

Basic p-Hub Location Model

$$\text{Min} \sum_{j \in J} \sum_{i \in I} h_{ij} \left(\sum_{k \in N} c_{ik} y_{ij} + \sum_{m \in N} c_{jm} y_{jm} + \alpha \sum_{l \in N} \sum_{n \in N} c_{ln} y_{il} y_{jn} \right) \quad (33)$$

$$\text{s.t.} \sum_{j \in N} x_j = p \quad (34)$$

$$\sum_{i \in I} y_{ij} = 1 \quad \forall j \in J \quad (35)$$

$$y_{ij} - x_j \leq 0 \quad \forall i \in I, \forall j \in J \quad (36)$$

$$x_j \in \{0,1\} \quad \forall j \in J \quad (37)$$

$$y_{ij} \in \{0,1\} \quad \forall i \in I, \forall j \in J \quad (38)$$

- (33) Minimizes sum of cost of moving items between a non-hub node and the hub to which the node is assigned, the cost of moving from the final hub to the destination of the flow, and the interhub movement cost which is discounted by a factor of α .
- (34) through (38) identical to constraints for p-median model
- (35) each node should be assigned to exactly one hub

Hub Location Problems Chapter 1

R. Forder



Hub Location Problems Chapter 1:

Facility Location Reza Zanjirani Farahani, Masoud Hekmatfar, 2009-07-09 Location problems establish a set of facilities resources to minimize the cost of satisfying a set of demands customers with respect to a set of constraints This book deals with location problems It considers the relationship between location problems and other areas such as supply chains

Optimization and Logistics Challenges in the Enterprise Wanpracha Chaovalitwongse, Kevin C. Furman, Panos M. Pardalos, 2009-06-17 In a world with highly competitive markets and economic instability due to capitalization industrial competition has increasingly intensified In order for many industries to survive and succeed they need to develop highly effective coordination between supply chain partners dynamic collaborative and strategic alliance relationships and efficient logistics and supply chain network designs Consequently in the past decade there has been an explosion of interest among academic researchers and industrial practitioners in innovative supply chain and logistics models algorithms and coordination policies Mathematically distinct from classical supply chain management this emerging research area has been proven to be useful and applicable to a wide variety of industries This book brings together recent advances in supply chain and logistics research and computational optimization that apply to a collaborative environment in the enterprise

Uncertainty in Facility Location Problems H. A. Eiselt, Vladimir Marianov, 2023-09-20 This book deals with an often neglected feature of location problems namely uncertainty by combining two related fields location theory and optimization Written by leading researchers and practitioners in these fields each chapter examines one aspect of the location process in different contexts such as supply chains location decisions under congestion disaster management design of resilient facilities uncertainty in the health sector and facility location in the retail sector under uncertainty The book also addresses methodological aspects such as chance constrained approaches heuristic algorithms scenario approaches and simulation As such it provides decision makers with essential methods tools and approaches to help them deal with these uncertainties It is mainly intended for graduate students in the fields of operations research and logistics as well as professionals in logistics and supply chain management

Handbook of Research on Applied Optimization Methodologies in Manufacturing Systems Faruk Yılmaz, Ömer Tüfekçi, Süleyman, 2017-11-30 Today's manufacturing systems are undergoing significant changes in the aspects of planning production execution and delivery It is imperative to stay up to date on the latest trends in optimization to efficiently create products for the market The Handbook of Research on Applied Optimization Methodologies in Manufacturing Systems is a pivotal reference source including the latest scholarly research on heuristic models for solving manufacturing and supply chain related problems Featuring exhaustive coverage on a broad range of topics such as assembly ratio car sequencing and color constraints this publication is ideally designed for practitioners seeking new comprehensive models for problem solving in manufacturing and supply chain management

Using Decision Support Systems for Transportation Planning Efficiency Ocalir-Akunal, Ebru V., 2015-08-12 The integration of technology into the

transport planning sector has allowed for more stable yet increasingly complex models that enable better analysis techniques and new approaches to decision making These modern advances ensure higher productivity in addressing various planning problems Using Decision Support Systems for Transportation Planning Efficiency is a valuable reference source of the latest scholarly research on the vast improvements that computational innovations have made for transportation planners Featuring extensive coverage on a range of topics relating to spatial planning environmental risks of transport and traffic information systems this publication is a pivotal reference source for transportation planners professionals and academicians seeking expert information on a multitude of transportation issues This publication features timely chapters relevant to the area of transport planning including artificial neural network models logistics hubs urban growth and expansion accessibility modeling sustainable mobility hazardous materials transport and urban intersections

