

A New Heuristic Algorithm To Assign Priorities And

The Harmony Search Algorithm (HSA) is one of the most well-known techniques in the field of soft computing, an important paradigm in the science and engineering community. This volume, the proceedings of the 2nd International Conference on Harmony Search Algorithm 2015 (ICHSA 2015), brings together contributions describing the latest developments in the field of soft computing with a special focus on HSA techniques. It includes coverage of new methods that have potentially immense application in various fields. Contributed articles cover aspects of the following topics related to the Harmony Search Algorithm: analytical studies; improved, hybrid and multi-objective variants; parameter tuning; and large-scale applications. The book also contains papers discussing recent advances on the following topics: genetic algorithms; evolutionary strategies; the firefly algorithm and cuckoo search; particle swarm optimization and ant colony optimization; simulated annealing; and local search techniques. This book offers a valuable snapshot of the current status of the Harmony Search Algorithm and related techniques, and will be a useful reference for practising researchers and advanced students in computer science and engineering.

This two-volume set of LNCS 12736-12737 constitutes the refereed proceedings of the 7th International Conference on Artificial Intelligence and Security, ICAIS 2021, which was held in Dublin, Ireland, in July 2021. The conference was formerly called "International Conference on Cloud Computing and Security" with the acronym ICCCS. The total of 93 full papers and 29 short papers presented in this two-volume proceedings was carefully reviewed and selected from 1013 submissions. Overall, a total of 224 full and 81 short papers were accepted for ICAIS 2021; the other accepted papers are presented in CCIS 1422-1424. The papers were organized in topical sections as follows: Part I: Artificial intelligence; and big data Part II: Big data; cloud computing and security; encryption and cybersecurity; information hiding; IoT security; and multimedia forensics

This book brings together papers from the 2018 International Conference on Communications, Signal Processing, and Systems, which was held in Dalian, China on July 14–16, 2018. Presenting the latest developments and discussing the interactions and links between these multidisciplinary fields, the book spans topics ranging from communications, signal processing and systems. It is aimed at undergraduate and graduate electrical engineering, computer science and mathematics students, researchers and engineers from academia and industry as well as government employees.

This book constitutes the thoroughly refereed post-proceedings of the 5th International Conference on Computers and Games, CG 2006, co-located with the 14th World Computer-Chess Championship and the 11th Computer Olympiad. The 24 revised papers cover all aspects of artificial intelligence in computer-game playing. Topics addressed are evaluation and learning, search, combinatorial games and theory opening and endgame databases, single-agent search and planning, and computer Go.

This book approaches its subject matter by promoting concepts, methods and solutions for the digital transformation of manufacturing through service orientation in holonic and agent-based control with distributed intelligence. The scientific theme of the book concerns "Manufacturing as a Service", developed by virtualizing and encapsulating manufacturing resources, activities and controls into cloud networked services in an open perspective that spans models from shop floor resource allocation to enterprise infrastructure sharing. The papers included in the application space have a profound human dedication and aim at solving societal needs serving the partnership of the future--people and industry in the era of Society 5.0. The book's readership includes researchers and engineers working in manufacturing, supply chains and logistics areas who innovate, develop and use digital control solutions and students enrolled in Engineering and Service Science programs.

A New Heuristic Algorithm for Resource-constrained Project Scheduling
A New Heuristic Algorithm to Assign Priorities and Resources to Tasks with End-to-end Deadlines
Design of Modern Heuristics
Principles and Application
Springer Science & Business Media

In times of declining economic growth, companies have to control their costs more than ever to save resources needed in the future. Regardless of the economic size of the company, the processes of production and logistics play a decisive role in stabilizing procedures and avoiding waste. Both are important cost drivers in manufacturing companies and therefore they offer large potential savings. Pervasive networking in the last years has contributed to a hitherto unknown transparency of global markets. This harmonization opened up new possibilities of entering foreign markets for procurement and sales to the companies. The emerging global procurement strategy was understood as a chance to rethink the relocation of existing production facilities to profit from existing differences in price and performance as a resource-saving factor. Many companies tended towards a reduction of their vertical integration by outsourcing sections of their value chain. These contracted services of production result in higher transport volumes, increased complexity of supply processes and new requirements on logistic networks. This trend of outsourcing has not stopped, but is slowing down noticeably.

