第四屆數值代數及高性能計算研討會(2012)

澳門大學

2012年12月8日-10日

目錄

會議介紹

會議名稱 第四屆數值代數及高性能計算研討會

會議時間 2012年12月8日-10日

背景與目標

第四屆數值代數與高性能計算學術研討會將於2012 年12 月8-10 日在澳門大學舉行。數值代數是現代科學計算的核心部分。會議的目的是給全球華人數值代數專家提供一個高水平學術交流平臺,回顧當前該領域的最新動態,探索有意義的發展方向。會議將涵括數值代數和科學計算中的理論、算法、以及實際應用等方面的最新研究成果。
本次會議爲系列會議的第四屆,前三屆會議分別在上海(2009)、廣州(2010)、以及香港(2011)舉行。本次會議免收註冊費,並爲所有非本地被邀請者提供住宿(12 月7 日至10 日共4晚)。

主辦單位 澳門大學科技學院數學系

組織委員會

- 金小慶 澳門大學科技學院數學系
- 孫海衛 澳門大學科技學院數學系
- 鄭智文 澳門大學科技學院數學系
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- 劉　志 澳門大學科技學院數學系

邀請報告名單

- 石鐘慈 中國科學院數學與系統科學研究院
- 柏兆俊 加州大學戴維斯分校
- 白正簡 廈門大學
- 白中治 中國科學院數學與系統科學研究院
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- 于　波　大連理工大學
- 張紹良　名古屋大學
- 張振躍　浙江大學
- 鄭　兵　蘭州大學

會議日程

會議地點: 澳門大學何賢會議中心　HG01

	12月8日	12月9日	12月10日
8:40 - 8:50 am	開幕禮		
8:50 - 9:00 am	合　影		
	I，主持人：金小慶	**V, 主持人：吳國寶**	**VII, 主持人：王筱平**
9:00 - 9:30 am	石鐘慈[18]	祁力群[17]	陳漢夫[4]
9:30 - 10:00 am	張振躍[30]	徐洪坤[26]	呂宗澤[14]
10:00 - 10:30 am	張紹良[29]	白正簡[2]	文有爲[23]
10:30 - 10:50 am	休　息	休　息	休　息
	II，主持人：石鐘慈	**VI, 主持人：祁力群**	**VIII, 主持人：白中治**
10:50 - 11:20 am	吳國寶[16]	白中治[3]	王筱平[21]
11:20 - 11:50 am	賈仲孝[9]	薛軍工[27]	鄭　兵[15]
11:50 - 12:20 am	高衛國[6]	林敏雄[12]	劉　志[13]
12:20 - 14:30 pm	午　餐	午　餐	午　餐
	III，主持人：湯　濤		**IX，主持人：黎　穩**
14:30 - 15:00 pm	柏兆俊[1]		于　波[28]
15:00 - 15:30 pm	蘇仰鋒[19]		吳　鋼[25]
15:30 - 16:00 pm	程璋琪[5]		黃玉梅[8]
16:00 - 16:20 pm	休　息		休　息
	IV，主持人：柏兆俊		**X，主持人：鄭智文**
16:20 - 16:50 pm	湯　濤[20]		黎　穩[11]
16:50 - 17:20 pm	魏益民[22]		黃桂林[24]
17:20 - 17:50 pm	王　麗[10]		胡光輝[7]
18:30 - 22:00 pm	晚宴:凱旋門酒店		

報告摘要

[1] **Minimization Principle and Computation of the Linear Response Eigenvalue Problem**.

Zhaojun Bai. University of California, Davis.

