2012 最佳化與工程系統研討會
2012 International Workshop on Optimization and Engineering Systems

In honor of Prof. Shu-Cherng Fang's 60th birthday

June 27 – 30, 2012

National Cheng Kung University, Taiwan

Invited Speaker

Shu-Cherng Fang	North Carolina State University, USA
David Yang Gao	University of Ballarat, Australia
Hang-Chin Lai	Chung Yuan Christian University, Taiwan
Jong-Shi Pang	University of Illinois at Urbana-Champaign, USA
Che-Lin Su	University of Chicago, USA
Jie Sun	National University of Singapore, Singapore
Kok Lay Teo	Curtin University, Australia
Hsiao-Fan Wang	National Tsing Hua University, Taiwan
Zhen-Bo Wang	Tsinghua University, China
Yong Xia	Beihang University, China
Wen-Xun Xing	Tsinghua University, China

Local Committee

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Pei-Tsang Wu	I-Shou University, Taiwan
Ming-Jong Yao	National Chiao Tung University, Taiwan

2012 International Workshop on Optimization and Engineering Systems
In Honor of Prof. Shu-Cherng Fang's 60th Birthday
Tainan, Taiwan

National Cheng Kung University, Taiwan

June 27-30, 2012

CONFERENCE PROGRAM

Day 1: June 27

Registration(16:00 ∼ 16:30)

Opening Ceremony(16:30 ∼ 16:45)

Talk 1:
Wen-Xun Xing(16:45 ∼ 17:30), Chair: Ruey-Lin Sheu
Title: **Effectiveness of Redundant Constraints in Conic Reformulation for 0-1 Quadratic Programming** 1

Reception Dinner(17:30 ∼ 21:00)

Day 2: June 28

Talk 2:
Jong-Shi Pang(9:00 ∼ 9:45), Chair: Shu-Cherng Fang
Title: **Estimation of Pure Characteristics Demand Models with Pricing** 2

Tea Break(9:45 ∼ 10:00)

Talk 3:
Jie Sun(10:00 ∼ 10:45), Chair: Kok Lay Teo
Title: **A Note on CVaR and Risk Measures** 3

Tea Break(10:45 ∼ 11:00)

Talk 4:
Chi-Lin Su(11:00 ∼ 11:45), Chair: Jong-Shi Pang
Title: **Estimating Discrete-Choice Games of Incomplete Information** 4

Lunch Time(12:00 ∼ 13:30)

Talk 5:
Ming-Jong Yao(13:30 ∼ 14:00), Chair: Wen-Xun Xing
Title: **The Joint Replenishment Problem Considering Transportation Costs and Material Handling Capacity Constraints** 5

Day 3: June 29

Lunch Time(12:00 ∼ 13:30)

Talk 14:
Hsing Luh(13:30 ∼ 14:00), Chair: Ming-Jong Yao
Title: **A Matrix Presentation for Information Effects on Performance of Two-tier Service Systems with Strategic Customers** 14

Talk 15:
Jein-Shan Chen(14:00 ∼ 14:30), Chair: Ming-Jong Yao
Title: **Lipschitz continuity of the solution mapping of symmetric cone complementarity problems** 15

Talk 16:
Zhenbo Wang(14:30 ∼ 15:00), Chair: Ming-Jong Yao
Title: **Combination of Optimization Problems** 16

Talk 17:
Yong Xia(15:00 ∼ 15:30), Chair: Ming-Jong Yao
Title: **Convex Relaxations for Quadratic Assignment Problem** 17

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Forum:
16:00 ∼ 17:30, Hosted by Shu-Cherng Fang and Ruey-Lin Sheu
Title: **Future developments and Opportunities in Operations Research** 18

Banquet

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Talk 19:
Wen-Xun Xing(9:00 ∼ 9:45), Chair: Hsiao-Fan Wang
Title: **Conic Programming of Nonnegative Quadratic Functions** 19

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Talk 20:
Hsiao-Fan Wang(10:00 ∼ 10:45), Chair: Wen-Xun Xing
Title: **Linear Invertible Conic Programming: A Footprint for More Innovative and Energetic Research Paradise** 20

Lunch Time(11:00 ∼ 13:30)

