Particle Swarm Optimization Matlab

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Metaheuristic Optimization: Nature-Inspired Algorithms Swarm and Computational Intelligence, Theory and Applications
OPTIMIZATION with MATLAB USING the GENETIC ALGORITHM. MULTIOBJECTIVE OPTIMIZATION
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Swarm Intelligence Algorithms (Two Volume Set)
Swarm Intelligence
Particle Swarm Optimization with Applications
Particle Swarm Optimization
Metaheuristics: Outlines, MATLAB Codes and Examples
Neural Networks and Learning Algorithms in MATLAB
Genetic Algorithms in Electromagnetics
Swarm Intelligence and Bio-Inspired Computation
2019 IEEE PES GTD Grand International Conference and Exposition Asia (GTD Asia)
Optimization
Swarm Intelligence
Pattern Recognition and Computational Intelligence Techniques Using Matlab

Computational Intelligence Paradigms
Genetic and Evolutionary Computation - GECCO 2003
Applying Particle Swarm Optimization

ZACHARY ALEX

Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK® Springer
As a swarm intelligence scheme, the Particle Swarm Optimization (PSO) technique is a stochastic population-based method, representing an intuitive methodology for global optimization and has been successfully applied to several fields of research. Through mimicking the unpredictable motion of bird flocks in search of food, PSO uses the mechanism of information sharing that affects the overall behavior of a swarm to converge to the optimal values of the unknown parameters for the problem under consideration. For this research, PSO was used to optimize the finite thrust transfers of a spacecraft between two circular orbits that are not coplanar. The transfer trajectory consists of two thrusting arcs separated by a coasting arc. For better performance, the plane change was incorporated in the second thrusting maneuver. The dynamics of the system depend of the twelve coefficients from three cubic polynomials used to represent the in-plane and out-of-plane thrust pointing angles as well as the three time intervals corresponding to the three arcs of trajectory. Using MATLAB, the PSO algorithm will determine these fifteen parameters as the solution converges to the global optimal solution, minimizing the objective function, which corresponds to minimizing propellant consumption. The algorithm consists of eight functions, using ode45 to numerically integrate the state equations for each thrusting arc. Several tests were conducted on the PSO algorithm to analyze the convergence to the global minimum including varying the swarm parameters and the ratio of outer to inner radii values, [beta]. Sometimes, the algorithm converged on a local minimum as the solution. Further research will attempt to correct the issue of local convergence, in hopes of consistently obtaining the global minimum.
Swarm Intelligent Systems Springer Science & Business Media
Considered one of the most innovative research directions, computational intelligence (CI) embraces techniques that use global search optimization, machine learning, approximate reasoning, and connectionist systems to develop efficient, robust, and easy-to-use solutions amidst multiple decision variables, complex constraints, and tumultuous environments. CI techniques involve a combination of learning, adaptation, and evolution used for intelligent applications. Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® explores the performance of CI in terms of knowledge representation, adaptability, optimality, and processing speed for different real-world optimization problems. Focusing on the practical implementation of CI

techniques, this book: Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch, harmonic reduction, load frequency control and automatic voltage regulation, job shop scheduling, multidepot vehicle routing, and digital image watermarking Explains the impact of CI on power systems, control systems, industrial automation, and image processing through the above-mentioned applications Shows how to apply CI algorithms to constraint-based optimization problems using MATLAB® m-files and Simulink® models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® provides a valuable reference for industry professionals and advanced undergraduate, postgraduate, and research students.

Particle Swarm Optimization Approach for Distributed Generation Planning to Improve the Voltage Profile Margin Springer Nature

The book presents eight well-known and often used algorithms besides nine newly developed algorithms by the first author and his students in a practical implementation framework. Matlab codes and some benchmark structural optimization problems are provided. The aim is to provide an efficient context for experienced researchers or readers not familiar with theory, applications and computational developments of the considered metaheuristics. The information will also be of interest to readers interested in application of metaheuristics for hard optimization, comparing conceptually different metaheuristics and designing new metaheuristics.