Abstract: The linear response (LR) eigenvalue problem

$$\begin{bmatrix} A & B \\ B & A \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \lambda \begin{bmatrix} \Sigma & \Delta \\ -\Delta & -\Sigma \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

arises from excitation state (energies) calculations in the study of collective motion of many particle systems, where A and B symmetric and $A \pm B$ are positive definite, and Σ is symmetric and Δ is skew-symmetric and $\Sigma \pm \Delta$ are nonsingular. There are a great deal of interests in developing efficient simulation techniques for excitation state calculations of molecules for materials design in energy science. In this talk, we first present theoretical results for the LR eigenvalue problem, which include a minimization principle for the sum of the smallest positive eigenvalues and Cauchy-like interlacing inequalities. Although the LR eigenvalue problem is a nonsymmetric eigenvalue problem, these results mirror the well-known trace minimization principle and Cauchy's inequalities for the symmetric eigenvalue problem. In addition, we will discuss the best approximation of the few smallest positive eigenvalues via a structure-preserving projection, and describe four-dimensional subspace search conjugate gradient-like algorithms for simultaneously computing these eigenvalues and their associated eigenvectors. Finally, we will present numerical results for computing multiple low-lying excitation energies of the benzene molecule. This is a joint work with Ren-cang Li, Dario Rocca and Giulia Galli. .

[2] **Minimum Norm Partial Quadratic Eigenvalue Assignment with Time Delay in Vibrating Structures Using the Receptance and the System Matrices**.

Zhengjian Bai. Ximen University.

Abstract: The partial quadratic eigenvalue assignment problem (PQEAP) is to compute a pair of feedback matrices such that a small number of unwanted eigenvalues in a structure are reassigned to suitable locations while keeping the remaining large number of eigenvalues and the associated eigenvectors unchanged. The problem arises in active vibration control of structures. For real-life applications, it is not enough just to compute the feedback matrices. They should be computed in such a way that both closed-loop eigenvalue sensitivity and feedback norms are as small as possible. Also, for practical effectiveness, the time-delay between the measurement of the state and implementation of the feedback controller should be considered while solving the PQEAP. These problems are usually solved using only system matrices and do not necessarily take advantage of the receptances which are available by measurements. In this paper, we propose hybrid methods, combining the system matrices and measured receptances, for solutions of the multi-input PQEAP and the minimum-norm PQEAP, both for systems with and without time-delay. These hybrid methods are more efficient than the standard methods which only use the system matrices and no the receptances. These hybrid methods also offer several

other computational advantages over the standard methods. Our results generalize the recent work by Ram, Mottershead, and Tehrani [Linear Algebra Appl., 434 (2011), pp. 1689—1696]. The results of numerical experiments demonstrate the effectiveness of the proposed methods.

[3] **Modulus-Based Matrix Splitting Iteration Methods for Linear Complementarity Problems**.

Zhongzhi Bai. Chinese Academy of Sciences.

Abstract: In order to solve large sparse linear complementarity problems on parallel multiprocessor systems, by making use of the modulus reformulation of the target problems and the multiple splittings of the system matrices we design the sequential and the parallel modulus-based matrix splitting iteration methods, the modulus-based matrix splitting two-stage iteration methods and their relaxed variants. We prove the asymptotic convergence of these matrix splitting iteration methods for the H-matrices of positive diagonal entries, and give numerical results to show the feasibility and effectiveness of the modulus-based matrix multisplitting iteration methods when they are implemented in the parallel computational environments.

[4] **Point spread function reconstruction in ground-based astronomy by $l^1 - l^p$ models**.

Raymond H. Chan. Hong Kong Chinese University.

Abstract: Images of objects in outer space acquired by ground-based telescopes are usually blurred by atmospheric turbulence. To improve the quality of these images, the wavefront of the light is utilized to derive the point spread function (PSF). We proposed the $l^1 - l^p$ $(p = 1, 2)$ model for reconstructing the wavefront gradients and hence the wavefront itself. The model can give a more accurate PSF and therefore better restored images. Numerical results are given to illustrate the performance of the proposed models.

[5] **Interactive High-Order Hidden Markov Model and Its Applications**.

Wai-Ki Ching. Hong Kong University.

Abstract: In this talk, an Interactive Higher-Order Hidden Markov Model (IHHMM) will be introduced. In the proposed IHHMM, the hidden states depend on the observable states, and vice versa, so that the feedback effect of the observable states is taken into account in the process. Efficient procedures are given to estimate the model parameters. The model is then used in the detection of machine failure. Numerical examples are given to demonstrate that the proposed IHHMM significantly outperforms the traditional HMM.