Talk 21:
Zih-Cin Lin(13:30 ∼ 14:00), Chair: Hui-Ju Chen
Title: **On Localizing Sensor Networks Based on Multilateration, Sensor Connectivity, and Seed Sensor Selection** 21

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EFFECTIVENESS OF REDUNDANT CONSTRAINTS IN CONIC REFORMULATION FOR 0-1 QUADRATIC PROGRAMMING

WEN-XUN XING*

Abstract. In this talk, we present our study for the 0-1 quadratic integer programming by the technique of adding redundant constraints. We consider effectiveness of adding redundant constraints to the 0-1 quadratic programming after its reformulated conic programming is relaxed. A sufficient condition of global minimizers is stated by the conic programming solution. More general sufficient and some necessary conditions for the validness of redundant constraints are presented. Numerical experiments are provided to illustrate our approach.

(Wen-Xun Xing) Tsing Hua University

*Presenting author.

Estimation of Pure Characteristics Demand Models with Pricing

Jong-Shi Pang [1]
[1] Department of Industrial and Enterprise Systems Engineering,
University of Illinois at Urbana-Champaign

Abstract: A pure characteristics model (PCM) is a class of discrete-choice random-coefficients demand models in which there is no idiosyncratic logit error term in a consumer's utility. The absence of the logit error term leads to a nonsmooth formulation of the predicted market share equations. As a result, inverting the market share equations for the unobserved product characteristics and estimating the model by using the nested fixed-point approach becomes computationally intractable. We introduce lotteries for consumers' purchase decisions, which are then characterized by a system of complementarity constraints. This reformulation leads to smooth market share equations. As a result, we can reformulate the generalized method of moments (GMM) estimation of a pure characteristics model as a quadratic program with nonlinear complementarity constraints. The reformulation of consumers' decision problem provides a unified framework to study the Nash-Bertrand pricing problem under pure characteristics demand models and the GMM estimation of the demand model with pricing equations. We present numerical results to demonstrate the effectiveness of our approach.

This is joint wok with Che-Lin Su at the University of Chicago Booth School of Business and graduate student Yu-Ching Lee at the University of Illinois at Urbana-Champaign.

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A NOTE ON CVAR AND RISK MEASURES

JIE SUN* AND YAO QIANG

Abstract. As a coherent risk measure, the conditional value at risk (CVaR for short) has received considerable attention in both theory (Risk measure, robust optimization) and practice (financial and logistic applications). We study this measure from its dual definition as the worst case expected value over a risk envelope. We derive the minimization formula of CVaR for the cases of discrete and continuous base distribution, which cover all base distributions arising in known applications of CVaR. We further consider the case that additional constraints are introduced to the base distribution, which is closedly related to the application of CVaR in two-stage stochastic programming. In particular, we provide some theoretical results involving the intersection and union of the dual envelopes of CVaR. These results may lead to more or less conservative risk mearues rooted in CVaR.

(Jie Sun) National University of Singapore

(Yao Qiang) National University of Singapore and East China Normal University

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ESTIMATING DISCRETE-CHOICE GAMES OF INCOMPLETE INFORMATION

CHI-LIN SU*

Abstract. I investigate the problem of estimating discrete-choice games under incomplete information. In these games, multiple equilibria can exist. Also, different values of structural parameters can result in different numbers of equilibria. Consequently, under maximum-likelihood estimation, the likelihood function is a discontinuous function of the structural parameters. I reformulate the maximum-likelihood estimation problem as a constrained optimization problem in the joint space of structural parameters and economic endogenous variables. Under this formulation, the objective function and structural equations are smooth functions. The constrained optimization approach does not require repeatedly solving the game or finding all the equilibria. I use a simple, static-game example to demonstrate this approach, conducting Monte Carlo experiments to evaluate the finite-sample performance of the maximum-likelihood estimator, two-step estimators, and the nested pseudo-likelihood estimator.

(Chi-Lin Su) Operations Management, The University of Chicago Booth School of Business

*Presenting author.