Additionally, there is an increasing proportion of companies restoring business units that were outsourced before. Reasons for turning back decisions are often to be found in missed goals. It is not unusual that important cost factors were disregarded in the original basis of decision-making. In the meantime many companies have realized that it is easier to achieve stability of processes and therewith a control of costs by increasing their own contribution to production. Especially in times of under-utilized capacities like in the current crisis, insourcing can be a strategic option.

The contributions in this book discuss large-scale problems like the optimal design of domes, antennas, transmission line towers, barrel vaults and steel frames with different types of limitations such as strength, buckling, displacement and natural frequencies. The authors use a set of definite algorithms for the optimization of all types of structures. They also add a new enhanced version of VPS and information about configuration processes to all chapters. Domes are of special interest to engineers as they enclose a maximum amount of space with a minimum surface and have proven to be very economical in terms of consumption of constructional materials. Antennas and transmission line towers are the one of the most popular structure since these steel lattice towers are inexpensive, strong, light and wind resistant. Architects and engineers choose barrel vaults as viable and often highly suitable forms for covering not only low-cost industrial buildings, warehouses, large-span hangars, indoor sports stadiums, but also large cultural and leisure centers. Steel buildings are preferred in residential as well as commercial buildings due to their high strength and ductility particularly in regions which are prone to earthquakes.

In recent years researchers have spent much effort in developing efficient heuristic algorithms for solving the class of NP-complete problems which are widely believed to be inherently intractable from the computational point of view. Although algorithms have been designed and are notorious among researchers, computer programs are either not implemented on computers or very difficult to obtain. The purpose of this book is to provide a source of FORTRAN coded algorithms for a selected number of well-known combinatorial optimization problems. The book is intended to be used as a supplementary text in combinatorial algorithms, network optimization, operations research and management science. In addition, a short description on each algorithm will allow the book to be used as a convenient reference. This work would not have been possible without the excellent facilities of Bell-Northern Research, Canada. H. T. Lau
Ile des Soeurs Quebec, Canada August 1986
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Chapter 3. Zero-one Knapsack Problem 38 Part II. NETWORK DESIGN Chapter 4. Traveling Salesman Problem 52 Chapter 5. Steiner Tree Problem 81 Chapter 6. Graph Partitioning 98 Chapter 7. K-Median Location 106 Chapter 8. K-Center Location 114 List of Subroutines 123 Bibliographic Notes 124 INTRODUCTION Following the elegant theory of NP-completeness, the idea of developing efficient heuristic algorithms has been gaining its popularity and significance.

Examines the job scheduling problem by proposing a recursive heuristic algorithm to solve the problem of scheduling n independent, atomic and nonpreemptive tasks among m identical processors.

A detailed review of a wide range of meta-heuristic and evolutionary algorithms in a systematic manner and how they relate to engineering optimization problems This book introduces the main metaheuristic algorithms and their applications in optimization. It describes 20 leading meta-heuristic and evolutionary algorithms and presents discussions and assessments of their performance in solving optimization problems from several fields of engineering. The book features clear and concise principles and presents detailed descriptions of leading methods such as the pattern search (PS) algorithm, the genetic algorithm (GA), the simulated annealing (SA) algorithm, the Tabu search (TS) algorithm, the ant colony optimization (ACO), and the particle swarm optimization (PSO) technique. Chapter 1 of Meta-heuristic and Evolutionary Algorithms for Engineering Optimization provides an overview of optimization and defines it by presenting examples of optimization problems in different engineering domains. Chapter 2 presents an introduction to meta-heuristic and evolutionary algorithms and links them to engineering problems. Chapters 3 to 22 are each devoted to a separate algorithm—and they each start with a brief literature review of the development of the algorithm, and its applications to engineering problems.