[6] **Solving nonlinear eigenvalue problem in resonant tunneling diodes**.

Weiguo Gao. Fudan University.

Abstract: In this talk, we demonstrate the convergence and deflation strategy for solving the nonlinear eigenvalue problem in resonant tunneling diodes with multi-mode approximation. Numerical experiments show the efficiency of our method.

[7] **An Adaptive Finite Element Method for Kohn-Sham Equation**.

Guanghui Hu. University of Macau.

Abstract: We present a finite element method for Kohn-Sham equation with the mesh redistribution technique. The derived nonlinear eigenvalue problem is solved by self-consistent field iteration method,

and some acceleration technique such as multi-grid methods is used to improve the efficiency of the method. To resolve the singularity introduced by the external potential in the Kohn-Sham hamiltonian, the r-adaptive method is applied. Numerical results are given to show the performance of our method.

[8] **Multiplicative Noise Removal via a Learned Dictionary**.

Yumei Huang. Lanzhou University.

Abstract: Multiplicative noise removal is a challenging image processing problem, and most existing methods are based on the Maximum A Posteriori formulation and the logarithmic transformation of multiplicative denoising problems into additive denoising problems. On the other hand, sparse representations of images have shown to be efficient approaches for image recovery. Following this idea, we propose to learn a dictionary from the logarithmic transformed image, and then to use it in a variational model built for noise removal. Extensive experimental results suggest that in terms of visual quality, PSNR and mean absolute deviation error, the proposed algorithm outperforms state-of-the-art methods.

[9] **Inner Iterations in the Shift-Invert Residual Arnoldi Method and the Jacobi–Davidson Method**.

Zhongxiao Jia. Tsinghua University.

Abstract: Using a new analysis approach, we establish a general convergence theory of the Shift-Invert Residual Arnoldi (SIRA) method for computing a simple eigenvalue nearest to a given target σ and the associated eigenvector. In SIRA, a subspace expansion vector at each step is obtained by solving a certain inner linear system. We prove that the inexact SIRA method mimic the exact SIRA well, that is, the former uses almost the same outer iterations to achieve the convergence as the latter does if all the inner linear systems are iteratively solved with *low* or *modest* accuracy during outer iterations. Based on the theory, we design practical stopping criteria for inner solves. Our analysis approach applies to the Jacobi–Davidson (JD) method with the fixed target σ as well, and a similar general convergence theory is obtained for it. Numerical experiments confirm our theory and demonstrate that the inexact SIRA and JD are similarly effective and are considerably superior to the inexact SIA.

[10] **A Simplified Low-rank Revealing QR Algorithm**.

Guangbin Li. Nanjing Normal University.

Li Wang. Nanjing Normal University.

Abstract: On the basis of the idea of the Low-rank Revealing QR Algorithm (LRRQR) in [T.F.Chan, Low-Rank revealing QR factorizations, Numer. Linear Algebra Appl., (1994) 33-44], a simplified algorithm is presented for computing rank revealing QR factorizations of low-rank matrices. The algorithm is guaranteed to reveal the rank of A and the cost is much less than the cost of LRRQR. A tight upper and lower bounds for all the largest singular values of A are derived and can be used to infer the numerical rank of A. The efficiency of our algorithm is illustrated by some numerical experiments.

[11] **The Perturbation Bound for the stationary probability distribution of a Transition Probability Tensor**.

Wen Li. Huanan Normal University.

Abstract: In this talk, we give the perturbation bound for the stationary probability distribution of transition probability tensor of an order m dimension n. Based on our analysis, we can derive a new

perturbation bound for the stationary probability distribution of a transition probability matrix, which refers to the case of m = 2. Numerical examples are presented to illustrate the theoretical results of our perturbation analysis.

[12] **The Shift Techniques for a Nonsymmetric Algebraic Riccati Equation**.

Min-Hsiung Lin. National Chung Cheng University.