The Joint Replenishment Problem Considering Transportation Costs and Material Handling Capacity Constraints

Ming-Jong Yao[1] Jen-Yen Lin[2] Jiun-Yi Chen[1]
[1]Department of Transportation Technology and Management, National Chiao Tung University
[2]Department of Applied Mathematics, National Chiayi University

The conventional Joint Replenishment Problem (JRP) considers the following cost terms: (1) major setup cost, (2) minor setup cost and (3) holding cost. This study focuses on the extension of the JRP by taking into account the container transportation cost and the capacity constraints of the material handling facilities. We formulate a mathematical model for the concerned problem. Also, we conduct theoretical analysis for the transportation cost with respect to the number of required containers and the value of the basic period. Our theoretical results facilitate in proposing a search procedure for seeking an optimal and feasible basic period for a given set of multipliers. By encoding the set of multipliers, we propose a genetic algorithm (GA) that incorporates with the proposed search procedure. Following our numerical experiments, we conclude that the proposed GA is an effective solution approach that obtains excellent solutions for the concerned JRP.

Keywords: Joint Replenishment Problem; Genetic Algorithm; Local Search

DESIGN AND MANAGEMENT OF PUBLIC BIKE SHARING SYSTEMS - FROM THE OR PERSPECTIVE

I-LIN WANG*

Abstract. Public Bike sharing systems have become popular in several metropolitan areas worldwide. In this talk, we will first introduce their background and current practices, and then discuss how the theories and solution methods of operations research can be applied for better design and management in such systems.

(I-Lin Wang) Department of Industrial and Information Management, National Cheng Kung University.

*Presenting author.

TBA

PEI-TSANG WU*

Abstract. TBA

(Pei-Tsang Wu) Department of Industrial Management, I-Shou University

*Presenting author.

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SET COVERING-BASED SURROGATE APPROACH FOR SOLVING SUP-$\mathcal{T}$ EQUATION CONSTRAINED OPTIMIZATION PROBLEMS

CHENG-FENG HU*

Abstract. This work considers solving the sup-$\mathcal{T}$ equation constrained optimization problems from the integer programming viewpoint. A set covering-based surrogate approach is proposed to solve the sup-$\mathcal{T}$ equation constrained optimization problem with a separable and monotone objective function in each of the variables. This is our first trial of developing integer programming-based techniques to solve sup-$\mathcal{T}$ equation constrained optimization problems. Our computational results confirm the efficiency of the proposed method and show its potential for solving large scale sup-$\mathcal{T}$ equation constrained optimization problems.

(Cheng-Feng Hu) Department of Industrial Management, I-Shou University

*Presenting author.

TBA

CHUNG-CHIEN HONG*

Abstract. Evolutionary computation is an important technique for searching the solutions of mathematical programming. The performance of evolutionary computation usually depends on the values of the parameters needed to provide before the searching processes. Since the Taguchi method is developed to efficiently and effectively optimize producing parameters in producing lines, it is also employed to find out the optimal values of the parameters in evolutionary computation. The Taguchi is a statistical method and obtains the optimal values of the parameters in evolutionary computation through several experiments in the searching space. However, if the experiments only cover a portion of the whole searching space, these optimal values shall only work for the space that the experiments have experienced. According to the above reason, it is not proper to directly apply the Taguchi method to enhance evolutionary computation. In this talk, I will provide some examples to illustrate the above mentioned problem. Meanwhile, a new method will be introduced to avoid this problem when the Taguchi method is employed to enhance evolutionary computation.

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A POLYNOMIAL-TIME ALGORITHM FOR JOINTLY REPLENISHMENT PROBLEM UNDER POWER-OF-TWO POLICY

JEN-YEN LIN* AND MING-JONG YAO

Abstract. The joint replenishment problem(JRP) models concern how to determine lot sizes and to schedule replenishment times for products so as to minimize the total costs per unit time. Power-of-two (PoT) policy requires replenishment frequency of each product, denoted by k_i, to be a PoT integer, i.e., $k_i = 2^p$ where $p = 0, 1, 2, \cdots$. Lee and Yao(COR, 2003) proposed an efficient algorithm for searching the global optimal solution of JRP under PoT policy, but the complexity of their algorithm is unknown. In this study, we provide a new lower bound for the global optimal solutions which can help us to modify the algorithm of Lee and Yao(COR, 2003). We prove that the complexity of this new algorithm is polynomial-time. Also we provide some numerical experiments.

(Jen-Yen Lin) Department of Applied Mathematics, National Chiayi University

(Ming-Jong Yao) Department of Transportation Technology and Management, National Chiao Tung University

*Presenting author.