The principles, steps, and execution of the algorithms are described in detail, and a pseudo code of the algorithm is presented, which serves as a guideline for coding the algorithm to solve specific applications. This book: Introduces state-of-the-art metaheuristic algorithms and their applications to engineering optimization; Fills a gap in the current literature by compiling and explaining the various meta-heuristic and evolutionary algorithms in a clear and systematic manner; Provides a step-by-step presentation of each algorithm and guidelines for practical implementation and coding of algorithms; Discusses and assesses the performance of metaheuristic algorithms in multiple problems from many fields of engineering; Relates optimization algorithms to engineering problems employing a unifying approach. Meta-heuristic and Evolutionary Algorithms for Engineering Optimization is a reference intended for students, engineers, researchers, and instructors in the fields of industrial engineering, operations research, optimization/mathematics, engineering optimization, and computer science. OMID BOZORG-HADDAD, PhD, is Professor in the Department of Irrigation and Reclamation Engineering at the University of Tehran, Iran. MOHAMMAD SOLGI, M.Sc., is Teacher Assistant for M.Sc. courses at the University of Tehran, Iran. HUGO A. LOÁICIGA, PhD, is Professor in the Department of Geography at the University of California, Santa Barbara, United States of America.

Calculus has been used in solving many scientific and engineering problems. For optimization problems, however, the differential calculus technique sometimes has a drawback when the objective function is step-wise, discontinuous, or multi-modal, or when decision variables are discrete rather than continuous. Thus, researchers have recently turned their interests into metaheuristic algorithms that have been inspired by natural phenomena such as evolution, animal behavior, or metallic annealing. This book especially focuses on a music-inspired metaheuristic algorithm, harmony search. Interestingly, there exists an analogy between music and optimization: each musical instrument corresponds to each decision variable; musical note corresponds to variable value; and harmony corresponds to solution vector. Just like musicians in Jazz improvisation play notes randomly or based on experiences in order to find fantastic harmony, variables in the harmony search algorithm have random values or previously-memorized good values in order to find optimal solution.

Overview of optimization -- Introduction to meta-heuristic and evolutionary algorithms -- Pattern search (PS) -- Genetic algorithm (GA) -- Simulated annealing (SA) -- Tabu search (TS) -- Ant colony optimization (ACO) -- Particle swarm optimization (PSO) -- Differential evolution (DE) -- Harmony search (HS) -- Shuffled frog-leaping algorithm (SFLA) -- Honey-bee mating optimization (HBMO) -- Invasive weed optimization (IWO) -- Central force optimization (CFO) -- Biogeography-based optimization (BBO) -- Firefly algorithm (FA) -- Gravity search algorithm (GSA) -- Bat algorithm (BA) -- Plant propagation algorithm (PPA) -- Water cycle algorithm (WCA) -- Symbiotic organisms search (SOS) -- Comprehensive evolutionary algorithm (CEA)

The present book outlines a new approach to possibilistic clustering in which the sought clustering structure of the set of objects is based directly on the formal definition of fuzzy cluster and the possibilistic memberships are determined directly from the values of the pairwise similarity of objects. The proposed approach can be used for solving different classification problems. Here, some techniques that might be useful at this purpose are outlined, including a methodology for constructing a set of labeled objects for a semi-supervised clustering algorithm, a methodology for reducing analyzed attribute space dimensionality and a methods for asymmetric data processing. Moreover, a technique for constructing a subset of the most appropriate alternatives for a set of weak fuzzy preference relations, which are defined on a universe of alternatives, is described in detail, and a method for rapidly prototyping the Mamdani's fuzzy inference systems is introduced. This book addresses engineers, scientists, professors, students and post-graduate students, who are interested in and work with fuzzy clustering and its applications