Abstract: We want to analyze a special instance of a nonsymmetric algebraic matrix Riccati equation arising from transport theory. Traditional approaches for finding its minimal nonnegative solution are based on fixed point iterations and the speed of the convergence is linear. Recently, iterative methods such as Newton method and the structure-preserving doubling algorithm with quadratic convergence are designed for improving the speed of convergence. But, in some case, the speed of convergence will significantly decrease so that linear convergence becomes sublinear convergence and quadratic convergence becomes linear convergence. In this talk, we provide a thorough analysis to show that after the shift techniques, the speed of linear or quadratic convergence is preserved. Finally, we apply the shift procedures to the discussion of the simple iteration algorithm, improve its speed of convergence, and reduce its total elapsed CPU time.

[13] **Disentangling the Effect of Jumps on Systematic Risk with a New Estimator of Integrated Co-Volatility**.

Zhi Liu. University of Macau.

Abstract: We propose a new thresholding-preaveraging realized estimator for the integrated co-volatility of two assets using non-synchronous observations with simultaneous presence of microstructure noise and jumps. We derive a noise-robust Hayashi-Yoshida estimator which allows very general structure of jumps in the underlying process. Based on the new estimator, different aspects and components of co-volatility are compared to examine the effect of jumps on systematic risk using tick-by-tick data from China stock market for 2009-2011. We find controlling for jumps contributes significantly to the beta estimation and common jumps dominate the jump's effect mostly but there's also evidence that idiosyncratic jumps can possibly lead to significant deviation. We also find that not controlling for noise and jumps in previous realized beta estimation tends to considerably underestimate the systematic risk.

[14] **Matrix with Spectrum Outside Its k-th Order Geršgorin's Region**.

Tzon-Tzer Lu. National Sun Yat-Sen University.

Abstract: Let $A = (a_{ij})_{n\times n}$ be an $n \times n$ complex matrix and

$$R_i = \sum_{k=1,k\neq i}^{n} |a_{ik}| \quad \text{for } i = 1, \cdots, n.$$

Its k-th order Geršgorin region is defined by

$$G_k(A) = \bigcup_{1\leq\rho_1<\cdots<\rho_k\leq n} \{z \in \mathbf{C} : \prod_{i=1}^{k} |z - a_{\rho_i\rho_i}| \leq \prod_{i=1}^{k} R_{\rho_i}\}.$$

In view of the Geršgorin Disk Theorem, it is natural to ask its generalization if the spectrum $\sigma(A) \subset G_k(A)$ for $k \leq n$. It turns out to be false with some counter-examples. Then Newman and Thompson

in 1994 raised the open problem: For what value of n and k, $3 \leq k \leq n$, there exists an $n \times n$ matrix A with $G_k(A) \cap \sigma(A) = \phi$. This talk is going to answer this question: such matrices exist for all pairs of n and k.

[15] **The multiplicative perturbation bounds of the group inverse and oblique projection**.

Lingsheng Meng. Lanzhou University.

Bing Zheng. Lanzhou University.

Abstract: In this paper, the multiplicative perturbation bounds of the group inverse and related oblique projection under general unitarily invariant norm are presented by using the decompositions of $B^{\#} - A^{\#}$ and $BB^{\#} - AA^{\#}$.

[16] **Contrast Maximization Method for Color-to-Grayscale Conversion**.

Michael Ng. Hong Kong Baptist University.

Abstract: Color-to-grayscale conversion is the process to convert a color image to a grayscale one, which is a basic tool in digital printing, photograph rendering and single-channel image processing. The main aim of this talk is to discuss effective contrast maximization methods for color-to-grayscale conversion.

[17] **Spectral Hypergraph Theory**.

Liqun Qi. Hong Kong Polytechnic University.