A Computational Method for a Free Terminal Time Optimal Control Problem

Kok Lay Teo
John Curtin Distinguished Professor
Department of Mathematics and Statistics
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Perth, Australia

Abstract. We consider a non-standard optimal control problem in which the state trajectory terminates once a stopping condition is satisfied. By using a finite-dimensional discretization of the control space, a class of approximate problems corresponding to this optimal control problem is constructed. Each of these approximate optimization problems can be viewed as a non-linear mathematical programming problem, and we develop a numerical scheme for computing the relevant gradients. On this basis, each approximate problem can be solved using existing gradient-based optimization techniques. Several important convergence results are provided to justify this approach. For illustration, our method is implemented to solve a practical aeronautical control problem.

Unified Understanding Complex Systems and NP-Hard Problems

David Yang Gao
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University of Ballarat, Victoria, Australia
http://guerin.ballarat.edu.au/ard/itms/staff/dgao.shtml

ABSTRACT:

Complex systems theory is a multidisciplinary scientific field which studies the common properties of systems that are considered fundamentally complex. The fundamental difficulty in complex systems theory is mainly due to nonsmooth and nonconvexity. In static systems, the nonconvexity usually leads to multi-solutions in the related governing equations. Each of these solutions represents certain possible state of the system. How to identify the global and local stability and extremality of these critical solutions is a challenge task. It turns out that many nonconvex problems in global optimization and computational science are considered to be NP-hard. In nonlinear dynamics, the so-called chaotic behavior is due to nonconvexity of the objective functions. In complex systems, even some qualitative questions such as regularity and stability are considered as the outstanding open problems.

In this talk, the speaker will first present some fundamental principles for modeling complex systems. Based on the definitions of objectivity and isotropy in continuum physics, a potentially powerful canonical duality theory is naturally developed. Based on the traditional oriental philosophy and some basic rules in systems theory, he will show a unified framework in complex systems and a fundamental reason that leads to challenging problems in different fields, including chaotic dynamics, NP-hard problems in global optimization, and the paradox of Buridan's donkey in decision sciences. By using the canonical duality theory, a unified analytical solution form can be obtained for a large class of problems in nonconvex systems and global optimization, both global and local optimality conditions can be identified by a triality theory. For many nonconvex variational problems, the global optimal solutions are usually nonsmooth, and cannot be captured by any traditional Newton-type direct approaches. Applications will be illustrated by certain well-known challenging problems in analysis (such as phase transitions and control of chaotic systems) and NP-hard problems in global optimization and computational science (such as integer programming, network optimization, and TSP etc).
Finally, some open problems and very recent solutions regarding the triality and unified theory will be addressed.

The speaker hopes this talk will bring some new insights into complex systems theory and decision science.

Minimax Theorey on Two-person Zero-sum Dynamic Game Systems

Hang-Chin Lai

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Abstract

Let X and Y be the stochastic strategy spaces of players I and II, respectively. Consider a two-person zero-sum dynamic game system:

$$(S_n, A_n, B_n, t_{n+1}, u_n, v_n, \theta) \text{ at time } n \in \mathbb{N}, \qquad (\star)$$

in which t_{n+1} is the transition probability from state S_n moved to state S_{n+1}. The total conditional expectations of players I and II are given by

$$\begin{cases} U(x,y)(s_1) = \lim\limits_{n\to\infty} E_{xy} u_n(s_1) \in \mathbb{R} \\ V(x,y)(s_1) = \lim\limits_{n\to\infty} E_{xy} v_n(s_1) \in \mathbb{R}_+ \end{cases}, \text{ for } (x,y) \in X \times Y,$$

where u_n (respective v_n) is the reward function of player I (respective player II) at time $n \in \mathbb{N}$.

The loss (gain) function of player I at $n \in \mathbb{N}$ is performed by

$$F_\theta^n(x,y) = E_{xy}(u_n - \theta v_n), \qquad (1)$$

and the player II has his loss (gain) function as

$$-F_\theta^n(x,y) \text{ at } n \in \mathbb{N}. \qquad (2)$$

Therefore, (1) + (2) is always equal to zero at any time $n \in \mathbb{N}$.

