International Conference on Modeling, Computation and Optimization

ICMCO-08

Indian Statistical Institute, 7, S. J. S Sansanwal Marg
New Delhi-110 016

January 9-10, 2008

Program and Abstracts

ICMCO-08

Organized by

Indian Statistical Institute,

SQC & OR Unit, Delhi Centre

Contents

Welcome to ICMCO-08

On behalf of the organizers of ICMCO-08, I welcome you in the *International Conference on Modeling, Computation and Optimization* at Indian Statistical Institute, Delhi Centre. This conference aims at discussing new developments in the methods of decision-making and promises to build an interaction between the academic model developers and practitioners by bringing them together to address the important issues in modeling, computation and optimization. There have been important new developments in the computational techniques of optimization and game problems. ICMCO-08 intends to present the state-of-the-art results and recent advances in these areas with a view to highlight possible future course of research in these areas. This provides also an opportunity to exchange ideas on any aspect of mathematical modeling, computation and optimization and promote newer international research relationships. The conference topics include (but not limited to):

- Mathematical Modeling
- Dynamic Modeling
- New developments in Classical Combinatorial Optimization Problems (Knapsack, Vehicle Routing & Scheduling, Traveling salesman problem)
- Heuristic and/or Meta-Heuristic Algorithms for optimization problems.
- Models and Optimization Techniques for various applications such as Supply Chain Management, Auto Manufacturing, Financial Optimization
- Multi-objective optimization.
- Optimization techniques for game problems

This conference also intends to bring out a publication of selected and refereed papers by *World Scientific*. Information about social events will be available to you at the time of registration.

S. K. Neogy
Organizing Committee Chair

Committees

Organizing Committee

S. K. Neogy (*Organizing Committee Chair*), R. Chakraborty, A. K. Das, Arunava Sen, R.B. Bapat

Programme Co-ordinating Committee

R. Chakraborty, P. Das, Prabal Roy Chowdhury

Facilities Committee

R. C. Satija, Simmi Marwah

International Conference on Modeling, Computation and Optimization
(January 9- 10, 2008)

Program Overview

Date: January 9, 2008

Time	Event	Venue
9:00-10:00	Registration	Conference Lounge
10:00-10:30	Inaugural Session	Conference Room-I
10:30-11:00	Tea	Conference Hall
11:00-13:00	Session-I A Session-I B	Conference Room-I Conference Room-II
13:00-14:00	Lunch	ISI Guest House
14:00-15:30	Session-II A Session-II B	Conference Room-I Conference Room-II
15:30-15:45	Tea	Conference Hall
15:45-17:45	Session-III A Session-III B	Conference Room-I Conference Room-II
17:45-18:00	Tea	Conference Hall
20:00	Symposium Dinner	India International Centre

Note: Bus leaves from Indian Statistical Institute on January 9, 2008 for India International Centre at 19:30

Date: January 10, 2008

Time	Event	Venue
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11:00-11:30	Tea	Conference Hall
11:30-13:00	Session-V A Session-V B	Conference Room-I Conference Room-II
13:00-14:00	Lunch	ISI Guest House
14:00-15:30	Session-VI A Session-VI B	Conference Room-I Conference Room-II
15:30-15:45	Tea	Conference Hall
15:45-17:45	Session-VII A Session-VII B	Conference Room-I Conference Room-II
17:45-18:00	Tea	Conference Hall

Inaugural Session Details

January 9, 2008 Time: 10:00 -10:30 Venue: Conference Room –I

1.	**Welcome address:** Director, Indian Statistical Institute
2.	**About Indian Statistical Institute and Delhi Centre:** Head, Delhi Centre
3.	**About symposium:** S. K. Neogy, Organizing Committee Chair, ICMCO-08
4.	**Vote of thanks:** A. K. Das, Organizing Committee Member

Technical Sessions Details

Parallel Sessions

January 9, 2008 Time: 11:00 -13:00 Venue: Conference Room –I

Session I A

Chairman : Kurt Helmes (Humboldt-Universitaet zu Berlin, Institut fuer Operations Research , Germany)

1.	**Masakazu Muramatsu** (The University of Electro-communications, Japan) Semidefinite Programming Relaxation for Polynomial Optimization Problems.
2.	**Juan Enrique Martinez-Legaz** (Universitat Autonoma de Barcelona, Spain) A Tabu Search Scheme for Abstract Problems with Applications to the Computation of Fixed Points.
3.	**Ravindra S. Gajulapalli** (Indian Institute of Management, Ahmedabad) and Leon S. Lasdon (University of Texas at Austin). Scaling Sparse Matrices for Optimization Algorithms
4.	**Sandeep Juneja** (Tata Institute of Fundamental Research) (joint work with Michael Gordy, Federal Reserve Board) Nested Simulation in Portfolio Risk Measurement

January 9, 2008 Time: 11:00 -13:00 Venue: Conference Room –II

Session-I B

Chairman : Theo S.H. Driessen (University of Twente, The Netherlands)

1.	J. Derks, J. Kuipers, M. Tennekes and **F. Thuijsman** (Maastricht University, The Netherlands) Existence of one-way flow Nash networks
2.	**Andrey Garnaev** (St Petersburg State University, Russia) A Jamming Game
3.	**Somdeb Lahiri** (Institute of Petroleum Management, India) Quasi-Bargaining Set For Contract Choice Problems
4.	**Luca Grilli** (Università di Foggia, Dipartimento di Scienze Economiche, Matematiche e Statistiche, Italy) A Stackelberg differential game with overlapping generations for the management of a renewable resource

January 9, 2008 Time: 14:00 -15:30 Venue: Conference Room –I

Session II A

Chairman : Masao Fukushima (Kyoto University , Japan)

1.	**Kurt Helmes** (Humboldt-Universitaet zu Berlin, Wirtschaftswissenschaftliche Fakultaet, Institut fuer Operations Research , Germany) A linear programming technique for infinite dimensional zero-sum games on polyhedral strategy spaces in $\mathbb{R}2$
2.	**K.C. Sivakumar** (Indian Institute of Technology Madras, India) Role of Nonnegative Generalized Inverses in Optimization
3.	**Anjana Gupta** (University of Delhi), Aparna Mehra (Indian Institute of Technology Delhi) and Davinder Bhatia (University of Delhi) Nonconvex Vector Minimization with Set Inclusion Constraint

January 9, 2008 Time: 14:00 -15:30 Venue: Conference Room –II

Session II B

Chairman : A. Sen (Indian Statistical Institute Delhi Centre)

1.	**Jacek B. Krawczyk** (Victoria University of Wellington, New Zealand, Javier Contreras (Universidad de Castilla–La Mancha, Spain) and James Zuccollo (Victoria University of Wellington, New Zealand) Thermal Electricity generators' competition with coupled constraints
2.	**Reinoud AMG Joosten** (University of Twente, The Netherlands) Strategic advertisement with externalities: a new dynamic approach.
3.	**Viswanathan Arunachalam** (University of los Andes, Bogota, Colombia) A Stochastic Model for the Valuation of options with Jumping Volatility.