Abstract: Spectral graph theory is a well-studied and highly applicable subject. It studies the connection between properties of a graph, and the eigenvalues of a matrix associated with that graph. Comparing with the research of spectral graph theory, the research on spectral hypergraph theory is still on its beginning stage. Recently, due to the development of spectral theory of tensors, spectral hypergraph theory has also made its first stage progress. Several papers appeared on eigenvalues of the adjacency tensor and the Laplacian tensor of a uniform hypergraph. The International Workshop on Spectral Graph and Hypergraph Theory is scheduled to be held at Fuzhou University during May 30 - June 2, 2013. A half day tutorial lecture session is arranged in the afternoon of May 30, 2013, before the workshop. 25 active researchers in USA, Australia and China will give invited talks at the workshop. In this talk, I will review the development on spectral hypergraph theory.

[18] **Studies on Finite Element Methods**.

Zhongci Shi. Chinese Academy of Sciences.

Abstract: I will present some of my results on finite element methods such as the Patch Test, a strange convergence behavior and convergence properties of certain important nonconforming elements, etc.

[19] **Equivalence Transformations for Quadratic Eigenvalue Problems**.

Yangfeng Su. Fudan University.

Abstract: Since there does not exist a simple equivalence transformation which can triangularize or diagonalize a quadratic matrix polynomial, we study more general equivalence transformations for quadratic eigenvalue problems in this paper. In order to well understand the equivalence of quadratic matrix polynomials, we first analyze properties of their decomposable pairs, which are closely related to

the equivalence. Furthermore, based on the theory about the equivalence of linear matrix polynomials, we construct equivalence transformations for quadratic matrix polynomials. Specifically, first, linearize a regular quadratic matrix polynomial as a linear matrix polynomial; second, apply a structure preserving transformation to the linear matrix polynomial to get another one; finally, recover a new regular quadratic matrix polynomial from the transformed linear matrix polynomial. In particular, we propose our definitions of structure preserving transformations and analyze their properties. We find that those transformations satisfying some constraints can transform a symmetric linearization for a regular quadratic $Q(\lambda)$ into another symmetric linearization for a new regular quadratic $wQ(\lambda)$. Meanwhile, we discover that they can preserve the structures of the original structured quadratic matrix polynomial and its structured linearizations.

[20] **Adaptive time stepping and energy stable schemes**.

Tao Tang. Hong Kong Baptist University.

Abstract: Numerical simulations for many physical problems require large time integration; as a result large time-stepping methods become necessary. In this talk, we will concentrate on the adaptive time stepping methods for physical problems with energy stable properties. The physical problems involving complex fluids, phase separations, epitaial growth of thin films, etc. By using the energy stable schemes, we are able to propose some time adaptivity strategies to resolve both the solution dynamics and the steady state solutions. Numerical simulation results will be reported and discussed.

[21] **Phase field modeling of purification process by zone melting technique**.

Xiao-Ping Wang. Hong Kong University of Science and Technology.

Abstract: Zone melting is an efficient purification method that is widely used in the manufacture of semiconductors. It is a complicated process consisting of both the melting-solidification process and the solute diffusion process. We derive a phase field model for the zone melting process. The model is applied successfully to the zone melting phosphorus purification and the results are also compared with the experiments.

[22] **A sharp version of Bauer—Fike's theorem**.

Yimin Wei. Fudan University.

Abstract: In this talk, we present a sharp version of Bauer—Fike's theorem. We replace the matrix norm with its spectral radius or sign-complex spectral radius for diagonalizable matrices; 1-norm and ∞-norm for non-diagonalizable matrices. We also give the applications to the pole placement problem and the singular system.

[23] **Projection-based Gradient Descent Method with Applications in the Construction of Probabilistic Boolean Networks**.

Youwen Wen. Kunming University of Science and Technology.

Abstract: In this talk, we are interested in solving Least Squares (LS) problems in which the unknowns are required to be non-negative and to satisfy a linear equation exactly. The challenge comes from the fact that the matrix in the LS problems is huge in practice such that it is impossible to store the matrix. A matrix free method is therefore desirable for the computational purpose. The main aim of this talk is to propose a new iterative algorithm to compute the optimal solution of the constrained LS problems.

We show that the proposed algorithm converges to a solution of the constrained LS problems. The proposed algorithm is applied to solve the inverse problem of probabilistic Boolean networks. Numerical results show that the proposed algorithm is very efficient.