Mathematical Methods on Optimization in Transportation Systems M. Pursula, Jarko Niittymäki, 2013-12-14 This book contains selected papers from the presentations given at the 7th EURO Working Group Meeting on Transportation which took place at the Helsinki University of Technology HUT Finland during August 2-4 1999 Altogether 31 presentations were given and 14 full papers have been selected in this publication through a peer review process coordinated by the editors The papers in this book cover a wide range of transportation problems from the simulation of railway traffic to optimum congestion tolling and mode choice modeling with stated preference data In general the variety of papers clearly demonstrates the wide areas of interest of people who are involved in the research of transportation systems and their operation They as well demonstrate the importance and possibilities of modeling and theoretical approaches in the analysis of transportation systems and problem solving Most of the papers are purely theoretical in nature that is they present a theoretical model with only a hypothetical example of application There are however some papers which are closer to the practice or describe applications of and give interesting results of studies made by known methodologies It is especially noteworthy that half of the accepted papers deal with planning and operation of public transport

Annals of Industrial Engineering 2012 J. Carlos Prado-Prado, Jesús García-Arca, 2013-12-03 Proceedings of the 6th International Conference on Industrial Engineering and Industrial Management and the XVI Congreso de Ingeniería de Organización CIO 2012 The aim of CIO is to establish a forum for the open and free exchange of ideas opinions and academic experiences about research technology transfer or successful business experiences in the field of Industrial Engineering The CIO 2012 is an annual meeting promoted by Asociación para el Desarrollo de la Ingeniería de Organización Industrial Engineers Association ADINGOR with a Scientific Committee composed of 61 international referees and more than 200 professionals from 7 countries A selection of the lectures and presentations made over three days by researchers and practitioners from different countries are presented here A range of topics is covered including Business Administration Economic Environment

Technological Organizational Innovation Logistics Supply Chain Management Production Operations Management Management Systems Sustainability The conference in Industrial Engineering CIO and its proceedings are an excellent platform for the dissemination of the outputs of the scientific projects developed in the frame of the International Research and Development plans

Optimization in the Energy Industry Josef Kallrath, Panos M. Pardalos, Steffen Rebennack, Max Scheidt, 2008-12-25 This book offers a broad in depth overview that reflects the requirements possibilities and limits of mathematical optimization and especially stochastic optimization in the energy industry

Fundamentals of Supply Chain Theory Lawrence V. Snyder, Zuo-Jun Max Shen, 2019-07-01 Comprehensively teaches the fundamentals of supply chain theory This book presents the methodology and foundations of supply chain management and also demonstrates how recent developments build upon classic models The authors focus on strategic tactical and operational aspects of supply chain management and cover a broad range of topics from forecasting inventory management and facility location to transportation process flexibility and auctions Key mathematical models for optimizing the design operation and evaluation of supply chains are presented as well as models currently emerging from the research frontier Fundamentals of Supply Chain Theory Second Edition contains new chapters on transportation traveling salesman and vehicle routing problems integrated supply chain models and applications of supply chain theory New sections have also been added throughout on topics including machine learning models for forecasting conic optimization for facility location a multi supplier model for supply uncertainty and a game theoretic analysis of auctions The second edition also contains case studies for each chapter that illustrate the real world implementation of the models presented This edition also contains nearly 200 new homework problems over 60 new worked examples and over 140 new illustrative figures Plentiful teaching supplements are available including an Instructor s Manual and PowerPoint slides as well as MATLAB programming assignments that require students to code algorithms in an effort to provide a deeper understanding of the material Ideal as a textbook for upper undergraduate and graduate level courses in supply chain management in engineering and business schools Fundamentals of Supply Chain Theory Second Edition will also appeal to anyone interested in quantitative approaches for studying supply chains

Network Optimization Julia Pahl, Torsten Reiners, Stefan Voß, 2011-06-03 This book constitutes the refereed proceedings of the 5th International Conference on Network Optimization INOC 2011 held in Hamburg Germany in June 2011 The 65 revised full papers presented were carefully reviewed and selected from numerous submissions The papers highlight recent developments in network optimization and are organized in the following topical sections theoretical problems uncertainty graph theory and network design network flows routing and transportation and further optimization problems and applications energy oriented network design telecom applications location maritime shipping and graph theory