January 9, 2008 Time: 15:45 -17:45 Venue: Conference Room –I

Session III A

Chairman: Suresh Chandra (Indian Institute of Technology Delhi, India)

1.	Atsushi Kajii (Institute of Economic Research, ,Kyoto University, Japan), Hiroyuki Kojima (Teikyo University. and **Takashi Ui** (Yokohama National University,Japan) Coextrema Additive Operators
2.	**Anulekha Dhara** and Aparna Mehra (Indian Institute of Technology Delhi, India) Fuzzy Optimality Conditions for Minimax Programming Problems
3.	**Deepali Gupta** and Aparna Mehra (Indian Institute of Technology Delhi) Approximate Optimality for Semi Infinite Programming
4	**Rupaj Kumar Nayak** (Utkal University, India) ,Mahendra Prasad Biswal (Indian Institute of Technology Kharagpur) and Sudarsan Padhy (Utkal University, India) A Semidefnite Relaxation for Portfolio Optimization Problem

January 9, 2008 Time: 15:45 -17:45 Venue: Conference Room –II

Session III B

Chairman: Andrey Garnaev (St Petersburg State University, Russia)

1.	Oguz Solyali and **Haldun Sural** (Middle East Technical University, Turkey) A relaxation based solution approach for the inventory control and vehicle routing problem in vendor managed systems
2.	**T. S. Arthanari** (University of Auckland, Auckland, New Zealand) Models without Main Players
3.	**Udayan Chanda** and A.K. Bardhan (University of Delhi, India) Dynamic Optimal Advertising Expenditure Strategies for Two Successive Generations of High Technology Products.
4	**Amit Choudhury** (Gauhati University, India) Order Splitting among suppliers

January 10, 2008 Time: 10:00 -11:00 Venue: Conference Room –I

Session IV A

Chairman: Juan Enrique Martinez-Legaz (Universitat Autonoma de Barcelona, Spain)

1.	**Reshma Khemchandani**, Jayadeva, and Suresh Chandra (Indian Institute of Technology, Delhi) Incremental Twin Support Vector Machines
2.	**Sanjeet Singh** (Indian Institute of Management Calcutta) Portfolio risk management using support vector machine

January 10, 2008 Time: 10:00 -11:00 Venue: Conference Room –II

Session IV B

Chairman: S. K. Neogy (Indian Statistical Institute Delhi Centre)

1.	**T Parthasarathy** (Indian Statistical Institute, Chennai) Q-property of multiplicative transformation in semidefinite linear complementarity problem
2.	S. K. Neogy (Indian Statistical Institute Delhi Centre), **A. K. Das** and A. Gupta (Indian Statistical Institute Kolkata) On weak $\overline{N}$ -matrices of exact order

January 10, 2008 Time: 11:30 -13:00 Venue: Conference Room –I

Session V A

Chairman: Masakazu Muramatsu (The University of Electro-communications, Japan)

1.	**Yasunori Kimura** (Tokyo Institute of Technology, Japan) Weak convergence of an iterative scheme with a weaker coefficient condition
2.	**Masao Fukushima** (Kyoto University , Japan) Equilibrium Problems under Uncertainty
3.	**Joydeep Dutta** (Indian Institute of Technology Kanpur) Inexact Proximal Point Methods for Monotone Variational Inequalities

January 10, 2008 Time: 11:30 -13:00 Venue: Conference Room –II

Session V B

Chairman: Reinoud AMG Joosten (University of Twente, The Netherlands)

1.	**Subhash Kochar** and Maochao Xu (Portland State University, USA) Connections Between Some Concepts In Reliability and Economics
2.	**K. Krishnamoorthy**, Yin Lin and Yanping Xia (University of Louisiana at Lafayette, USA) A Unified Approach for Weibull Analysis
3.	**K.K. Thampi** (M.G.University, India)and M. J. Jacob (NITC,India) The Distribution of Deficit at ruin on a Renewal Risk Model

January 10, 2008 Time: 14:00 -15:30 Venue: Conference Room –I

Session VI A

Chairman: T. S. Arthanari (University of Auckland, Auckland, New Zealand)

1.	Megha Sharma and **Diptesh Ghosh** (Indian Institute of Management Ahmedabad, India) An empirical investigation into randomly generated Euclidean symmetric traveling salesman problems
2.	Yogesh K. Agarwal (Indian Institute of Management Lucknow) and **Prabha Sharma** (Indian Institute of Technology, Kanpur, India) Bender's Partitioning Approach for Optimal Communication Spanning Tree Problem
3.	**R.B.Bapat** (Indian Statistical Institute, Delhi Centre) Sperner's lemma with multiple labels

January 10, 2008 Time: 14:00 -15:30 Venue: Conference Room –II

Session VI B

Chairman: F. Thuijsman (Maastricht University, The Netherlands)

1.	**Anna B. Khmelnitskaya** (St.Petersburg Institute for Economics and Mathematics Russian Academy of Sciences, Russia) Values for graph-restricted games with coalition structure
2.	**Theo S.H. Driessen** (University of Twente, The Netherlands) A new axiomatization of the Shapley value for TU-games in terms of semi-null players applied to 1-concave games
3.	**Irinel Dragan** (University of Texas at Arlington, U.S.A) On multiweighted Shapley values and random order values

January 10, 2008 Time: 15:45 -17:45 Venue: Conference Room –I

Session VIIA

Chairman: A. K. Das (Indian Statistical Institute Kolkata)

1.	Y.P. Aneja (University of Windsor, Canada) and **Yogesh K. Agarwal** (Indian Institute of Management Lucknow) Polyhedral Structure of the Fixed Charge Transportation Problem
2.	Roudra Chakraborty (Jadavpur University, India), Debapriya Sengupta(Indian Statistical Institute, Kolkata) and **Sagnik Sinha** (Jadavpur University, India) Pitch Tracking of Acoustic Signals based on Average Squared Mean Difference Function
3.	**Abhijit Ghosh** and S K Mazumder (Indian Statistical Institute Kolkata, India) Finding the Optimum Batch Mix of Cast Rolls with Maximum NSR and Maximum Tonnage
4.	Aditya Shastri **(**Banasthali Vidyapith, India**),** Shivraj Pundir **(**D.N.P.G. College, Meerut) and **Shalley Gupta (**Banasthali Vidyapith, India) Effect of geometrical arrivals of negative customers on a G-Queue in discrete time.

January 10, 2008 Time: 15:45 -17:45 Venue: Conference Room –II

Session VIIB

Chairman: Prabal Roy Chowdhury ((Indian Statistical Institute Delhi Centre))

1.	**Rudra Prakash Pradhan** (Indian Institute of Technology Kharagpur, India) Education and Economic Growth in India: A Cointegration and Causality Approach
2.	**Sidhartha S. Padhi** (Indian Institute of Technology Kharagpur, India) Sourcing of works considering past performance in government procurement
4.	**Sanjay Jain** (Government College, Ajmer, India) On fractional trans-shipment problem

ABSTRACT OF THE PAPERS

January 9, 2008 Time: 11:00 -13:00 Venue: Conference Room –I

Session I A

Chairman : Kurt Helmes (Humboldt-Universitaet zu Berlin, Institut fuer Operations Research , Germany)

Semidefinite Programming Relaxation for Polynomial Optimization Problems

Masakazu Muramatsu

The University of Electro-communications
Japan

A Polynomial Optimization Problem (POP) is an optimization problem having polynomials in its constraints and objective. Recently a new solution method to compute a global optimal solution of POP is proposed based on the Sums Of Squares (SOS) relaxation and the SemiDefinite Programming (SDP) relaxation. In this survey, we review this method from the viewpoint of the polynomial and linear SDP relaxation, and introduce further developments to widen the applicability of the method.