[24] **High Performance Computing at the Joint Institute for Computational Sciences**.

Kwai-Lam Wong. University of Tennessee.

Abstract: The University of Tennessee (UT) and Oak Ridge National Laboratory (ORNL) established the Joint Institute for Computational Sciences (JICS) to advance scientific discovery and state-of-the-art engineering and to further knowledge of computational modeling and simulation by: 1). Taking full advantage of petascale and beyond computers housed at ORNL; 2). Educating a new generation of scientists and engineers well-versed in the application of computational modeling and simulation for solving the most challenging scientific and engineering problems. JICS is also home to the National Institute for Computational Sciences (NICS), `www.nics.utk.edu`, a national high performance computer center funded by the National Science Foundation. Three supercomputers managed by NICS have ranked in the current Top500 List of the world's top supercomputers. Kraken (no. 25) is a Cray XT5 Petascale machine, Keeneland (no. 74) is a cluster with GPUs, and Beacon (no. 253) is a cluster with Xeon Phi processor. An overview of the activities in JICS and NICS will be presented in this talk.

[25] **A Preconditioned and Shifted GMRES Algorithm for the PageRank Problem with Multiple Damping Factors**.

Gang Wu. Jiangsu Normal University.

Yan chun Wang. Jiangsu Normal University.

Xiao qing Jin. University of Macau.

Abstract: Google has become one of the most popular and successful search engines in recent years. Google's success can be attributed to its simple and elegant algorithm: PageRank. In practice, one often needs to solve the PageRank problem with multiple damping factors, or with multiple damping factors and multiple personalization vectors. The conventional PageRank algorithm has to solve these problems one by one. The shifted GMRES(m) algorithm can be used to solve them in the same search subspace. However, there are two disadvantages of this algorithm. The first one is "near singularity", and the second one is "stagnation". In this paper, we first present a modified and shifted GMRES(m) algorithm to deal with the problem of near singularity. In order to overcome the drawback of stagnation and to improve convergence, we propose a polynomial preconditioner for the modified algorithm. We show that the resulting algorithm can circumvent the drawbacks of near singularity and stagnation that occur in its original counterpart. Finally, we consider how to solve the PageRank problem with multiple damping factors and multiple personalization vectors, using a preconditioned and shifted block GMRES(m) algorithm. Numerical experiments illustrate the efficiency of our new algorithms, as well as their theoretical properties.

[26] **The Geometry of the Lasso and Iterative Methods**.

Hong-Kun Xu. National Sun Yat-Sen University.

Abstract: The lasso (least absolute shrinkage and selection operator), introduced by Tibshirani in 1996, is now formulated as the minimization problem

$$\min_{x\in\mathbb{R}^n} \varphi_\gamma(x) := \frac{1}{2}\|Ax-b\|_2^2 + \gamma\|x\|_1, \qquad (\star)$$

where A is an $m \times n$ matrix, $b \in \mathbb{R}^m$ is a given vector, and $\gamma > 0$ is a regularization parameter. Let S_γ be the set of solutions of $(\star)$; it is closed convex nonempty. In this talk, I will present some properties of this solution set as a function of $\gamma > 0$. I will also present some iterative methods that solve the lasso $(\star)$.

[27] **Matrix Computations in Markov-modulated Fluid Flow Models**.

Jungong Xue. Fudan University.

Abstract: Recent years matrix-analytic method has been successfully applied to stationary analysis and transient analysis of Markov-modulated fluid flow models, which gives rise to some matrix computation problems. The talk discusses these problems and analyze this method in perspective of numerical linear algebra.

[28] **Solving Polynomial Systems Derived from Eigenfunction Expansion Discretization of Elliptic Equations**.

Bo Yu. Dalian Polytechnic University.

Abstract: Eigenfunction expansion discretization is considered for numerical multiple solutions of semilinear elliptic equations with polynomial nonlinearity. Error estimates of the discretization are derived. An efficient polynomial homotopy is constructed for computing all solutions of the resulting polynomial system on coarse level. A filter strategy on successively finer levels is designed to remove spurious solutions and to refine nonspurious solutions, simultaneously. The filtered solutions are further refined by a finite-element-Newton method. Numerical results are included to verify the error estimates derived, the efficiency of the homotopy and the effectiveness of the filter strategy. A specific case of the Lazer-McKenna conjecture is numerically verified.