Particle Swarm Optimisation CRC Press

Global Optimization Toolbox provides functions that search for global solutions to problems that contain multiple maxima or minima. Toolbox solvers include surrogate, pattern search, genetic algorithm, particle swarm, simulated annealing, multi start, and global search. You can use these solvers for optimization problems where the objective or constraint function is continuous, discontinuous, stochastic, does not possess derivatives, or includes simulations or black-box functions. For problems with multiple objectives, you can identify a Pareto front using genetic algorithm or pattern search solvers. You can improve solver effective es by adjusting options and, for applicable solvers, customizing creation, update, and search functions. You can use custom data types with the genetic algorithm and simulated annealing solvers to represent problems not easily expressed with standard data types. The hybrid function option lets you improve a solution by applying a second solver after the first.Simulated annealing is a method for solving unconstrained and bound-constrained optimization problems. The method models the physical process of heating a material and then slowly lowering the temperature to decrease defects, thus minimizing the system energy. At each iteration of the simulated annealing algorithm, a new point is randomly generated. The distance of the new point from the current point, or the extent of the search,

is based on a probability distribution with a scale proportional to the temperature. The algorithm accepts all new points that lower the objective, but also, with a certain probability, points that raise the objective. By accepting points that raise the objective, the algorithm avoids being trapped in local minima, and is able to explore globally for more possible solutions. An annealing schedule is selected to systematically decrease the temperature as the algorithm proceeds. As the temperature decreases, the algorithm reduces the extent of its search to converge to a minimum.You might need to formulate problems with more than one objective, since a single objective with several constraints may not adequately represent the problem being faced. If so, there is a vector of objectives, F(x) = [F1(x), F2(x), ..., Fm(x)], that must be traded off in some way. The relative importance of these objectives is not generally known until the system's best capabilities are determined and tradeoffs between the objectives fully understood. As the number of objectives increases, tradeoffs are likely to become complex and less easily quantified. The designer must rely on his or her intuition and ability to express preferences throughout the optimization cycle. Thus, requirements for a multiobjective design strategy must enable a natural problema formulation to be expressed, and be able to solve the problem and enter preferences into a numerically tractable and realistic design proble *ADVANCED OPTIMIZATION with MATLAB Using BIG DATA TECHNIQUES* BoD – Books on Demand
An accessible introduction to metaheuristics and optimization, featuring powerful and modern algorithms for application across engineering and the sciences From engineering and computer science to economics and management science, optimization is a core component for problem solving. Highlighting the latest developments that have evolved in recent years, Engineering Optimization: An Introduction with Metaheuristic Applications outlines popular metaheuristic algorithms and equips readers with the skills needed to apply these techniques to their own optimization problems. With insightful examples from various fields of study, the author highlights key concepts and techniques for the successful application of commonly-used metaheuristc algorithms, including simulated annealing, particle swarm optimization, harmony search, and genetic algorithms. The author introduces all major metaheuristic algorithms and their applications in optimization through a presentation that is organized into three succinct parts: Foundations of Optimization and Algorithms provides a brief introduction to the underlying nature of optimization and the common approaches to optimization problems, random number generation, the Monte Carlo method, and the Markov chain Monte Carlo method Metaheuristic Algorithms presents common metaheuristic algorithms in detail, including genetic algorithms, simulated annealing, ant algorithms, bee algorithms, particle swarm optimization, firefly algorithms, and harmony search Applications outlines a wide range of applications that use metaheuristic

algorithms to solve challenging optimization problems with detailed implementation while also introducing various modifications used for multi-objective optimization Throughout the book, the author presents worked-out examples and real-world applications that illustrate the modern relevance of the topic. A detailed appendix features important and popular algorithms using MATLAB® and Octave software packages, and a related FTP site houses MATLAB code and programs for easy implementation of the discussed techniques. In addition, references to the current literature enable readers to investigate individual algorithms and methods in greater detail. Engineering Optimization: An Introduction with Metaheuristic Applications is an excellent book for courses on optimization and computer simulation at the upper-undergraduate and graduate levels. It is also a valuable reference for researchers and practitioners working in the fields of mathematics, engineering, computer science, operations research, and management science who use metaheuristic algorithms to solve problems in their everyday work.