A Tabu Search Scheme for Abstract Problems with Applications to the Computation of Fixed Points

Juan Enrique Martinez-Legaz

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In this joint work with Antoine Soubeyran we present a general tabu search iterative algorithm for solving abstract problems on metric spaces. At each iteration, if the current solution turns out to be unacceptable then a neighborhood consisting of unacceptable solutions is determined and excluded from further exploration. We prove that, under mild assumptions, an acceptable solution is asymptotically reached. We also present a specialization of our general method to the computation of fixed points.

Scaling Sparse Matrices for Optimization Algorithms

Ravindra S. Gajulapalli
Indian Institute of Management, Ahmedabad

Leon S. Lasdon
University of Texas, Austin

To iteratively solve large scale optimization problems in various contexts like planning, operations, design etc, we need to generate descent directions that are based on linear system solutions. Irrespective of the optimization algorithm or the solution method employed for the linear systems, ill conditioning introduced by problem characteristics or the algorithm or both need to be addressed. We used an intuitive heuristic approach in scaling linear systems that improved performance of a large scale interior point algorithm significantly. We saw a factor of 10^3 improvements in condition number estimates. In this paper, given our experience with optimization problems from a variety of application backgrounds like economics, finance, engineering, planning etc., we examine the theoretical basis for scaling while solving the linear systems. Our goal is to develop reasonably "good" scaling schemes with sound theoretical basis.

We introduce concepts and define "good" scaling schemes as well as explain related work in this area. Scaling has been studied extensively and though there is a broad agreement on its importance, the same cannot be said about what constitutes good scaling. A theoretical framework to scale an $m \times n$ real matrix is established. We use the first order conditions associated with the Euclidean metric to develop iterative schemes that approximate the solution in O(mn) time for real matrices.

We discuss symmetry preserving scale factors for an $n \times n$ symmetric matrix. The importance of symmetry preservation is discussed. An algorithm to directly compute symmetry preserving scale factors in $O(n^2)$ time based on Euclidean metric is presented.

We also suggest scaling schemes based on rectilinear norm. Though all p-norms are theoretically equivalent, the importance of outliers increases as p increases. For barrier methods, due to large diagonal corrections, we believe that the taxicab metric ($p = 1$) may be more appropriate. We develop a linear programming model for it and look at a "reduced" dual that can be formulated as a minimum cost flow problem on networks. We are investigating algorithms to solve it in O(mn) time that we require for an efficient scaling procedure. We hope that in future special structure of the "reduced" dual could be exploited to solve it quickly. The dual information can then be used to compute the required scale factors. We discuss Manhattan metric for symmetric and as in the case of real matrices, we are unable to propose an efficient computational scheme for this metric. We look at a linearized ideal penalty function that only uses deviations out of the desired range. If we could use such a metric to generate an efficient solution, then we would like to see impact of changing the range on the numerical behavior.

Nested Simulation in Portfolio Risk Measurement

Sandeep Juneja

Tata Institute of Fundamental Research
Joint work with Michael Gordy, Federal Reserve Board

Risk measurement for derivative portfolios almost invariably calls for nested simulation. In the outer step one draws realizations of all risk factors up to the horizon, and in the inner step one re-prices each instrument in the portfolio at the horizon conditional on the drawn risk factors. Practitioners may perceive the computational burden of such nested schemes to be unacceptable, and adopt a variety of second-best pricing techniques to avoid the inner simulation. In this paper, we question whether such short cuts are necessary. We show that a relatively small number of trials in the inner step can yield accurate estimates, and analyze how a fixed computational budget may be allocated to the inner and the outer step to minimize the mean square error of the resultant estimator.

January 9, 2008 Time: 11:00 -13:00 Venue: Conference Room –II

Session-I B

Chairman : Theo S.H. Driessen (University of Twente, The Netherlands)

Existence Of One-Way Flow Nash Networks

J. Derks, J. Kuipers, M. Tennekes and F. Thuijsman

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We study a one-way flow connections model of unilateral network formation. We prove the existence of Nash networks for games where the corresponding payoff functions allow for heterogeneity among the profits that agents gain by the network. Furthermore, we show by a counterexample that, when link costs are heterogeneous, Nash networks do not always exist.

A Jamming Game

Andrey Garnaev
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We consider jamming in wireless networks in the framework of zero-sum games with linear utility. We show that for this game which can be described as a game of user versus nature the linear payoff function is very natural for user since in the optimal behaviour it turns out that user as well as the nature plays on the same sub-carries. For this game we developed an efficient algorithm which can find the optimal strategies in finite number of steps.

Quasi-Bargaining Set For Contract Choice Problems

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The main result in this paper states that every contract choice problem has a nonempty quasi-bargaining set. The need for such a solution concept which is considerably weaker than the core arises, since it is well known that even for very simple contract choice problems, the core and bargaining sets may be empty.

A Stackelberg Differential Game With Overlapping Generations For The Management Of A Renewable Resource

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In this paper we study a Stackelberg Differential Game for the problem of the extraction of a natural resource. We consider the case in which players are overlapping generation of extractors. As a result players have asynchronous time horizon. The framework of overlapping generations allows us to consider both intragenerational and intergenerational competition. We suppose that competition among extractors in different generations follows a leader-follower rule, as a consequence of the overlapping generations dynamic, the leader-follower structure is not fixed but it depends on what part of her economic life a player is living in. We consider two different behaviours: the myopic and not myopic.

January 9, 2008 Time: 14:00 -15:30 Venue: Conference Room –I

Session-II A

Chairman : Masao Fukushima (Kyoto University, Japan**)**

A Linear Programming Technique For Infinite Dimensional Zero-Sum Games On Polyhedral Strategy Spaces In $\Re^2$

Kurt Helmes

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A linear programming technique which provides approximations to the value of zero-sum games with, f.\,i., bell-shaped pay-off functions defined on polyhedral strategy spaces in $\Re^2$ will be presented. The algorithm is based on the characterization of moment sequences of measures defined on general triangles. The results extend previous theorems by the author which were based on characterizations of Hausdorff polytopes. The new results rely on characterizations of Dale- and generalized Dale polytopes. The method will be illustrated by analyzing several examples.

Role of Nonnegative Generalized Inverses in Optimization

K.C. Sivakumar
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Let X be a partially ordered real Banach space, $a, b \in X$ with $a \leq b$. Let ϕ be a bounded linear functional on X. We call X a Ben-Israel-Charnes space (or a B-C space) if the linear program defined by Maximize $\phi(x)$, subject to $a \leq x \leq b$ has an optimal solution for any ϕ, a and b. Such problems arise naturally in solving a class of problems known as Interval Linear Programs. B-C spaces were introduced in the author's doctoral thesis. In this talk, we review this notion, study certain problems on positive operators over partially ordered Banach spaces and identify some new B-C spaces.