This volume of Advances in Intelligent and Soft Computing contains accepted - pers presented at SOCO 2010 held in the beautiful and historic city of Guimarães, Portugal, June 2010. The global purpose of SOCO conferences has been to provide a broad and - terdisciplinary forum for soft computing and associated paradigms, which are playing increasingly important roles in an important number of industrial and - vironmental applications fields. Soft computing represents a collection or set of computational techniques in machine learning, computer science and some engineering disciplines, which - vestigate, simulate and analyze very complex issues and phenomena. This wo- shop is mainly focused on its industrial and environmental applications. th SOCO 2010 is the 5 International Workshop on Soft Computing Models in Industrial Applications and provides interesting opportunities to present and d- cuss the latest theoretical advances and real world applications in this multidis- plinary research field. This volume presents the papers accepted for the 2010 edition, both for the main event and the Special Sessions. SOCO 2010 Special Sessions are a very u- ful tool in order to complement the regular program with new or emerging topics of particular interest to the participating community. Special Sessions that emp- size on multi-disciplinary and transversal aspects, as well as cutting-

edge topics were especially encouraged and welcome. SOCO 2010 included a total of 3 Special Sessions: Ensemble Learning and - formation Fusion for Industrial Applications; Soft Computing for Service Management; Hybrid Intelligent Systems and Applications.

This book presents original contributions on the theories and practices of emerging Internet, Data and Web technologies and their applications in businesses, engineering and academia. As a key feature, it addresses advances in the life-cycle exploitation of data generated by digital ecosystem technologies. The Internet has become the most proliferative platform for emerging large-scale computing paradigms. Among these, Data and Web technologies are two of the most prominent paradigms, manifesting in a variety of forms such as Data Centers, Cloud Computing, Mobile Cloud, Mobile Web Services, and so on. These technologies altogether create a digital ecosystem whose cornerstone is the data cycle, from capturing to processing, analysis and visualization. The need to investigate various research and development issues in this digital ecosystem has been made even more pressing by the ever-increasing demands of real-life applications, which are based on storing and processing large amounts of data. Given its scope, the book offers a valuable asset for all researchers, software developers, practitioners and students interested in the field of Data and Web technologies.

Due to an ever-decreasing supply in raw materials and stringent constraints on conventional energy sources, demand for lightweight, efficient and low cost structures has become crucially important in modern engineering design. This requires engineers to search for optimal and robust design options to address design problems that are often large in scale and highly nonlinear, making finding solutions challenging. In the past two decades, metaheuristic algorithms have shown promising power, efficiency and versatility in solving these difficult optimization problems. This book examines the latest developments of metaheuristics and their applications in water, geotechnical and transport engineering offering practical case studies as examples to demonstrate real world applications. Topics cover a range of areas within engineering, including reviews of optimization algorithms, artificial intelligence, cuckoo search, genetic programming, neural networks, multivariate adaptive regression, swarm intelligence, genetic algorithms, ant colony optimization, evolutionary multiobjective optimization with diverse applications in engineering such as behavior of materials, geotechnical design, flood control, water distribution and signal networks. This book can serve as a supplementary text for design courses and computation in engineering as well as a reference for researchers and engineers in metaheuristics, optimization in civil engineering and computational intelligence. Provides detailed descriptions of all major metaheuristic algorithms with a focus on practical implementation Develops new hybrid and advanced methods suitable for civil engineering problems at all levels Appropriate for researchers and advanced students to help to develop their work

This comprehensive handbook brings together experts who use optimization to solve problems that arise in telecommunications. It is the first book to cover in detail the field of optimization in telecommunications. Recent optimization developments that are frequently applied to telecommunications are covered. The spectrum of topics covered includes planning and design of telecommunication networks, routing, network protection, grooming, restoration, wireless communications, network location and assignment problems, Internet protocol, World Wide Web, and stochastic issues in telecommunications. The book's objective is to provide a reference tool for the increasing number of scientists and engineers in telecommunications who depend upon optimization.

