ABSTRACTS

Abstracts for Plenary Speeches

Title: BSDES, Nonlinear Expectations and Their Application to Stochastic Controls
Speaker: Professor Shige Peng (Shandong University)
Abstract: We present the theory of backward stochastic differential equations (BSDE), nonlinear expectations and applications to stochastic optimal controls and stochastic differential games with feedback controls. A new method of nonlinear probability distributions is applied to controlled stochastic processes.

Title: Coherent Optimal Control for Quantum Linear Systems
Speaker: Professor Ian Petersen (University of NSW at the Australian Defence Force Academy)
Abstract: This presentation surveys some recent results on the coherent feedback control of quantum linear systems. Quantum linear systems are a class of systems whose dynamics, which are described by the laws of quantum mechanics, take the specific form of a set of linear quantum stochastic differential equations (QSDEs). Such systems commonly arise in the area of quantum optics and related disciplines. Systems whose dynamics can be described or approximated by linear QSDEs include interconnections of optical cavities, beam-spitters, phase-shifters, optical parametric amplifiers, optical squeezers, and cavity quantum electrodynamic systems.
An important approach to the feedback control of quantum linear systems involves the use of a controller which itself is a quantum linear system. This approach to quantum feedback control, referred to as coherent quantum feedback control, has the advantage that it does not destroy quantum information, is fast, and has the potential for efficient implementation. The presentation discusses recent results concerning the synthesis of optimal coherent quantum controllers such as coherent LQG control and quantum H infinity control. In particular, the coherent LQG control problem remains a challenging area of current research in which methods such as rank constrained LMI methods, evolutionary optimization methods and variational methods have been applied.

Title: Strong Polynomiality of the Simplex Method
Speaker: Professor Shinji Mizuno (Tokyo Institute of Technology)
Abstract: The simplex method for linear programming (LP) is not known to be a polynomial or strongly polynomial algorithm, even if an LP problem is non-degenerate and its coefficient matrix is totally unimodular. In this talk, we present an algorithm for LP, which uses Tardos' basic algorithm and solves auxiliary LP problems by the simplex method with Dantzig's rule. It is shown that the total number of distinct basic solutions

generated by the proposed algorithm is bounded by a polynomial function of the number of constraints, the number of variables, and the maximum determinant of submatrices of a coefficient matrix. If the coefficient matrix is totally unimodular and all the auxiliary problems are nondegenerate, then the algorithm is strongly polynomial. We present both primal and dual versions of the algorithm. In the analysis of the algorithm, we use the recent results by Kitahara and Mizuno, which show new bounds for the number of distinct solutions generated by the simplex method. They extend results of Ye for Markov decision problems to LP problems.

Title: A Fixed Point Approach to Vector Optimization Problems and Related Fields
Speaker: Professor Franco Giannessi (University of Pisa)
Abstract: Based on Image Space Analysis, which is here briefly introduced, a new scalarization method for Vector Optimization Problems (VOP) is described. The main feature is a fixed point approach, which leads to formulate a scalar problem of type "quasi-minimum problem". Unlike some existing scalarization methods, the vector of parameters, which scalarizes the objective function, is fixed at the beginning and do not vary during the performance of the method. The particular linear case is briefly outlined. The minimization of a scalar function over the set of solutions to VOP, namely a Bi-Level VOP, is briefly outlined as a possible development. Other perspectives are discussed.

Title: Computational Models and Challenging Optimization Problems
Speaker: Professor Panos M. Pardalos (University of Florida)
Abstract: Most of the conventional computer models are based on the von Neumann computer architecture and the Turing machine model. However, quantum computers (several versions!), analog computers, dna computers, and several other exotic models have been proposed in an attempt to deal with intractable problems. We are going to give a brief overview of different computing models and discuss several classes of optimization problems that remain very difficult to solve. Such problems include graph problems, nonlinear assignment problems, and global optimization problems. We will start with a historical development and then we will address several complexity and computational issues. Then we are going to discuss heuristics and techniques for their evaluation.

Title: Time Dependent Stimulations in Simple Dynamical Systems
Speaker: Professor V. Sree Hari Rao (Jawaharlal Nehru Technological University)
Abstract: Real world practical scenarios are essentially input-output oriented problems. Often it is a difficult proposition as to how one should choose the inputs so as to achieve desired outputs. There are no specific rules that enable one to estimate the inputs required to generate a specific output. Mathematical description of these processes leads to non-autonomous systems of

dynamical equations with variable (time dependent) inputs. The variable inputs may be viewed as external factors that influence the corresponding systems with constant inputs.

The following are the main concerns for such systems:

1. If the equilibrium for a system with constant inputs is stable(unstable), under what circumstances the corresponding system with time dependent inputs approaches the same equilibrium?

2. In the event that the system with constant inputs does not possess an equilibrium, how to understand the behaviour of solutions of the system with variable inputs?

3. For an a priori specified output, under what conditions the solutions of a system with variable inputs approach that pre-specified output?

4. How to choose output oriented inputs for a system to approach that pre-specified output?

5. How to estimate the various system parameters of the system?

Answers for these questions will form the main content of my talk. This effort provides a mathematical frame work for an upcoming technology that helps one to design intelligent systems that would exhibit good recognition capabilities.

Abstracts for Parallel Sessions

Title: Nonsmooth DC programming approach to clusterwise linear regression
Speaker: Adil Bagirov (Federation University Australia)
Abstract: Clusterwise linear regression consists of finding a number of linear regression functions each approximating a subset of the data. This problem is formulated as a nonsmooth nonconvex optimization problem using the squared regression error function. The objective function in this problem is represented as a difference of convex functions and optimality conditions are derived using this representation. An algorithm is designed for solving the clusterwise linear regression problem based on such a representation. An incremental approach is proposed to generate starting solutions for this algorithm. The algorithm is tested on small to large data sets and compared with other algorithms using numerical results.

Title: Global Optimization Approach to Nonzero Sum Three-person Game

Speaker: Batbileg Sukhee (National University of Mongolia)

Abstract: Game theory plays an important role in applied mathematics, economics and decision theory. First, we formulate non zero sum three person game and show that it can be formulated as a global optimization problem with quadratic constraints. Based on global optimization reformulation, we propose a hybrid evolutionary algorithm for the problem. In order to prevent searching process from returning to the already detected global or local solutions, we employ the tunneling and hump-tunneling function techniques in [3]. The proposed algorithm is tested on some test problems and numerical results indicate that it works well in practice.

Title: Global and parametric optimization approaches to the Solow growth model
Speaker: Bayanjargal Darkhijav (National University of Mongolia)
Abstract: We generalize the classical growth theory Solow model using parametric and global optimization models. We assume that production function is arbitrary continuously differentiable function on its domain and saving rate and epreciation rate of capital depend on time. Then the per capita consumption maximization problem reduces to one dimensional parametric maximization problem as well asglobal optimization problem. In other to solve parametric optimization problem weuse a nite discretization method to ensure an approximation solution. For solving global optimization problem, we employ the Lipschitz optimization method. Some numerical methods are provided.

Title: SEMIDEFINITE QUASICONVEX PROGRAMMING
Speaker: Bayartugs Tamjav (Mongolian University of Science and Technology)
Abstract: We introduce so-called semidefinite quasiconvex programming which consists of maximization and minimization of quasiconvex functions defined over positive semidefinite

matrices and a certain set. Both problems belong to a class of nonconvex optimization problems. We derive new global optimality conditions for these problems. Based on the global optimality conditions, we construct an algorithm which generates a sequence of local maximizers that converges to a global solution. Subproblems of the proposed algorithm are semidefinite linear programming. Some numerical examples are provided.

Title: An improved Differential Evolution Algorithm for Parameter Identification in an Asset Flow Model

Speaker: Benchawan Wiwatanapataphee (Curtin University)

Abstract: The global stock markets have experienced significant downturns over recent years. These crises play significant roles in the failure of the world economy. It is therefore important to have a thorough understanding of market dynamics, especially when market data moves rapidly due to the fast-rate changes of the state variables including asset prices, the trend-based and value-based components of the investor preference. Fitting one set of these variables in a financial market model does not guarantee an accurate fit with another model. In order to motivate the investor in buying or selling a stock of a finiteness asset with microeconomic principles, it is essential to identify the model parameters frequently in each financial model. In this paper, we present an asset flow model in which the equilibrium point is determined. The model objective function is constructed and then minimized by using the improved differential evolution algorithm to predict the model parameters. We then use the predicted parameters in understanding the behavior of the market, particularly, the flow of asset price. The result show that the trend of computed data derived from the predicted parameters approaches the measured data.

Title: A Reduced Complexity Zero-Forcing Beamformer Design for Multiuser MIMO Systems with a Circular Base Station in Rural Australia

Speaker: Bin Li (Curtin University)

Abstract: Providing high speed broadband services in the rural areas of Australia is a challenging task. One of the most used technique, Multiuser MIMO, is considered in this paper to increase the spectral efficiency. A low complexity pre-coding scheme, zero-forcing precoding, is adopted and a practical system design constraint, the per-antenna power constraint, is also imposed. A channel tested by CSIRO in rural Australia is considered in this paper. Different from the pure random channels, performance will depend on the base station array geometry. By investigating this broadcast channel with a uniform circular base station array, some valuable properties are found in the channel matrix as well as in the optimal weighting matrix. Particularly, some equality constraints can be removed from the original formulation. With these properties and exploring the structure of the problem, a reduced complexity zero-forcing beamformer design method is proposed based on a primal-dual interior point method. Numerical examples under several different scenarios are provided.

Title: A New Method for Denoising Images Based on Weights Optimization

Speaker: Bo Sun(Changsha University of Science and Technology)
Abstract: Consider images with Poisson noises, we propose a new denoising algorithm. Our approach is based on the weighted average of the observations in a neighbor-hood as in the case of the Optimal Weights Poisson Noise Filter where the weights are nonnegative. We propose to choose them without nonnegative constraint, and get the weights by a simpler model solved by the Lagrange Multipliers Method. Simulation results are presented to show the performance of the presented filter.

Title: Dynamic relative robust shortest path problem
Speaker: Bo Xu(University of Shanghai for Science and Technology)
Abstract: The traditional static relative robust shortest path (S-RSP) problem expresses great applications in transportation, construction and other route design problems. This paper extends the S-RSP to a dynamic relative robust shortest path (D-RSP) problem. There are two reasons for this extension: first, the construction time in the construction problems is often long, which results in the operational constraints dynamically change in this period; second, in the transportation and other route design problems, making great use of the real-time data can reduce the uncertainty, especially under the big data enviorment. We formulates the D-RSP in the form of a mixed integer problem (MIP) and designs a polynomial algorithm, named nested Dijkstra (ND), to give a solution. We proves that ND can find the global optimal solution when the global optimal RSP contains the local optimal RSP; otherwise, ND can also return a reasonable solution containing the local optimal RSP. An efficient example illustrates this result, and two application directions of ND are given. Then some rules are proposed to speed ND, while the conclusions are summarized in the end.

Title: Multi-timescale and Multi-Objective Reactive Power Optimization Control of Dispersed Wind Farms based on Power Forecasting
Speaker: Bo Zhang (Shenyang University of Technology)
Abstract: Dispersed wind farms consisting of DFIG with dynamic reactive power regulation, In order to achieve economic and stable operation, a multi-objective reactive power optimization based on wind power forecasting was proposed. Considering the change of the wind speed to predict the reactive power output based on the correlation grouping-single unit. The reactive power demand of the power network is compensated by wind turbine and SVC. According to the wind power forecasting, the multi-timescale multi-objective reactive power optimization wind turbines considering reactive power forecasting and wind speed fluctuation to track reactive power demand. Choosing different time grade control objectives for reduce the numbers of equipment movements, minute grade optimization target is minimum active power loss, seconds grade optimization target are maximum voltage stability margin and minimum short flicker, millisecond grade optimization target is maximum reactive power support capability. Engineering example proves that the proposed strategy reduces the transmission losses of wind farms and improves the ability of supporting voltage effectively.

Title: Smoothing Power Penalty Method for Nonlinear Complementarity Problems
Speaker: Boshi Tian (Hunan University)
Abstract: In this presentation, we introduce a new penalty method for solving nonlinear complementarity problems, which unifies the existing l_1-penalty method and the natural residual equation-based method. We establish the exponential convergence rate between a solution of the penalized equations and that of the complementarity problem under a uniform ξ-P -function and study a perturbed b-regularity condition. Two kinds of numerical algorithms with global and fast local convergence are designed by virtue of the proposed penalty method. Preliminary numerical experiments conducted on test problems from MCPLIB show that the proposed method is efficient and robust.

Title: Implicit integration and sensitivity analysis for optimal control involving index-1 differential-algebraic equations
Speaker: Canghua Jiang (Hefei University of Technology)
Abstract: Differential-algebraic equations (DAEs) arise naturally in the description of a variety of systems such as large industrial processes, electrical power systems, and electrochemical environments, etc. However, there are few optimal control solvers tailored for them. An issue is that explicit Runge-Kutta (RK) integrators are not applicable to solving the initial-value problems of DAEs. In this talk, implicit RK integrators are embedded in the sequentially solving procedure of optimal control problems for index-1 DAEs. The continuous control input is parameterized as piece-wise constant functions, and an efficient method to derive the sensitivity with respect to the control parameters is proposed from the implicit function theorem. Different from the existing results, the switching time instants of the control are not fixed but chosen as control parameters to be optimized. As the DAEs do not depend on these switching time instants explicitly, it is not an easy task to compute the sensitivity with respect to these switching time instants. In this talk, the time-scaling transformation is introduced to transform the optimal control problem into an equivalent one, where the sensitivity can be computed conveniently. Accordingly, the gradients of cost or constraints can be derived, and the approximate optimal control problem can be solved by many nonlinear programming routines off-the-shelf.

Title: Bicriteria Portfolio Optimization Problem under the Minimax Rule
Speaker: Carisa K.W. Yu (Hang Seng Management College)

Abstract: In this paper, we investigate the bicriteria portfolio optimization problem under the l_∞ risk measure allowing short selling. According to an equivalence relation between a multicriteria linear program and its weighted sum linear programs, and by a simple transformation, the problem can be solved by considering its weighted sum linear programs. By analyzing the KKT system of the weighted sum linear programs, we will give a completed description of the solutions, and thus for the Pareto solution sets of the bicriteria portfolio optimization problem.

Title: On the sparse design of acoustic beamformer
Speaker: Cedric Yiu (The Hong Kong Polytechnic University)
Abstract: In designing acoustic broadband beamformers, when the number of micro-phone increases and the filters are long, the complexity can grow significantly.It is advantageous if many of the filter coefficients are zeroes so that the implementation can be executed with less computation. In this paper, the sparse design of beamformer is studied. We will study the successive thinning technique in reducing he complexity of the filters and beamforming array. The trade-off between the performance of the designed frequency responses and the number of zero elements in the design will be investigated. Numerical results show that sparsity of the designed beamformers can be reduced significantly without affecting very much of the performance.

Title: Moving Object Tracking and Touching by AR. Drone Quadrotor
Speaker: Changchun Ye (Zhejiang University)
Abstract: This paper presents an implementation of a hybrid system consisting an AR. Drone Quadrotor and an iRobot Create. This system is designed in the context of Inter-national Aerial Robotics Competition (IARC) Mission-7, which achieves moving object tracking and touching under the competition environment. The moving object tracking and touching approach utilizes Cam Shift algorithm to recognise the moving iRobot Create and estimate the relative position between the quadrotor and the iRobot Create. The quadrotor's position is controlled by a classical Proportional-Derivation (PD) controller, and a height controller is designed for the moving object touching. Series of experiments show that the quadrotor can fly autonomously while performing real-time visual tracking and touching with well tuned parameters.

Title: On a new computational strategy for time-delay optimal control problem
Speaker: Changjun Yu (Shanghai university)
Abstract: In this paper, we consider a class of nonlinear time-delay optimal control problems with canonical equality and inequality constraints. We propose a new computational approach, which combines the control parameterization technique with a time-scaling strategy, for solving this class of optimal control problems. The proposed approach involves approximating the control variables by piecewise constant functions, whose heights and switching times are decision variables to be optimised. Since it is well known that standard gradient-based optimization algorithms struggle to optimize variable switching times, we develop a novel transformation procedure that converts a given time-delay system into an equivalent system-defined on a new time horizon-in which the switching times are fixed, but the mode dynamics contain a variable time-delay. Despite the challenge posed by the variable time-delay, we show that an optimal control policy for the equivalent system can be obtained efficiently using gradient-based optimization techniques. This optimal control policy can then be used to determine the optimal switching times and optimal system parameters for the original control system.

Title: Reference Tag Supported RFID Tracking Using Robust Support Vector Regression and Kalman Filter

Speaker: Changzhi Wu (Curtin university)

Abstract: Site operations usually contain potential safety issues and an effective monitoring strategy for operations is essential to identify risk in advance and further prevent the following accidents. Regarding the status monitoring among material, equipment and personnel during site operations, much work is conducted on localization and tracking using RFID (Radio Frequency Identification) technology. However, existing tracking methods suffer from low accuracy and instability, due to severe interference in industrial sites with many metal structures. To improve RFID tracking performance in industrial sites, a RFID tracking method integrating MSVR (Multivariate Support Vector Regression) and Kalman filter is developed in this paper. Extensive experiments are conducted on a real Lignified Natural Gas (LNG) facility site with long range active RFID system to evaluate performance of this approach. Results demonstrate the effectiveness and stability of the proposed approach with severe noise and outliers. It is feasible to adopt the proposed approach which satisfies intrinsically-safe regulations for monitoring operation status in current practice.

Title: Optimal Harvesting Control in a Delayed Bioeconomic System with Beddington-DeAngelis Functional Response

Speaker: Chao Liu (Northeastern University)

Abstract: This paper concerns an exploited prey-predator ecosystem with Beddington-DeAngelis functional response, where maturation delay for prey and gestations delay for predator are all considered. Positivity and persistence of solutions are discussed. By analyzing the associated characteristic transcendental equation, it is found that interior equilibrium loses local stability when double time delays cross corresponding critical values. According to Hopf bifurcation theorem for functional differential equation, existence of Hopf bifurcation is investigated as local stability switches. Based on normal form theory and center manifold theorem, directions of Hopf bifurcation and stability of the bifurcating periodic solutions are studied. By using the optimal control strategy, we present an optimal harvesting control to maximizing social benefits and minimizing the cost associated with harvest effort. Numerical simulations are carried out to show consistency with theoretical analysis.