Consequently,

$$F_\theta(x,y) = U(x,y) - \theta V(x,y) = \lim_{n\to\infty} E_{xy}(u_n - \theta v_n).$$

In this talk, we will establish the minimax theorem held in the game system $(\star)$. That is

$$\min_{x\in X} \max_{y\in Y} F_\theta(x,y) = \max_{y\in Y} \min_{x\in X} F_\theta(x,y), \quad \theta \text{ is a parameter.}$$

Besides, a practical economic example problem will present in this lecture.

Deliver at National Cheng Kung University in Tainan, Taiwan.

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A MATRIX PRESENTATION FOR INFORMATION EFFECTS ON PERFORMANCE OF TWO-TIER SERVICE SYSTEMS WITH STRATEGIC CUSTOMERS

ZHE GEORGE ZHANG, HSING LUH*, AND CHUNG-MING LIN

Abstract. This talk considers a two-tier service system with one free service channel and one toll service channel. While the free system offers free service with a long waiting time, the toll service system offers paid service with a guaranteed maximum expected waiting time at a price. This kind of service system can be found in many public service situations. For example, for a certain type of non-urgent surgery, the free system may represent the public hospital service covered by the government medical insurance plan and accessed by all patients and the toll system may represent the private hospital service with limited number of patients admitted at any point in time. We study the information effects on the performance of such a two-tier service system with strategic heterogeneous customers.

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A COMPUTATIONAL METHOD FOR A FREE TERMINAL TIME OPTIMAL CONTROL PROBLEM

JEIN-SHAN CHEN*

Abstract. This paper investigates the Lipschitz continuity of the solution mapping of symmetric cone (linear or nonlinear) complementarity problems (SCLCP or SCCP, respectively) over Euclidean Jordan algebras. We show that if the transformation has uniform Cartesian P-property, then the solution mapping of the SCCP is Lipschitz continuous. Moreover, we establish that the monotonicity of mapping and the Lipschitz continuity of solutions of the SCLCP imply ultra P-property, which is a concept recently developed for linear transformations on Euclidean Jordan algebra. For a Lyapunov transformation, we prove that the strong monotonicity property, the ultra P-property, the Cartesian P-property and the Lipschitz continuity of the solutions are all equivalent to each other.

(Jein-Shan Chen) Department of Mathematics, National Taiwan Normal University.

*Presenting author.

COMBINATION OF OPTIMIZATION PROBLEMS

ZHENBO WANG*

Abstract. This talk will introduce our studies on combination of optimization problems. We present and study some combinations of some classical optimization problems, including machine scheduling problem, vertex cover problem, network flow problem, network design problem, knapsack problem, max cut problem and independent set problme,etc. In other words, we optimize two related optimization problems at the same time by considering the problems at different levels, i.e. one problem is considered as a subproblem or a constraint of the another. This study will bridge different fields of combinatorial optimization, and contains abundant contents. We not only study the combination of optimization problems, but also build the relationship of methods and theories in different fields, and investigate the underlying properties of the combination problems. This talk introduces some combination problems, and present their computational complexity and approximation algorithms design and analysis. For example, we study a combination of parallel machine scheduling and vertex cover problem. Given some weighted vertices in an undirected graph, a set of vertices is called a vertex cover if for each edge at least one endpoint belongs to this set. Our problem is to schedule a set of vertices on m identical parallel machines such that the set of vertices is a vertex cover and the makespan is minimized. We show this problem is hard to be approximated within any constant factor better than 2. We develop an approximation algorithm based on local ratio method and LPT rule, and prove it is a (3-2/(m+1))-approximation algorithm.

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Convex Relaxations for Quadratic Assignment Problem *

Yong Xia

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Abstract

Quadratic assignment problem (QAP) is one of the great challenges in combinatorial optimization. It is known to be NP-hard. Moreover, finding an ϵ-solution remains NP-hard. Convex relaxation techniques play a great role in solving the quadratic assignment problem. In this talk, we survey some most popular efficient convex relaxation approaches (e.g., linear programming, eigenvalue optimization, convex quadratic programming, second-order cone programming, semidefinite programming and convex nonlinear programming), and show how they can be further improved.

*This research was supported by National Natural Science Foundation of China under grants 11001006 and 91130019/A011702 and by the fund of State Key Laboratory of Software Development Environment under grant SKLSDE-2011ZX-15.