[29] **An intermediate eigenvalue problem in electronic structure calculation**.

Shaoliang Zhang. Nagoya University.

Dongjin Lee. Nagoya University.

Takafumi Miyata. Nagoya University.

Tomohiro Sogabe. Aichi Prefectural University.

Abstract: We consider the generalized eigenvalue problem $Ax = \lambda Bx (x \neq 0)$, where A and B are real symmetric matrices and B is also positive definite. A property of this problem is that all the eigenvalues are real, and it is often needed to compute a number of eigenvalues which are important for applications. In the field of electronic structure calculation, there has emerged a need to find the eigenvalues related to luminescence of organic materials. The targets are small in number, and from the atomic configuration of the material it is determined which eigenvalues need to be computed. In this talk, we present a bisection approach to obtaining the eigenvalues related to the luminescence. By iteratively searching and narrowing the interval within which the target eigenvalues exist, we can find them without computing unwanted eigenvalues.

[30] **Linear projection preserving nonlinear manifold structures for dimensionality reduction**.

Zhenyue Zhang. Zhejiang University.

Abstract: This talk proposes a new model of low-rank matrix factorization that incorporates manifold regularization to the matrix factorization. Superior to the graph-regularized nonnegative matrix factorization, this new regularization model has globally optimal and closed form solutions. A direct algorithm (for data with small number of points) and an alternate iterative algorithm with inexact inner iteration (for large scale data) are proposed to solve the new model. A convergence analysis establishes the global convergence of the iterative algorithm. Efficiency and precision of the algorithm are demonstrated numerically through applications to six real-world data sets on clustering and classification. Performance comparison with existing algorithms shows the effectiveness of the proposed method for low-rank factorization in general.

相關信息

酒店信息

酒店名稱: 麗景灣酒店Regency Hotel

酒店網址:http://www.regencyhotel.com.mo/home-index-zh_cn

酒店位置: 澳門仔史伯泰海軍將軍馬路二號

酒店地圖:

