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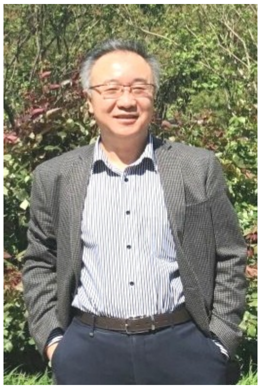
Welcome Message from Chairs



Prof. Shiwei Ma

Prof. Peter Benner

Dear friends and colleagues, on behalf of the organizers, we are very honored to welcome you to the 2016 Sino-German Symposium on “**Modeling, Model Reduction, and Optimization of Flows**” (MMOF2016 in short). This symposium is sponsored by the Sino-German Center for Research Promotion in Beijing, the Natural Science Foundation of China and the German Research Foundation. The objective of this symposium is to bring together active scientists mainly from Germany and China and from third country with interests in the computational aspects of flows and of related problems appearing in the area of applied sciences. The underlying value of this symposium is to promote the Sino-German bilateral academic exchange and cooperation. Through the in-depth discussions on modeling and optimization, solution of PDEs, model order reduction, flow problems in engineering and flow control & control theory between Chinese scholars and German scholars, we expect to ignite new ideas and to improve the Sino-German research level especially on computational fluid dynamics. Moreover, another potential objective of this symposium is to open opportunities for Sino-German bilateral joint research project application in the future.

It is our great pleasure to have you with us at the symposium. Best regards, and wish you have a wonderful and stimulation stay in Shanghai.

Final Program

Date	Activities	Remark
25 Sep	Arrival in Shanghai	
	Participants Registration and Dinner	17:00-21:00, Reception Hall, New Lehu Hotel Baoshan Campus, Shanghai University, No.716 Jinqiu Road, Shanghai
26 Sep	Participants Registration	Siyuan Hall, New Lehu Hotel
	Opening Ceremony	10:00-10:45
	-Session 1: Modeling and Optimization **–Chairs: Dr. Robert Altmann & Prof. Yanqin Bai**	10:45-16:30
	-Session 2.1: Solution of PDEs **-Chairs: Prof. Baolin Tian & Prof. Jiequan Li**	16:45-17:45
27 Sep	**-Session 2.2: Solution of PDEs** **-Chairs: Prof. Baolin Tian & Prof. Jiequan Li**	08:30-12:00
	-Session 3.1: Model Order Reduction **- Chair: Dr. Yongjin Zhang & Prof. Julius Reiss**	14:00-17:30
28 Sep	**-Session 3.2: Model Order Reduction** **- Chair: Dr. Yongjin Zhang & Prof. Julius Reiss**	08:30-11:30
	-Session 4.1: Flow Problems in Engineering **- Chair: Dr. Quan Zhou & Prof. Siegfried Mueller**	13:00-16:30
29 Sep	**-Session 4.2: Flow Problems in Engineering** **- Chair: Dr. Quan Zhou & Prof. Siegfried Mueller**	08:30-11:30
	-Session 5: Flow control & Control theory **-Chair: Prof. Timo Reis & Prof. Guang-Hong Yang**	13:30-17:00
30 Sep	Group Activities	

26 September, 2016

08:00-10:15	**Participants Registration**	
Timeline	Speaker	Title
10:00-10:45	**Opening ceremony -- Chair: Prof. Shiwei Ma**	
	Prof. Min Wang	Welcome speech from Shanghai University
	Prof. Lesheng Chen	Welcome speech from Sino-German Center, NSFC & DFG
	Prof. Peter Benner	Welcome speech from MPI Magdeburg
	Group Picture, Coffee/Tea Break	
-Session 1: Modeling and Optimization –Chairs: Prof. Yanqin Bai & Dr. Robert Altmann		
10:45-11:15	Dr. Robert Altmann	Modelling Flow Equations as Operator DAEs
11:15-11:45	Dr. Yue Qiu	Preconditioning Optimal In-Domain Control of Navier-Stokes Equation Using Multilevel Sequentially Semi-separable Matrix Computations
12:00-14:00	**Lunch Break**	
14:00-14:30	Prof. Dmitri Kuzmin	PDE-constrained optimization for level set methods
14:30-15:00	Prof. Yuan Yao	Bayesian Migration for Efficient Meta-Modeling of Computational Fluid Dynamics (CFD)
15:00-15:30	**Coffee/Tea Break**	
15:30-16:00	Dr. Yongjin Zhang	Accelerating optimization and uncertainty quantification of nonlinear SMB chromatography using reduced-order models
16:00-16:30	Prof. Yanqin Bai	The advances in accelerated gradient algorithms and nonlinear optimization
16:30-16:45	**Coffee/Tea Break**	
-Session 2: Solution of PDEs -Chairs: Prof. Baolin Tian & Prof. Jiequan Li		
16:45-17:15	Prof. Jianxian Qiu	A simple and efficient WENO method for hyperbolic conservation laws
17:15-17:45	Prof. Jiequan Li	Lagrangian schemes and carbuncle phenomenon
18:00-20:00	**Banquet**	