Title: Determination of Optimal Weights and Parameterized Integer Programming Approach in Multi-criterion Representatives Apportionment Problems

Speaker: Ming Chen (Central South University)

Abstract: Representatives apportionment problems is a fundamental issue in management sciences. Multi-criterion representatives apportionment method can be used to mitigate the unfairness of apportionment, but it is often difficult to determine the optimal weights of the criteria. In this paper, two different models are developed to optimize the choice of the weights, where the objective functions are involved in measuring the total distance of the hybrid contributions among all the units by two different norms of vectors, respectively, so that a wide

acceptability is achieved. For the constructed constrained min-max problem, an efficient algorithm is developed to find the solution. In virtue of the optimal weights, a parameterized integer programming approach is proposed to solve the problem of multi-criterion representatives apportionment. The presented method is applied into the representatives apportionment of National People's Congress in China. The numerical results offer many useful insights for the managerial practice.

Title: Containment of second-order heterogeneous nonlinear multi-agent systems
Speaker: Chengjie Xu (Hunan University of Technology)
Abstract: This paper investigates the containment problem of second-order heterogeneous nonlinear multi-agent systems. In virtu of variable structure control method, a containment protocol is proposed. Convergency of the containment error system is given by using Lyapunov stability theory. A numerical simulation is given to illustrate the effectiveness if the proposed scheme.

Title: An Indirect Foot Force Estimation Approach for Legged Walking Robot
Speaker: Chenkun Qi(Shanghai Jiao Tong University)
Abstract: Foot force is very important for the gait planning and stability control of the legged walking robot. Traditional foot force sensors are often easy to corrupt due to the strong impact from the ground. In this study, the indirect foot force estimation method is proposed. The foot force is estimated from the actuator force by using the dynamics model. The dynamics model is enhanced by identifying unknown uncertainties from the robot data. Additional foot force sensors are not required so that it is easy to protect the robot. The effectiveness of the proposed method is verified by the experiments.

Title: A Distributed Parameter Model Identification Approach for a Micro-Manipulator
Speaker: Chenkun Qi (Shanghai Jiao Tong University)
Abstract: The micro-manipulator is a spatially distributed mechanical system. An accurate model of the micro-manipulator is essential for the positioning control of the end effector. In this study, a distributed parameter model identification approach is proposed for the micro-manipulator with unknown nonlinear dynamics. A nominal Euler-Bernoulli beam model is derived to describe the linear dynamics. To compensate unknown nonlinear dynamics, a nonlinear term is added in the nominal model. The spectral method is used to reduce the infinite-dimensional partial differential equation (PDE) model into a finite-dimensional ordinary differential equation (ODE) model. A finite-dimensional neural network model is identified from the data to approximate the original nonlinear spatio-temporal dynamics. The effectiveness of the proposed distributed parameter model identification approach is verified by the simulations on a micro-manipulator.

Title: Multi-objective dynamic optimization of a nonlinear switched time-delay system in fed-batch process
Speaker: Chongyang Liu (Shandong Institute of Business and Technology)

Abstract: In this paper, we propose multi-objective dynamic optimization model involving a nonlinear switched time-delay system to optimize the 1,3-PD production in a microbial fed-batch process, where the productivity of 1,3-propanediol (1,3-PD) and the consumption rate of glycerol are taken as the two objectives. The switching instants between the batch and feeding processes as well as the feeding rate of glycerol in each feeding process are taken as the decision variables. By a time-scaling transformation, we first transform the problem to the one with fixed terminal time but involving a new switched system with variable time-delay. The weighted sum method and Normal Boundary Intersection method are then used to convert the resulting problem into a sequence of single-objective dynamic optimization problems. A gradient-based method incorporating the constraint transcription technique is developed to solve each of these single-objective dynamic optimization problems. Finally, numerical results are provided to demonstrate the effectiveness of the developed solution method.

Title: Path Planning for a Wave-propelled Autonomous Surface Vehicle in Dynamical Ocean Environment

Speaker: Chunlin Zhou (Zhejiang University)

Abstract: The wave-propelled autonomous surface vehicle is a novel autonomous ocean monitoring platform with the capability to harvest wave energy for propulsion with its propelling mechanism instead of motors or propellers. For marine operation efficiency and accuracy, path planning for wave-propelled vehicle in marine mission is becoming a necessity. The complexity and the variability of ocean wave, however, make the vehicle speed no longer directly controllable, with which the variable ocean current will result in the difficulty in path planning. Classical path planning algorithms are designed either without any consideration of ocean current or assuming it to be steady or known previously, which may lead to suboptimal or even infeasible path. In the paper, we present a modified level set method, combing the predicted current with the vehicle forward speed predicted from the dynamic model of the vehicle, to find the time-optimal path for the wave-propelled vehicle in dynamical ocean current. The method equipped with a current predicting scheme can be applied for real time navigation in temporal and spatial ocean environment.

Title: Observer Design for Singularly Perturbed Systems and Its Application to Fault Estimation

Speaker: Dan Liu (Peking University)

Abstract: This paper studies observer design problem for singularly perturbed systems and further considers its application to fault estimation issue. Firstly, sufficient conditions for the existence of the presented observer is derived in the form of a set of LMIs. Based on the obtained results, a robust fault estimator is then constructed to obtain fault information subject to a given H_∞ performance index. Finally, a numerical example is given to show effectiveness of the proposed results.

Title: An Multi-server Queueing-inventory Systems with Emergency Replenishment and Non-homogeneous Poisson Arrival

Speaker: Dequan Yue (Yanshan University)
Abstract: An queueing-inventory system is a kind of system that integrated queue and inventory, where the customer take one item away from the inventory at the moment his or her service is completed. We consider a multi-server queueing-inventory system with (r;Q) policy. In order to avoid being out of stock, emergency replenishment policy is considered so that the number of the inventory can never decrease to zero. The arrival process of the customers is non-homogeneous Poisson process. The customer's service time follows exponential distribution. We give the sufficient and necessary condition that the steady state distribution of the system exits and prove that the stationary distribution of the system has the form of matrices product. Moreover, we derive the performance measures of system and the average cost function which are illustrated by numerical examples.

Title: Estimation of Extreme Value Vehicle Loads Based on MGPD Model
Speaker: Deru Li (Changsha University of Science and Technology)
Abstract: According to the WIM dates of Nanxi Yangtze River Bridge, the MGPD extreme value estimation model of vehicle loads is constructed. The model is based on the extended Burr XII distribution, which includes the Wei bull distribution, GPD and log-logistic distribution. Thus the GPD model is a special form of the MGPD model. Then, the correlation of the vehicle loads is excluded using a Peak Over Threshold (POT) method. Additionally, Markov Chain Monte Carlo (MCMC)-Bayesian method is applied to estimating the parameters, and the MGPD model is compared with other traditional models. Finally, 0.95 fractile of maximum distribution of overloaded trucks in the design reference period is considered as the evaluation load of the overloaded trucks. The conclusion shows: accepted by a level of 99% Kolmogorov-Smirnov test, the extended Burr XII distribution is more suitable to capture sparse extreme points than other traditional distributions. The MGPD model is more safety than other traditional models in estimating the extreme value of vehicle loads.

Title: Distributed Portfolio Pricing Strategy Research of Charging Stations Based on Demand Response
Speaker: Duo Qiu (Hunan University)
Abstract: A reasonable charge, discharge price scheme and coordinated strategy are the main means to realize electric vehicle charging or discharging control and management. In this paper, for parking charging stations with photovoltaic power generation, a pricing model is proposed to encourage different consumers to participate in demand response by providing them with a list of price plans. Firstly, we introduce the system structure of the grid-connected photovoltaic charging station. Afterwards, the portfolio pricing model for the charging station is proposed, aiming to achieve maximum profit. The formulated objective for this model is to maximize the profit of selling electricity to electric vehicles and back to the grid, feed-in-tariffs revenue and parking revenue or to minimize charging stations cost of purchasing electricity, while considering various electric vehicles demands. The decision variables for charging station include the time-of-use price, the rebate on parking fee and the charging-discharging power. To solve the pricing model,

the distributed alternating direction method of multipliers is adopted to determine the operational strategies of charging stations via local decision making and limited communication between neighbors. Finally, the simulation results prove the efficiency of the proposed model.

Title: Robust utility maximizatioin problem
Speaker: Enkhbayar Jamsranjav (National university of Mongolia)
Abstract: The theory of mathematical programming has been applied to a wide variety of problems in economics. It has been used to characterize the solution of fundamental problems in virtually all areas of economics. Microeconomic problems are typically formulated as those of economic agents (consumers and firms) attempting to maximize an objective function subject to certain constrains. There are number of works [1],[2],[3],[4] devoted to optimality conditions of microeconomic optimization problems but it seems that less attention has been paid so far to robust utility maximization problem. Aim of this paper is to derive new optimality conditions for the robust utility maximization problem.

Title: Data-based Linear Quadratic Optimal Control for Singular Discrete-time System
Speaker: Fengjun Wang (Northeastern University)
Abstract: In this paper, a singular discrete-time system without knowing its system parameters is considered, and the adaptive dynamic programming (ADP) is developed to solve the linear quadratic optimal control problem of this uncertain singular system. Without the process of identification, only measured input/output data is required to design the controller. To optimize control strategy, the control performance index is estimated by function approximator. And the iterative method is adopted by using new data to improve the accuracy of the Q function estimate. Finally, the simulation results are given to verify the effectiveness of the theoretic results.

Title: Numerical Results of European Call Option with transaction costs under fractional Brownian motion and Mixed fractional Brownian motion
Speaker: Francisca Angkola (Curtin University)
Abstract: The classical assumption of Brownian motion has long been understood and shown through numerous empirical studies to be insufficient in describing the volatile financial market. Hence, Mandelbort (1971) first introduced the idea of fractional Brownian motion (fBm) presuming its ability to capture the long-range dependence in the market. Despite various controversies against fBm, empirical studies have shown the possibility of it being more suitable in describing the market. There are no yet clear answer of whether the fractals' families are appropriate in finance, but the concept of it is puzzling enough. Thus this paper will analyse the difference shown in terms of numerical results of discrete time European call option pricing with transaction costs assuming fractional Brownian motion and Mixed fractional Brownian motion as its stock dynamics. The Finite Difference Method is employed to attain the results and to understand the general characteristics of the European call option when long-range dependence and transaction costs are included.

Title: Multi-source Heterogeneous Information Resources Knowledge Base Construction Method based on Ontology

Speaker: Gan Jianhou (Yunnan Normal University)

Abstract: The describing and presentation of multi-source, heterogeneous knowledge is a hot issue in recent years. After studying the knowledge forming process on the basis of multi-source heterogeneous information resources, we present a new method, for putting the different information resources into a mutual RDF(S) data model, and describing and semantic reasoning of RDF(S). Moreover, a knowledge base construction framework of multi-source heterogeneous information source with combination of Ontology knowledge model is put forward, and an algorithm of knowledge base construction is also proposed, in which the most kernel are knowledge including and knowledge updating. Then the time complexity of our algorithm is analyzed. Finally, aiming at the heterogeneous, out-of-order, and uneven horizontal of geographical distribution of ethnic minority information resources in Yunnan, we use the proposed method to construct a domain knowledge base of ethnic minority information resources, and to evaluate the efficiency from the knowledge including algorithm responding time and indexing responding time of different data resources by our experiments.

Title: A Framework for Ranking and KNN Queries in a Probabilistic Skyline Model

Speaker: Gan Jianhou (Yunnan Normal University)

Abstract: Skyline computation has gained a lot of attention in recent years. Due to the recently proposed probabilistic skyline model, skyline objects containing multiple elements can be compared with each other. In the probabilistic skyline model, each object is assigned a skyline probability to denote its likelihood of being a skyline object. However, there are two questions: (1) Given an object, which of the objects are the K nearest neighbors to it based on their skyline probabilities? (2)Given an object, what is the ranking of the objects which have skyline probabilities greater than the given object? Aiming to the above two questions, we propose a novel framework based on the idea of bounding-pruning-refining strategy on the fly efficiently. Firstly, the skyline probabilities of the target object and all its elements are computed. For the rest of the objects, instead of computing their accurate skyline probabilities, the upper bound skyline probabilities and lower bound ones using the elements of the target object are computed. Based on lower bound and upper bound of their skyline probabilities, some objects, which cannot be in the result, will be pruned. Those objects, which we are unknown whether they are in the results or not, needed to be refined their bounds of skyline probabilities. The refinement strategy is based on the idea of space partition. Specifically, we first partition the whole data space into several subspaces based on the distribution of elements in the target object, then do the partitioning strategy in each subspace when we iteratively do the refinement of the bounds. In order to implement this framework, a novel tree, called Space Partition Tree (SPTree) is proposed to index the objects and their elements. Finally we evaluate the proposed work using three synthetic datasets and one real-life dataset.

Title: Optimal Control of Stochastic Dynamics under Regime switches, Paradigm Shifts and Delayed - Applications in Economics, Finance and Science

Speaker: Gerhard-Wilhelm Weber (Middle East Technical University)

Abstract: In this presentation, we contribute to modern OR by hybrid, e.g., mixed continuous-discrete dynamics of stochastic differential equations with jumps and to its optimal control. These hybrid systems allow for the representation of random regime switches or paradigm shifts, and are of growing importance in economics, finance, science and engineering. We introduce some new approaches to this area of stochastic optimal control: one is based on the finding of optimality conditions and closed-form solutions. We further discuss aspects of differences in information, given by delay or insider information. The presentation ends with a conclusion and an outlook to future studies.

Title: Kernel function-based interior-point methods for the Cartesian $P_*(\kappa)-LCP$ over symmetric cones

Speaker: Guoqiang Wang (Shanghai University of Engineering Science)

Abstract: Kernel functions play an important role in the design and analysis of interior-point methods. They are not only used for determining the search directions but also for measuring the distance between the given iterate and the μ-center for the algorithms. In this talk, we give a unified computational scheme for the complexity analysis of kernel function-based interior-point methods for the Cartesian $P_*(\kappa)-LCP$-linear complementarity problem over symmetric cones.

By means of Euclidean Jordan algebras, together with the feature of the eligible kernel functions, we derive the iteration bounds that match the currently best known iteration bounds for large- and small-update methods. Furthermore, our algorithm and its polynomial iteration complexity analysis provide a unified treatment for a class of primal-dual interior-point methods and their complexity analysis.

Title: Lyapunov Method for Stability of Descriptor Second-Order and High-Order Systems

Speaker: Guoshan Zhang (Tianjin University)

Abstract: Lyapunov equation method for the stability of matrix descriptor second-order linear systems is investigated. Equivalent conditions of determining the existence of the solutions of Lyapunov equations are derived, and some sufficient conditions assuring the global asymptotic stability of the solutions are given. Based on Lyapunov method, linear matrix inequality condition for the stability of second-order systems and all parameterized solutions of Laypunov equations are obtained. Furthermore, the Lyapunov equations and LMI conditions for second-order systems are extended to high-order descriptor systems.

Title: Distributed Fault-tolerant Consensus Tracking For Networked Nonidentical Motors

Speaker: Han Wu (Hunan University of Technology)

Abstract: This paper investigates a distributed fault-tolerant consensus tracking algorithm for a group nonidentical motors with unmeasured angular speed and unknown failures. First, the failures are modeled by nonlinear functions, and sliding mode observer is designed to estimate the angular speed and nonlinear failures. Then, in order to achieve the desired results, a novel distributed fault-tolerant algorithm is constructed based on the estimated angular speed and reconstructed failures. Theoretical analysis illustrates the stability and globally exponentially asymptotically convergence of the proposed observer and controller. The numerical simulations verify the high estimation accuracy, effectiveness and robustness of the proposed methods. The semi-physical experiments based on RT-LAB real-time simulator further test the system and controller with accurate performance in real-time.

Title: Multi-objective Programming Approach for Optimizing Regional Urban Mining

Speaker: Han Wu (Central South University)

Abstract: As emerging important strategic resources, urban minerals have been paid more and more attention. Owing to the requirement of friendly environment and resource saving, construction and layout of the recycling system of urban mineral have become a hot topic in the management sciences and practical decision-making of the government in China. In this paper, a multi-objective mixed-integer linear programming (MOMILP) model is constructed to formulate the problem of recycling and processing the urban minerals in China. In the model, the total recycling profit and merit from the improvement of environment are maximized, while the social negative effect is minimized by optimizing the structure of the recycling system. According to the different needs in practice, the weighted sum method, the lexicographic minimax method and the ε-constraint method are presented to find the optimal decisions. By numerical experiments, some managerial implications of the model are obtained.

Title: Distributed maximum likelihood estimation for dependent quantized data with missing

Speaker: Hongzeng Wang (Northeasten University)

Abstract: In this paper, we consider the problem of distribution parameters estimation with dependent quantized communication data in the case of where some of the data is missing to the Fusion Center. We propose a two-step maximum likelihood estimation under the assumption that the joint probability density function of the population is known. The likelihood of the observation and the Fisher Information matrix are discussed to show the asymptotic efficiency of the estimator. Numerical examples demonstrate the effectiveness of the proposed scheme.

Title: The asymptotical stability for neutral stochastic partial differential equations with unbounded distributed delays and Poisson jump

Speaker: Huabin Chen (Nanchang University)

Abstract: In this paper, our main aim is to investigate the asymptotic stability in mean square moment for mild solution of neutral stochastic partial differential equations with unbounded distributed delays and Poisson jump. By establishing an integral inequality, some sufficient conditions ensuring the asymptotic stability in mean square moment for mild solution of such systems can be obtained. Our results are new and some previous works are generalized. Finally,

an illustrative example is given to demonstrate the effectiveness and feasibility of our obtained results.

Title: The sharp well-posedness of quasilinear wave equation
Speaker: Huali Zhang (Fudan University)
Abstract: In this presentation, I will give a brief introduction of the low regularity Cauchy's problem for the quasi-linear wave equation, including local well-posedness for large initial data and long time existence for small initial data. For local well-posedness, the commuting vector fields approach have significant improvements of this problem, which pioneered by Klainerman and Rodnianski. In 2014, Q.Wang give the affirmative answer to the sharp regularity in three dimensions by the commuting vector fields method. A nature question is that how to adapt this methods in two dimensions. For long time existence, the question is that the life span of the small data with low regularity initial data. In my talk, I will introduce my recent consideration and the main difficulties in my work.

Title: Nonlinear Separation in the Image Space with Constrained Optimization
Speaker: Jafar Zafarani (Sheikhbahaee University)
Abstract: In this talk, by means of the image space analysis, we obtain optimality conditions for vector optimization of objective multifunction with multivalued constraints based on disjunction of two suitable subsets of the image space. By the oriented distance function a nonlinear regular separation introduced and some optimality conditions for the constrained extremum problem are obtained. It is shown that the existence of a nonlinear separation is equivalent to a saddle point condition for the generalized Lagrangian function. Furthermore, we obtain some equivalent conditions on exact penalty methods for the given problem.