Computing and Combinatorics Weili Wu, Guangmo Tong, 2023-12-08 This two volume set LNCS 14422 14423 constitutes the refereed proceedings of the 29th International Conference COCOON 2023 held in Hawaii HI USA during December 2023

The 60 full papers were carefully reviewed and selected from 146 submissions They are organized in the following topical sections Part I Combinatorics and Algorithms Algorithmic Solution in Applications and Algorithm in Networks Part II Complexity and Approximation Graph Algorithms and Applied Algorithms **OR, Defence and Security R.** Forder,2014-12-03 OR Defence and Security presents eleven papers originally published in the Journal of the Operational Research Society and the Journal of Simulation which exemplify important themes and topics in Operational Research OR as applied to modern day defense and security issues Topics range from frontline OR in a peace support operation to new developments in combat modelling and from the logistics of overseas intervention to defence planning at the top level Also included are examples of applications addressing insurgency and terrorism Edited by Dr Roger A Forder who had a distinguished career in OR in the UK Ministry of Defence he has also written an authoritative introductory chapter which sets the papers in the context of the global strategic environment as it has evolved since the end of the Cold War The OR Essentials series presents a unique cross section of high quality research work fundamental to understanding contemporary issues and research in across a range of Operational Research OR topics It brings together some of the best research papers from the esteemed Operational Research Society and its associated journals also published by Palgrave Macmillan

Routing, Flow, and Capacity Design in Communication and Computer Networks Michal Pioro,Deep Medhi,2004-07-21 In network design the gap between theory and practice is woefully broad This book narrows it comprehensively and critically examining current network design models and methods You will learn where mathematical modeling and algorithmic optimization have been under utilized At the opposite extreme you will learn where they tend to fail to contribute to the twin goals of network efficiency and cost savings Most of all you will learn precisely how to tailor theoretical models to make them as useful as possible in practice Throughout the authors focus on the traffic demands encountered in the real world of network design Their generic approach however allows problem formulations and solutions to be applied across the board to virtually any type of backbone communication or computer network For beginners this book is an excellent introduction For seasoned professionals it provides immediate solutions and a strong foundation for further advances in the use of mathematical modeling for network design Written by leading researchers with a combined 40 years of industrial and academic network design experience Considers the development of design models for different technologies including TCP IP IDN MPLS ATM SONET SDH and WDM Discusses recent topics such as shortest path routing and fair bandwidth assignment in IP MPLS networks Addresses proper multi layer modeling across network layers using different technologies for example IP over ATM over SONET IP over WDM and IDN over SONET Covers restoration oriented design methods that allow recovery from failures of large capacity transport links and transit nodes Presents at the end of each chapter exercises useful to both students and practitioners *Artificial Neural Nets. Problem Solving Methods* José Mira,José R. Alvarez,2003-08-03 The two volume set LNCS 2686 and LNCS 2687 constitute the refereed proceedings of the 7th International Work Conference on

Artificial and Natural Neural Networks IWANN 2003 held in Ma 3 Menorca Spain in June 2003 The 197 revised papers presented were carefully reviewed and selected for inclusion in the book and address the following topics mathematical and computational methods in neural modelling neurophysiological data analysis and modelling structural and functional models of neurons learning and other plasticity phenomena complex systems dynamics cognitive processes and artificial intelligence methodologies for net design bio inspired systems and engineering and applications in a broad variety of fields nbsp

Operations Research Proceedings 2007 Jörg Kalcsics,Stefan Nickel,2008-03-20 The symposium Operations Research 2007 was held from September 5 7 2007 at the Saarland University in Saarbru cken This international conference is at the same time the annual meeting of the German erations Research Society GOR The transition in Germany and many other countries in Europe from a production orientation to a service society combined with a continuous demographic change generated a need for intensi ed Op ations Research activities in this area On that account this conference has been devoted to the role of Operations Research in the service industry The links to Operations Research are manifold and include many di erent topics which are particularly emphasized in scienti c sections of OR 2007 More than 420 participants from 30 countries made this event very international and successful The program consisted of three p nary elevensemi

plenaryandmorethan300contributedpresentations which had been organized in 18 sections During the conference the GOR Dissertation and Diploma Prizes were awarded We congratulate all winners especially Professor Wolfgang Domschke from the Da stadt University of Technology on receiving the GOR Scienti c Prize Award