27 September, 2016

Timeline	Speaker	Title
08:30-09:00	Dr. Alexander Linke	Towards pressure-robust mixed methods for the incompressible Navier-Stokes equations
09:00-09:30	Prof. Yanren Hou	On the Weak Solutions to the Mixed Navier-Stokes/Darcy Model
09:30-10:00	Prof. Wu Zhang	Lattice Boltzmann Method for Complicated Flows
10:00-10:30	**Coffee/Tea Break**	
10:30-11:00	Prof. Shubin Wang	Global existence and nonexistence of the initial–boundary value problem for the dissipative Boussinesq equation
11:00-11:30	Prof. Chunwu Wang	High Order Positivity-preserving Discontinuous Galerkin Method for Compressible Multi-medium Flow
11:30-12:00	Prof. Baolin Tian	High resolution numerical simulation of compressible Rayleigh-Taylor instability
12:00-14:00	**Lunch Break**	
-Session 3: Model Order Reduction **- Chairs: Dr. Yongjin Zhang & Prof. Julius Reiss**		
14:00-14:30	Prof. Yao-Lin Jiang (Zhen-Zhong Qi)	Polynomials-based model order reduction for input and output systems
14:30-15:00	Prof. Athanasios Antoulas	Data-driven Model Reduction for Nonlinear Systems
15:00-15:30	Prof. Gianluigi Rozza	Advances in Reduced Order Methods for viscous flows: challenges and perspectives
15:30-16:00	**Coffee/Tea Break**	
16:00-16:30	Prof. Qifeng Liao	Reduced Basis ANOVA Methods for Partial Differential Equations with High-Dimensional Random Inputs
16:30-17:00	Prof. Yangfeng Su	Two-level Orthogonal Arnoldi procedure
17:00-17:30	Dr. Xin Du	Frequency-dependent balanced truncation of linear systems over finite-frequency ranges
17:30-19:30	**Dinner**	

28 September, 2016

Timeline	Speaker	Title
08:30-09:00	Dr. Xiaolong Wang	Model order reduction of weakly nonlinear systems using some special orthogonal polynomials
09:00-09:30	Mladjan Radic	Reduced Basis Application for Coupled Problems
09:30-10:00	Prof. Kangji Li	POD based indoor thermal environment modeling, control and optimization
10:00-10:30	**Coffee/Tea Break**	
10:30-11:00	Dr. Juan Du	POD reduced-order modeling applied to 2D and 3D fluid flow
11:00-11:30	Dr. Julius Reiss	Data assimilation and model reduction applied a compressible and reactive flow
11:30-13:00	**Lunch Break**	
-Session 4: Flow Problems in Engineering **- Chairs: Dr. Quan Zhou & Prof. Siegfried Mueller**		
13:00-13:30	Prof. Quan Zhou	Small-Scale Properties of two-dimensional Rayleigh-Taylor Turbulence
13:30-14:00	Prof. Yun Bao (Jiahui Luo)	DNS parallel direct solution for two dimensional turbulent thermal convection.
14:00-14:30	Prof. Siegfried Mueller	Drag Reduction of Airfoils with Structured or Actuated Surfaces
14:30-15:00	**Coffee/Tea Break**	
15:00-15:30	Prof. Yiwei Wang	Large eddy simulation on cloud cavitating flow near the free surface
15:30-16:00	Prof. Zhan Wang	Dynamics of patches of wind ripples: what happens after initial focussing?
16:00-16:30	Prof. Hongjiong Tian	Numerical solution of general linear methods for neutral delay differential algebraic equations
17:00-19:00	**Free time** **Dinner**	