Nonconvex Vector Minimization With Set Inclusion Constraint

Anjana Gupta and Davinder Bhatia

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Aparna Mehra
Department of Mathematics,
Indian Institute Of Technology, Delhi
Hauz Khas, New Delhi-110016, India

In this paper we employ a nonconvex separation theorem to scalarize the vector minimization problem subject to the constraint given in the form of set inclusion. A new Lagrange function is formulated for the scalarized problem. Saddle point criteria is developed which ensure the existence of the Lagrange multipliers. We also discuss the Lagrange duality.

January 9, 2008 Time: 14:00 -15:30 Venue: Conference Room –II

Session-II B

Chairman : A. Sen (Indian Statistical Institute**)**

Thermal Electricity Generators' Competition With Coupled Constraints

Jacek B. Krawczyk, Javier Contreras, And James Zuccollo

Competitive thermal generators' emissions constitute an externality, on which the regulator might impose constraints. On the other hand, transmission capacities for sending energy may naturally be restricted by the grid facilities. Both pollution standards and transmission capacities impose several constraints upon the joint strategy space of the agents. We assume that the regulator can levy charges or taxes on the generators that could mitigate the emissions and also the grid congestion. Seeking to constrain the competitive electricity generators' behaviour the regulator solves a generalised Nash equilibrium problem. Using the coupled constraints' Lagrange multipliers, which arise from that equilibrium, as taxation coefficients the regulator can modify the players' payoffs and thus control them toward an equilibrium where both congestion and excessive pollution are avoided. Alternatively, the regulator can inform the generators of the maximum flows and emissions and, should they be observable, tax the players individually for exceeding the maxima. However, for the payoff modification to induce the required behaviour, and also to compute the flow and emission caps, a coupled constraints equilibrium needs to exist and be unique. A three-node bilateral market example with a DC model of the transmission line constraints possesses these properties and will be used in this paper to discuss and explain the behaviour of the agents subjected to coupled constraints. We report that the imposition of joint restrictions may result in increasing the output share of an "inefficient" generator and in a decrease of consumer surplus.

Strategic Advertisement With Externalities: A New Dynamic Approach

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We model and analyze strategic interaction over time in a duopolistic market. Each period the firms independently and simultaneously choose whether to advertise or not. Advertising increases the own immediate sales, but may also cause an externality, e.g., increase or decrease the immediate sales of the other firm ceteris paribus. There exists also an effect of past advertisement efforts on current sales. The `market potential' of

each firm is determined by its own but also by its opponent's past efforts. A higher effort of either firm leads to an increase of the market potential, however the impact of the own past efforts is always stronger than the impact of the opponent's past efforts. How much of the market potential materializes as immediate sales, then depends on the current advertisement decisions. We determine feasible rewards and (subgame perfect) equilibria for the limiting average reward criterion using methods inspired by the repeated-games literature. Uniqueness of equilibrium is by no means guaranteed, but Pareto efficiency may serve very well as a refinement criterion for wide ranges of the advertisement costs.

A Stochastic Model for the Valuation of options with Jumping Volatility

Viswanathan Arunachalam

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The volatility is crucial component for the pricing of options and stochastic volatility is more nature to study options. The well-know Black-Scholes model for the financial derivatives deals with constant volatility. In general, the volatility cannot be observed because it is not traded asset. The main idea of this talk is to introduce a new mechanism to explain the dynamics of stock return volatility, since volatility is crucial to capture stock return variability. We propose stochastic volatility models with respect to shot noise behaviour, in which the volatility jump occurs in random instant of non-Markov times. We show that the proposed model is flexible and alternative to other existing models. A special case for the value of European option is implemented with example.

January 9, 2008 Time: 15:45 -17:45 Venue: Conference Room –I

Session-III A

Chairman : Suresh Chandra (Indian Institute of Technology, Delhi, India**)**

Coextrema Additive Operators

Atsushi Kajii,
Institute of Eonomic Research,
Kyoto University, Japan
Hiroyuki Kojima,
Teikyo University
Takashi Ui
Yokohama National University, Japan

This paper proposes a class of weak additivity concepts for an operator on the set of real valued functions on a finite state space Ω, which include additivity and comonotonic additivity as extreme cases. Let $\mathcal{E} \subseteq 2^{\Omega}$ be a collection of subsets of Ω. Two functions x and y on Ω are $\mathcal{E}$-coextrema if, for each $E \in \mathcal{E}$, the set of minimizers of x restricted on E and that of y have a common element, and the set of maximizers of x restricted on E and that of y have a common element as well. An operator I on the set of functions on Ω is $\mathcal{E}$-coextrema additive if $I(x+y) = I(x)+I(y)$ whenever x and y are $\mathcal{E}$-coextrema. The main result characterizes homogeneous $\mathcal{E}$-coextrema additive operators.

Fuzzy Optimality Conditions for Minimax Programming Problems

Anulekha Dhara and Aparna Mehra
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The Lagrange multiplier rules and the Karush-Kuhn-Tucker (*KKT*) necessary optimality conditions lie at the heart of nonlinear optimization. To derive the necessary optimality conditions of KKT type in which the Lagrange multiplier associated with the objective function is non zero one needs to impose some kind of constraint qualification. These constraint qualifications may sometimes be cumbersome to verify. Moreover, in the absence of constraint qualifications, the *KKT* optimality conditions may fail to hold.

Recently, work has been done in this respect for convex programming problems by Jeyakumar et al. (2003). To avoid the constraint qualification they introduced the concept of sequential Lagrange multiplier rules. These rules in turn help to derive sequential type optimality conditions for convex programs in terms of $\mathcal{E}$-subdifferentials computed at the optimal solution.

But this approach cannot be applied when the optimization problem involves locally Lipschitz functions. Convexity imparts nice geometrical properties to the epigraph set which fail to hold in the locally Lipschitz setting. The chain rule of the Clarke subdifferential (Clarke (1983)) is applicable under certain conditions. Also for optimization problem involving locally Lipschitz functions Fritz John optimality conditions are obtained in absence of any constraint qualification. To obtain *KKT* optimality conditions constraint qualification is usually required. Since we aim to derive *KKT* type optimality conditions in absence of constraint qualifications, we move to the proximal subdifferentials (Clarke et al. (1998)). The proximal subdifferential calculus rules, although not exact but fuzzy in nature (Borwein and Zhu (1999), Ngai and Thera (2002)), help us to derive the optimality conditions which can be viewed as approximate KKT type optimality conditions in the neighborhood of the exact optimal solution of the problem without any constraint qualification. However, there is a drawback of proximal subdifferentials that is the subdifferential set can be empty even for Lipschitz functions. To avoid such a scenario we move to the limiting subdifferentials which is basically the limit set of the proximal subdifferential obtained at the neighboring point. It is observed that in presence of appropriate constraint qualification, the standard *KKT* optimality conditions are obtained in terms of limiting subdifferentials.