Title: The Effects of Transportation Cost and Container Capacity Constraints on the Multi-Item Replenishment Problem
Speaker: Jen-Yen Lin (National Chiayi University)
Abstract: This talk studies on a new kind of multi-item replenishment problem which considers transportation cost and container capacity constraints. A new mathematical model is given and determines the optimal replenishment time for multiple items. We give some theoretical analysis and then conduct a meta-heuristic algorithm for solving the given model. Also, the optimal solutions of the traditional model and our model are compared in order to study the effects of transportation cost and container capacity constraints.

Title: Improved Cuckoo Search algorithm for numerical function optimization
Speaker: Jianjun Liu (China University of Petroleum)
Abstract: Cuckoo Search (CS) is a recently proposed metaheuristic algorithms. For improving its performance both on search efficiency and convergence speed, we proposed an improved Cuckoo search algorithm based on dynamic weighted teaching-learning strategy (TLCS). For a better balance between intensification and diversification, a Kent sequence and a overstep control

strategy are also introduced into TLCS. The results of Numerical experiment demonstrate that our improved TLCS perform better than basic CS and the other improved CS in literatures.

Title: Research on decision of financing on retailer's purchasing from supplier's perspective
Speaker: Jiaxing Shi (Central South University)
Abstract: This paper studies whether the supplier who is the core business of the single period product supply chain finances the capital constrained retailer and which way he chooses to do it. For that we explore the relationship between supplier's profit under no financing, trade credit and confirming warehouse and retail's initial or working capital, time-value of capital, default possibility, interest rate in confirming warehouse model and supplier's time-value of capital. As it turns out, financing the large retailer always helps the supplier himself benefits more and which financing mode is superior depends on the size relationship between supplier's time-value of capital and interest rate and supplier's amount of liquidity. While whether the supplier obtains more profit from financing the small retailer and comparison of the two financing modes are both connected with supplier's time-value of capital and retail's attributes above.

Title: Semismooth Newton's Methods: 25 Years in Progress
Speaker: Jie Sun (Curtin University)
Abstract: Newtons method is a classical numerical method for solving nonlinear equation systems. It is still the core of many modern algorithms in optimization. In 1993, the speaker co-authored a paper that extends Newtons method to a class of nonsmooth equation systems called semismooth equation systems. The semismooth Newton method had evolved into a major tool in solving complementarity problems and variational inequalities in the 90s. Starting around 2000, the speaker has collaborated with D. Sun to further extend the semismooth Newton method to matrix equations, aiming at developing new algorithms for semide¯nite, and more generally, for matrix optimization problems. Recently, this semismooth Newton method has been shown to be particularly promising in solving large-scale matrix optimization problems if it is used as a core step of the augmented Lagrange method.

Title: A New Technique to Choose the Penalty Parameter and the Lagrangian Multipliers in the Augmented Lagrangian
Speaker: Jie Tao (University of Shanghai for Science & Technolog)
Abstract: Large-scale constrained optimization problems were generally computed by augmented Lagrangian (AL) methods because of its property of matrix-free. The most critical disadvantage of the AL based methods, poor choice of the penalty parameter and the Lagrangian multipliers, was addressed with a new technique. Also the generalized block Lanczos method was introduced in the inner iteration of the AL methods, and convergence results were also presented. A large-scale numerical example was used to testify the superiority of this new technique.

Title: A novel demonstration based control framework for robot assisted rehabilitation
Speaker: Jin Hu (Zhejiang University)

Abstract: Stroke is one of the leading causes of long-term disability today. To support this large population in recovery, robotic technologies are being developed to assist in the delivery of rehabilitation. Robot-assisted rehabilitation devices are either guiding patient's limb to track a predefined point series or designing a simulated environment to train everyday life's task. However, current methods for rehabilitation do not contribute to recover the kinematic structure of normal limb movements. This paper presented a demonstration based control framework to assist impaired person towards a kinematically correct motion. Firstly, motion data of upper-limb movement demonstrated by healthy person will be recorded. Then dynamic movement primitive is used to encode the human motion data to generate time-independent reference trajectory. To enable complaint interaction for patients, impedance controller is implemented on robot platform PR2, with complete dynamic compensation and external force estimation. During the therapy, robot will generate a combination of force fields based on error between arm position and reference trajectory, to guide human arm to follow the kinematically correct reference trajectory with desired velocity profile, which avoids motion artefact derived from current methods. Experiment is conducted to investigate the performance of the proposed framework.

Title: Robust synchronous control of multi-motor integrated with artificial potential field and sliding mode variable structure

Speaker: Jing He (National University of Defense Technology)

Abstract: To resolve the critical problem of increasing the synchronous performance of a multi-motor system, this study presents a systems synchronous motion from a new perspective, that of a framework of an artificial potential field. Necessary conditions for multi-motor synchronous motion are obtained by graph theory analysis of the topological structure of multi-motor systems. In engineering practice, a variation in motor parameters can affect the system performance deleteriously. An artificial potential field model is constructed to increase the system robustness, and a synchronous controller that integrates the artificial potential field with a sliding mode variable structure is designed by combining flocking control ideas. The controller stability is analyzed by Lyapunov-stability theory. Simulated and experimental results illustrate the efficient performance of the suggested method.

Title: Optimal Strategy of Airline and HSR in Multi-modal Hub Network

Speaker: Jing Zhang(Guangzhou Civil Aviation College)

Abstract: In this paper, an equilibrium optimization model is constructed for the integration of high-speed rail and airline in a multi-modal hub network, where the passengers travel disutility function is involved in the price, access and egress time, in-vehicle time, transfer time and delay time. Taking into consideration the full cooperation between the high speed transit operators, a multinomial Logit model is established to describe the travelers selection about the travel modes, travel operators and the travel routes. A Nash equilibrium optimization model is presented for the Air rail cooperative operators and their competitors such that their individual profits are maximized in the hub transportation network. By the KKT conditions for constrained optimization problems, the model is converted into a complementary problem. Then, by

smoothing method in virtue of Fischer-Burmeiste function, a series of sub-problems of nonlinear equations are solved to find the equilibrium point. The numerical results show that the integration can increase the demand growth in the international market and the connection market.

Title: Convergence rates of trinomial tree methods for option pricing with regime-switching models
Speaker: Jingtang Ma (School of Economic Mathematics)
Abstract: Recently trinomial tree methods have been developed to option pricing under regime-switching models. Although these novel trinomial tree methods are shown to be accurate via numerical examples, it needs to give a rigorous proof of the accuracy which can theoretically guarantee the reliability of the computations. In the current work we will give the proof of the convergence rates (measure of the accuracy) of the trinomial tree methods for the option pricing under regime-switching models. Both one and two underlying assets are considered.

Title: Robust Convergence Analysis of Iterative Learning Control for impulsive Riemann-Liouville Fractional-order Systems
Speaker: Jinrong Wang (Guizhou University)
Abstract: In this paper, we explore P-type and D-type learning laws for impulsive Riemann-Liouville fractional-order controlled systems to track the varying reference accurately by adopting a few iterations in a finite time interval. We establish open and closed-loop P-type and D-type robust convergence results in the sense of ($PC_{1-\alpha},\lambda$)-norm $\|\bullet\|_{PC_{1-\alpha},\lambda}$ for Riemann-Liouville fractional-order system of order $0 < \alpha < 1$with initial state learning. Finally, two numerical examples are given to illustrate our theoretical results.

Title: Optimizing the Intermodal Transportation of Emergency Medical Supplies Using Balanced Fuzzy Clustering
Speaker: Junhu Ruan (Northwest A&F University)
Abstract: Recently, various large-scale disasters disturbed the world, such as 2005 Hurri-cane Katrina, 2008 Wenchuan earthquake, 2009 H1N1 pandemic, 2010 Haiti earth-quake, 2013 Philippines typhoon, and 2015 Nepal earthquake. In response to these disasters, prompt medical services and supplies to affected areas could effectively reduce the loss of life. However, relief supplies transportation often faces different challenges and difficulties in different disaster situations.
In this paper, we are concerned with the problem of the “helicopters and vehicles" intermodal transportation of medical supplies in response to large-scale disasters. To deal with the disadvantages of the use of classic Fuzzy C-Means (FCM) in the intermodal transportation optimization, two balanced FCM methods, that is, FCM with capacity constraints (FCMCC) and FCM with number constraints (FCMwNC), are formulated to select emergency distribution centers (EDCs) and assign medical aid points (MAPs), which could construct balanced “helicopters and vehicles" intermodal transportation network. Then, considering helicopter travel

time, transfer time and vehicle delivery time, a clustering-based intermodal routes optimization model is presented to produce intermodal transportation routes. Numerical experiments are presented to show the effectiveness and advantage of the developed approach, and observe the impact of number of EDCs and transfer efficiency at EDCs on the performance of intermodal transportation. This paper could provide methodological and operational supports for the "helicopters and vehicles" intermodal transportation of medical supplies in response to large-scale disasters.

Title: A high order schema for the numerical solution of the impulsive fractional ordinary differential equations
Speaker: Junying Cao (Guizhou Minzu University)
Abstract: In this paper we present a general technique to construct high order schemes for the numerical solution of the impulsive fractional ordinary differential equations (IFODEs). This technique is based on the so-called block-by-block approach, which is a common method for the integral equations. In our approach, the classical block-by-block approach is improved in order to avoiding the coupling of the unknown solutions at each block step with an exception in the first two steps, while preserving the good stability property of the block-by-block schemes. By using this new approach, we are able to construct a high order schema for IFODEs of the order q, $0 < q \le 1$. The convergence of the schema is rigorously established. We prove that the numerical solution converges to the exact solution with order 3+ q for $0 < q \le 1$. A series of numerical examples are provided to support the theoretical claims.

Title: Numerical Valuation of Options on Zero-Coupon Bonds with a Fitted Finite Volume Method
Speaker: Kai Zhang (Shenzhen International Business School)
Abstract: We present a novel numerical scheme to price European options on discount bond, where the single factor models are adopted for the short interest rate. This method is based on a fitted finite volume (FFVM) scheme for the spatial discretization and an implicit scheme for the time discretization. We show that this scheme is consistent, stable and monotone, hence it ensures the convergence to the solution of continuous problem. Numerical experiments are performed to verify the effectiveness and usefulness of this new method.

Title: Constrained Programming Models for Partially Ordered Strip Packing with Applications in Stockyard Management
Speaker: Lanbo Zheng (Wuhan University of Technology)
Abstract: We study a special variation of the strip packing problem motivated from stockyard management at a coal exporting port. We use a Constraint Programming system to solve the problem. Different modelling methods of the main and optional constraints are explored and their impacts on system efficiency are investigated. Additionally we test different variable and value

ordering heuristics that are interleaved with constraint propagation. Extensive computational experiments are performed to show the effectiveness of our approaches. The results provide practical insights for stockyard management and illustrate potential theoretical development on this packing problem.

Title: An Interactive Optimization Scheme with High Resolution for Indoor Thermal Comfort and Energy Saving

Speaker: Lei Pan (Jiangsu University)

Abstract: Optimal indoor spatial parameters such as temperature and air flow fields can help satisfy the thermal comfort and energy saving requirements simultaneously in space. With rapid development of computer technology, computational fluid dynamic (CFD) has become an efficient tool for such indoor environment simulation and system design. However, it is hard to optimize the control variables according to specific design goals conveniently. On the other hand, various kinds of online optimization methods are frequently reported and have been widely applied to engineering design, parameter identification and system optimization, etc. But limited effort is put on the optimization framework , which couples optimization algorithms into CFD simulations. Lawrence Berkeley National Laboratory, USA, developed an interactive program, called Genopt, for the minimization of a cost function that is evaluated by an external simulation program. This software will not be available if the model file of the simulation program is considerable large, which is normal situation for CFD modeling. In addition, the algorithm interface only allows adding new optimization algorithms which are programmed by Java.

In this paper, an online optimization scheme, which couples matlab based optimization algorithms with CFD simulations, is proposed. In this method, model files are automatically created by an interface module at the beginning of each iteration. CFD solver engine is called for parameters calculation and the results are passed to matlab for cost function evaluation. The data interaction between CFD and matlab is conducted by the interface module programmed by C language. A plenty of optimization algorithms can be directly applied from matlab library without requiring code adaption. A CFD based classroom case is used to evaluate the feasibility of the optimization framework. In this case, the inlet velocity and temperature of the ventilation system are chosen as input parameters. The objective function is constructed by aggregating and weighting Predicted Mean Vote (PMV) index and ventilation energy consumption into one indicator. An improved Particle Swarm Optimization algorithm (IPSO) is implemented in the interactive scheme for the case study. In order to investigate the optimization performance, GenOpt with PSO algorithm is chosen for comparison. Results indicate that the proposed scheme reaches convergence in fewer iterations and accesses optimal solutions closer to the overall best one than GenOpt does. Detailed analysis will prove the effectiveness and superiority of the proposed scheme.

Title: A Linear Optimal Feedback Control for Producing 1,3-propanediol via Microbial Fermentation

Speaker: Lei Wang(Dalian University of Technology)

Abstract: In this paper, we consider disproportionation fermentation of glycerol for 1,3-propanediol (1,3-PD) by bacteria. This bioprocess is described by a nonlinear dynamic system with terminal state and continuous inequality constraints. Based on the time-scaling and control parameterization techniques, this problem can be regarded as a semi-infinite optimization problem. And the terminal state and continuous inequality constraints can be transformed into a sequence of nonlinear programming problems by using an exact penalty approach. We then develop a combined particle swarm and gradient-based optimization algorithm to obtain the global solution of this optimal feedback control problem. Finally, we present our conclusion via numerical simulation

Title: Real-Time Prediction of Operation Resistance in Submerged Arc Furnace Based on Just-in-Time Approach
Speaker: Li Pei (Central South University)
Abstract: As it decides the amount of power poured into melting pools, operation resistance is a vital control variable for submerged arc furnace. In recent years, many manufactures begin to execute Peak-avoiding schedule aiming at cost reduction, models in existing literatures become unable to catch up with the dynamic change in the furnace due to the severe and constantly temperature variation brought by this new operation schedule. In this paper, an operation resistance model com-posed of arc resistance and burden resistance is proposed, this structure can well characterize the state within the furnace and thus help to obtain a model that can adapt to wider operation range. Just-in-Time approach is implemented to predict burden resistance. By solving both time varying and non-linearity issues under JIT framework, the proposed model can provide with both precise and reliable results, especially under some abnormal conditions that can not be pre-detected by current control system.

Title: A Penalty PALM Method for Sparse Portfolio Selection Problems
Speaker: Li Yang (Dalian University of Technology)
Abstract: A penalty proximal alternating linearized minimization method is proposed for the large-scale sparse portfolio problems. In the method, a sequence of penalty subproblems are solved by utilizing proximal alternating linearized minimization frame and sparse projection techniques. For exploiting the structure of the problems and reducing the computation complexity, each penalty subproblem is solved by alternately solving two projection subproblems. The global convergence of the method to a KKT point or a local minimizer of the problem can be proved under the characteristic of the problem. The computational results with practical problems demonstrate that our method can find the suboptimal solutions of the problems efficiently and is competitive with some other local solution methods.

Title: Output Feedback Stabilization for Networked Control Systems with Partly Unknown Transition Probabilities
Speaker: Li Yuan (University of Technology)
Abstract: This paper investigates output feedback stabilization of networked control systems

(NCSs) with random delays and random sampling periods. Sampling periods can random switch in three cases according to the high, low and medium three types of network load. The sensor-to-controller (S-C) random delays, controller-to-actuator (C-A) random delays and random sampling periods are modeled as three different Markov chains, respectively. The transition probabilities of Markov chains do not need completely known. An output feedback controller is designed via the iterative linear matrix inequality (LMI) approach. It is shown that the designed controller is three-mode-dependent and depends on not only the current S-C delay but also the most recent available sampling period and the most recent available C-A delay at the controller node. The resulting closed-loop systems are special discrete-time jump linear systems with three modes. The suffcient conditions for the stochastic stability are established. An example of the cart and inverted pendulum is given to illustrate the effectiveness of the theoretical result.

Title: Optimal homing trajectory design for parafoil systems using sensitivity analysis approach
Speaker: Haiyan Liang (Zhejiang University)
Abstract: An optimal control problem with three degree-of-freedom (3 DOF) toward homing trajectory design is proposed for parafoil systems. The control parameterization and time-scaling techniques are used to generate numerical solutions. The sensitivity approach is then used to generate the gradient numerically. The simulation results demonstrate the effectiveness of our computational optimal control algorithm. Rather than solving the two boundary value problem (TBVP) from the Pontryagin maximum principle (PMP), the proposed method only requires to integrate the state ODE and the sensitivity system with known initial conditions for all the equations, which makes the computational cost much less than solving the TBVP. Although the dimension of the sensitivity system is higher than that of the adjoint equation of the TBVP, it still can reduce the computational cost significantly. This method can effectively improve the accuracy in landing a parafoil system and reduce the control energy consumption, which verifies the feasibility of the proposed optimization algorithm.

Title: Optimal allocation method of power battery for battery swapping station
Speaker: Liang Liang (Changsha University of Science and Technology)
Abstract: Battery swapping mode is an effective means to solve the problem of electric vehicle (EV) range insufficient and charging difficulties. In this mode, the battery swapping station needs to configure a certain number of power batteries to meet customer needs, but too much battery reserves will increase the cost of the power plant, reduce operating efficiency. Considering the uncertainty of customer demand and the effect of time-of-use electricity price, the optimal model has been built by taking the number of battery as the variable and the maximum operational benefit of the battery swapping station as the optimal goal. Further consideration of the operational benefit by different charge and discharge strategy, the battery allocation method of battery swapping station under optimum benefit have been given. Case study illustrates the effectiveness of this method.

Title: Finite time filtering of Markov jumping systems

Speaker: Lijie Zhu (Jiangnan University)
Abstract: In actual production, most of control systems we met are the systems of multiple models. and at different times or different operating segments a multi-model system has a number of different mathematical models, so we need to fully take the operation of the system into account. Therefore, in order to make research have more practical sense, this paper decides to use Markov hopping systems. On the other hand, in the control field of research, most studies are designed for the systems which have infinite horizon. However, in the actual production, a lot of control system pay more attention to the situation in a short time, so this paper do the study on how to design a multi-model system filter in limited short period of time. During the design process, this paper first presents the Markov jump system. Then according to the jump system, this paper designs mathematical model of filter and constructs Lyapunov-Krasoviskii energy function. After having reached the energy function, this paper combines with the calculation method of LMI to present sufficient condition for existence of the filter. Then, according to mathematical method, it is expressed as LMI constrained optimization problems. Finally, this paper uses specific numerical computing and software simulation to prove the validity of the entire design process.