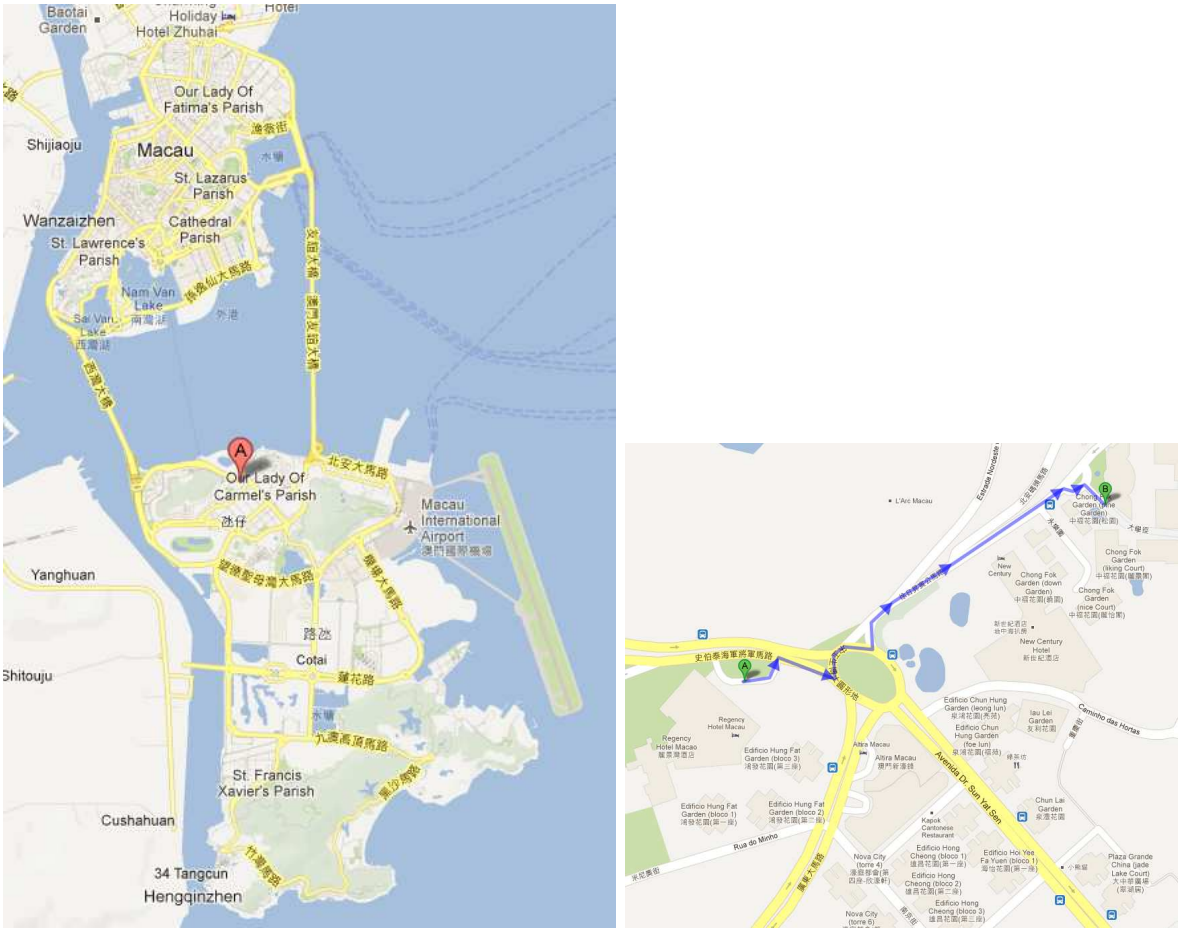

Figure 1: 圖中標記A 爲麗景灣酒店　　B 爲澳門大學. 從A 到B 步行大約8 分鐘.

晚宴信息

酒店名稱: 凱旋門L'Arc Macau

酒店網址: http://www.larcmacau.com/zh/main.php

酒店位置: 

招待會信息

酒店名稱: 澳門君怡酒店Grandview Hotel
酒店網址: http://www.grandview-hotel.com/chinese/

酒店位置: 

澳門遊信息

澳門遊時間: 2012年12月9日15:00 - 19:00 pm

澳門遊路線: 路灣黑沙海岸 $\longrightarrow$ 媽祖文化村 $\longrightarrow$ 大三巴牌坊

- 路灣黑沙海岸: http://zh.wikipedia.org/wiki/%E9%BB%91%E6%B2%99%E6%B5%B7%E7%81%98
- 媽祖文化村: http://macau.ggogo.com/tour/event/A_Ma_Cultural_Village.html
- 大三巴牌坊: http://zh.wikipedia.org/wiki/%E5%A4%A7%E4%B8%89%E5%B7%B4%E7%89%8C%E5%9D%8A

交通信息

珠海機場到澳門交通信息: 兩種選擇

1. “珠澳直通快線”: 由珠海機場直達澳門市區，時間表及停車地點如下.

   線路：珠海機場——新濠天地酒店——英皇酒店——皇朝大廈首層（星際酒店側）

   始發時刻：10:00、10:20、11:30、12:30、13:30、14:40、16:00、17:00、18:00

   詳情咨詢：珠海(86)(756) 8111333 http://www.zhairport.com/news_detail.php?id=640

   註：進入澳門後，在新濠天地酒店站下車，然後乘坐出租車到麗景灣酒店。

2. 由珠海機場乘坐出租車或者機場大巴到拱北關口，通關以後乘坐出租車直接到麗景灣酒店。關於機場大巴信息，參考http://www.zhairport.com/raffic.php?ty=bus.

關於澳門交通信息,請查詢http://www.macautourism.gov.mo/cn/info/transport.php#3.

澳門緊急電話:999

重要信息二維碼