FORUM: FUTURE DEVELOPMENTS AND OPPORTUNITIES IN OPERATIONS RESEARCH

HOSTED BY PROF SHU-CHERNG FANG AND PROF. RUEY-LIN SHEU

THE PRELIMINARY. Operations Research was not widely known to researchers in Taiwan a quarter century ago. Without doubt, Prof. Shu-Cherng Fang is one important pioneer among early overseas students originated from Taiwan who studied this very field. Most significantly, he devoted himself to promoting OR in Taiwan and also graduated a number of students who now continue to teach OR to new generations or apply OR skills to various industry. In this forum, we have invited many first-tier scholars who own many indispensible views and experiences in OR. We hope, through this informal discussions, that we can share each others' opinions about the roles OR can further play in the future.

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CONIC PROGRAMMING OF NONNEGATIVE QUADRATIC FUNCTIONS

WEN-XUN XING*

Abstract. In this talk, we shall introduce the conic programming of nonnegative quadratic functions from a systemic Lagrange lower bound method and show that any lower bounded quadratically constrained quadratic programming (QCQP) is equivalent to the conic programming. Well known models like SDP and co-positive programs are special cases of it. Thus their known results guide us to study the model accordingly. We shall state different aspects from theory or applications to handle the problem. Based on the computable concept of continuous optimization, extended global optimality conditions and algorithms are provided for QCQP. Finally, computable cones of nonnegative quadratic functions are considered and an adaptive approximation method for any linear conic programming is presented by using the techniques of linear matrix inequalities.

(Wen-Xun Xing) Tsing Hua University

*Presenting author.

Linear Invertible Conic Programming: A Footprint for More Innovative and Energetic Research Paradise

Hsiao-Fan Wang
Department of Industrial Engineering & Engineering Management
National Tsing Hua University, Hsinchu, Taiwan, ROC

"Linear Conic Programming: A New Modeling Tool for More Serious Analysis and Decision Making" is the most recent seminar talk given by Prof. Fang, SC, at Tsing Hua University, which highlights the development of linear programming and paves the way towards the generalization theory of optimization.

How about the inverse? Let's review the conditions of a unique solution on the independence, generality and consistency as a paradigm.

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ON LOCALIZING SENSOR NETWORKS BASED ON MULTILATERATION, SENSOR CONNECTIVITY, AND SEED SENSOR SELECTION

ZIH-CIN LIN*

Abstract. The wireless sensor network localization problem (SNL) is to determine position of sensors with given inter-sensor connectivity and distance information, as well as a set of anchors whose positions are known beforehand. SNL can be modeled as an unconstrained nonlinear programming problem is often solved by Semi-Definite Programming (SDP) that are time-consuming for larger cases or distributed algorithms that are less accurate. In order to locate more sensors with better accuracy in shorter time, we propose a framework that first locates some sensors by tri-lateration, and then iteratively conducts gradient methods that exploits shortest path lengths between nonadjacent sensors as estimates and adjusts positions of sensors based on connectivity. Results of computational tests indicate our proposed algorithm performs better than SDP. We will also discuss techniques to solve SNL of few or no anchors.

(Zih-Cin Lin) Department of Industrial and Information Management, National Cheng Kung University.

*Presenting author.

Using Genetic Algorithm and Optimal Computing Budget Allocation to Solve Vehicle Routing Problem with Stochastic Demands

Ming-Jong Yao[1] Jen-Yen Lin[2] Chia-Pei Chen[1]

Department of Transportation Technology and Management
National Chiao Tung University, Hsinchu, Taiwan, ROC

Since vehicle routing problem (VRP) was introduced by Dantzig and Ramser in 1959, numerous research efforts have been devoted to it and its variants. However, as there are full of uncertainties in real world, more and more researches have focus on stochastic versions of the VRP in recent years.

According to one of global forwarding companies in Taiwan, in case of not knowing who should be responsible for some customers being omitted, each driver has been assigned a "responsible region" to satisfy every customer's demands in his region. Besides, in practice, customer's demand is a random variable, which means it may be zero in a certain day, in order to save traveling cost, driver doesn't need to visit those who have zero demand, just heading to next customer directly. Moreover, cars have capacity limits, whenever customer's demand exceeds car's capacity, we called it route failure, which will cause extra cost to take recourse action. Thanks to the help of information system, nowadays driver will know each customers demand before he leaves depot, however, it will cost a lot if global forwarder want to reschedule driver's visiting route based on the actual situation every day. In addition, stochastic models also arise naturally in situations where routes are planned for a long planning horizon but executed repeatedly during that horizon.