Title: STA-based Forecast combination Model of inflation
Speaker: Lilin Zhu (Cental South University)
Abstract: The accuracy of the ination forecast is becoming important for the successful execution of ination targeting as the intermediate target for monetary policy. In order to improve the forecast accuracy, this article combines three different models, which are the Phillips Curve model, the ARIMA model and the Vector Autoregression (VAR) model with monthly data for several years. The weigh coefficients of forecast combination are obtained by the State Transition algorithm (STA). The result shows that this method can effectively improve the accuracy of inflation forecast, compared with the results of original models.

Title: Poles assignment for periodic second-order systems
Speaker: Lingling Lv (Jiangnan University)
Abstract: The problem of poles assignment for discrete-time second-order periodic systems is considered in this paper. By some technical deduction, this problem is converted into solving two matrix algebraic equations. Utilizing our recent research results on nonhomogeneous periodic Sylvester matrix equations, the considered problem can be solved completed. A detailed algorithm is presented and a numerical example is employed to verify the effectiveness of the proposed method.

Title: A novel robust real-time optimization for blending operation of alumina production
Speaker: Lingshuang Kong (Hunan University of Technology)
Abstract: The blending operation is a key process in alumina production. The real-time optimization (RTO) of finding optimal raw material proportioning is crucially important for achieving the desired quality of the product. However, the presence of uncertainty is unavoidable

in a real process, leading to much difficulty for making decision in real-time. This paper presents a novel robust real-time optimization (RRTO) method for alumina blending operation, where no prior knowledge of uncertainties is needed to be utilized. The robust decision is made at each RTO interval in two stages: (i) Predict blending model by minimizing the deviation between the output of the model and the latest output of the real plant, where the unknown disturbances in the blending operation and the variations in the quality of raw materials are considered together as composition parameters. (ii) Calculate the robust solution through solving a newly introduced semi-infinite optimization problem, where the maximum allowable uncertain tolerance of the composition parameters of the raw materials is obtained. The robust solution obtained is applied to the real plant and the two-stage operation is repeated. In comparison to previous intelligent optimization (IRTO) method, the proposed two-stage optimization method can much better handle the uncertainty nature of the real plant and the computational cost is much lower. From the industrial experiment, the results obtained show that the proposed optimization method can guarantee that the desired quality of the product quality is achieved in the presence of uncertainty on the plant behavior and the qualities of the raw materials. This outcome suggests that the proposed two-stage optimization method is a practically significant approach for the control of alumina blending operation.

Title: Fault detection of Stochastic systems
Speaker: Liqiang Jin (Jiangnan University)
Abstract: In this paper, we introduce the fault detection problem study of jump system. Using the way of observer, we study fault detection problems of linear jump system. Applying norm of thought, we obtain two energy norm, which are H_2 and H_∞. So the problem of fault detection is transformed into the optimization problem. By constructing Lyapunov function and using linear matrix inequality (LMI) technology, we give sufficient conditions of optimal observer, and simulation shows the effectiveness of the methods proposed.

Title: Multi-objective structural optimization of an aerospace assembly based on orthogonal experimental design
Speaker: Liu Lei (China Astronaut Research and Training Center)
Abstract: The finite element model of the aerospace assembly was created and by modal analysis the first integral vibration frequency and feature was achieved. Then the orthogonal experimental design were done to get the data of responses as the size variable changes. Based on the data, a Kriging response surface was created to equivalent the solver of the optimum problem. Finally the Pareto front and the Pareto set was got using multi-objective genetic algorithm on the response surface. The designer can choose suitable Pareto solution to modify the structure. The method can save the design time and cost and can provide a reference for similar products at the same time.

Title: Rate Analysis of the ADMM for Composite Convex Quadratic and Semi-Definite Programming

Speaker: Liwei Zhang (Jiangnan University)

Abstract: In this paper, we aim to prove the linear rate convergence of the alternating direction method of multipliers (ADMM) for solving linearly constrained convex composite optimization problems. Under an error bound condition, we establish the global linear rate of convergence for a more general semi-proximal ADMM with the dual steplength being restricted to be in $(0,(1+\sqrt{5})/2)$. In our analysis, we assume neither the strong convexity nor the strict complementarity except the error bound condition, which holds automatically for convex composite quadratic programming. This semi-proximal ADMM, which covers the classic one, has the advantage to resolve the potentially non-solvability issue of the subproblems in the classic ADMM and possesses the abilities of handling the multi-block cases efficiently. We shall use convex composite quadratic programming and quadratic semi-definite programming to demonstrate the significance of the obtained results. Of its own novelty in second-order variational analysis, a complete characterization is provided on the isolated calmness for the convex semi-definite optimization problem in terms of its second order sufficient optimality condition and the strict Robinson constraint qualiffication for the purpose of proving the linear rate convergence of the semi-proximal ADMM when applied to two- and multi-block convex quadratic semi-definite programming.

Title: Alternating Direction Method of Multipliers For Separable Convex Optimization of Real Functions in Complex Variables

Speaker: Lu Li (Shanghai University of Engineering Science)

Abstract: The alternating direction method of multipliers (ADMM) is now widely used in many fields, and its convergence has been proved in the scope of the real number domain. In this paper, we present an ADMM for separable convex optimization of real functions in complex variables. The convergence of the proposed method in the scope of the complex number domain is established by using the elegance f Wirtinger Calculus. We also give the basis pursuit algorithm for the equality-constrained l_1 minimization problem in the form of ADMM and extend the soft thresholding formula in the real number domain to the general case. The simulation results are provided to show that the algorithm has good convergence.

Title: Mean Square Exponential Stability of Nonlinear Impulsive Switched Stochastic Systems with Stable and Unstable Subsystems

Speaker: Mengyi Shi (China University of Petroleum)

Abstract: In this paper mean square exponential stability and robust mean square exponential stability relating to impulsive switched stochastic systems which consist of stable and unstable nonlinear subsystems are studied. The impulsive increments which are nonlinear functions of the states are happened at each switching time instant. Using the average dwell time method and piecewise Lyapunov function approach, obtain the sufficient conditions of the mean square exponential stability of the stochastic system, that is when the total active time of unstable subsystems compared to the total active time of stable subsystems is less than a certain proportion.

The switching law is designed which includes the average dwell time of the switched system. Switched systems with uncertainties are also studied. Finally, simulations show the effectiveness of the result.

Title: A new extragradient-type method for mixed variational inequalities
Speaker: Ming Zhu (Guangxi University for Nationalities)
Abstract: In this paper, a new projection method for mixed variational inequalities is introduced in Euclidean spaces. The Armijo-type linesearch is similar to that of Hes method for variational inequalities. Under some suitable assumptions, we prove that the sequence generated by the proposed method is globally convergent to a solution of the problem. If, in addition, a certain error bound holds, we analyze the convergence rate of the iterative sequence. The results presented in this paper generalize and improve some known results given in literatures.

Title: Operational Planning of Electric Vehicles under Mode of Charging-Discharging-Storage Integrated Station
Speaker: Mingyong Lai (Changsha University of Science and Technology)
Abstract: Compared with fuel vehicles the electric vehicles have significant advantages in the logistics system under the background of energy crisis and environmental issues. However, the energy supply mode of electric vehicles has become a bottleneck restricting the development of electric vehicles. The existing energy supply modes include regular charging, fast charging and switching mode, but these three kinds of charging methods have their advantages and disadvantages. Charging-Discharging-Storage integrated station integrated the functions of charge , discharge and energy storage, It provides a new way to solve the energy supply of electric vehicles. This paper focus on electric vehicles in the logistics system. A logistics system including Charging-Discharging-Storage integrated station is build. Taking into account the different characteristics of the electric vehicle energy supply modes, the driving route optimization model is proposed. The model considers different types of electric vehicles energy needs in the driving way, use the Charging-Discharging-Storage integrated station to participate in the distribution system of power distribution system, to realize the electric vehicle distribution costs and charging and discharging of the power plant operation benefit. The model is written in MATLAB language and solved by invoking the ILOG CPLEX IBM, and the validity and feasibility of the proposed model is verified by the results of the simulation.

Title: A Hybrid grey wolf optimizer and genetic algorithm for minimizing potential energy function
Speaker: Mohamed Tawhid (Thompson Rivers University)
Abstract: The problem of finding the minimization of the potential energy function is an NP hard problem which is difficult to solve since the number of the local minima increases exponentially with the molecular size. In this paper, we propose a new hybrid algorithm between the grey wolf optimizer algorithm and the genetic algorithm in order to minimize a simplified model of the energy function of the molecule. We call the proposed algorithm by Hybrid Grey Wolf Optimizer

and Genetic Algorithm (HGWOGA). The HGWOGA is based on there mechanicians. The first mechanisms is applying the grey wolf optimizer algorithm to balance between the exploration and the exploitation process in the proposed algorithm. The second mechanism is based on the dimensionality reduction process and the population partitioning process by dividing the population into sub-populations and applying the arithmetical crossover operator in each sub-population in order to increase the diversity of the search in the algorithm. The last mechanism is using the genetic mutation opera-tor in the whole population in order to avoid the premature convergence and avoid trapping in local minima. Before we apply the proposed HGWOGA to minimize the potential energy function of the molecule size, we test it on 13 unconstrained large scale global optimization problems with size up to 1000 dimension in order to investigate the general performance of the proposed algorithm for solving large scale global optimization problems then we test the proposed algorithm with various molecule size with up to 200 dimensions. Furthermore, we compare the proposed algorithm against the standard grey wolf optimizer algorithm to solve large scale global optimization problems and 9 benchmark algorithms, in order to verify the efficiency of the proposed algorithm for solving molecules potential energy function. The numerical experiment results show that the proposed algorithm is a promising and efficient algorithm and can obtain the global minimum or near global minimum of the molecular energy function faster than the other comparative algorithms.

Title: Approximation algorithms for nonnegative polynomial optimization problems over unit spheres
Speaker: Mohammed Alqahtani (Curtin university of science and technology)
Abstract: In this paper, we consider approximation algorithms for nonnegative polynomial optimization problems over unit spheres. These optimization problems have wide applications e.g., in signal and image processing, high order statistics, and computer vision. Since these problems are NP-hard, we are interested in studying on approximation algorithms. In particular, we propose some polynomial-time approximation algorithms with new approximation bounds. In addition, based on these approximation algorithms, some practical algorithms are presented and numerical results are reported to show the efficiency of our proposed algorithms.

Title: Existence of Non-linear Bi-level Programming Problem with Varying Parameters
Speaker: Mrinal Jana (Indian Institute of Technology Kharagpur)
Abstract: This paper addresses a bi-level programming problem whose parameters in the upper and lower level objective functions and constraints vary in intervals. A partial order relation in the set of intervals is introduced and the existence of the solution of the problem is discussed using this partial order relation. A methodology is developed to find a compromising solution. The main idea of the methodology is to transform the original model to a general optimization problem, which is free from interval uncertainty. Relationship between the solution of the original problem and the transformed problem is established. Finally, the methodology is illustrated through numerical example.

Title: Determination of Meniscus shape in the Continuous Steel Caster
Speaker: Nathnarong Khajohnsaksumeth (Mahidol University)
Abstract: Many important phenomena in science and engineering involve flows with free surface, fluid-solid, fluid-fluid, solid-solid and fluid-structure interfaces. One of the most challenging problem is modelling the fluid flow above the moving surface of another fluid. In this study, we present a mathematical model of two-phase flow in the continuous steel caster with electromagnetic stirring. Numerical technique based on the arbitrary Lagrangian Eulerian method is employed for the solution of the mathematical model. Effects of nozzle port angle, casting speed and electromagnetic force on meniscus shape investigated.

Title: A family of order 1 to 4 compact finite difference formulation for three-space dimensional non-linear Poisson equations in spherical polar coordinate
Speaker: Navnit Jha (Akbar Bhwan)
Abstract:In this article, we develop a new algorithm for solving three-space dimensional non-linear Poisson equation in spherical polar coordinate based on non-uniform spacing of meshes in finite difference approximations. The proposed scheme gives an accuracy of order one to four and provides stable solution. The especial compact behaviour of the new scheme on non-uniform mesh spacing makes it easier to compute in case of problems exhibiting singularity and layer behaviour. The convergence theory has been developed by the help of matrix analysis and obtained the bounds of discretization errors for the sufficiently small values of mesh spacing. The proposed scheme has been applied to solve various linear and non-linear Poisson equations. The root mean squared error of the theoretical and numerical solutions along with the computational convergence order have been reported, showing close resemblance with the estimated bounds of error.

Title: Research on Layered Coordinated Optimization Control of Micro-grid Including Energy Storage System and Heat Storage System
Speaker: Ning Yan (Shenyang University of Technology)
Abstract: This paper mainly studies layered coordinated optimization control of micro-grid including energy storage system and heat storage system, at first, research on mathematical model and control model of distributed power, putting forward different time scales micro-grid hierarchical coordinated control strategy, and applied to distributed power micro-grid including interface type inverter, by simulation analysis micro-grid different operating modes and mode switching characteristics, to deter-mine the validity this policy. Taking the economic operating coat as optimization objective respectively, the model of the micro-grid optimization scheduling strategy are established, the optimal operation programs of the micro-grid including energy storage system and heat storage system under different power flow constraints and different optimization objectives are researched, And analysis of the effect to micro-grid operational when using energy storage system and heat storage system.

Title: Tracking Control for Quad-Rotor Unmanned Aerial Vehicles with Wind Disturbances

Speaker: Jing Xu (Nanjing University of Science and Technology)
Abstract: We present a control strategy to achieve a desired trajectory tracking performance of UAV flights in the presence of wind disturbances. This strategy consists of three parts: the inner-loop control, outer-loop control and flight scheduling scheme. For the inner-loop control, finite frequency H1 control is used to enhance robustness of the flight system against wind disturbances and provide adequate decoupling such that the outer loop may control each translational dynamic in-dependently. For the outer-loop control, H1 loop shaping control via proportion-integration-differentiation control is utilized in each outer feedback loop to guarantee good tracking performance. The flight scheduling scheme is employed to provide a trade-off between trajectory tracking performances and robustness.

Title: Multi-agent Formation Control system of Limited Sensing Range and Communication Capability
Speaker: Hongjun Yu (The University of Adelaide)
Abstract: The collaboration and interaction of agents is an important aspect of multi-agent formation control. The problem we addressed is primarily on the formation control of multi-agent system with limited sensing range and communication capability.A key issue is on driving the agents from an arbitrary formation to a predefined formation, and maintaining the system connectivity. In the paper, we will discuss the problem setup and control law design, and propose scalable formation control schemes.

Title: Maximum A Posteriori Estimation for Linear Markovian Jump Systems with Uncertain Time Delays
Speaker: Peng Shi (The University of Adelaide)
Abstract: The maximum a posteriori estimation problem is addressed for a class of linear Markovian jump systems with uncertain mode-dependent time delays. For computing the maximum a posteriori probability state sequence estimator, a recursive maximum likelihood state estimation algorithm is developed. For avoiding the exponential computational cost brought with computing the optimal estimate, the recursive algorithm is derived based on two approximation strategies: the optimal principle of expectation maximization and the interacting multiple mode approximation. In order to calculate the posterior probability of each possible candidate time delay, an online calculation method is derived within the Bayesian framework, conditioned on the priori knowledge and posterior information embedded in the likelihood density function of state.

Title: A New Method for Fundamental Matrix Estimation Based on Continuous-Time Optimization
Speaker: Qiang Fui (Beihang University)
Abstract: In the field of computer vision, the methods of minimizing algebraic distance in fundamental matrix estimation have attracted a lot of attention. In this paper,a new method based on continuous-time optimization is proposed to estimate the fundamental matrix, which directly incorporates the rank-2 constraint in the optimization. The estimation is finally converted into an integration process of a derived continuous-time dynamical equation, whose step size is

controlled automatically and can sometimes be made larger than usual. This advantage suggests that the pro-posed method can facilitate faster convergence. Experiments have demonstrated that the proposed method gives near-optimal results with faster convergence than several existing methods, especially when the number of point correspondences is very large.

Title: A System of Nonsmooth Equations Solver Based upon Subgradient Method
Speaker: Qiang Long (Southwest University of Science and Technology)
Abstract: In this paper, a subgradient method is developed to solve the system of (nonsmooth) equations. First, the system of (nonsmooth) equations is transformed into a nonsmooth optimization problem with zero minimal objective function value. Then, a subgradient method is applied to solve the nonsmooth optimization problem. During the processes, the pre-known optimal objective function value is adopted to update step sizes. The corresponding convergence results are established as well. Several numerical experiments show that the proposed method is efficient and robust.

Title: Semicontinuity of approximate solution mappings for parametric generalized weak vector equilibrium problems
Speaker: Qilin Wang (Chongqing Jiaotong University)
Abstract: In this paper, we first introduce a new set-valued mapping by the f -approximate solution mapping of parametric generalized weak vector equilibrium problems and obtain some of its properties. By a scalarization method, we establish the lower semicontinuity the approximate solution mapping to parametric generalized weak vector equilibrium problems without the assumptions about monotonicity and approximate solution mappings. Simultaneously, under some suitable conditions, we obtain the upper semicontinuity of the approximate solution mapping to generalized parametric weak vector equilibrium problems. Our main results improve and extend the corresponding ones in the literature.

Title: Stabilization of descriptor Markovian jump system with two Markov chains
Speaker: Qingling Zhang (Northeastern University)
Abstract: This paper investigates the stabilization problem for discrete-time descriptor Markovian jump system. The case that two different Markov chains respectively exist in the state matrix and in the derivative-term matrix is firstly taken into account. Sufficient conditions, which guarantees the considered system is regular, impulse free and stochastically stable, are derived in term of linear matrix inequality(LMI) technique. Based on these, mode-dependent stabilizing controllers are designed and can be expressed by a series of solutions of LMIs. Finally, several numerical examples are provided to support the theoretical findings.