In this article, we consider the nonsmooth Lipschitz minimax programming problem (*MP*) with set inclusion and abstract constraint stated as follows

$$\begin{aligned} &\min \max_{y\in Y} \quad f(x,y) \\ &subject\,to \quad g(x)\in U \\ &\qquad\qquad x\in C \end{aligned}$$

where $f:\Re^n\times\Re^m\to\Re$ is Lipschitz with respect to the first variable x and continuous with respect to the second variable y, Y is a compact subset of $\Re^m$, $g:\Re^n\to\Re^k$ is Lipschitz and, U and C are closed subsets of $\Re^k$ and $\Re^n$ respectively. Our aim is to develop multiplier rules for (*MP*) in term of proximal subdiffrentials without using any constraint qualification. Then by applying the limiting process along with an appropriate constraint qualification the standard optimality conditions are established.

Approximate Optimality for Semi Infinite Programming

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Numerous models in the physical and social sciences require the consideration of the constraints on the state or the control of the system during the whole period of time or at every point in the geometric region. Mathematical formulation of these models leads to the functional inequality constraints which are characteristic of "Semi Infinite Programming (SIP)". The term SIP refers to the class of problems involving infinite number of constraints while the number of variables is finite.
In this article, we consider the following semi infinite programming problem

$$(SIP) \qquad \min \quad f(x)$$
$$\text{subject to} \quad g(x, t) \leq 0, \forall\, t \in T \subseteq \Re^p,$$

where $f : \Re^n \to \Re$ and $g : \Re^n \times T \to \Re$, T is an infinite index set. For convenience the problem has been restricted to one semi infinite constraint and auxiliary constraints have been omitted.
The rich bibliographies in the review articles reflect the interest in (SIP) and its variants have generated over the past. The theoretical research article and references therein are also worth mentioning. On the computational side, various globally convergent algorithms and references therein have been developed for (SIP).
It is often noticed that the iterative algorithms designed to solve the optimization problems converge to the exact optimal solutions in the limiting scenario only. Though this is theoretically acceptable, but in practice, it sounds more reasonable for the algorithms to produce approximate solutions of the problems in finite number of iterations. Moreover, it is very common that an optimization problem fails to possess an optimal solution. One such simple problem of linear SIP was constructed way back in 1962. These observations are strong enough for us to talk about the approximate solutions in SIP. We found that no serious attempt has been made in this direction and hence in this work we venture into the zone of approximate solutions of SIP.

Our aim is to use exact penalty function approach to transform the SIP into an unconstrained problem. Thereafter we establish the necessary optimality conditions for approximate optimality. We also develop the bounds on the penalty parameter in terms of the Lagrange multipliers. The results are supported by examples.

A Semidefinite Relaxation for Portfolio Optimization Problem

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Semidefinite programming (SDP) has been successfully used to solve many financial problems. SDP relaxations have been found for moment problems in finance, specifically in the areas of portfolio optimization and SDP is proving to be a very useful tool for portfolio optimization. Therefore, to solve this optimization problem with much larger data, we present a practical interior point method, which is a variant of MTY-P-C method. The convergence of the proposed method is also established. The proposed method uses the two search direction such as AHO in predictor step and HKM in corrector step. The implementable MTY-P-C algorithm achieves a duality gap of at most $\in$ in $\sqrt{n}\log\left(\frac{3X^0 \bullet S^0}{2\in}\right)$ iterations.

January 9, 2008 Time: 15:45 -17:45 Venue: Conference Room –II

Session-III B

Chairman : Andrey Garnaev (St. Petersburg State University, Russia**)**

A Relaxation Based Solution Approach For The Inventory Control And Vehicle Routing Problem In Vendor Managed Systems

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We consider a one supplier-multiple retailers system over a finite planning horizon. Retailers have external demands for a single product and their inventories are controlled by the supplier based on order-up-to level inventory policy. The problem is to determine the time and the quantity of product to order for the supplier, the retailers to be visited in any period, the quantity of product to be delivered in these visits and the vehicle routes for deliveries so as to minimize system-wide inventory and routing costs. We present a Lagrangian relaxation based solution procedure and implement the procedure on test instances. Computational study shows that fairly good solutions are found in reasonable time.

Models without Main Players

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Bill Gates recently introduced the phrase, `creative capitalism', and urged the need for reengineering of the market system as it exits today. In this paper we discuss how to be creative and apply the IDEA process to market system. Nobel Laureate Robert Aumann discussed Game Engineering in his inaugural speech at the International symposium on Mathematical Programming for Decision making, at New Delhi, 2007. Two kinds of applications of Game theory were outlined by him, in one we get insight into an interactive situation and in the other, Game theory tells us what to do. Aumann called the second kind of applications, Game Engineering. Organisational Systems gurus, Russell Ackoff and Sheldon Rovin explain how to outsmart bureaucracies, in their celebrated work, `Beating the System'\cite{AandR05}.
What is common between Game Engineering and Beating the System, is creativity. Illustrative examples are given. In particular the question, `Where are the consumers in the market games?' opens up the possibilities for new market models which have consumer (a human) as the main player.

Dynamic Optimal Advertising Expenditure Strategies for Two Successive Generations of High Technology Products

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Advertising and promotions help future adopters (purchasers) understand the features and benefits of new innovations. Drawing the promotional plan over a period of time for a new product is a very important problem in marketing. There is a substantial literature on optimal dynamic advertising policy for new products, but the same problem for new products that are part of technological generations have received less attention. This paper deals with the determination of optimal advertising expenditure policies of two-generation consumer durables and also introduces a framework for modeling innovation diffusion for two competing generations that incorporates advertising influence.

Order Splitting Among Suppliers

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Companies often prefer more than one supplier for a variety of reasons. Given that the requirement of a particular commodity is presently sourced from n suppliers, a decision problem often faced by procurement managers of such companies is whether the choice of n suppliers is optimal. Given order quantity Q, if is often necessary to ensure that a certain proportion p of this order is received within a particular time frame of say t units. With this requirement, this paper examines the issue of benefits arising out of increasing the number of suppliers. Specifically, it is shown that increasing their number is not always a desirable proposition. Decision rules for analysing the same are presented. Proofs are provided assuming that lead times of suppliers are stochastic following either Uniform distribution or Exponentiated Weibull distribution. These two distributions have been considered so to accommodate a variety of lead time behaviours.

January 10, 2008 Time: 10:00 -11:00 Venue: Conference Room –I

Session-IV A

Chairman : Juan Enrique Martinez-Legaz (Universitat Autonoma de Barelona, Spain**)**

Incremental Twin Support Vector Machines

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Support Vector Machines (SVMs) suffer from the problem of large memory requirements and CPU time when trained in batch mode on large data sets. Therefore incremental techniques have been developed to facilitate batch SVM learning. In this paper we propose a new incremental technique called Incremental Twin Support Vector Machines for training in batch mode. This technique is based on a newly developed classifier, called Twin Support Vector Machines (TWSVM) classifier. The TWSVM classifier determines two non-parallel planes by solving two related support vector machines-type problems, each of which is smaller than in a conventional Incremental SVM. Numerical implementation on several benchmark datasets has shown that the Incremental Twin SVM is not only fast, but also has good generalization.