Therefore, in this research, we focus on a single responsible region (single vehicle) and customers have stochastic demands, by using genetic algorithm and optimal computing budget allocation, try to find an optimal solution in a reasonable time which can suggest the global forwarder a long run visiting route to save total cost.

Keywords: Vehicle Routing Problem; Genetic Algorithm; Stochastic Demand; Optimal Computing Budget Allocation

The Optimal Replenishment and Payment Policy for EPQ Models under conditions of Permissible Delay in Payments and Cash Discount

Jen-Yen Lin[2] Chia-Yu Cheng[1]

Department of Applied Mathematics National Chiayi University,
Chiayi, Taiwan, ROC

In real world, the suppliers often provide two policies for their retailers, One is permissible delay in payments, the other is cash discount. The retailers can choose exact one from these two policies. In this paper, we propose a new EPQ model considering both options of cash discount and permissible delay in payment, and allowing two-stage payments. Besides providing the new model, we also discuss some properties of its objective function and organize an algorithm for obtaining optimal cycle time.

Keywords: EPQ ; cash discount ; permissible delay in payments

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A STRATEGIC STUDY ON MANAGING PUBLIC BIKE SHARING SYSTEMS BY DEMAND PROFILE AND TEMPORARY MANPOWER ALLOCATION

MIN-TING LIAO*

Abstract. In this talk we first present how to formulate the network design problem for selecting the best locations for constructing rental sites and best amount of bikes and racks to be installed in each site with minimum total cost. To mimic the actual behaviors of bikers, we force the bikes leaving from a station to different destinations to be proportional to their designed pattern obtained by a surveyed demand profile. We then introduce how to allocate temporary manpower on rental sites to take care excessive returned bikes and on some specific origin-destination routes to balance the imbalanced bikes, so that the designed quality of service can be achieved with minimum cost. Efficient heuristics based on Particle Swarm Optimization have been proposed to solve both problems. We finally introduce a static repositioning mathematical programming model that seeks best routing and load/unload plans for each repositioning vehicle with balanced workload.

(Min-Ting Liao) Department of Industrial and Information Management, National Cheng Kung University.

*Presenting author.

The Economic Lot Scheduling Problem for a Profit-maximizing Manufacturer Producing Regular and Remanufactured Products

Ming-Jong Yao[1] Jen-Yen Lin[2] Chi-Husan Tsai[1]

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Economic lot scheduling problem(ELSP) has been studied over 50 years. In this study, we are interested in the ELSP producing different types of products, named regular product and remanufactured product. In the production system, we produce regular products to the customers and then collect the refuses to do remanufacture. To the concern of the quality of recycled materials, sometimes we can only product the goods more inferior than the originals. These kind of goods is so called remanufactured product in this paper, servicing customers in different market than the regular one. To this problem, we compete these two categories of products on the same facility and they must be scheduled simultaneously. In additional, if recycle time is not long enough to collection sufficient materials toward next remanufacturing production, it may suffer lost sales.

In this paper, we formulate a mathematical model using the time varying lot size (TVLS) approach in which provides feasible schedules by allowing the lot sizes and thus the cycle times for each product to vary over time. Different to literatures, we use genetic algorithm to solve a basic-period-based model, then generating a schedule cycle time and production sequence based on longest production time. Dealing with TVLS approach, the production sequence still has to improve by neighborhood search method. In our numerical examples, we demonstrate our methodology within different utilization and compare with the results with common cycle approach and independent solution.

Approximating term structure of interest rates using cubic L_1 splines

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The term structure of interest rates is typically represented by three curves, the discount function, spot rate and instantaneous forward rate, hence it is important to generate one of these three curves from observed bond prices. Chiu et al. (EJOR, 2008) proposed cubic L_1 spline model for term structure analysis. Their model is built on the relationship between bond price and its discount function. In this paper, we use the relationship between bond price and spot rate in order to build a new cubic L_1 model for term structure analysis. We also provide an algorithm for solving this model.

Keywords: Cubic L_1 spline; Term structure; Spot rate.

List of Speakers