Title:Time optimal control problem for time-delay system based on non-uniform parameterization
Speaker: Qinqin Chai(Fuzhou University)
Abstract: Time-delay exist in many real systems including signal processing, biology, and chemical engineering, etc.. Optimal control problems for time-delayed problems are usually hard

to be solved. In this paper, we consider an optimal control problem base on a general nonlinear time-delay system. And we proposed a computation method based on non-uniform control parameters to solve this problem. Firstly we approximate the control by a piecewise-constant function, where the control switching times are variables and can change their values. Then, we apply a time scaling transformation to map the control switching times to fixed points in a new time horizon. On this basis, the optimal control problem becomes a parameter optimization problem for a switching systems, where the switching times and the heights of the control vectors become decision variables in the new time horizon. A fully-informed particle swarm optimization algorithm is then utilized to solve this problem. Numerical example demonstrate that by using non-uniform control parameters much better results are obtained. The proposed method is effective.

Title: A Hybrid Tabu Search and ILP Heuristic for the Maximum Total Flow with Flexible Arc Outages
Speaker: Qipeng Xu (Wuhan University of Technology)
Abstract: We present a new hybrid mathematical programming and meta-heuristic method for the Maximum Total Flow with Flexible Arc Outages (MaxTFFAO) problem. In this problem, a network with arc capacities is given, together with, for every arc of the network, a set of maintenance jobs that need to be carried out within specific time windows. The objective is to find a feasible maintenance schedule of arcs on the network so that the total flow over the planning time horizon is maximized. This MaxTFFAO problem mixes the complexities of the dynamic flow problem and the scheduling problem, and has wide applications in maintenance management of network structures critical to modern life, e.g. water, sewerage and electricity networks. In our approach, an integer and linear programming based maximum flow algorithm is integrated within a tabu search framework. The primal and dual information of the flow variables are explored to define effective neighbourhood structures. The tabu list and aspiration criteria are adaptivley maintained to implement various search strategies. We examine the effectiveness of this approach through extensive experimental comparisons with the existing algorithms on the same problem instances.

Title: Degree Theory and Solution Existence of Set-Valued Vector Variational Inequalities in Reflexive Banach Spaces
Speaker: Renyou Zhong(Guangxi Normal University)
Abstract: A degree theory for set-valued vector variational inequalities is built in reflexive Banach spaces. By using the method of degree theory, some existence results of solutions for set-valued vector variational inequalities are established under suitable conditions. Furthermore, some equivalent characterizations for the nonemptiness and boundedness of solution sets to single-valued vector variational inequalities are obtained under pseudomonotonicity assumption. To the best of our knowledge,there are still no papers dealing with the degree theory for vector variational inequalities.

Title: Predictive Sliding Mode Control for Discrete-Time Systems with Input Rate Constraint
Speaker: Rong Li (Nanjing University of Aeronautics and Astronautics)
Abstract: In this paper, a control strategy is proposed using sliding mode control (SMC) method and model based predictive control (MPC) technique for linear multiple-input and multiple-output (MIMO) discrete-time systems with unknown external disturbance. In the developed predictive sliding mode control strategy, a discrete-time reaching law is designed to overcome the problem of input rate saturation constraints. To efficiently tackle the unknown external disturbance, a disturbance observer based on sliding mode method is developed. Simulation results are provided to illustrate the effectiveness and the improved performance of the developed control strategy.

Title: A projection iterative algorithm for strong vector equilibrium problem
Speaker: Sanhua Wang (Nanchang University)
Abstract: In this paper, iterative algorithm for strong vector equilibrium problem (SVEP) is studied. Firstly, an auxiliary problem for SVEP is introduced and the relation-ships between these two problems are discussed. Then, based on the auxiliary problem, a projection iterative algorithm for SVEP is proposed. Moreover, analysis of convergence of this iterative algorithm is investigated under suitable conditions of continuity and convexity. The main result obtained in this paper generalizes and improves some corresponding ones in the literature.

Title: Delayed Model for HIV Infection with Drug Effects
Speaker: Saroj Kumar Sahani (South Asian University)
Abstract: In this article, a intracellular delay and immune response delay model of HIV infection on human have been proposed and discussed taking the account of commonly used drug effect. It is assumed that the uninfected $CD4^+$ T cell grows logistically. The local and global stability behaviour of the model have been discussed. It has been proved that when R_0 , the basic reproduction number is less than unity, the disease free equilibrium point become stable and becomes unstable otherwise. The Hopf bifurcation conditions are obtained with respect to delayed parameter using geometric switching conditions. Extensive numerical simulations have been carried out on the model to ascertain the validity of results of the model. The other dynamical properties of the model and effects of drug therapy on the proposed model has been explored through numerical simulations.

Title: Parameter Estimation for Ginzburg-Landau Equation via Implicit Sampling
Speaker: Shan Guo (Zhejiang University)
Abstract: We estimate the parameters for the Ginzburg- Landau equation which models the phenomenon of vortex shedding in flows past a circular cylinder. In this paper, we apply implicit sampling to sample the posterior probability density of the parameter estimation problem. We illustrate the solving procedure in detail and demonstrate the method is efficient with numerical simulation.

Title: A Note on Quadratic Integral Equations involving Erdelyi-Kober Fractional Integrals in

Holder Spaces
Speaker: Shan Peng (Guizhou University)
Abstract: In this note, we investigate the solvability of quadratic integral equations involving Erdelyi-Kober fractional integrals in Holder spaces. We present the interesting existence and uniqueness results via the well known Schauder fixed point theorem. Finally, an example is given to illustrate our results.

Title: Real-Time Pricing Decision Based on Multi-Leader-Follower Game in Smart Grid
Speaker: Shaojian Qu (University of Shanghai for Science and Technology)
Abstract: The real-time pricing plays an important role in demand-side management for smart grid. In this paper, we study real-time pricing strategy of electricity retailers by means of game theory in smart grid. The retailers are in the game situation where there is multi-leader with multi-followers. We propose a real-time electricity demand function and analyze the interactions between the retailers, then obtain its equilibrium solution. The analysis and simulation results of the equilibrium solution show the effectiveness of the proposed method.

Title: Bi-level Multi-objective Optimization Model for Integrated Resort/Urban Logistics
Speaker: Shaojian Qu (Harbin Institute of Technology)
Abstract: To reduce traffic congestion as well as to improve workforce productivity, a bi- level multi-objective model is proposed for integrated resort-urban logistics metropolis, in which there are two decision-makers that one is the center operator (leader) of an urban consolidation center at the upper level and the other is the logistics parties (follower) who manages the deliver at the lower level. In this model, we suppose that the supply side risk and the demand side risk exist simultaneously and the decision-makers in both levels are all risk-averse. Then, the leader makes his decision by considering the demand from the follower and economic efficiency, environmental emissions, and highly dependent time windows with penalties for late delivery, simultaneously, while the follower arranges his transportation plan by considering the cost for the order from stores and the time window set by the operator at the upper level. To solve the resulting bi-level multi-objective models, a new solution method is constructed. Numerical tests are also given to show the efficiency of our method.

Title: A study on institutional investors selecting better stocks: Evidence from SEOs in China
Speaker: Shaoyong Lai (Southwestern University of Finance and Economics)
Abstract: Using the data of stock returns and the variations of quarterly institutional ownership around Secondary Equity Offerings (SEOs) in China from 2004 to 2008, we verify institutional investors to be smart in stock selection. By sorting the SEOs samples into two groups according to either an increase or decrease in institutional ownership, we find different stock returns between the two groups before SEOs, but significantly higher returns among the group of stocks which has increased institutional ownership over 1 month, 3 month, 6 month, 9 month, 12 month and 18 month periods, separately. This result indicates the evidence of the strong stock selecting ability of institutional investors.

Title: On the Fractional Order Iterative Learning Control with Randomly Varying Trial Lengths
Speaker: Shengda Liu (Guizhou University)
Abstract: In order to tracking the reference trajectory associated with the fractional nonlinear differential systems with randomly varying trial lengths, we design a new type iterative learning control of the output equation with an integral of nonlinear input term. As a result, convergence analysis results for several classes of learning laws with local average operator are given. In the end, some illustrative examples are given to illustrate our results.

Title: System Identification and Model Predictive Control of Vortex Shedding Behind a Rotating Cylinder
Speaker: Shengze Cai (Zhejiang University)
Abstract: In this report we present an approach for modeling and control of the unsteady flow over a circular cylinder at a low Reynolds number (Re = 60). Actuation is achieved by rotating the cylinder and the measured variable is the vertical velocity at a specific point of the center line behind the cylinder. Instead of using the Navier-Stokes equation (NSE) for control synthesis, a linear ARMAX (Auto Regressive Moving Average with eXogenous inputs) model for this flow system is derived by a system identification method based on input-output data sequences, which are collected from the computational fluid dynamics (CFD) software FLUENT. The models identified for Reynolds number Re = 40 and Re = 60 both fit the flow dynamics with an acceptable accuracy. Even when the Reynolds number varies over a small range, the linear models still work, since the changes are considered as an external disturbance for the identified system. After model validation, a model predictive controller is designed to suppress the actual vortex shedding. The closed-loop control procedure is implemented using collaborative simulation between MATLAB and FLUENT, and the results show that the proposed control strategy can effectively reduce oscillations in vortex wakes.

Title: H_∞ control for networked control systems via free-matrix-based integral inequality
Speaker: Shenping Xiao (Hunan University of Technology)
Abstract: In this paper, we aim at deriving a less conservative H stability criterion for networked control systems (NCSs) with state delay. By employing the auxiliary function-based integral inequalities and the free-matrix-based integral inequality, some novel stability and stabilization conditions are formulated based on LMI approach. Subsequently, we derive a robust H_∞ stability condition for NCSs. Finally, three numerical examples demonstrate the validity and advantage of the methods.

Title: A rapid computational optimization method for model reduction based on POD
Speaker: Shichao Zhou (Zhejiang University)
Abstract: Model reduction has been commonly used in many computationally intensive applications especially in control design procedures. Proper Orthogonal Decomposition (POD) with Galerkin projection is a tractable method to represent a large-scale system through a

relatively lower-dimensional model. To improve the accuracy of the reduced model, we use an optimal control frame-work to search a projection basis with lower prediction error than the POD modes. A rapid computation approach is also proposed to reduce the computational cost of the nonlinear constrained optimization.

Title: Optimal control for zinc electrowinning process depending on electricity variation
Speaker: Shijun Deng (Cental South University)
Abstract: Zinc electrowinng is an important step in zinc hydrometallurgy. Because of its complex reaction mechanism and dynamic characteristics, human supervision with low level control is not sufficient to keep the stable and optimal operation of zinc electrowinning process. This paper presents an optimal control strategy of zinc electrowinning process. The control strategy consists of process monitoring unit, current density setting unit, ratio of acid to zinc (RAZ) setting unit and ow rate controller. When the process is at the stable state, economical optimization is conducted by allocation suitable RAZ. Moreover, to solve the control problem of RZA caused by the time-sharing power supply mode during the switching period of electricity, an optimal control strategy with pre-regulating has been proposed. The industrial experiment shows that by using the proposed optimal control strategy, energy consumption can be reduced while the stability of zinc electrowinning process can also be improved in predefined ranges.

Title: A rapid computational optimization method for model reduction based on POD
Speaker: Shuai Huang (Central South University)
Abstract: In this paper, a new spectral residual method is proposed to solve large-scale nonlinear system of equations, where the step length is obtained by minimizing the square residue of the nonlinear equations. Especially, for strictly convex quadratic function, locally Q-linearly convergence of the method is established. Combined with a new nonmonotone line search strategy, a new derivative-free algorithm is developed. Under mild assumptions, global convergence is proved for locally Lipschitz continuous nonlinear system. Compared with the state-of-the-art algorithms available in the literatures, the new algorithm is more efficient to solve some large-scale benchmark test problems.

Title: The analysis for video data based on ant colony algorithms
Speaker: Shuangyun Xing (Shenyang Jianzhu University)
Abstract: There is a practical demand to determine the missing date and location of the video. There have been many published articles describing solar position algorithms for solar radiation applications. This paper utilizes the solar position to analyze the changes of the shadow in the video to determine the location and date of the video. This paper extracts the information of the video to obtain the coordinate of the vertex of the shadow. With the analyzing of the information of the coordinate of the vertex of the shadow, this paper introduces two parameters to determine the location and the date of the video. The first parameter is the changes of the length of the shadow, which can be used to determine the changes of the solar zenith angle. The second parameter is the changes of the angle of the shadow, which can be used to determine the changes

of the solar azimuth angle. We apply the ant colony algorithms to search the possible area to improve computation efficiency and the accuracy of results. At last, this paper analyzes a specific video to test the mathematical model and the intelligent algorithm.

Title: Rapid control for the Transmission of Ebola virus disease
Speaker: Shuangyun Xing (Shenyang Jianzhu University)
Abstract: The outbreak of Ebola virus disease (EVD) in West Africa caused a great concern of the international community and the panic of people. It is particularly important to establish a highly efficient medicine delivery system and control the transmission of EVD. Firstly, in order to determine the delivery route and locations, through applying Floyd algorithm, an optimal route of drug delivery routes is proposed. In addition, we select a general scope of airports by risk evaluation, and then, one optimal airport as the starting point of transportation is given. Secondly, we build a SVIR epidemic model, which accords with the transmission mechanism of EVD. Our model limits the number of patients under treatment through the quantity of vaccine and medicine. By this model, the relationships among the spread of disease,speed of manufacturing about the vaccine or drug and the quantity of the medicine needed are clarified. Hence, our study provides an effective method to eradicate EVD to some extent.

Title: Optimal Harvesting of Two Symbiotic Populations in Toxin Environment
Speaker: Shuanghong Zhang(Northeastern University)
Abstract: Symbiosis is the beneficial relationship between the different two or three close contact creatures, and there are many kinds' forms of the symbiosis. Some symbionts needed a symbiotic relationship to sustain life is called obligate symbiosis;and some symbiotic relationship only increases the chances of commensal organism survival, but is not required, this symbiosis is called facultative symbiosis. Facultative symbiosis is common in aquaculture. A variety of fish is usually hybrid breeding to protect the water quality, optimize production, and etc.
In aquaculture, on the one hand, algae can be certain of farmed fish food. On the other hand, the transition growth algae will cause lack of oxygen of breeding environment, and then suffocate the fish. At the same time, the toxicity of some toxic algae will cause the farmed fish poisoning then to death, which bring huge economic losses.
In this article, based on the above actual situation of the aquaculture industry,symbiotic biological growth model in the toxin environment is built. The balance of ecological environment and finite-time stability of the system are discussed. While the fish aquiculture and the elimination of the algae toxin targeted as pollutant source can be carried out simultaneously, an optimal harvesting method is made by the Pontryagin maximum principle, from which a general algorithm of the optimal harvesting solution can be obtained. The stimulation shows the effectiveness of the result.

Title: Socially Optimization of Spectrum Reservation Strategy with Random Retrial Feedback in CRNs
Speaker: Shunfu Jin (Yanshan University)

Abstract: With the development of wireless devices, there has been a dramatic increase in the demand for radio spectrum in wireless communication networks. Cognitive Radio Networks (CRNs) are new networks to improve the utilization of the limited spectrum resource, and spectrum reservation strategy is an effective technology with the aim of conserving the network resources. However, in CRNs, cognition of second users (SUs) is the basic ability in the networks. The SUs interrupted by primary users (PUs) can alter their behavior based on current spectrum environment, therefore, spectrum reservation strategy without considering the retrial feedback of interrupted SUs will be conservative.
For this, in this paper, we propose a spectrum reservation strategy with a retrial feedback in CRNs to improve the quality experience of service for SUs. We build a preemptive priority queueing model with one retrial buffer to capture the stochastic behavior of the system. Then we construct a three-dimensional Continuous Time Markov Chain (CTMC) to represent the system state transitions, and give the transition probability matrix accordingly. By decomposing the solution of steady-state equations for the system into two separate parts, we derive the exact formulas for system capacity and average latency for both kinds of users, SUs and PUs. We also provide numerical experiments to indicate that the system performance is sensitive to aside spectrum ratio. Finally, by trading off system capacity and average latency, we establish individually and socially benefit functions, respectively, and carry out a pricing mechanism in order to oblige the SUs to adopt socially optimal policy.

Title: Multi-robot Formation Control on a Plane via PDE Approach
Speaker: Shuxia Tang (University of California)
Abstract: This paper introduces a methodology for modelling, analysis and control design of a large-scale agent-system. The agents are robots imposed on a fixed mesh-grid communication topology, which can be mapped into a continuous region by treating the robots' identities as a continuum. We model the robots' collective dynamics by partial differential equations (PDEs) whose states denote the position coordinates of robots. A rich family of formation manifolds can be achieved due to a wide variety of the system equilibria governed by the boundary conditions. From PDE analysis, we prove that the tracking error between the desired trajectory and the actual one is bounded provided that the acceleration of the reference orbit is finite. By discretization of the PDE, an easy-implementable leader-follower distributed control law is obtained, in which only the neighbor-range relative information is needed for the follower robots to track and keep the formation. Simulation studies are also provided to demonstrate the effectiveness of the proposed approach.

Title: Least Squares Solution for Discrete Time Nonlinear Stochastic Optimal Control Problem
Speaker: Sie Long Kek (Universiti Tun Hussein Onn Malaysia)
Abstract:In this paper, an efficient computational approach is proposed to solve the discrete time nonlinear stochastic optimal control problem. For this purpose, a linear quadratic regulator model, which is a linear dynamic system with the quadratic criterion cost function, is employed. It is assumed that the output is measurable for both of the real plant and the model used. Since the

structures for the original optimal control problem and the linear model-based optimal control problem are definitely different, an effective matching scheme is therefore necessary required. In our approach, the model-based optimal control problem is reformulated such that the input-output equations could be simply derived. In this relationship between the input data and the output data, the Hankel matrix and the observability matrix are constructed from the model matrices. Further, the sum squares of output error, which is in the quadratic criterion, is defined. In such a way, the least squares problem is introduced, where the differences between the real output and the model output are calculated. Applying the first-order derivative to the sum squares of output error, the necessary condition is then obtained. After some algebraic manipulations, the optimal control law, which is the input data, is analytically produced. By substituting this control policy into the input-output equations, the model out-put is updated. For illustration, an example is studied and the comparison between the least squares solution and the filtering solution is made. As a result, it is found that the model output trajectory is closest to the real output with the minimum value of the sum squares of output error. In conclusion, the efficiency and the accuracy of the approach proposed are highly recommended.