29 September, 2016

Timeline	Speaker	Title
08:30-09:00	Prof. Nicolas Gauger	Efficient Optimization and Control in CFD and CAA
09:00-09:30	Prof. Shiwei Ma (Dr. Yanyan Liu)	Finite element modeling and simulation of ultrasonic trapping capability in fluids
09:30-10:00	Prof. Yan Zhang	Characterization of Carbon Nanomaterials and Application in Electronic Devices
10:00-10:30	**Coffee/Tea Break**	
10:30-11:00	Prof. Hongxun Chen	Research on Turbulence Models for Engineering Turbulence
11:00-11:30	Prof. Yaosong Chen (Dr. Qifeng Wang)	New actuator disk model for propeller-aircraft computation
11:30-13:30	**Lunch Break**	
-Session 5: Flow control & Control theory **-Chairs: Prof. Guang-Hong Yang & Prof. Timo Reis**		
13:30-14:00	Prof. Peter Benner	Linear feedback stabilization of incompressible flow problems
14:00-14:30	Prof. Chao Gao	Research on plasma flow control
14:30-15:00	Prof. Timo Reis	The Funnel Controller
15:00-15:30	**Coffee/Tea Break**	
15:30-15:30	Prof. Guang-Hong Yang	Fault-tolerant control for a class of nonlinear systems
16:00-16:30	Dr. Jan Heiland	LQG-Balanced Truncation for Low-Order Controllers for Laminar Flow
16:30-17:00	Dr. Matthias Voigt	Linear-Quadratic Control of DAEs with an Application to Flow Control Problems
17:00-17:15	**Closing Remarks**	
17:15-19:15	**Dinner**	

Book of Abstracts

Modelling Flow Equations as Operator DAEs

Robert Altmann

Technical University of Berlin

Abstract

It is well-known that the spatial discretization of the Navier-Stokes equations leads to a differential-algebraic equation (DAE). Without discretization, the equations can be seen as a DAE in an abstract setting, also called operator DAEs. Therein, the constraint is given by the incompressibility condition. We discuss the well-posedness of initial conditions, their consistency as well as suitable ansatz spaces for the solution.

Dr. Robert Altmann

Biography

2010, Research stay at the Yonsei University in Seoul (1 month)

2011, Diploma, Humboldt University Berlin

2011, Research stay at the Ecole des Ponts in Paris (2 months)

2015, Minisymposium Organizer, ICIAM in Beijing and GAMM in Lecce

2015, PhD, Technical University Berlin

2016, Research stay at the University of Innsbruck (4 months)

Preconditioning Optimal In-Domain Control of Navier-Stokes Equation Using Multilevel Sequentially Semiseparable Matrix Computations

Yue Qiu

Max-Planck Institute, Magdeburg, Germany

Abstract

Due to the wake interactions, power extracted by the wind turbines located in the downstream is reduced. To maximize the total output power of the wind farm, control strategies should be implemented. This can be formulated as a PDE-constrained optimization problem while the control only acts on each wind turbine, which is a small part of the domain. Optimal solution for this in-domain control problem can be obtained by solving a set of nonlinear equations. At each linearized step, a linear system of the generalized saddle-point type needs to be solved.

Since only a small part of the domain is controlled, the Schur complement of the resulting saddle-point system is difficult or even impossible to approximate. This makes standard block preconditioners fail for such problems. In this talk, we will introduce the multilevel sequentially semiseparable (MSSS) preconditioning technique for this problem. This type of preconditioner exploits the global multilevel sequentially semiseparable structure of the saddle-point system and computes an approximate factorization of the global saddle-point system with prescribed accuracy in linear complexity. We will illustrate the performance of the MSSS preconditioner by a simple wind farm control example.

Dr. Yue Qiu

Biography

Dec. 2015 – now, Postdoc researcher at Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany.

Sep. 2011 -- Dec. 2015, PhD of Applied Mathematics and Systems & Control, Delft University of Technology, Delft, the Netherlands.

Sep. 2009 -- Jun. 2011, MSc of Control Theory and Control Engineering, Northeastern University, Shenyang, China.

Sep.2005 -- Jun. 2009, BSc of Automatic Control, Northeastern University, Shenyang, China.