Computational optimization is an important paradigm with a wide range of applications. In virtually all branches of engineering and industry, we almost always try to optimize something - whether to minimize the cost and energy consumption, or to maximize profits, outputs, performance and efficiency. In many cases, this search for optimality is challenging, either because of the high computational cost of evaluating objectives and constraints, or because of the nonlinearity, multimodality, discontinuity and uncertainty of the problem functions in the real-world systems. Another complication is that most problems are often NP-hard, that is, the solution time for finding the optimum increases exponentially with the problem size. The development of efficient algorithms and specialized techniques that address these difficulties is of primary importance for contemporary engineering, science and industry. This book consists of 12 self-contained chapters, contributed from worldwide experts who are working in these exciting areas. The book strives to review and discuss the latest developments concerning optimization and modelling with a focus on methods and algorithms for computational optimization. It also covers well-chosen, real-world applications in science, engineering and industry. Main topics include derivative-free optimization, multi-objective evolutionary algorithms, surrogate-based methods, maximum simulated likelihood estimation, support vector machines, and metaheuristic algorithms. Application case studies include aerodynamic shape optimization, microwave engineering, black-box optimization, classification, economics, inventory optimization and structural optimization. This graduate level book can serve as an excellent reference for lecturers, researchers and students in computational science, engineering and industry.

In the last few years, the society is witnessing ever-growing levels of complexity in the optimization paradigms lying at the core of different applications and processes. This augmented complexity has motivated the adoption of heuristic methods as a means to balance the Pareto trade-off between computational efficiency and the quality of the produced solutions to the problem at hand. The momentum gained by heuristics in practical applications spans further towards hyper-heuristics, which allow constructing ensembles of simple heuristics to handle efficiently several problems of a single class. In this context, this short book compiles selected applications of heuristics and hyper-heuristics for combinatorial optimization problems, including scheduling and other assorted application scenarios.

The purpose of this book is to provide readers with an introduction to the very active field of integer programming and network models. The idea is to cover the main parts of the field without being too detailed or too technical. As a matter of fact, we found it somewhat surprising that most--especially newer---books are strongly algorithmically oriented. In

contrast, the main emphasis of this book is on models rather than methods. This focus expresses our view that methods are tools to solve actual problems and not ends in themselves. As such, graduate (and with some omissions, undergraduate) students may find this book helpful in their studies as will practitioners who would like to get acquainted with a field or use this text as a refresher. This premise has resulted in a coverage that omits material that is standard fare in other books, whereas it covers topics that are only infrequently found elsewhere. There are some, yet relatively few, prerequisites for the reader. Most material that is required for the understanding of more than one chapter is presented in one of the four chapters of the introductory part, which reviews the main results in linear programming, the analysis of algorithms, graphs and networks, and dynamic programming, respectively. Readers who are familiar with the issues involved can safely skip that part. The three main parts of the book rely on intuitive reasoning and examples, whenever practical, instead of theorems and proofs.

Computer Science and Operations Research continue to have a synergistic relationship and this book - as a part of the Operations Research and Computer Science Interface Series - sits squarely in the center of the confluence of these two technical research communities. The research presented in the volume is evidence of the expanding frontiers of these two intersecting disciplines and provides researchers and practitioners with new work in the areas of logic programming, stochastic optimization, heuristic search and post-solution analysis for integer programs. The chapter topics span the spectrum of application level. Some of the chapters are highly applied and others represent work in which the application potential is only beginning. In addition, each chapter contains expository material and reviews of the literature designed to enhance the participation of the reader in this expanding interface.

Real life problems are known to be messy, dynamic and multi-objective, and involve high levels of uncertainty and constraints. Because traditional problem-solving methods are no longer capable of handling this level of complexity, heuristic search methods have attracted increasing attention in recent years for solving such problems. Inspired by nature, biology, statistical mechanics, physics and neuroscience, heuristics techniques are used to solve many problems where traditional methods have failed. Data Mining: A Heuristic Approach will be a repository for the applications of these techniques in the area of data mining.