Portfolio Risk Management Using Support Vector Machine

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Portfolio diversification (i.e. possessing shares of many companies at the same time for reducing risks) is considered to be an important task in the investor's community to reduce the risk of a portfolio without not necessarily reducing the returns. Classification of companies (belonging to various industrial sectors) into different categories and assigning ratings on the basis of their performance is a critical step of Portfolio diversification. This paper will present a classification study of different categories of companies on the basis of their various financial attributes using a quadratic optimization based classifier namely Support Vector Machine (SVM). First, we employed the SVM module to learn and understand the classification characteristics from a given set of data. We then predicted the rating of some of the unrated companies with us. We have also used this model for sector wise classification of the company. We compared the results with the ratings for companies provided by ICICI direct, a well known trading website in Indian stock market, to validate the performance of the model used by us. The comparison shows that the model generated by SVM is efficient and the results obtained using this technique are quite impressive. This shows that using this approach portfolio can be diversified effectively and better investment decisions can be made with respect to capital market.

January 10, 2008 Time: 10:00 -11:00 Venue: Conference Room –II

Session-IV B

Chairman : S.K. Neogy (Indian Statistical Institute, Delhi Centre**)**

Q-Property Of Multiplicative Transformation In Semidefinite Linear Complementarity Problem

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In this talk we characterise Q-property of multiplicative transformation in semidefinite linear complementarity problem. In particular we show when the matrix defining the transformation is normal, Q-property = P-property. This result is known when the matrix is symmetric. It is still not known whether this result holds in general.

On Weak $\overline{N}$ -Matrices Of Exact Order

S. K.Neogy
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A. K. Das & A. Gupta
Indian Statistical Institute, Kolkata

In this article we introduce weak $\overline{N}$ -matrices of exact order and study the properties of this class of matrices. We show that weak $\overline{N}$ -matrices of exact order class with positive value under some additional assumptions possess *Q* property.

January 10, 2008 Time: 11:30 -13:00 Venue: Conference Room –I

Session-V A

Chairman : Masakazu Muramatsu (The University of Electro-Communications, Japan**)**

Weak Convergence Of An Iterative Scheme With A Weaker Coefficient Condition

Yasunori Kimura
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We deal with a generalized proximal point algorithm for a sequence of m-accretive operators in Banach spaces. We investigate the condition of coefficients more deeply, and obtain weak convergence of an iterative scheme with a weaker coefficient condition.

Equilibrium Problems under Uncertainty

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We consider the stochastic version of equilibrium problems including linear and nonlinear complementarity problems and variational inequalities. In particular, we consider the expected residual minimization (ERM) formulation for such problems and discuss their theoretical properties. Some numerical examples are provided to illustrate the characteristics of the solutions of the ERM formulation. This talk is based on joint research with Xiaojun Chen, Haitao Fang, Guihua Lin, Nobuo Yamashita and Chao Zhang.

Inexact Proximal Point Methods for Monotone Variational Inequalities

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Proximal point methods for convex optimization problems is a very well known and popular method. Given a convex function $f:\Re^n \to \Re$ and suppose we seek a minimum for this problem over $\Re^n$. The proximal point method is based on the following iterative scheme,

$$x^k = \arg\min\left\{ f(x) + \frac{1}{2}\lambda_k \left\| x - x^{k-1} \right\|^2 \right\}$$

where $\lambda_k > 0$ and bounded away from zero. Further the addition of the squared norm term is actually a regularization which converts the problem to that of minimizing a strictly convex function at each step and thus having a unique solution. Of course in terms of the subdifferential of the convex function *f* we can write the iteration as

$$0 \in \partial f\left(x^k\right) + \lambda_k \left(x^k - x^{k-1}\right)$$

Since the subdifferential of a convex function is a maximal monotone operator then the above proximal iteration scheme can be used to find the zero of a general maximal monotone operator $T:\Re^n \to \Re^n$, i.e. we need to find a *x* such that $0 \in T(x)$. Thus for a maximal monotone operator one can use the scheme

$$0 \in T\left(x^k\right) + \lambda_k \left(x^k - x^{k-1}\right)$$

The question that we intend to answer here is that can this idea be extended to the case of a variational inequality where in we need to solve the inclusion

$$0 \in T(x) + N_c(x),$$

where *C* is a closed convex subset of $\Re^n$ and $N_c(x)$ denotes the normal cone to the convex set *C* at *x*. In order to take care of the constraints and yet have a proximal point scheme as in the unconstrained case one has to bring in some generalized distances like Bregman distances to play a pivotal role in the process. We present the different generalized distances used and also present some ways to develop inexact proximal point algorithms. We would conclude the talk by presenting our recent work in which we use the notion of induced proximal distances and develop conditions in order to unify the previous approaches and also to remove the notion of paramonotonicity which is an additional assumption used in previous approaches to prove the convergence of the iterates to an actual solution.

January 10, 2008 Time: 11:30 -13:00 Venue: Conference Room –II

Session-V B

Chairman : Reinoud AMG Joosten (University of Twente, The Netherlands**)**

Connections Between Some Concepts In Reliability and Economics

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Unaware of the developments in each other area, researchers in the disciplines of Economics and Reliability Theory have been working independently. Our objective in writing this paper is to point out some interesting relationships that exist between some of the notions in these two areas. In particular, we will discuss notions of NBUE (New Better Than Used in Expectation) order, HNBUE order, TTT (Total Time on Test) order from Reliability Theory and those of Lorenz Ordering, Excess Wealth Order from Economics. Some new results obtained recently about these stochastic orders will also be presented.

A Unified Approach for Weibull Analysis

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In this article, generalized variable (GV) approach for making inference for Weibull distributions is proposed. One-sample as well as two-sample problems are considered. It is shown that the GV approach produces exact inferential procedures for one-sample problems such as setting confidence limits on quantiles and survival probabilities. GV methods are given for making inference on a Weibull mean, for constructing prediction limits and for obtaining upper prediction limits that include at least l of m observations from a Weibull distribution at each of r locations. GV procedures are also given for comparing two Weibull means, comparing scale parameters when the shape parameters are unknown and arbitrary, setting confidence bounds on stress-strength reliability involving two independent Weibull random variables, and estimating the ratio of two survival probabilities. The proposed GV methods are conceptually simple and easy to use. The GV procedures are illustrated using some practical examples.

The Distribution of Deficit at Ruin on a Renewal Risk Model

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In this paper, we consider the probability and severity of ruin for a renewal class of risk process in which the claim inter occurrence times is Generalized Exponential distribution. We have obtained closed form expression for the distribution of the deficit at ruin for different claim amount distributions.