Title: Multi-robot Formation Control on a Plane via PDE Approach
Speaker: Song Wang (Curtin University)
Abstract: In this work we propose an interior penalty approach to a finite-dimensional large-scale Linear Complementarity Problem (LCP) arising from the discretization of infinite-dimensional LCP in financial engineering. In this approach, we approximate the LCP by a nonlinear algebraic equation containing a penalty term linked to the logarithmic barrier function for conventional constrained optimization problems. We show that the penalty equation has a unique solution and establish a convergence theory for the approximate solution. A smooth Newton method is proposed for solving the penalty equation and properties of the Jacobian matrix in the Newton method have been investigated. Numerical experimental results using two non-trivial test examples are presented to demonstrate the rates of convergence, efficiency and usefulness of the method for solving practical problems.

Title: Least Squares Solution for Discrete Time Nonlinear Stochastic Optimal Control Problem
Speaker: Songbin Wu (ShenZhen university)
Abstract: The purpose of this report is to obtain the price of American option in integral representation when the underlying stock price is driven by Geometric Fractional Brownian Motion,in this case ,we take Wick product instead of ItŎ product to circumvent some stochastic analysis puzzle accompanying by modelling in Fractional Brownian Motion .By using fractional(Wick)-ItŎ formula and quasi-martingale to get the integral representation of the American option price:the corresponding European price plus early exercise premium , the result is similar to the standard case,but the optimal exercise boundary is no longer monotonic as the stock price being with long-memory .In the last part,we compare this method with finite difference method.

Title: Algorithms for infinite quadratic programming in Lp spaces
Speaker: Soon-Yi Wu (National Cheng Kung University)
Abstract: We study in finite dimensional quadratic programming problems of an integral type. The decision variable is taken in the L_p space where $1 < p < 1$. In this paper the decision variable is required to have a lower bound and an upper bound on a compact interval. Two numerical algorithms are proposed for solving these problems, and the convergence properties of the proposed algorithms are given. Two numerical examples are also given to implement the proposed algorithms.

Title: Splitting Method for the p-Elastic Net
Speaker: Souhail Chebbi (King Saud University, Saudi Arabia)
Abstract: The lasso of Tibshirani is a popular model for variable selections. The elastic net of Zou and Hastie applies Tikhonov's regularization to the lasso to break some limitations of the lasso in the case where the number of predictors is much bigger than the number of observations, or where a group of variables have pairwise high correlations. We generalize the elastic net by replacing Tikhonov's regularization with a more general l_p-norm regularization which we refer to as the p-elastic net. One difficulty for dealing with the p-elastic net lies in the fact that the l_p-norm raised to the pth power fails to have a Lipschitz continuous gradient. We will discuss fundamental properties of the p-elastic net, and moreover, provide a splitting proximal algorithm for solving the p-elastic net.

Title: A CG-PC Algorithm for Solving Ill-conditioned Trust Region Problem
Speaker: Su Zhang (Nankai University)
Abstract: For solving ill-conditioned trust region problem, we present a new algorithm that is the combination of the Conjugate Gradient (CG) method and the Projection Contraction (PC) method of Levenberg-Marquardt (L-M) type. Some numerical examples show that for ill-conditioned problems, our method is efficient in practice in view of the moderate number of iterations and the cost of each iteration (only one matrix decomposition is required in the whole process). Meanwhile, we also present an inexact version of the method.

Title: LS-SLAM: SLAM with Lebesgue Sampling
Speaker: Tao Han (Zhejiang University)
Abstract: In the traditional SLAM framework, the state estimate is updated at a fixed frequency. However, such an approach can be inefficient because there is no need to update the state estimate when the deviation between two sequential estimates is within the predefined tolerance bound. Thus, an adaptive scheme for frequency updating seems more promising from the point view of computational efficiency. Inspired by the concept of Lebesgue sampling, a new SLAM framework (or LS-SLAM) is proposed, in which the updating frequency is determined in an adaptive manner according to the motion of robot. When the updating frequency of LS-SLAM is inconsistent with the sampling frequency of observational signals, constraints are introduced to synchronize the state estimate updating instants with the observational sampling instants. The

experimental results for an open source dataset show that the introduction of Lebesgue sampling into SLAM can improve the computational efficiency of the algorithm without sacrificing accuracy.

Title: Computational optimal control of water hammer equations
Speaker: Tehuan Chen (Zhejiang University)
Abstract: When liquid flow in a pipeline is suddenly halted, a pressure surge or wave is created within the pipeline. This phenomenon, called water hammer, can cause major damage to pipelines, including pipeline ruptures. In this paper, we model the problem of mitigating water hammer during valve closure by an optimal boundary control problem involving a nonlinear hyperbolic PDE system that describes the fluid flow along the pipeline. The control variable in this system represents the valve boundary actuation implemented at the pipeline terminus. To solve the boundary control problem, we adopt the discretize-then-optimize and optimize-then-discretize computational approaches based on the control parameterization method. Then, by using variational principles, we derive formulas for the gradient of the objective function (which measures pressure fluctuation) with respect to the decision parameters. Finally, numerical results demonstrate the capability of optimal boundary control to significantly reduce pressure fluctuation.

Title: Sparse Feedback in Linear Control Systems with l_0-Moreau-Yoshida Regularization
Speaker: Wah June Leong (University Putra Malaysia)
Abstract: A linear quadratic control optimal problem of distributed controllers for interconnected systems is considered. In addition to the standard performance achievements, the feedback matrix that governs the optimal controllers is required to be sparse. For this purpose of promoting sparsity of the resulting feedback matrix we employ l_0-norm minimization within the model problem. To address the algorithmic difficulty caused by the use of l_0-norm, we propose to approximate the l_0-norm by its Moreau-Yoshida regularization and a simplified fixed-point proximity algorithm is constructed to solve the approximated optimization problem. Our numerical examples show that the proposed model problem and the related algorithm can obtain an optimal feedback matrix with higher sparsity.

Title: Optimal Control Problems Arising from a Sterilization Process for Packaged Foods
Speaker: Wei Wei (Guizhou Minzu University)
Abstract: In this talk, we will present optimization problems arising from a sterilization process for packaged foods by using a microwave heating method. The goal of the optimal control is to find the optimal function such that the temperature profile at the final stage has a relative uniform distribution in the food product. Two kinds of mathematics model are introduced, which controlled system is the coupled Maxwell's system and a heat equation.. In linear case, we consider the bang-bang control stage, numerical simulation are illustrated. In nonlinear case, we consider the control variable for the system is chosen to be the electric frequency function. We show that there exists an optimal frequency which minimizes the cost functional. An optimality

condition is also derived.

Title: Dynamic Pricing with Reference Effects Based on a Finite Memory Window
Speaker: Wenjie Bi (Central South University)
Abstract: We consider a dynamic pricing model where the purchase decisions of consumers are affected by a reference price that is updated on the basis of a few previous prices. These prices may include all previous prices in a finite memory window or a weighted average of the first price and the most recent price in the memory window. In contrast with exponential smoothing, we show that first-end anchoring leads to a range of optimal constant pricing policies independent of the initial reference price of consumers if their memory window is finite. This steady-state range becomes wider when consumers are loss averse. We generally show that skimming or penetration strategies are optimal depending on the length of the memory window and initial reference price of consumers. Numerical analysis results show that our model is a more flexible method to create a pricing strategy than the exponential smoothing model if the firm can anticipate the length of the memory window of consumers.

Title: 3-D Filter Bank Wavelet Video Coding Using Face Center Cubic Sampling Geometry, Trained Vector Quantization and Turbo Coding
Speaker: Wing-Kuen Ling (Guangdong University of Technology)
Abstract: There is a great demand on multimedia applications in this decade, such as video conferencing, video telephony, video-on-demand and interactive TV [4]. Those video technologies rely on fast and efficient compression algorithms. Two video compression standards have recently been developed. They are the H.261-H.263 [1],[2] and the MPEG1-MPEG2 [1]-[3]. Those coding schemes divide a video sequence into three different types of frames, namely the I-frame, P-frame and B-frame. The I-frames are processed by the block transform coding. The discrete cosine transform (DCT) is usually employed. Here, the energy is re-distributed in the spectral domain and the pixel values are decorrelated [7]. For the B-frames and the P-frames, they are coded using the motion vectors [1]-[3]. However, there are several drawbacks based on this block transform coding and motion estimation approach. Motion estimation is to find a motion vector that minimizes the error between the block in the current frame and the translated block in the corresponding frame. In fact, this is a nonconvex optimization problem. For a video sequence with fast moving objects or with the presence of non-translational motions such as rotation, zooming and shearing of objects [5], the obtained motion vector is usually a local optimal solution of the optimization problem. In this case, the motion estimation approach cannot yield a good result. In order to obtain a better solution, a full search approach is employed. However, the required computational power is too large for real time applications. To address the drawbacks of the motion estimation approach, a 3-D DCT coding scheme is proposed [4]-[6]. A video sequence is visualized as a volume of data or a 3-D signal. By extending the 2D-DCT to the 3-D DCT, motion estimation is not required. Hence, the drawbacks of the motion estimation approach are avoided [5]. However, the required computational complexity for computing the 3-D DCT is very high. It required a large buffer of memory for the implementation. Like the motion estimation

approach [4], it is not efficient. Also, the drawbacks due to the block transform coding still exist. Hence, it can achieve a high video quality only at a moderate compression ratio [5]. In order to avoid the drawbacks due to the block transform coding, a filter bank wavelet based coding is proposed [7]-[9]. In the filter bank wavelet coding approach, the image is decomposed by the analysis filter bank and it is reconstructed through the synthesis filter bank. Once the analysisnd synthesis filter bank achieves the perfect reconstruction (PR) condition, the liasing due to the downsampling structure is cancelled among various channels. Also, there is no magnitude distortion and phase distortion introduced by the filter bank. In this case, the filter bank behaves as a pure delay gain [7]. Although the required computational power for implementing the filter bank is low and the wavelet based coding supports the scalability multiresolution transmission, the bit rate is high. This is because those algorithms do not enjoy the advantages of 3-D sampling geometry. In this paper, a 3-D filter bank wavelet video coding scheme is proposed. The video sequences are sampled in the face center cubic manner. Then, the wavelet transform is applied. The wavelet coefficients are coded by a trained vector quantizer followed by a turbo coder. It is found that the bit rate is significantly reduced without degrading the video quality.

Title: Necessary and sufficient condition for having incompatible set of maximally decimated matrices with applications to image and video nonuniform decomposition

Speaker: Wing-Kuen Ling (Guangdong University of Technology)

Abstract:It is worth noting that conventional wavelet approaches for processing images and videos are to apply one dimensional tree structure uniform filter banks both horizontally and vertically [3] to the images and videos. In this paper, multidimensional maximally decimated nonuniform filter banks with nonseparable decimation matrices are applied to nonuniformly decompose these images and videos. As the multidimensional maximally decimated nonuniform filter banks with nonseparable decimation matrices can better exploit the frequency characteristics of the images and videos, they play an important role in the image and video coding applications[1], [2]. The condition for one dimensional uniform filter banks to achieve the exact perfect reconstruction is well known [4]. Based on this exact perfect reconstruction condition, many designs of the one dimensional uniform filter banks are proposed [5]. To realize one dimensional nonuniform filter banks, one dimensional uniform filter banks are connected in a tree structure [3]. In this case, the one dimensional nonuniform filter banks could achieve the exact perfect reconstruction if the corresponding one dimensional uniform filter bank in each tree achieves the exact perfect reconstruction. However, the nonuniformity of the one dimensional filter banks is constrained by the corresponding tree structure. There is another kind of one dimensional nonuniform filter banks. They call the one dimensional incompatible nonuniform filter banks. However, they cannot achieve the exact perfect reconstruction [6]. The condition for having compatible sets of maximally decimated integers is derived [7]. This result is extended to the necessary and sufficient condition [8].On the other hand, the exact perfect reconstruction condition for the multidimen-sional uniform filter banks is derived [1], [2]. However, the incompatibility issue in the multidimensional nonuniform filter banks [9] has not been addressed. The paper is to address this issue. In particular, the necessary and sufficient condition of having

incompatible sets of maximally decimated matrices in multidimensional nonuniform filter banks is derived.

Title: Global Behaviors Analysis for Tryptophan Operon System with Bounded Random Noise
Speaker: Xi Zhu (Tianjin University of Technology)
Abstract: Global behavior for stochastic system of Regulation of Bacterial trp Operon is analyzed in this paper. This bioprocess cannot avoid the random perturbation caused by internal and external disturbance which reflect on the cell growth rate on the biosynthesis of tryptophan. These factors can affect the integrated effects of repression and attenuation which lead to the genetic circuit or switch. The equilibriums and bifurcations of the deterministic system are analyzed. Then, a stochastic model is presented by a bounded Markov diffusion process. In order to analyze the global behavior, we compute the control sets through the associated control system. Especially, we compute the hard bifurcation as discontinuous change in the support of a stationary measure. The probability distributions of relative supports are also provided. The results indicate that how the disturbance affects the bioprocess with sustained oscillations.

Title: A two-stage optimization approach for vehicle routing problem with time windows
Speaker: Xiao Hu (Central South University)
Abstract: Vehicle routing problem (VRP) is a typical and important combinatorial optimization problem. It is often involved in many complicate conditions in practice. In this article, the VRP is formulated as an optimization model to minimize the vehicle number and transportation cost under the constraints on loading plan, service time and weight capacity. The transportation cost consists of the fuel cost, the carbon tax owing to carbon emission and the cost from renting vehicles. Since the constructed model is NP-hard problem, a two-stage optimization approach is proposed to find the solution: at the first stage, the number of vehicles is minimized, then with this optimal number of vehicles, the loading plan is optimized at the second stage. Scenario analysis and numerical experiments are employed to show the efficiency of our method.

Title: Sensor Optimization Placement for Health Monitoring Based on Fault Detectability and Trackability
Speaker: xiaodong Tan (Officers College of PAP, Chengdu)
Abstract: Correctly selecting and reasonably arranging sensors are critical to high fidelity health assessment and low testing costs. A novel approach of sensor optimization placement for health monitoring based on fault detectability and trackability is proposed in this paper. Firstly, the requirements of sensor selection for health monitoring, the definitions and calculations of fault detectability and trackability are presented. Thus, a Sensor Optimization Placement Model (SOPM), whose objectives are to maximize the fault detectability and trackability and minimize cost of sensors, is built. Afterwards, an Adaptive Simulated Annealing Genetic Algorithm (ASAGA) is implemented to solve the SOPM. Finally, the real gearboxes and experimental data are used to verify the effectiveness of the SOPM proposed in this paper and its solution. The results from this study have shown that the approach can provide a better strategy for health

monitoring in order to reduce the test cost, improve the reliability and the capability.

Title: Homogeneous multilinear functions on hypergraph cliques
Speaker: Qingsong Tang (Department of mathematics,College of Sciences, Shenyang)
Abstract:Motzkin and Straus established a close connection between the maximum clique problem and a solution (namely graph-Lagrangian) to the maximum value of a class of homogeneous quadratic multilinear functions over the standard simplex of the Euclidean space in 1965. This connection and its extensions were successfully employed in optimization to provide heuristics for the maximum clique problem in graphs. It is useful in practice if similar results hold for hypergraphs. In this paper, we develop a homogeneous multilinear function based on the structure of hypergraphs and their complement hypergraphs. Its maximum value (called generalized graph-Lagranian) generalizes the graph-Lagrangian. Specifically, we establish a connection between the clique number and the generalized graph-Lagrangian of 3-uniform graphs, which supports five conjectures posed in this paper.

Title: Dynamic optimization approach: a novel algorithm framework for global optimization
Speaker: Xiaojun Zhou (Central South University)
Abstract: Global optimization, normally nonconvex optimization, has found wide applications in almost every science and engineering fields. However, due to its NP-hardness, it is impossible to find an exact global solution for this kind of problem in polynomial time. In engineering applications, effort has shifted to find a satisfactory solution in a reasonable amount of time. Nevertheless, getting trapped into local minima is inevitable for global optimization, resulting solutions far from satisfaction. To achieve this goal, in this talk, we will give a novel algorithm framework for global optimization, in which, we will focus on strategies to escape from local minima in a fast and effective way, involving four aspects, i.e., dynamic starting points, dynamic operators, dynamic models and dynamic criteria. Some specific dynamic optimization algorithms based on these dynamic elements are constructed. Effectiveness and efficiency of the proposed dynamic optimization approach are demonstrated by a series of benchmark global optimization problems and engineering application problems.

Title: An iterative algorithm based on positive operator for solving continuous-time stochastic Lyapunov equations
Speaker: Xiaomei Wang (Shenzhen Graduate School, Harbin Institute of Technology)
Abstract: In this paper, an iterative algorithm is established for solving continuous-time coupled Lyapunov equations of It$\hat{o}$ stochastic systems with Markovian jump parameters. The main idea in the proposed algorithm is to use the latest updated information. When the estimate in the current step is updated, the lasted updated information is used. It is shown that the iteration converges to the unique positive definite solutions of the continuous-time coupled Lyapunov equations if the corresponding stochastic system is mean square stable. Moreover, the convergence of the proposed algorithm is analyzed based on positive operator theory. Finally, an

illustrative example is worked out to show the effectiveness of the proposed algorithm.

Title: Numerical methods for pricing European and American options under jump-diffusion model
Speaker: Xiaoting Gan (Tongji University)
Abstract: In this paper, numerical methods are developed for pricing European and American options under jump-diffusion model. Spatial differential operators are discretized using the classical finite volume method on uniform grids, and time stepping is performed using the backward Euler and Crank-Nicolson schemes, respectively. For the evaluation of the integral term, a linear interpolation technique is derived. We show that both the system matrices of the fully discretized systems are M-matrices. When pricing European option, the resulting dense linear systems are solved by GMRES method. In particular, for the American option pricing, we consider the modulus-based successive overrelaxation (MSOR) method for the resulting linear complementarity problems (LCPs). Further, the H+-matrix property of the system matrix which guarantees the convergence of the proposed method is analyzed. Numerical experiments are implemented to show that the developed methods are very efficient and robust.

Title: Improved Artificial Bee Colony Algorithm with Two New Search Equations
Speaker: Ming Zhao (Shenyang Jianzhu University)
Abstract: In this paper, problem that ABC (Artificial Bee Colony) algorithm is good at exploring but poor at exploiting for numerical optimizing is studied, and improved algorithm, TNE-ABC (Artificial Bee Colony Algorithm with Two New Equations), is proposed. In TNE-ABC, employed bee and onlooker bee use distinct new equations to search for optimal solution: employed bee uses current optimal solution and random solutions to guide the searching around its food source, and shortens the range of searching step properly, in order to enhance exploitation while maintaining high exploration; to further enhance exploitation, onlooker bee searches around the center of two solutions selected randomly which guided by current optimal solution to ensure exploitation at its neighbor, and difference of the two selected random solutions whose coefficient is computed by their target function values is added as guiding information into this searching process too, adjusting moving step adaptively while making searching direction moving towards the better one. Experiments results on a set of numerical benchmark functions have demonstrated the effectiveness and efficiency of TNE-ABC. And the comparisons with some other improved ABCs and several state-of-the-art algorithms showed that TNE-ABC has higher convergence and better search ability for almost all functions.