Optimization techniques have developed into a significant area concerning industrial, economics, business, and financial systems. With the development of engineering and financial systems, modern optimization has played an important role in service-centered operations and as such has attracted more attention to this field. Meta-heuristic hybrid optimization is a newly development mathematical framework based optimization technique. Designed by logicians, engineers, analysts, and many more, this technique aims to study the complexity of algorithms and problems. Meta-Heuristics Optimization Algorithms in Engineering, Business, Economics, and Finance explores the emerging study of meta-heuristics optimization algorithms and methods and their role in innovated real world practical applications. This book is a collection of research on the areas of meta-heuristics optimization algorithms in engineering, business, economics, and finance and aims to be a comprehensive reference for decision makers, managers, engineers, researchers, scientists, financiers, and economists as well as industrialists.

Reinforced concrete structures are one of the major structural types and must adhere to design regulation codes. It is ideal to find the best design (section dimension, material type, and amount of reinforcement) with the minimum cost providing the design constraints (design formulation considering loading of structure). Metaheuristic methods inspired by natural phenomena can consider design constraints by combining the analyses of formulation of reinforced concrete structures with an iterative numerical algorithm using several convergence options of random generation of candidate design solutions. Metaheuristic Approaches for Optimum Design of Reinforced Concrete Structures: Emerging Research and Opportunities is a pivotal reference source that focuses on several metaheuristic algorithms and the design of several types of structural members. Additionally, retrofit applications and seismic design issues are considered for readers in earthquake zones. Highlighting a wide range of topics including algorithms, design variables, and retrofit design, this book is ideally designed for architects, engineers, urban designers, government officials, policymakers, researchers, academicians, and students.

Many decision and optimization problems arising in bioinformatics field are time demanding, and several algorithms are designed to solve these problems or to improve their current best solution approach. Modeling and implementing a new heuristic algorithm may be time-consuming but has strong motivations: on the one hand, even a small improvement of the new solution may be worth the long time spent on the construction of a new method; on the other hand, there are problems for which good-enough solutions are acceptable which could be achieved at a much lower computational cost. In the first case, specially designed heuristics or metaheuristics are needed, while the latter hyper-heuristics can be proposed. The paper will describe both approaches in different domain problems.

Most textbooks on modern heuristics provide the reader with detailed descriptions of the functionality of single examples like genetic algorithms, genetic programming, tabu search, simulated annealing, and others, but fail to teach the underlying concepts behind these different approaches. The author takes a different approach in this textbook by focusing on the users' needs and answering three fundamental questions: First, he tells us which problems modern heuristics are expected to perform well on, and which should be left to traditional optimization methods. Second, he teaches us to systematically design the "right" modern heuristic for a particular problem by providing a coherent view on design elements and working principles. Third, he shows how we can make use of problem-specific knowledge for the design of efficient and effective modern heuristics that solve not only small toy problems but also perform well on large real-world problems. This book is written in an easy-to-read style and it is aimed at students and practitioners in computer science, operations research and information systems who want to understand modern heuristics and are interested in a guide to their systematic design and use. This

book is written in an easy-to-read style and it is aimed at students and practitioners in computer science, operations research and information systems who want to understand modern heuristics and are interested in a guide to their systematic design and use. This book is written in an easy-to-read style and it is aimed at students and practitioners in computer science, operations research and information systems who want to understand modern heuristics and are interested in a guide to their systematic design and use. One of the ultimate goals of robotics research is to create autonomous robots. Progress toward this goal requires advances in many domains, including automatic motion planning. The basic problem in motion planning is to construct a collision-free path for a moving object among fixed obstacles. Several approaches have been proposed, including cell decomposition, retraction, and potential field. Nevertheless, most existing planners still lack efficiency, or reliability, or both. In this paper, we consider one of the most popular approaches to path planning: hierarchical approximate cell decomposition. We propose a set of new algorithms for constructing more efficient and reliable path planners based on this general approach. These algorithms concern the hierarchical decomposition of the robot's configuration space into rectangloid cells, and the search of the connectivity graphs built at each level of decomposition. We have implemented these algorithms in a path planner and experimented with this planner on various examples. Some are described in the paper. These experiments show that our planner is significantly faster than previous planners based on the same general approach. (KR).