Introduction to Nature-Inspired Optimization

CRC Press

Choose the Correct Solution Method for Your Optimization Problem Optimization: Algorithms and Applications presents a variety of solution techniques for optimization problems, emphasizing concepts rather than rigorous mathematical details and proofs. The book covers both gradient and stochastic methods as solution techniques for unconstrained and constrained optimization problems. It discusses the conjugate gradient method, Broyden-Fletcher-Goldfarb-Shanno algorithm, Powell method, penalty function, augmented Lagrange multiplier method, sequential quadratic programming, method of feasible directions, genetic algorithms, particle swarm optimization (PSO), simulated annealing, ant colony optimization, and tabu search methods. The author shows how to solve non-convex multi-objective optimization problems using simple modifications of the basic PSO code. The book also introduces multidisciplinary design optimization (MDO) architectures-one of the first optimization books to do so-and develops software codes for the simplex method and affine-scaling interior point method for solving linear programming problems. In addition, it examines Gomory's cutting plane method, the branch-and-bound method, and Balas' algorithm for integer programming problems. The author follows a step-by-step approach to developing the MATLAB ® codes from the algorithms. He then applies the codes to solve both standard functions taken from the literature and real-world applications, including a complex trajectory design problem of a robot, a portfolio optimization problem, and a multi-objective shape optimization problem of a reentry body. This hands-on approach improves your understanding and confidence in handling different solution methods. The MATLAB codes are available on the book's CRC Press web page.

ADVANCED OPTIMIZATION FUNCTIONS in MATLAB

Springer Nature
Choose the Correct Solution Method for Your Optimization Problem Optimization: Algorithms and Applications presents a variety of solution techniques for optimization problems, emphasizing concepts rather than rigorous mathematical details and proofs. The book covers both gradient and stochastic methods as solution techniques for unconstrained and constrained optimization problems. It discusses the conjugate gradient method, Broyden–Fletcher–Goldfarb–Shanno algorithm, Powell method, penalty function, augmented Lagrange multiplier method, sequential quadratic programming, method of feasible directions, genetic algorithms, particle swarm optimization (PSO), simulated annealing, ant colony optimization, and tabu search methods. The author shows how to solve non-convex multi-objective optimization problems using simple modifications of the basic PSO code. The book also introduces multidisciplinary design optimization (MDO) architectures—one of the first optimization books to do so—and develops software codes for the simplex method and affine-scaling interior point method for solving linear programming problems. In addition, it examines Gomory's cutting plane method, the branch-and-bound method, and Balas' algorithm for integer programming problems. The author follows a step-by-step approach to developing the MATLAB® codes from the algorithms. He then applies the codes to solve both standard functions taken from the literature and real-world applications, including a complex trajectory design problem of a robot, a portfolio optimization problem, and a multi-objective shape optimization problem of a reentry body. This hands-on approach improves your understanding and confidence in handling different solution methods. The MATLAB codes are available on the book's CRC Press web page.

Fractional Order Darwinian Particle Swarm Optimization
CRC Press
Choose the Correct Solution Method for Your Optimization ProblemOptimization: Algorithms and Applications presents a variety of solution techniques for optimization problems, emphasizing concepts rather than rigorous mathematical details and proofs. The book covers both gradient and stochastic methods as solution techniques for unconstrained and co

Vehicle Propulsion Systems Springer Nature
This is the first book devoted entirely to Particle SwarmOptimization (PSO), which is a non-specific algorithm, similar toevolutionary algorithms, such as taboo search and ant colonies. Since its original development in 1995, PSO has mainly beenapplied to continuous-discrete heterogeneous strongly non-linearnumerical optimization and it is thus used almost everywhere in theworld. Its convergence rate also makes it a preferred tool indynamic optimization.

Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK®
John Wiley & Sons
Technology/Engineering/Mechanical Provides all the tools needed to begin solving optimization

problems using MATLAB® The Second Edition of Applied Optimization with MATLAB® Programming enables readers to harness all the features of MATLAB® to solve optimization problems using a variety of linear and nonlinear design optimization techniques. By breaking down complex mathematical concepts into simple ideas and offering plenty of easy-to-follow examples, this text is an ideal introduction to the field. Examples come from all engineering disciplines as well as science, economics, operations research, and mathematics, helping readers understand how to apply optimization techniques to solve actual problems. This Second Edition has been thoroughly revised, incorporating current optimization techniques as well as the improved MATLAB® tools. Two important new features of the text are: Introduction to the scan and zoom method, providing a simple, effective technique that works for unconstrained, constrained, and global optimization problems New chapter, Hybrid Mathematics: An Application, using examples to illustrate how optimization can develop analytical or explicit solutions to differential systems and data-fitting problems Each chapter ends with a set of problems that give readers an opportunity to put their new skills into practice. Almost all of the numerical techniques covered in the text are supported by MATLAB® code, which readers can download on the text's companion Web site www.wiley.com/go/venkat2e and use to begin solving problems on their own. This text is recommended for upper-level undergraduate and graduate students in all areas of engineering as well as other disciplines that use optimization techniques to solve design problems.

Applied Optimization with MATLAB Programming Springer Nature

This book explains the theoretical structure of particle swarm optimization (PSO) and focuses on the application of PSO to portfolio optimization problems. The general goal of portfolio optimization is to find a solution that provides the highest expected return at each level of portfolio risk. According to H. Markowitz's portfolio selection theory, as new assets are added to an investment portfolio, the total risk of the portfolio's decreases depending on the correlations of asset returns, while the expected return on the portfolio represents the weighted average of the expected returns for each asset. The book explains PSO in detail and demonstrates how to implement Markowitz's portfolio optimization approach using PSO. In addition, it expands on the Markowitz model and seeks to improve the solution-finding process with the aid of various algorithms. In short, the book provides researchers, teachers, engineers, managers and practitioners with many tools they need to apply the PSO technique to portfolio optimization.

Electronically Scanned Arrays MATLAB® Modeling and Simulation Springer Nature

Offering a wide range of programming examples implemented in MATLAB®, Computational Intelligence Paradigms: Theory and Applications Using MATLAB® presents theoretical concepts and a general framework for computational intelligence

(CI) approaches, including artificial neural networks, fuzzy systems, evolutionary computation, genetic algorithms and programming, and swarm intelligence. It covers numerous intelligent computing methodologies and algorithms used in CI research. The book first focuses on neural networks, including common artificial neural networks; neural networks based on data classification, data association, and data conceptualization; and real-world applications of neural networks. It then discusses fuzzy sets, fuzzy rules, applications of fuzzy systems, and different types of fused neuro-fuzzy systems, before providing MATLAB illustrations of ANFIS, classification and regression trees, fuzzy c-means clustering algorithms, fuzzy ART map, and Takagi–Sugeno inference systems. The authors also describe the history, advantages, and disadvantages of evolutionary computation and include solved MATLAB programs to illustrate the implementation of evolutionary computation in various problems. After exploring the operators and parameters of genetic algorithms, they cover the steps and MATLAB routines of genetic programming. The final chapter introduces swarm intelligence and its applications, particle swarm optimization, and ant colony optimization. Full of worked examples and end-of-chapter questions, this comprehensive book explains how to use MATLAB to implement CI techniques for the solution of biological problems. It will help readers with their work on evolution dynamics, self-organization, natural and artificial morphogenesis, emergent collective behaviors, swarm intelligence, evolutionary strategies, genetic programming, and the evolution of social behaviors.

Metaheuristic Computation with MATLAB® Elsevier

"This book presents the most recent and established developments of Particle swarm optimization (PSO) within a unified framework by noted researchers in the field"--Provided by publisher.