Title: New Delay-dependent robust H-infinity control for uncertain stochastic time-delay systems
Speaker: Xuhuan Xie (Harbin University of Science and Technology)
Abstract: Robust H-infinity control for uncertain stochastic time-delay systems is concerned in the paper. By applying the idea of scalar function and augmented variables, dealing with the positiveness of a functional via the reciprocally convex approach, a novel sample Lyapunov-Krasovskii functional (LKF) which contains more-fold integral terms is established.

Then, by employing Jensen inequality and reciprocally convex approach, the controller gain and H-infinity index are solved by an optimization problem with some linear matrix inequalities constraints. Different from previous results, the theory results not only are less conservative but also have a higher computational efficiency since there is not model transformation method and free-weighting matrix technique in the derivation process. Finally, some examples are provided to show the effectiveness and improvements of the proposed method.

Title: The Asymptotic Properties of Stochastic Differential Systems with Impulsive Effects Suffered by Logic Choice
Speaker: Xin Liu (China University of Petroleum)
Abstract: In this paper, we investigate the asymptotic properties of stochastic differential systems with impulsive effects suffered by logic choice. We use semi-tensor product to get criterions of asymptotic stability and exponential stability in mean square for the provided system.

Title: A Kernel-Free Proximal Quadratic Surface Support Vector Machine for Semi-Supervised Binary Classification
Speaker: Xin Yan (College of Sciences, Shanghai)
Abstract: In this paper, a proximal quadratic surface support vector machine model is proposed for semi-supervised binary classification without using kernel functions.This model can be reformulated as a 0-1 mixed-integer quadratic programming poblem. Semi-definite relaxation is then adopted and a primal alternating direction method is developed for fast computation. We test the proposed model on some artificial and public benchmark data sets. Preliminary results indicate that our method is computational efficient and outperforms some well-known methods for semi-supervised classification in terms of the accuracy of classification.

Title: Fuzzy Multi-objective Programming Approach for Production and Transportation Problems in Sustainable Supply Chain Network
Speaker: Xinbo Zhang (Central South University)
Abstract: This paper proposes a fuzzy multi-objective linear programming model to formulate sustainable supply chain problems under fuzzy environment, where the total costs of production and carbon dioxide emission are simultaneously minimized. Since the maximal capacities of material supply, production and CO2 emission are supposed to be fuzzy parameters in the model, the constructed model is converted into an auxiliary crisp multi-objective linear model (MOLP)by a chance constrained programming approach in the case that the fuzzy sets are of S-curve membership. Then, a novel interactive fuzzy approach is used to solve this MOLP and finding a compromise solution. The proposed model and solution method are validated through an example in reality. Some managerial implications are also drawn from the numerical experiments.

Title: A class of dynamical multi-objective optimization
Speaker: Xing Wang (Jiangxi University of Finance and Economics)
Abstract: In this paper, a class of dynamical multi-objective optimization problems are introduced

and studied infinite-dimensional spaces. By using differential variational inequality as a tool for studying the problem, an existence theorem of the Caratheodory efficient solution of dynamical multi-objective optimization problem is established. Furthermore, a convergence result on Euler time-dependent procedure for solving the dynamical multi-objective optimization problem is given.

Title: Optimal Decision-making for Online and offline Retailers Under BOPS Mode
Speaker: Xingran Chen (Central South University)
Abstract: As a new business form, buy-online and pick-up-in-store (BOPS) mode admits the consumers to pay for the goods online, and pick up it in a physical store. In this paper, an equilibrium model is constructed to formulate the optimal decision-making problem for the online and offline retailers under BOPS mode, where the online retailer determines the retail price of the goods and the consignment quantity in the physical store, while the offline one chooses the revenue share of profit by a consignment contract. Different from the existing models, the cost of overstocking and the loss of understocking are incorporated into the profit objective of the online retailer due to the randomness of the demand, and the objective of the offline retailer takes into account the cross-sale quantity generated by the BOPS mode. Then, the interest game between the online and offline retailers is expressed as a stochastic Nash equilibrium model. On the basis of the analysis on the properties of the model, we find the analytic equilibrium solution of the model. And some interesting findings have been revealed through a case study and sensitivity analysis: (a) Price sensitivity, cost assignment and cross-sale factor have substantial influence on the optimal decisions in the equilibrium system. Specially, the stocking factor only relies on price sensitivity and is not affected by price sensitivity and cross-sale factor. What's more, the extent of influence depends on the values of price sensitivity, cost assignment and cross-sale factor. (b) Whether under the circumstances of price sensitivity changing or cost assignment changing, the lower cross-sale always brings a higher revenue share and a higher retail price. In other words, the revenue share and the retail price increases with the cross-sale factor. (c) The online retailer prefers to offer a higher optimal retail price even if the offline retailer undertakes a larger cost assignment. The reason lies in that if the offline retailer undertakes a larger proportion of the cost, the online retailer will gain less profits from the consignment goods sold by offline one. (d) The expected profits of the online and offline retailers decrease with cross-sale factor. A lower cross-sale factor is helpful to give rise to larger profits of both online and offline retailers.

Title: An interior-point primal-dual method with rapid infeasibility detection for nonlinear programs
Speaker: Xinwei Liu (Hebei University of Technology)
Abstract: We present an interior-point primal-dual method for nonlinear programs. Without assuming complementarity or its relaxation, this method uses a new system of primal-dual nonlinear equations, which depends on both the penalty parameter and the barrier parameter. The search directions are derived from applying the Levenberg-Marquardt approach to the system, and the residual functions are used to guarantee the global convergence. As a result, our method

can produce interior-point iterates without truncation of the step, which is entirely different from the current primal-dual interior-point methods in the literature. Our method has strong global convergence. Locally, it can not only be rapidly convergent to the Karush-Kuhn-Tucker point, but also be rapidly convergent to the infeasible stationary point. Preliminary numerical results show that the method is efficient in solving some simple but hard problems, and some standard test problems from the CUTE collection.

Title: Study on the Supply Chain Financing Decision and Its Coordination Considering Fairness Preference
Speaker: Xiudong Pan (Central South University)
Abstract: This paper introduced fairness preference into Stackelberg game model and studied its effect on the decision of the financing and coordination of the supply chain. The study found that (1) when the market demand and unit production cost meet certain conditions, there is a threshold and when the degree of the retailer's fairness preference is higher than the threshold, the manufacturer will refuse to provide trade credit and set the highest wholesale price, as a result that the retailer can only finance from bank, leading to a double marginalization. When the degree of the retailer's fairness preference is higher than the threshold, the manufacturer will offer trade credit and the double marginalization will be eliminated. (2) In the case of whichever form of financing, the retailer's bargaining power is enhanced as the degree of the retailer's fairness preference increases below the threshold. (3) In the case of whichever form of financing, the acceptable wholesale price for the retailer is positively related to the unit cost of production, and this relationship is enhanced with the increase of the degree of the retailer's fairness preference. In conclusion, this paper proves that the retailer's fairness preference affects the financing decisions as well as the coordination of the whole supply chain.

Title: Exponential Stability and L2-gain Analysis for Discrete-Time Switched Systems With Time-Varying Delays
Speaker: Honglei Xu (Curtin University)
Abstract: We will study stability and L2-gain problems for a class of discrete-time switched systems with time-varying delays. Less conservative sufficient conditions are derived using a set of numerical feasible linear matrix inequalities (LMIs) and a mode-dependent average dwell time approach. Furthermore, the results are extended to analyse L2-gain performance for discrete-time switched delay systems. Finally, two numerical examples are provided to demonstrate the validity and less conservatism of the obtained results.

Title: Preventive Replacement Policies for Aging Failure and Third-part Damage
Speaker: Xufeng Zhao (Qatar University)
Abstract: In general, corrosions, degrading the mechanical strength of pipelines gradually with its age in a stochastic way, is the predominant cause of pipeline leaks. On the other hand, the third-part damage is the leading cause of pipeline ruptures, which occurs randomly in a statistical sense. Naturally, corrective replacement (CR) is done immediately when the pipeline is subjected

to a random failure resulting the loss of productivity. To reduce the failure probabilities, preventive replacement (PR)policies are scheduled (i) at a planned time T ($0 < T \leqslant \infty$) of operation, which is a classical policy called age replacement, (ii) at the Nth (N = 1; 2;…) cycle of aging, where intervals for aging cycles are random variables Yn (n = 1; 2; …), (iii)at a number K (K = 1; 2;…) of damages, in order to monitor the fatal third-part damages. Policies (i) and (ii) are taken to meet the failure due to aging from both determinate and indeterminate viewpoints, meanwhile, policy (iii) is planned to monitor the failure caused by the third-part damage. That is, the pipeline should be replaced preventively before failure at T, N, or K, whichever takes place first. We model the above PR policies, using the renewal theory in reliability, and obtain their optimal solutions analytically to minimize the expected replacement cost rates.Finally, numerical examples are given to compare these policies.

Title: Nonsmooth vector optimization and vector variational inequalities using covexificators
Speaker: Yadvendra Singh (Banaras Hindu University)
Abstract: In this paper, we consider a vector optimization problem and vector variational inequalities involving locally Lipschitz functions. We formulate vector variational inequalities of Stampacchia and Minty type in terms of convexificators and use these vector variational inequalities as a tool to find out necessary and sufficient conditions for a point to be an efficient solution of the vector optimization problem. Examples are given to illustrate the obtained results.

Title: q-ball projection gradient method for quadratic compressed sensing
Speaker: Ailing Yan (Hebei University of Technology)
Abstract: In this paper we study the so-called quadratic compressive sensing which extends the usual compressive sensing. We employ the lq($0 < q < 1$)-ball constrained least squares method to find the sparse signal. By the majorization method, We derive a fixed point equation and then use it to construct a q-ball projection gradient algorithm for numerical optimization. Moreover, we also discuss the convergence of the sequence generated by the algorithm.

Title: Financing mode innovation of internet finance platform based on double principal agent
Speaker: Yang Mei (Central South University)
Abstract: Dual asymmetry information makes the allocation of resources are always not the optima in the traditional finance environment, resulting in the traditional investment institutions gradually narrowing their profit margins. Under the background of Internet finance, this paper considers introducing Internet finance service platform (E-commerce platform) extended from the traditional investment and financing model which is composed of investment institutions and SMEs, as well as applying the principal-agent theory, to construct a new type of indirect investment and financing incentive model of tripartite participation. Applying this model, it compares the income structure of the main participation in the traditional financing model with that in the Internet financial investment and financing mode. And by numerical simulation it further analyzes the impact of key parameters on the investment income and incentive contract. The results show that: when the Operational capability of SMEs is at a low level, the introduction

of Internet finance service platform (E-commerce platform), can effectively alleviate the problem of adverse selection and moral hazard caused by asymmetric information between the investment institutions and SMEs. Thereby the return of investment can be significantly improved while reducing the threshold for SME lending.

Title: Adaptive scheduling H-infinity control for nonlinear stochastic systems with nonhomogeneous process
Speaker: Yanqing Liu (Jiangnan University)
Abstract: An adaptive scheduling H-infinity controller design is considered for a class of nonlinear Markov jump systems with nonhomogeneous Markov jump process, which is modeled as being enclosed by a polytope set. The nonlinearity is linearized at each operating state through gradient linearization procedure. Then, a cluster of stochastic linear models are constructed in the vicinity of selected operating states. By applying Lyapunov stability theory, sufficient conditions are derived for the design of a controller such that the corresponding closed-loop system is stochastically stable and a prescribed H-infinity performance index is satisfied. Finally, a continuous gain-scheduling approach is employed to design a continuous time-varying controller for the original nonlinear Markov jump system. Conditions are formulated and solved as a constrained optimization problem with linear matrix inequality (LMI) constraints. A simulation example is given to illustrate the effectiveness of the approach proposed.

Title: Constrained model predictive control for Markov jump system with disturbances
Speaker: Yanyan Yin (Jiangnan University)
Abstract: This study is concerned with model predictive control (MPC) for a class of discrete-time Markov jump system with disturbances. A synthesis method to design robust model predictive controller is proposed by considering H2=H1 performance index, a serious of sufficient conditions are obtained which guaranteeing the stability of system, meanwhile satisfying the constraints. Finally, a numerical example is presented to illustrate the effectiveness of the developed results.

Title: Probabilistic Controller Design for Stochastic Systems by Scenario Optimization
Speaker: Yanyan Yin (Jiangnan University)
Abstract: The problem of probabilistic robust stabilization controller design for a class of uncertain continuous-time Markov jump systems will be addressed, which is represented in the form of minimizing a linear objective subject to convex constraints. By sampling the constraints parameterized by uncertain system parameters, it is transferred into a standard convex scenario problem, where with the increasing number of samples, the violated set rapidly decreases to zero, and then, a bound on the number of samples required to attain a-priori specified levels of probabilistic are given to guarantee the probabilistic robustness. Based on these, sufficient conditions are derived for the design of a probabilistic controller such that the corresponding closed-loop system is robustly probabilistically stochastically stable. A simulation example is given to illustrate the effectiveness of the approach proposed.

Title: Numerical algorithms for convex composite optimization with applications
Speaker: Yaohua Hu (College of Mathematics and Statistics, Shenzhen)
Abstract: In this paper, we investigate a linearized proximal algorithm (LPA) for solving a convex composite optimization problem. Each iteration of the LPA is a proximal minimization on the composition of the outer function and the linearization of the inner function at current iterate. The LPA has the attractive computational advantage that the solution of each subproblem is a singleton, which avoids the difficulty of finding the whole solution set of the subproblem, as in the Gauss-Newton method (GNM), while it still maintains the same local convergence rate as that of the GNM.Under the assumptions of local weak sharp minima of order p (p 2 [1; 2]) and the quasi-regularity condition, we establish the local superlinear convergence rate for the LPA. We also propose a globalization strategy for the LPA based on the backtracking line-search and an inexact version of the LPA, as well as the superlinear convergence results. We further apply the LPA to solve a feasibility problem, as well as a sensor network localization problem. Our numerical results illustrate that the LPA meets the demand for an efficient and robust algorithm for the sensor network localization problem.

Title: Derivative Feedback Guaranteed Cost Control for a Class of Descriptor Biological Systems
Speaker: Yi Zhang (University of Technology, Shenyang)
Abstract: This paper focuses on the guaranteed cost control problem via derivative state feedback for a class of norm-bounded nonlinear descriptor biological systems with parameter uncertain and external disturbance, of which the systems parameters, including derivative matrix have norm-bounded perturbations. Design method of robust guaranteed cost control is proposed. Under the fact that derivative matrix is rank-invariant, perturbations in the derivative matrix can be described in a new two forms. We transform nonlinear biological descriptor system into linear one using Differential Mean Value theorem. Then based on the Lyapunov stability theorem and linear matrix inequality technique, we transform the robust stability problems into LMI feasible solution problem using approximate linearization method and design robust guaranteed cost controller so that the resultant closed loop system not only is robustly asymptotically stable and satisfies the corresponding performance indexes for all the admissible uncertainties and external disturbances but also is regular and impulse-free. Besides, sufficient conditions to the existence of robust guaranteed cost controller of the system are obtained, and simulation results are given to verify the effectiveness of the proposed method.

Title: A System of Time-Dependent Hemivariational Inequalities with Volterra Integral Terms
Speaker: Yi-bin Xiao (University of Electronic Science and Technology of China)
Abstract: In this talk, we consider a system of time-dependent hemivariational inequalities with Volterra integral terms by using a surjectivity theorem for pseudomonotone operators and the Banach fixed point theorem, rather than the KKM theorems used by many researchers in recent literature for systems of hemivariational inequalities. Under some suitable conditions, the existence and uniqueness result of solution to the problem considered is obtained by proving that

a derived vector inclusion problem with Volterra integral term is solvable.

Title: A Kind of New Consensus Protocol for Two-Dimension Multi-Agent Systems
Speaker: Yibo Zhang (Zhejiang Sci-Tech University)
Abstract: A kind of new consensus protocol for two-dimension multi-agent system(MAS) is proposed. First, after describing MAS and its dynamic, the conventional protocol is introduced. And some character is analyzed. Secondly, a kind of two-dimension MAS system is adopted, and its dynamic equation is proposed. Then a new protocol based on Laplacian matrix is adopted to take account plate dynamic character of multi-agents. By introducing several parameters, dynamic characters of multiagents are controllable. According to two kinds possible roots of Laplacian character equation, two lemmas are put up to show consensus asymptotical conditions respectively. Furthermore, convergence conditions under different parameters are analyzed. Several simulating examples illustrate that consensus are achieved if the convergence conditions are satisfied.

Title: Spherical Section Property for Matrix Schattern-p Minimization
Speaker: Yifu Feng (Jilin Normal University)
Abstract: Low-rank matrix recovery is a hot issue with various applications in recent years. Unfortunately, the original mathematical problem is NP-hard. One of the popular methods to handle this is to relax low-rank matrix recovery problem into a computable optimization problem. In this paper, we consider one nonconvex relaxation of the original problem and discuss the conditions to guarantee the equivalence between the original problem and its nonconvex relaxation. Specifically, we propose a null space analysis named Spherical Section Property for exact recovery via the Schattern-p minimization ($0 < p < 1$).

Title: A computational approach to optimal control problems with almost smooth controls
Speaker: Ying Zhang (Zhejiang Normal University)
Abstract: In this paper, we consider a class of optimal control problems involving continuous control and state inequality constraints where the control is almost smooth. We first employ the control parametrization technique that vias approximating the control signal by a piece wise linear function. Then, we develop a time scaling transformation procedure for transforming the approximate problem into an equivalent problem that can be solved readily using conventional methods. On this basis,a novel exact penalty function is constructed by appending penalized constraint violations to the cost function. The gradient formulas and convergent properties ensure that the transformed unconstrained optimal parameter selection problems can be solved by existing optimization algorithms or software packages. Finally, an example is solved showing the effectiveness and applicability of the approach proposed.

