and resourceful operation of an interconnected power grid. It requires effective and optimal coordination of all sources of reactive power present in the network. Recently, the Teaching Learning Based Optimization (TLBO) algorithm has been developed and finds its application in the field of engineering optimization. In the proposed work, an optimization algorithm based on TLBO is used for reactive power planning and applied in the IEEE 30 and IEEE 57 bus system. The results obtained by this method are compared with the results obtained by other optimization techniques such as PSO (Particle swarm optimization), Krill heard, HSA (Harmony search algorithm) and BB-BC (Big Bang-Big Crunch). Finally, TLBO appears to be the most efficient method for reactive power planning among all discussed methods and can be considered as one of the standard reactive power optimization methods [14]

Peifeng Wu et.al [2013] suggested that the reactive power interpretation problem has a significant impact on the safe and economic handling of power systems. The reactive power interpreter of power systems is a kind of combined nonlinear integer programming problem and can reduce network losses by changing transformer taps,adjusting the terminal voltage of the generator and connecting the shunt capacitors. This paper presented a global differential evolution (GDE) algorithm that can improve the convergence speed and avoid the local optimum. GDE is used to troubleshoot the reactive power interpreter. [15]

Yuancheng Li et.al [2013] proposed the optimal reactive power flow (ORPF) is a domain problem in the gradual development of the optimal power flow problem. Differential evolution (DE) has been shown to be a promising evolutionary algorithm for solving the ORPF case, but it requires a relatively large population size to avoid premature convergence, which will increase the convergence moment of the algorithm. On the other hand, the Artificial Bee Colony (ABC) algorithm has been shown to have good global search efficiency. By integrating the respective advantages of differential evolution (DE) and artificial bee colony (ABC), this study presents an ABC breed DE assistance algorithm, denoted as DE–ABC, to overcome the loss of DE requiring a large population size and enhance global search. efficiency. [16]

S. Ramesh et.al [2012] proposed this paper discussing the application of modified non-dominated sorting genetic algorithm-II (MNSGA-II) to the case of multi-objective reactive power planning (RPP). The three motives considered are the minimization of the combined operational and VAR allocation costs, the correction of the bus voltage profile, and the improvement of voltage stability. To maintain good diversity in non-dominant solutions, a Dynamic Crowding Distance (DCD) procedure is implemented in NSGA-II and is called MNSGA-II. The performance of NSGA-II and MNSGA-II is compared with respect to the best, mean, worst and standard deviation of multi-objective performance measures namely gamma, spread, smallest spacing and Inverted Generational Distance (IGD) in 15 free runs [17] .

M.R. Nayak et. al [2012] proposed this paper a non-dominance learning-based multi-objective optimization algorithm for solving the optimal power flow (OPF) case. The OPF case is a nonlinear constrained multi-objective interpreter case where fuel cost, transmission degradation and L-index are to be skeletonized. Since the issue is deportation as a true case of a multiple-target interpreter, a different settlement is provided. The judgment constructor has the option to choose a solution among different compromise solutions provided in the Pareto-optimal front [18].

Xiang-junZenget al. (2012) Reactive power optimization plays a significant role in wind farm inter-grid operation to maintain voltage stability and system reliability. Genetic Algorithm (GA) is an effective method that can be used in reactive power optimization to reduce power losses and improve power quality. However, traditional GA has some defects such as slow convergence and prematurity. For improvement, the decoding method, genetic operators, crossover and mutation probability, iteration stop criterion based on catastrophism theory are modified in the article. A wind farm reactive power optimization technique based on improved genetic algorithm (IGA) is presented. The simulation results for Chinese Mongolia Huitengliang Power Plant show that the proposed method meets the global performance, high convergence speed and stable convergence performance, so it is suitable to solve the optimal reactive power planning [19].

Wang xiao-hua et al. (2011) Investigate the multi-objective reactive power optimization problem, use the theory of multi-objective fuzzy optimization to change the multi-objective optimization to single-objective optimization, and adopt the fuzzy adaptive particle swarm algorithm to perform the solution. Comprehensively considering the safety and economic efficiency of the system as well as the state of operational constraints, propose a comprehensive and practical multi-objective reactive power optimization model. Considering the multi-objective reactive power optimization model of the voltage stability index can optimize the economic benefit and safety benefit of the system. Applying the multi-objective fuzzy optimization theory combined with the adaptive particle swarm optimization algorithm to the reactive power multi-objective optimization problem could solve the multi-dimensional multi-objective optimization problem better. After adopting the fuzzy adaptive particle swarm algorithm, advantages such as achieving a global optimal solution, reducing computational complexity, and improving computational efficiency are displayed [20].