January 10, 2008 Time: 14:00 -15:30 Venue: Conference Room –I

Session-VI A

Chairman : T.S. Arthanari (University of Auckland, Auckland, New Zealand**)**

An Empirical Investigation Into Randomly Generated Euclidean Symmetric Traveling Salesman Problems

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The traveling salesman problem is one of the most well-solved hard combinatorial optimization problems. Any new algorithm or heuristic for the traveling salesman problem is empirically evaluated based on its performance on standard test instances, as well as on randomly generated instances. However, properties of randomly generated traveling sales-man instances have not been reported in the literature. In this paper, we report the results from an empirical investigation on the properties of randomly generated Euclidean traveling salesman problem. Our experiments focus on the distribution of the tour lengths of all tours in instances for symmetric traveling salesman problems.

Bender’s Partitioning Approach for Optimal Communication Spanning Tree Problem

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Optimal Communication Spanning Tree Problem (OCSTP) is formulated as a mixed integer programming problem and Bender’s Partitioning approach is applied for solving it. It is shown that after fixing the values of integer variables for defining a given tree, the dual of the resulting problem is very easy to solve. This dual solution is used to generate a cut for the Benders’ master problem. Rather than solve the master problem directly as an integer program, we use the standard local search algorithm to obtain an approximate solution. The algorithm proposed by us evaluates the Benders’ objective function at each neighboring tree, and moves to the neighbor that minimizes this objective function. A cut for the master problem is generated from the new solution and added to the master problem. In order to achieve faster convergence some constraints are imposed on the search. We present computational results on randomly generated 100-node problems, and compare the standard local search with Bender’s search. The results show that starting from randomly selected initial trees, average solution quality produced by Benders’ search is significantly better than that produced by the standard local search.

Sperner's Lemma With Multiple Labels

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We present a version of Sperner's lemma for the triangulated triangle, involving multiple labels at each vertex. The work extends a result due to Hochberg, McDiarmid and Saks proved in the context of determining the bandwidth of the triangulated triangle.

January 10, 2008 Time: 14:00 -15:30 Venue: Conference Room –II

Session-VI B

Chairman : F. Thuijsman (Maastricht University, The Netherlands**)**

Values For Graph-Restricted Games With Coalition Structure

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We consider a new model for TU games with both coalition and cooperation structures that applies to different network situations. It is assumed that cooperation (via bilateral agreements between participants) is only possible either among the entire coalitions of the coalition structure, in other terms a priori unions, or among single players within a priori unions, no communication and therefore no cooperation is allowed between single players from distinct elements of the coalition structure. A cooperation structure is introduced by means of graphs of two types, first, presenting links among the a priori unions of the coalition structure and second, presenting links among players within each a priori union. We consider cooperation structures presented by combinations of graphs of different types -- general undirected graphs, cycle-free graphs, line-graphs with linearly ordered players. Our approach to the value for such a game is close to that of both Myerson (1977) and Aumann and Dreze (1974): it is based on ideas of component efficiency and fairness adopted to graph situations under scrutiny, and it treats an a priori union as a self-contained unit. Moreover, to link both communication levels between a priori unions and within a priori unions we incorporate also the idea of the quotient game property of the Owen value (1977). We introduce the new values axiomatically and show that they possess the explicit formula representation that in many cases lead to quite simple computational algorithms. We apply the results obtained to the problem of sharing an international river among multiple users without international firms.

A New Axiomatization Of The Shapley Value For TU-Games In Terms Of Semi-Null Players Applied To 1-Concave Games

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In the framework of cooperative games, we introduce the notions of semi-null players and semi-dummy players in order to provide a new axiomatization for the Shapley value. A semi-null player is powerful as a singleton, but powerless by joining another nonempty coalition. According to the axiomatic approach to solutions, semi-null players receive the egalitarian payoff. It is shown that the Shapley value is the unique solution verifying semi-null player property, symmetry, efficiency, and linearity. Shapley's original proof technique is essentially adapted in that the basis of unanimity games is replaced by the basis of the so-called complementary unanimity games being the main representatives of the class of 1-concave games.

On Multiweighted Shapley Values And Random Order Values

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There are several axiomatizations of the Shapley value. In some of them the authors removed the symmetry, but to get uniqueness they introduced other axioms. In this paper we do not introduce any new axiom and we are able to get a formula for the values satisfying the other axioms of the Shapley value for TU games. Of course, in the formula appear a system of weights subject to some conditions spelled out in the paper. Any value obtained in this way is called a Multiweighted Shapley value, (MWSV). A quite long list of known values, including the Shapley value, the Semivalues, the quasi-values, the Kalai/Samet values, the Owen coalition structure values, etc. belong to the MWSV class. We show that any random order value is also a MWSV and characterize them as MWSV's. Finally, we give some dynamic method to compute any MWSV, similar to the Maschler's method to compute the Shapley value.

January 10, 2008 Time: 15:45 -17:45 Venue: Conference Room –I

Session-VII A

Chairman : A.K. Das (Indian Statistical Institute, Kolkata**)**

Polyhedral Structure of the Fixed Charge Transportation Problem

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We consider the well-known Fixed Charge Transportation Problem. We are given an index set *S* of *m* sources $s_1, s_2, \ldots, s_m$ with positive respective supplies $a_i, i \in S$, and an index set *T* of *n* sinks $t_1, t_2, \ldots, t_n$ with positive demands $d_j, \forall_j \in T$. The problem is assumed to be balanced, i.e. $\sum_i a_i = \sum_j b_j = D$. We consider the so called "pure" version of the problem in which there are no flow costs, but a fixed non-negative cost c_{ij} is incurred if a positive quantity is shipped from source s_i to sink t_j .

The problem can be formulated as the following Mixed Integer Programme with flow variables x_{ij} representing flow from s_i to t_j , and binary variables y_{ij} representing the open routes. We define $m_{ij} = \min\{s_i, t_i\}$. This is the maximum flow that can take place on edge *(i, j).* The MIP formulation is given below.

$$\text{Minimize} \quad \sum_{i=1}^{m}\sum_{j=1}^{n} c_{ij}\, y_{ij}$$

$$\text{Subject to:} \quad \sum_{i \in S} x_{ij} = b_j \qquad \forall\ j \in T$$

$$\sum_{j \in T} x_{ij} = a_i \qquad \forall\ i \in S$$

$$x_{ij} \le m_{ij}\, y_{ij} \qquad \forall\ i \in S,\ j \in T$$

$$x_{ij} \ge 0$$

$$y_{ij} = 0/1$$

The above formulation can be translated into a stronger set-covering formulation, which is a pure integer program in y_{ij} variables, by using Gales' Theorem which is a restatement of Max-Flow Min-Cut theorem. Consider $P \subseteq S$, and $Q \subseteq T$, and let $A_p = \sum_{i \in p} a_i$ ai and $B_Q = \sum_{j \in Q} b_j$. Let $\overline{P} = S \setminus P$, and $\overline{Q} = T \setminus Q$. It is obvious that if B_Q exceeds D - A_P , i.e. total supply available in $\overline{P}$, then at least $B_Q - (D - A_P)$ units must be shipped from sources in *P* to sinks in *Q*. In other words, the total capacity of arcs leading

from P to Q must not be less than B_Q -$(D$-A_P). Similarly, if A_P exceeds D-B_Q, then at least A_P - $(D$ - $B_Q)$ units must be shipped from S to T. Note that both of these situations can be combined into a single statement, that at least $A_P + B_Q - D$ units must be shipped from S to T. We define $\alpha_{PQ} = A_P + B_Q - D$. This leads to the following equivalent formulation of the problem.

$$\textit{Minimize} \quad \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij}\, y_{ij}$$

$$\textit{Subject to} \quad \sum_{i \in S,\, y_{ij} \geq 0} m_{ij}\, y_{ij} \geq \alpha_{PQ} \quad \forall\, P \subseteq S, Q \subseteq T$$

We wish to study the polyhedral structure of the polytope defined by the above formulation. Our main result is a theorem which specifies the conditions under which an inequality can be shown to be facet-defining for the problem. We utilize this theorem to show that some of the set-covering inequalities are facet-defining if they satisfy certain simple conditions. In addition to the setcovering inequalities, we also present inequalities with rhs of 2, and present conditions under which they can be shown to be facet-defining by utilizing the main theorem.