Particle Swarm Optimization and Intelligence: Advances and Applications Springer Science & Business Media

Global Optimization Toolbox provides functions that search for global solutions to problems that contain multiple maxima or minima. Toolbox solvers include surrogate, pattern search, genetic algorithm, particle swarm, simulated annealing, multi start, and global search. The genetic algorithm is a method for solving both constrained and unconstrained optimization problems that is based on natural selection, the process that drives biological evolution. The genetic algorithm repeatedly modifies a population of individual solutions. At each step, the genetic algorithm selects individuals at random from the current population to be parents and uses them to produce the children for the next generation. Over successive generations, the population "evolves" toward an optimal solution. You can apply the genetic algorithm to solve a variety of optimization problems that are not well suited for standard optimization algorithms, including problems in which the objective function is discontinuous, nondifferentiable, stochastic, or highly

nonlinear. The genetic algorithm can address problems of mixed integer programming, where some components are restricted to be integer-valued.A surrogate is a function that approximates an objective function. The surrogate is useful because it takes little time to evaluate. So, for example, to search for a point that minimizes an objective function, simply evaluate the surrogate on thousands of points, and take the best value as an approximation to the minimizer of the objective function. Surrogate optimization is best suited to time-consuming objective functions. The objective function need not be smooth, but the algorithm works best when the objective function is continuous. Surrogate optimization attempts to fin a global minimum of an objective function using few objective function evaluations. To do so, the algorithm tries to balance the optimization process between two goals: exploration and speed.Simulated annealing is a method for solving unconstrained and bound-constrained optimization problems. The method models the physical process of heating a material and then slowly lowering the temperature to decrease defects, thus minimizing the system energy. At each iteration of the simulated annealing algorithm, a new point is randomly generated. The distance of the new point from the current point, or the extent of the search, is based on a probability distribution with a scale proportional to the temperature. The algorithm accepts all new points that lower the objective, but also, with a certain probability, points that raise the objective. By accepting points that raise the objective, the algorithm avoids being trapped in local minima, and is able to explore globally for more possible solutions. An annealing schedule is selected to systematically decrease the temperature as the algorithm proceeds. As the temperature decreases, the algorithm reduces the extent of its search to converge to a minimum.

Security Constrained Optimal Power Flow Using Particle Swarm Optimization John Wiley & Sons

This book is intended to gather recent studies on particle swarm optimization (PSO). In this book, readers can find the recent theoretical developments and applications on PSO algorithm. From the theoretical aspect, PSO has preserved its popularity because of the fast convergence rate, and a lot of hybrid algorithms have recently been developed in order to increase the performance of the algorithm. At the same time, PSO has also been used to solve different kinds of engineering optimization problems. In this book, a reader can find engineering applications of PSO, such as environmental economic dispatch and grid computing.

Metaheuristic Optimization: Nature-Inspired Algorithms Swarm and Computational Intelligence, Theory and Applications John Wiley & Sons

Although the particle swarm optimisation (PSO) algorithm requires relatively few parameters and is computationally simple and easy to implement, it is not a globally convergent algorithm. In Particle Swarm Optimisation: Classical and Quantum Perspectives, the authors introduce their concept of