Title: Bi-level Programming Approach to Optimal Decision-making for VMI Problems under Random Demand
Speaker: Yinxue Li (Central South University)

Abstract: In this paper, we present an extension to the VMI problems by taking into consideration the advertising and pricing policies. In the model of the VMI supply chain, the profits of a manufacturer and multiple retailers are maximized, assuming that the manufacturer procures many kinds of raw materials to produce one type of finished products and supplies them at the same wholesale price to the retailers, while the retailers sell the products in independent markets at a retail price. Diffierent from the existing results available in the literature, the demand of each market in this paper is supposed to depend on the retail price and advertisement policies of the manufacturer and retailers, and is of a random nature. Consequently, the optimization model for the VMI supply chain management is a stochastic bi-level programming problem, where the manufacturer is the up-level decision-maker and the retailers are the lower-level ones under random demands. By expectation method, we first transform the stochastic model into a deterministic model, then from the optimality conditions, the bi-level programming problem is converted into a mathematical program with complementarity constraints (MPCC). In virtue of a locally smoothing approach, an approximate solution of the MPCC is obtained by the standard smooth optimization techniques. Numerical experiments are employed to reveal some managerial implications from the constructed model.

Title: The Optimal Experiment Design of a Class of Industrial Nonlinear Dynamic System with State Delay

Speaker: Yiting Liang (Central South University)

Abstract: Quite a number of industrial processes can be described by nonlinear dynamic systems with state delay. The identification of model parameters is the premise behind model-based process control of the processes. Via optimizing the experiment conditions, Process information can be maximized to the greatest extent, but little research has been done to the optimal experiment design for dynamical systems with state delay. This paper focuses on the model-based design of experiment for the type of systems. First of all, model-based experiment design issue is transformed to a nonlinear mixed integer programming problem, and further a nonlinear programming problem; Second, considering that the evaluation of the Information criterion require the gradient information of measured variables against the parameters to be estimated, the sensitivity equations are presented. Simulations show that the method is feasible for experiment design, and it effectively improves the identification precision.

Title: Semantic Regularized ICP Algorithm

Speaker: Yiyi Liao (Zhejiang university)

Abstract: The Iterative Closest Point (ICP) algorithm is a fundamental technique in the community of robotics, as it provides geometric alignment between point clouds for further applications such as the Simultaneously Localization and Mapping. Many variants of ICP algorithms have been proposed with respect to low-level information (e.g. distribution of normals), while the high-level information (e.g. per-pixel object classification) has the potential to provide more robust alignment. In this paper, we propose a semantic regularized ICP algorithm, which takes advantage of the object-level knowledge provided by semantic segmentation. More

specifically, we first implement the semantic segmentation based on the Convolutional Neural Networks using RGB-D image pairs, and then project the semantic knowledge to the point cloud, on which the ICP algorithm is optimized with the constraints of the semantic knowledge. Experimental results suggest that our semantic regularized ICP algorithm achieves superior performance than the comparing approaches.

Title: Applications of Stochastic Differential equations in Asset pricing and management
Speaker: Yonghong Wu(Curtin University)
Abstract: Stochastic differential equations have played a very important role in the study of many complex phenomena in financial market. This talk will first give an overview of our recent work in the study of stochastic differential equations in various problems, and then will focus on the application in asset pricing and management. Methods for the solution of the underlying optimization problem and nonlinear differential equations will be presented and discussed in the talk.

Title: A Generalized Partly Augmented Lagrange Method for Sloving Mathematical Programs with Equilibrium Constraints
Speaker: Yu Chen (Guangxi Normal University)
Abstract: Based on the primal-dual augmented Lagrange function, we propose a generalized partly augmented Lagrange method for solving mathematical programs with equilibrium constraints. In virtue of this method, the quality of dual variables is controlled during the solution of the subproblem, and dual estimation is improved on early termination of the subproblem. It is proved that any an accumulation point of the stationary point sequence generated by the proposed method is a strongly stationary point of the original problem under mild conditions. Preliminary numerical results have shown the efficiency of the proposed method.

Title: Existence and stability of solutions for a class of generalized vector equilibrium problems
Speaker: Yu Han (Sichuan university)
Abstract: In this paper, two existence theorems concerning the strong efficient solutions and the weakly efficient solutions of generalized vector equilibrium problems are derived by using the Fan-KKM Theorem and an existence theorem for the efficient solutions of generalized vector equilibrium problems is established by using the scalarization method. Moreover, the lower semicontinuity of the strong efficient solution mapping and the weakly efficient solution mapping to parametric generalized vector equilibrium problems are showed under suitable conditions with neither monotonicity nor any information of the solution mappings. Finally, some applications to the vector optimization problems and the Stackelberg equilibrium problem are also given.

Title: Performance Analysis and Optimization of Cognitive Radio Networks with Retransmission Control
Speaker: Yuan Zhao (Northeastern University)
Abstract: In cognitive radio networks, the secondary users (SUs) can make opportunistic use of

the licensed spectrum. However, because there is an absolute priority of the primary users (PUs), the transmission of the SUs may be interrupted by the PUs. In usual, to reduce the loss rate of the SU packets, the interrupted SU packets will return back to the SU buffer for retransmission later. But this may increase the average delay of the SU packets and therefore interference the transmission of the PU packets. In this paper, we propose a novel spectrum sharing strategy (SSS) to control the retransmission of the SU packets dynamically by introducing a retrial threshold and a retrial probability, to control the retransmission of the SU packets and guarantee the Quality of Service (QoS) for the SUs at the same time. In this SSS, when the transmission of an SU packet is interrupted, if the number of SU packets already in the SU buffer is smaller than a retrial threshold that will be set in advance as a system parameter, this interrupted SU packet is admitted to return to the SU buffer with probability 1; Otherwise, this interrupted SU packet is admitted to return to the SU buffer with a dynamic retrial probability, which is inversely proportional to the total number of packets in the system. Based on the SSS with retransmission control proposed in this paper, we build a discrete-time preemptive priority queueing model to comply with such digital nature of modern networks. Accordingly, by presenting and analyzing a two-dimensional discrete-time Markov chain represented the system state transition, we obtain the steady-state distribution of the system and then provide the formulas for several performance measures of the SU packets, such as the blocking probability, interrupting probability, throughput and average delay. Moreover, with numerical results, we show the influence of the retrial threshold on different performance measures. Finally, by building a net benefit function, we make optimization of the system performance for the retrial threshold to balance different system performance measures.

Title: Parameter identification techniques applied to an environmental pollution model

Speaker: Yuepeng Wang (Nanjing University of Information Science and Technology)

Abstract: The retrieval of parameters related to an environmental model is explored. Some computational challenges occur due to a significant numerical difference of up to two orders of magnitude between the two parameters we aim to retrieve. First, the corresponding optimization problem is of poorly scaled, such that minimization algorithms that fail to address it will perform poorly (see Gill et al., practical optimization, AP,1981,401pp). This can be solved by proper rescaling. Difficulties also arise from and are induced by the strong nonlinearity and the ill-posedness which means that the parameters do not converge to a single deterministic set of values, but rather there exists a range of complementary parameter combinations that produce the same model behavior. We will address these computational issues by resorting to the addition of a regularization term in the cost function. All these computational approaches are easily addressed in the framework of variational adjoint assimilation. The used observational data are derived from numerical simulation results located only at two spatial points. The effect of different initial guess value of parameters on retrieval results is also considered. As indicated by results of numerical experiments, the method presented in this paper achieves a near perfect parameter identification, and overcomes the indefiniteness that may occur in inversion process even in the case where we deal with noisy input data.

Title: Discussing on the Relationship Between the Stabilities of two Different Stochastic Differential Equations via the Theory of Weak Solution
Speaker: Yuyun zhao (China University of Petroleum)
Abstract: In this paper, we discuss the relationship between the stabilities of two die rent stochastic differential equations. We present an approach to talk about the stochastic stability in a new view of nite-dimensional distribution of solution. We show that if two continuous stochastic processes have the same finite-dimensional distribution, then their future trend of development will coincide in some sense. Then using this result together with the weak uniqueness of weak solution, we obtain the theorems to judge wether two different stochastic differential equations have the same stability.

Title: A Class of Global Fractional-order Projective Dynamical Systems with Delay and Perturbation
Speaker: Zengbao Wu (Sichuan University)
Abstract: In this paper, some existence and uniqueness of the solutions for a new class of global fractional-order projective dynamical systems with delay and perturbation are proved by employing the Krasnoselskii fixed point theorem and the Banach fixed point theorem. Moreover, an approximating algorithm is also provided to find a solution of the global fractional-order projective dynamical systems. Finally a numerical example is presented to demonstrate the validity of the results presented in this paper.

Title: Binary Artificial Algae Algorithm for Multidimensional Knapsack Problems
Speaker: Xuedong zhang (Anhui University of Finance &Economics)
Abstract: The multidimensional knapsack problem (MKP) is a well-known NP-hard optimization problem. Various meta-heuristic methods are dedicated to solve this problem in literature. In this paper, we will propose a novel binary artificial algae algorithm to solve this problem. This algorithm is composed of discrete process, repair operators and elite local search. To demonstrate the efficiency of our proposed algorithm, simulations and evaluations are carried out over 84 benchmark instances and compared with many exiting meta-heuristic algorithms published in the recent years. The results show the superiority of BAAA to many compared existing algorithms.

Title: Decomposition-Based Multi-Objective Firefly Algorithm for RFID Network Planning with
Speaker: Chuanxin Zhao (Anhui Normal University)
Abstract: Radio frequency identification (RFID) is widely applied in industry and logistics for item identification or tracking. Due to the limited range of communication between reader and tag, how to deploy a RFID system in a large area is important and challenging. Different from existing approaches based on deterministic identification model, we will study a multi-objective network planning problem based on probabilistic model for RFID identification and develop a new multi-objective firefly algorithm to solve this problem. The decomposition mechanism is adopted to optimize three objectives at the same time. In order to improve the individual firefly

performance, virtual force is combined for its updating. The experimental results show that our proposed method to this multi-objective optimization problem is superior to NSGA-II and MOPSO in terms of tag coverage and interference level.

Title: On power penalty methods for linear complementarity problems arising from American option pricing
Speaker: Zhe Sun (Jiangxi Normal University)
Abstract: Power penalty methods for solving a linear parabolic complementarity problem arising from American option pricing have attracted much attention. These methods require us to solve a series of systems of nonlinear equations (called penalized equations). In this paper, we first study the relationships among the solutions of penalized equations under appropriate conditions. Additionally, since these penalized equations are neither smooth nor convex, some existing algorithms, such as Newton method, cannot be applied directly to solve them. We shall apply the non-linear Jacobian method to solve penalized equations and verify that the iteration sequence generated by the method converges monotonically to the solution of the penalized equation. Some numerical results confirm the theoretical results and the effectiveness of the proposed algorithm.

Title: Financing Decisions for Financing decisions for confirming warehouse with core enterprise’s buyback guarantee with Core Enterprise’s Buyback Guarantee
Speaker: Zhen Ma (Central South University)
Abstract: In the supply chain, consisting of a single retailer and supplier, considering the retailer’s bankruptcy probability, the supplier buys back a certain percentage of unsold products and retailer takes the acceptance draft as a settlement tool to finance products. we analyze the optimal decisions of the retailer’s order quantity, suppliers buyback rate and the bank’s interest rate. Through numerical examples, we know the increase of the buyback rate can encourage the retailer to order and improve the profit of the supply chain. However, changes of the buyback rate to the bank’s profit is greatly influenced by retailer’s bankruptcy probability. Higher buyback rate can stimulate creditworthy retailer to order more, and thus increase the bank’s profit. To poor credit retailer, the increase of order quantity will make bank a greater probability to suffer from loss, with expected profit reducing at the same time.

Title: Optimal Ordering Model of Two-product by Loss-averse Retailer with Information Updating
Speaker: Zhen Shen (Central South university)
Abstract: In this paper, we establish a two-product ordering model for a loss-averse retailer with information updating to solve the multi-product newsvendor problem with a long lead time and a short sale season. we derive the value functions as well as the subjective probability functions and decision weighting functions for different supply-and-demand relationships. The numerical analysis reveals how psychological reference point, loss aversion coefficient and product demand information value impact a loss-averse retailers optimal order policy, including optimal ordering quantity and optimal ordering time. We find that the optimal order quantities of both high-risk

product and low-risk product are closely related to the loss-averse retailers risk-attitude. The retailers optimal ordering quantity for high-risk products is more sensitive with respect to psychological reference points when compared with low-risk products, and hence the corresponding demand information is more valuable for the retailer. The optimal ordering times for both products are not obviously affected by retailers psychological reference points, however, they will be delayed as the loss aversion coefficient increases.

Title: An empirical study of the influence of the player's attributes and the advertising attributes on the impact of the in-game-ads clicks
Speaker: Zhenlu Zhang(Central South University)
Abstract: Using the structural equation model, this paper explores the main factors that affect the behavior of players to the in-game-ads(IGA), and briefly analyzes how these factors affect the commercial value of the IGA. In this paper, the two questionnaires were collected, the object of the study were college students and all kinds of mobile games players. Survey results show that the players' behavior to IGA is affected by the attributes of players and attributes of advertising: in terms of players' attributes, the players' mobile games experience and online time has a significant impact of the IGA; The pleasure, frequency, reliability, relevance has a significant impact of the IGA. There is a difference between IGA to traditional mobile advertising, the results of this survey show that the impact of customized hasn't a significant impact of the IGA.

Title: Sparse and Robust Markowitz Mean-Variance Portfolio Selection problem
Speaker: Zhifeng Dai (Changsha University of Science and Technology)
Abstract: Mean-variance portfolios have been criticized because of unsatisfying out-of-sample performance and the presence of extreme and unstable asset weights. The bad performance is caused by estimation errors in inputs parameters, that is the covariance matrix and the expected return vector, especially the expected return vector. Recently, by imposing regularization term to objective function or additional norm-constrained in portfolio selection problems, a number of alternative portfolio strategies are proposed. However, these models belong to minimum-variance portfolio model which delete the mean return in Markowitz mean-variance portfolio selection problem. In this paper, we propose some sparse and robust mean-variance portfolio selection models where we use robust optimization to deal with the mean return. Finally, empirical studies are proposed with real market data.

Title: Fireworks Algorithm for Markowitz Portfolio Optimization
Speaker: Zhifeng Liu (Hainan University)
Abstract: Portfolio selection is one of the most important topics in the field of modern finance, which deals with the problem of how to seek an optimal capital proportion of assets. As a field of research, it began with the pioneering work of Markowitz (1952)[1], who proposed the mean-variance (M-V) model and thus formulated the fundamental portfolio framework. Markowitz's portfolio selection model is a nonlinear programming problem, and many techniques have been applied to solving this optimization problem. In recent years, some well-known swarm

intelligence algorithms (SIA), e.g. genetics algorithm (GA), particle swarm optimization (PSO), etc., have become popular among scholars working on portfolio optimization problems[3, 4, 5], which have been confirmed to be very effective and usually outperform the traditional algorithms. Fireworks Algorithm (FWA), inspired by observing fireworks explosion, is a novel swarm intelligence algorithm which was proposed by Tan and Zhu (2010)[2] and becomes popular in recent years. As a new swarm intelligence algorithm, fireworks algorithm not only has the common advantages of swarm intelligence algorithm, but also has its own characteristics and superiorities. And, the specificity of fireworks algorithm is the fortissimo of explosion (depends on the number of sparks and the explosion radius) which has been endowed by the explosive mechanism during the fireworks explosion processes. It is totally a new efficient intelligent search algorithm, although it has been proposed just a few years and still in the process of further developing and being perfected[6, 7, 8]. And so far, fireworks algorithm has not been used to solve the problem of portfolio optimization. Therefore, if we notice its rapidly development in several years and its excellent performances in dealing with various kinds of optimization problems[9], trying to use fireworks algorithm in the issue of portfolio optimization becomes more and more urgent.

Title: The Impact of Decision Right Allocation on Performance of IoT-based Virtual Enterprise: Evidence from China

Speaker: Zhiping Zhou (Hefei University of Technology)

Abstract: This paper aims to explore the impact of decision right allocation (DRA) on performance of virtual enterprises which were formed with the support of the internet of things (IoT) in their operating process. A questionnaire survey has been conducted among massive IoT-based manufacturing enterprises in mainland China. Factorial analysis and correlation analysis are used to model the relationship between DRA and performance. We find that strategic decision right allocated to the top management plays a positive role in promoting the operation and growth performance, while operation decisions made by business segments make for flat management, elevate working efficiency and have significant positive effect on the financial and operation performance of a virtual organization. Rationalities of the conclusions are analyzed to verify our proposed hypotheses, and then we put forward DRA suggestions for different virtual enterprises according to the conclusions. The results of this study provide empirical evidence and a better description of the relationship between DRA and performance. The findings have an impetus on impelling the effective use of IoT, improving enterprise performance and improving DRA relationship within virtual enterprises for rapid response to the dynamic environment.

Title: Estimation and Consensus Control for Networked Systems

Speaker: Zhongmei Wang (Shandong University)

Abstract: The problem of estimation and consensus control of multi-agent networked systems is considered in this paper. The agent’s state is estimated by Kalman-filtering theory. Each agent makes Kalman-filtering state estimation for its neighbors based on the noisy communication information received from the neighbors. Then a distributed consensus protocol is proposed based

on the estimated state information. Under the proposed protocol, the consensus error can be calculated via the solution of a lyapunov equation.

Title: Radial expansion-contraction control of multi-agent systems relative to target group
Speaker: Yingjing Shi (University of Electronic Science and Technology of China)
Abstract: This paper investigates radial expansion-contraction control of second-order multi-agent systems relative to a group of targets, which can be stationary or moving. Formal definition of radial expansion-contraction control is introduced and some of its mathematical properties are given. Then, a central estimator with parameter in differential form is constructed. Moreover, Lasalle's Invariance Principle and homogeneous property of the system are used to build the parameter selection principles for the estimator according to both stationary target and moving target. Based on the proposed estimator, the state feed-back control protocol is designed to achieve the radial expansion-contraction control for the target group. Furthermore, the convergency analysis of the de-signed protocol is given. Finally, simulation studies are carried out for radial expansion-contraction control problems by using the proposed method.

Title: Modelling and Computation for the Valuation of Two-period R&D Projects by Option Games
Speaker: Shuhua Zhang (Tianjin University of Finance and Economics)
Abstract: In R&D investment projects, the value and exibility of investments can be captured by real option models, while the competition among the investors should be analyzed by the game theory. In this paper, we present an option game model in which two firms can invest the same program during a period of time. The leader can achieve more market shares, and the follower can gain some pieces of investment information from the leader. To solve the option game model, we then propose a fitted finite volume method and power penalty method. Several managerial results, such as the payoffs and the effects of parameters, are also discussed. Finally, by comparing the compound American option with the European one, we can find that the former is more suitable in the analysis of R&D investment projects.