We develop simple heuristics as well as exact procedure for identifying the violated inequalities. A comparison between the two on small test problems shows the effectiveness of the heuristics. Computational results of randomly generated problems with n = m = 15 show that the facet inequalities identified by us lead to a substantial increase in the LP lower-bound. The addition to these inequalities also significantly decreases the solution time of FCTP by standard branch and bound technique.

Pitch Tracking of Acoustic Signals Based on Average Squared Mean Difference Function

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In this paper, a method of pitch tracking based on variance minimization of locally periodic subsamples of an acoustic signal is presented. Replicates along the length of the periodically sampled data of the signal vector are taken and locally averaged sample variances are minimized to estimate the fundamental frequency. Using this method, pitch tracking of any text independent voiced signal is possible for different speakers over any database.

Finding the Optimum Batch Mix of Cast Rolls with Maximum NSR and Maximum Tonnage

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The problem formulated here is one of optimum selection of the orders (i.e.; batch mix) of Cast rolls (constituting about 56% of total rolls manufactured in the company) from the order bank such that (i) their monthly delivery schedules to different customers are met, (ii) the total NSR (Net Sales Realization) generated is maximized and also (iii) the total weight of cast rolls produced every month is maximized simultaneously subject to the capacity constraints in heat treatment and machining facilities. The machining facility is common to both cast and forge rolls. Forge rolls were not considered within the scope of the present problem since their manufacture solely depended on the vagaries of availability of forge blanks from outside sources. However, the formulation can easily be modified to encompass forge rolls along with cast rolls should there arise such need.
The problem was formulated as a Multi-Objective Linear Programming Problem and was solved in the following four stages,
Stage-I: Maximizing the number of batches of different categories of rolls undergoing heat treatment subject to (i) meeting their demand constraints and (ii) constraints on capacity of heat treatment furnaces.
Stage-II: Maximizing the utilization of heat treatment facilities in terms of number of days heat treated considering the optimum batch mix of different categories of rolls found in stage-I as another constraint.
Stage-III: Maximizing the total net sales realization by considering the numbers of different categories of rolls computed from the optimum batch mix of rolls found from the stage-II as constraints in addition to other constraints regarding demand pattern, heat treatment capacity and machine shop capacity.
Stage-IV: Maximizing the total weight of rolls produced subject to the constraints in respect of the maximum total NSR found in stage-III, demand constraints, capacity constraints of machining and heat treatment and usual non-negativity constraints.
The solution (i.e.; the number of rolls of different categories to be produced in a given month) obtained finally by running this optimization problem in computer was compared with the actual production of rolls in the past three months. It was found that on an average 60 tonnes of extra production of rolls could have been obtained if this optimization model were used. Having assumed that the magnitude of quality problems in rolls is about 20% (higher side), an average extra quantity of 48 tonnes of good rolls can still be produced per month (or, equivalently 576 tonnes per annum) by following the given optimization model. Also it is found that the NSR value for the produced rolls can be maximized on an average by 1 %. The optimum NSR comes out to be Rs. 11.5 crores on an average whereas it is just averagely Rs. 10.7 crores.

Effect Of Geometrical Arrivals Of Negative Customers On A G-Queue In Discrete Time

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In this paper we have considered the case of a discrete time single server queue with geometrical arrivals of both positive as well as negative customers. There are three types of negative customers. Here we consider both the cases where negative customers remove positive customers from the front and the end of the queue. The effect of several parameters is also shown numerically.

January 10, 2008 Time: 15:45 -17:45 Venue: Conference Room –II

Session-VII B

Chairman : Probal Roy Chowdhury (Indian Statistical Institute, Delhi Centre**)**

Education and Economic Growth in India: A Cointegration and Causality Approach

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The paper specifically investigates the causality between education and economic growth in India during 1951 to 2001. The empirical investigation follows unit root test, cointegration test and causality test. The unit root test confirmed that both education and economic growth are non-stationary at the level but found stationary at the first difference level, indicating that they are integrated of order one. The cointegration test established that they are cointegrated to each other, indicating an existence of long run equilibrium relationship between the two. Granger causality test finally confirmed that there is presence of unidirectional causality from economic growth to education but there is absence of reverse causality.

Sourcing Of Works Considering Past Performance In Government Procurement

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Single-attribute procurement auctions based on price alone have given way in recent years to multi-attribute e-reverse auctions. But there is hardly any work done in sourcing of works contracts considering the performance of the contractor on his past work. In this paper, we propose a model to find the most favorable bidder in a multi-attribute procurement auction. In this paper, we define a contractor performance index considering his past work records and, using this index, propose a model for government procurement auction. The index is based on eleven bid evaluations attributes and they are divided into three clusters: Financial bid, Past performance, and Infrastructure. We have adopted the Analytic Network Process (ANP) approach for calculation of attribute weights. Collecting the past records for the selection attributes, we have conducted a single-factor (contractor), multi-level (bidders), multi-replicate (past work) and multi-response (attributes) surface method to compare the past performance of the contractors. To explain this model, we have taken the Rural Development Department of the Orissa government as a case study.

On Fractional Trans-Shipment Problem

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In this paper a fractional trans-shipment problem is introduce and an algorithm is carried out to obtain its solution. In the proposed algorithm, ratio of cell entry for which i ≠ j is calculated first then a solution is found by an existing method for trans-shipment problem and thereafter tested for optimality. In this approach basic feasible solution provides better optimal solution within smaller number of iterations. An example is given to illustrate the algorithm.

Abstracts of the Paper Submitted for the Edited Volume but not Scheduled for Presentation

Probability of Conflicts in Unstable Effectivity Function

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An effectivity function is unstable if it has a cycle if order r. We prove in this paper that the Nakamura number of a simple game gives full information on its instability and the minimal length of the order of a circularity gives the same information for anonymous and neutral effectivity function. In general, this number does not give information on instability.

Proportional Allocation As Policy Handle To Discourage Free Riding Behavior

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This paper presents the feasible proportional allocation rule to discourage free riding for a special class of free riding problems. Some theoretical and practical properties of the rule are discussed. Applications to the management of the Baltic Sea cod fishery and the Norwegian spring-spawning herring fishery are presented.