quantum-behaved particles inspired by quantum mechanics **OPTIMIZATION with MATLAB USING the GENETIC ALGORITHM. MULTIOBJECTIVE OPTIMIZATION** Springer "Swarm intelligence is one of the fastest-growing sub-fields of artificial intelligence and soft computing. This field includes multiple optimization algorithms to solve NP-hard problems for which conventional methods are not effective. It inspires researchers in engineering sciences to learn theories from nature and incorporate them. Swarm Intelligence: Foundation, Principles, and Engineering Applications provides a comprehensive review of new swarm intelligence techniques and offers practical implementation of Particle Swarm Optimization (PSO) with MATLAB code. The book discusses the statistical analysis of swarm optimization techniques so that researchers can analyze their experiment design. It also includes algorithms in social sectors, oil and gas industries, and recent research findings of new optimization algorithms in the field of engineering describing the implementation in Machine Learning. This book is written for students of engineering, research scientists, and academicians involved in the engineering sciences"-- *Introduction to Genetic Algorithms* Chapman and Hall/CRC
Swarm intelligence algorithms are a form of nature-based optimization algorithms. Their main inspiration is the cooperative behavior of animals within specific communities. This can be described as simple behaviors of individuals along with the mechanisms for sharing knowledge between them, resulting in the complex behavior of the entire community. Examples of such behavior can be found in ant colonies, bee swarms, schools of fish or bird flocks. Swarm intelligence algorithms are used to solve difficult optimization problems for which there are no exact solving methods or the use of such methods is impossible, e.g. due to unacceptable computational time. This set comprises two volumes: Swarm Intelligence Algorithms: A Tutorial and Swarm Intelligence Algorithms: Modifications and Applications. The first volume thoroughly presents the basics of 24 algorithms selected from the entire family of swarm intelligence algorithms. It contains a detailed explanation of how each algorithm works, along with relevant program codes in Matlab and the C ++ programming language, as well as numerical examples illustrating step-by-step how individual algorithms work. The second volume describes selected modifications of these algorithms and presents their practical applications. This book presents 24 swarm algorithms together with their modifications and practical applications. Each chapter is devoted to one algorithm. It contains a short description along with a pseudo-code showing the various stages of its operation. In addition, each chapter contains a description of selected modifications of the algorithm and shows how it can be used to solve a selected practical problem.
Optimization of Power System Problems IGI Global
This book presents integrated optimization methods and algorithms

for power system problems along with their codes in MATLAB. Providing a reliable and secure power and energy system is one of the main challenges of the new era. Due to the nonlinear multi-objective nature of these problems, the traditional methods are not suitable approaches for solving large-scale power system operation dilemmas. The integration of optimization algorithms into power systems has been discussed in several textbooks, but this is the first to include the integration methods and the developed codes. As such, it is a useful resource for undergraduate and graduate students, researchers and engineers trying to solve power and energy optimization problems using modern technical and intelligent systems based on theory and application case studies. It is expected that readers have a basic mathematical background.

Optimization Academic Press

Global Optimization Toolbox provides functions that search for global solutions to problems that contain multiple maxima or minima. Toolbox solvers include surrogate, pattern search, genetic algorithm, particle swarm, simulated annealing, multi start, and global search. You can use these solvers for optimization problems where the objective or constraint function is continuous, discontinuous, stochastic, does not possess derivatives, or includes simulations or black-box functions. For problems with multiple objectives, you can identify a Pareto front using genetic algorithm or pattern search solvers. You can improve solver effective es by adjusting options and, for applicable solvers, customizing creation, update, and search functions. You can use custom data types with the genetic algorithm and simulated annealing solvers to represent problems not easily expressed with standard data types. The hybrid function option lets you improve a solution by applying a second solver after the first.Global Optimization Toolbox functions include three direct search algorithms called the generalized pattern search (GPS) algorithm, the generating set search (GSS) algorithm, and the mesh adaptive search (MADS) algorithm. All are pattern search algorithms that compute a sequence of points that approach an optimal point. At each step, the algorithm searches a set of points, called a mesh, around the current point-the point computed at the previous step of the algorithm. The mesh is formed by adding the current point to a scalar multiple of a set of vectors called a pattern. If the pattern search algorithm finds a point in the mesh that improves the objective function at the current point, the new point becomes the current point at the next step of the algorithm.The GPS algorithm uses fixed direction vectors. The GSS algorithm is identical to the GPS algorithm, except when there are linear constraints, and when the current point is near a linear constraint boundary. The MADS algorithm uses a random selection of vectors to define the mesh.A surrogate is a function that approximates an objective function. The surrogate is useful because it takes little time to evaluate.Multiobjective optimization is concerned with the minimization of a vector of objectives F(x) that can be the subject of

a number of constraints or bounds.In Big Data problems Parallel Processing is an attractive way to speed optimization algorithms. To use parallel processing, you must have a Parallel Computing Toolbox license, and have a parallel worker pool (parpool).This book develops the advanced functions of Matlab for optimization through examples