PianZhaoyu et al. (2011) The reactive power optimization problem is a typical nonlinear problem with the characteristics of multiple objectives, uncertainty and multiple constraints. Classical mathematical techniques are insufficient and inadequate for the optimal operation of energy systems due to inherent complexity. This work studied the PSO algorithm and reactive power optimization and introduced some new ideas to the PSO algorithm to improve its optimization ability. The particle swarm adaptive swarm algorithm was designed to solve the problem of large-scale search failure and presented a way to adjust the parameters for the adaptive PSO algorithm according to the optimization speed. When the convergence conditions were met, the algorithm allowed the particle velocity in accordance with the ideal setting of the adaptive search parameters. Based on this, to overcome the disadvantage that PSO can get in the local optimization solution, an improved PSO was developed. The algorithm used statistical laws of particle fitness to classify particles and took different evolutionary models for different kinds of particles. Finally, a standard IEEE-6 node test system was calculated to optimize the reactive power, compared to the standard PSO, the proposed PSO algorithm had higher search efficiency and better global optimization ability [21].

Liu Zifa et.al [2011] proposed to deal with the reactive power interpreter case, an adaptive Niche Particle Swarm Optimization (ANPSO) algorithm is presented. The differential evolution (DE) algorithm is easy to use and has the advantages of strong robustness, but its capacity is limited and it may fall into a local optimum because of population loss of diversity after several generations. ANDE introduces gap-sharing mechanisms for changing individual values and accelerates the elimination of individuals who have a lower rate. Niching radius can also be adjusted adaptively based on the relative distance between individuals, which reflects the centrality of the settlement. Using the above method, a global search algorithm capability is developed. [22]

Shengqing Li et.al [2011] proposed a new multi-objective concordance evolution algorithm (MOCEA) for the efficiency of active power loss, voltage divergence, static voltage bar and reactive power based on the traditional reactive power interpreter model. The algorithm organically superimposes a multi-objective decision concordance model with group evolution reasoning.In the restricted group, everyone is evaluated according to the matching model to improve the efficiency of the interpreter method. [23]

Enqi Wu et.al [2010] proposed an adaptive particle swarm optimization (APSO) algorithm to solve the problem that the standard particle swarm optimization (PSO) algorithm can easily fall into a locally optimized point where the inertial mass is nonlinearly pure. using population information. The rate mutation factors and position selling factor are proposed. The APSO algorithm thus improves its solubility for global optimization to effectively avoid premature convergence. [24]

Congyu Zhang et.al [2010] proposed considering active power loss and voltage divergence, Multi-objective Particle Swarm Optimization Algorithm (MOPSO) is presented for power system reactive power remittance. MOPSO understands non-dominated sorting, interference outliers and special mutation operation into particle swarm optimization to improve the algorithm's exploration ability and improve the variety of Pareto solutions. [25]

Hongxia Miao et.al [2009] proposed Quantum Genetic Algorithm (QGA) is a genetic algorithm (GA) based on quantum computing (QC) principles. To complete the evolutionary search, it uses quantum bit encoding, full perturbation, and a quantum gate as an update operator. [26]

GENG Huan-Tong et.al [2009] proposed that this paper presents an algorithm for solving the reactive power optimization problem using Evolution Strategy (ES) application with stochastic category. In order to greatly improve the performance and practicality of the interpreter, an encoding prescription for integer transformer tap position data is deliberately designed, and a termination condition for variance-based self-adaptive optimization is also provided. [27]

Haoming Liu et.al [2008] proposed a hybrid algorithm called OOTS for reactive power interpreter in distributed system which is based on Ordinal Optimization (OO) and Tabu Search (TS). The reactive power interpreter is an important issue in the delivery system, which can reduce the power loss and improve the voltage setting. The process of interpreting the mathematical model consists of two steps, the first is to obtain a good pilot solution for Tabu Search using Ordinal Optimization, and the second is to find the global optimal solution using TS. [28]

Xuexia Zhang et.al [2008] proposed a new algorithm, called Oriented Search Algorithm (OSA), which deals with the problem of reactive power interpretation in an article. The interpreter's motive is to minimize active power losses while maintaining acceptable voltage profiles. In the oriented search algorithm, the searched individual simulates human behavior, and the searched object (i.e., the optimal solution of the objective functions) acts as an intelligent agent that can convey oriented information to the searched individuals. [29]

Bo yang et.al [2007] proposed a review of particle swarm interpreter applications to solve power system optimization problems such as optimal power flow, reactive power dispatch, unit deployment, economic dispatch, generation and transmission scheduling, maintenance planning, condition estimation, identity model , load forecasting, monitoring and more. [30]

Conclusion

This paper presents a review study of reactive power optimization using evolutionary computing techniques. A number of optimization techniques have been proposed in the literature to solve the reactive power optimization problem... The limitations of conventional optimization methods have been outlined. The potential for the application of the particle swarm optimization algorithm to solve the reactive power optimization problem was presented.

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