Reviews state-of-the-art technologies in modern heuristic optimization techniques and presents case studies showing how they have been applied in complex power and energy systems problems Written by a team of international experts, this book describes the use of metaheuristic applications in the analysis and design of electric power systems. This includes a discussion of optimum energy and commitment of generation (nonrenewable & renewable) and load resources during day-to-day operations and control activities in regulated and competitive market structures, along with transmission and distribution systems. Applications of Modern Heuristic Optimization Methods in Power and Energy Systems begins with an introduction and overview of applications in power and energy systems before moving on to planning and operation, control, and distribution. Further chapters cover the integration of renewable energy and the smart grid and electricity markets. The book finishes with final conclusions drawn by the editors. Applications of Modern Heuristic Optimization Methods in Power and Energy Systems: Explains the application of differential evolution in electric power systems' active power multi-objective optimal dispatch Includes studies of optimization and stability in load frequency control in modern power systems Describes optimal compliance of reactive power requirements in near-shore wind power plants Features contributions from noted experts in the field Ideal for power and energy systems designers, planners, operators, and consultants, Applications of Modern Heuristic Optimization Methods in Power and Energy Systems will also benefit engineers, software developers, researchers, academics, and students.

As known, it is not possible to develop an algorithm that can compute the exact value of the minimum makespan on identical parallel machines in polynomial time. Therefore heuristic methods are convenient to find near optimal solutions. In this thesis, it is aimed to compose a new heuristic algorithm to minimize the makespan on identical parallel machines. This algorithm can present better solutions than LPT (Longest Processing Time) algorithm in general. The computer models of the proposed and LPT algorithms are developed. 1640 different problems are solved using the two models to compare the performances of the algorithms. Numbers of jobs, numbers of machines or the mean of processing times are changed one at a time, while keeping the rest constant and, the variation in the makespan is observed. Finally it is concluded that there is sufficient evidence that the proposed algorithm provides better solutions than LPT in the light of the data collected from the uniform distribution. The proposed algorithm is also modified to the probabilistic cases.

This book provides a thorough and up-to-date discussion of arc routing by world-renowned researchers. Organized by problem type, the book offers a rigorous treatment of complexity issues, models, algorithms, and applications. Arc Routing: Problems, Methods, and Applications÷opens with a historical perspective of the field and is followed by three sections that cover complexity and the Chinese Postman and the Rural Postman problems; the Capacitated Arc Routing Problem and routing problems with min-max and profit maximization objectives; and important applications, including meter reading, snow removal, and waste collection.÷

This book focuses on the fields of nature-inspired algorithms, optimization problems and fuzzy logic. In this book, a new metaheuristic based on String Theory from Physics is proposed. It is important to mention that we have proposed the new algorithm to generate new potential solutions in optimization problems in order to find new ways that could improve the results in solving these problems. We are presenting the results for the proposed method in different cases of study. The first case, is optimization of traditional benchmark mathematical functions. The second case, is the optimization of benchmark functions of the CEC 2015 Competition and we are also presenting results of the CEC 2017 Competition on Constrained Real-Parameter Optimization that are problems that contain the presence of constraints that alter the shape of the search space making them more difficult to solve. Finally, in the third case, we are presenting the optimization of a fuzzy inference system, specifically for finding the optimal design of a fuzzy controller for an autonomous mobile robot. It is important to mention that in all study cases we are presenting statistical tests in order to validate the performance of proposed method. In summary, we believe that this book will be of great interest to a wide audience, ranging from engineering and science graduate students, to researchers and professors in computational intelligence, metaheuristics, optimization, robotics and control.

This book explores how developing solutions with heuristic tools offers two major advantages: shortened development time and more robust systems. It begins with an overview of modern heuristic techniques and goes on to cover specific applications of heuristic approaches to power system problems, such as security assessment, optimal power flow, power system scheduling and operational planning, power generation expansion planning, reactive power planning, transmission and distribution planning, network reconfiguration, power system control, and hybrid systems of heuristic methods.

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