Interfaces in Computer Science and Operations Research R. S. Barr,R.V. Helgason,Jeffrey L. Kennington,2012-12-06 The disciplines of computer science and operations research OR have been linked since their origins each contributing to the dramatic advances of the other This work explores the connections between these key technologies how high performance computing methods have led to advances in OR de ployment and how OR has contributed to the design and development of ad vanced systems The collected writings from researchers and practitioners in Computer Science Operations Research Management Science and Artificial Intelligence were among those delivered at the Fifth INFORMS Computer Science Technical Section Conference in Dallas Texas January 8 10 1996 The articles advance both theory and practice Presented are new approaches to complex problems based on metaheuristics neural networks genetic al gorithms and Tabu Search optimization and mathematical programming stochastic methods constraint programming and logical analysis These ad vanced methodologies are applied to new applications in such areas as telecom munications network design financial engineering manufacturing project man agement and forecasting airline and machine scheduling vehicle routing mod eling and decision support systems Featured is a remarkable paper by keynote speaker Fred Glover creator of the Tabu Search family of metaheuristics In it he develops the principles of memory based heuristic methods contrasts them with the popular genetic algorithms and simulated annealing provides a sweeping survey of application vignettes and points to promising avenues for future research Intelligent

Computing Theories De-Shuang Huang, Vitoantonio Bevilacqua, Juan Carlos Figueroa, Prashan Premaratne, 2013-07-20 This book constitutes the refereed conference proceedings of the 9th International Conference on Intelligent Computing ICIC 2013 held in Nanning China in July 2013. The 74 revised full papers presented were carefully reviewed and selected from numerous submissions and are organized in topical sections on neural networks, nature inspired computing and optimization, cognitive science and computational neuroscience, knowledge discovery and data mining, evolutionary learning and genetic algorithms, machine learning theory and methods, natural language processing and computational linguistics, fuzzy theory and models, soft computing, unsupervised and reinforced learning, intelligent computing in finance, intelligent computing in Petri nets, intelligent data fusion and information security, virtual reality and computer interaction, intelligent computing in pattern recognition, intelligent computing in image processing, intelligent computing in robotics, complex systems theory and methods.

Intermodal Freight Transport and Logistics Jason Monios, Rickard Bergqvist, 2017-06-14 Applying sophisticated management techniques to freight transport offers the potential for significant cost savings as well as greater efficiency. Yet the inherent complexity of intermodal transport presents many challenges. This practical textbook on the operations of intermodal transport and logistics focuses on the practical concerns and the basics of operations such as vehicles, containers, handling, operations, logistics management and optimisation. All chapters are written by field specialists and the volume includes additional chapters on economics, law and the environment to put the practical topics into context. It presents a balanced textbook for postgraduate students and also a reference text for those in industry or the public sector involved in the planning of intermodal freight transport.

Facility Location Zvi Drezner, Horst W. Hamacher, 2004-05-03 The book covers both theory and applications of locational analysis, LocAn. The reader will see the power of LocAn models in various real world contexts, varying from communication design to robotics and mail delivery. It is divided into two parts. The first part contains an overview of some of the LocAn methodologies. The second part describes in thorough detail some selected applications. The text provides researchers with an excellent and well thought out review of available location models.

Applications of Combinatorial Optimization Vangelis Th. Paschos, 2014-08-08 Combinatorial optimization is a multidisciplinary scientific area lying in the interface of three major scientific domains: mathematics, theoretical computer science and management. The three volumes of the Combinatorial Optimization series aim to cover a wide range of topics in this area. These topics also deal with fundamental notions and approaches as with several classical applications of combinatorial optimization. *Concepts of Combinatorial Optimization* is divided into three parts: On the complexity of combinatorial optimization problems, presenting basics about worst case and randomized complexity; Classical solution methods, presenting the two most known methods for solving hard combinatorial optimization problems that are Branch and Bound and Dynamic Programming; Elements from mathematical programming, presenting fundamentals from mathematical programming based methods that are in the heart of Operations Research since the origins of this field.

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