PDE-constrained optimization for level set methods

Dmitri Kuzmin

Technical University of Dortmund, Dortmund, Germany

Abstract

This talk presents an optimal control approach to constraining level set functions in finite element methods for evolving interfaces. The use of PDE-constrained optimization makes it possible to enforce local mass conservation by correcting the convective flux in the level set transport equation. The approximate distance function property is preserved using a bilinear source term to correct the slopes so as to minimize the residual of the Eikonal equation.

Prof. Dmitri Kuzmin

Biography

2014–present: Professor (W2, tenure), TU Dortmund University

2010–2014: Professor (W2, tenure), University Erlangen-Nuremberg

2009–2010: Associate Professor, University of Houston

2008–2009 Senior Lecturer (AOR), TU Dortmund University

2002–2008 Junior Professor, University of Dortmund

2000–2002 Postdoc Researcher, University of Dortmund

1998–1999 Researcher, University of Jyväskylä

Bayesian Migration for Efficient Meta-Modeling of Computational Fluid Dynamics (CFD)

Yuan Yao

National Tsing Hua University, Hsinchu, Taiwan, China

Abstract

Complex simulations, e.g. computational fluid dynamics (CFD), have been widely used to investigate chemical process system recent years. However, the computational burden makes it difficult to conduct simulations with many physical factors for process optimization and control. A solution to this problem is to translate CFD models to the corresponding meta-models which are less computational intensive. Performing a number of computer experiments is usually necessary to collect enough data for meta-modeling, which may still be too time-consuming. In this talk, a migration-based model calibration method is introduced, which integrates rough process knowledge and a small amount of computer experiment data through a Bayesian framework. The feasibility of the proposed method is illustrated with a non-isothermal continuous stirred tank reactor (CSTR). The results show that, by applying Bayesian model migration, an effective meta-model can be developed using a simplified lumped kinetic model and a limited number of CFD runs.

Prof. Yuan Yao

Biography

Prof. Yuan Yao was graduated from Department of Control Science and Engineering, Zhejiang University in 2001 with a Bachelor degree. After that he obtained his Master degree from the same department in 2004 and his Ph.D. degree from Department of Chemical and Bimolecular Engineering, Hong Kong University of Science and Technology in 2009. During 2009 to 2011, Dr. Yao was a research associate in Center for Polymer Processing and Systems, Hong Kong University of Science and Technology. Now, he is an associate professor in Department of Chemical Engineering, National Tsing Hua University. Prof.. Yao's research interests include but not limited to process control and systems engineering, process chemometrics, etc. He has published over 40 papers in SCI journals including AIChE Journal, Industrial & Engineering Chemistry Research, Journal of Process Control, Chemical Engineering Science, Chemometrics and Intelligent Laboratory Systems, Composites Part B: Engineering, Journal of the Taiwan Institute of Chemical Engineers, Polymer Testing, Polymer Composites, etc.

Accelerating optimization and uncertainty quantification of nonlinear SMB chromatography using reduced-order models.

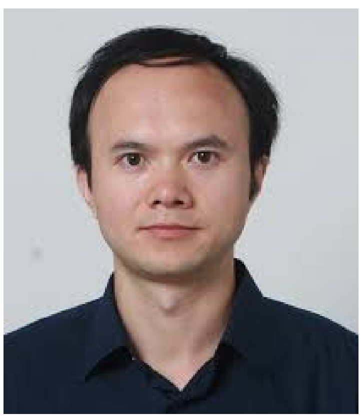
Yongjin Zhang

Henan Polytechnic University, Jiaozuo, China

Abstract

A parametrized reduced-order model is constructed and employed as a surrogate for the full-order model in optimization and uncertainty quantification of nonlinear simulated moving bed chromatography. The reduced-order model is obtained by the reduced basis method using an efficient error estimation. The complexity of the model is reduced by an empirical interpolation method applied to the nonlinear part of the model. Due to the reduced size and complexity of the surrogate model, the processes of optimization and uncertainty quantification are speed up by a factor of 10.

Dr. Yongjin Zhang



Biography

Dr. Yongjin Zhang received his Bachelor from Henan Normal University in 1998, Master in Computational Mathematics from Capital Normal University in 2011, and Ph.D. in Mathematics from Otto von Guericke University Magdeburg in 2016. He has been working as a lecturer in Henan Polytechnic University since July 2002. From September 2011 to June 2016, he worked as a Ph.D. student in the research group of Computational Methods in Systems and Control at Max Planck Institute for Dynamics of Complex Technical Systems.

The advances in accelerated gradient algorithms and nonlinear optimization

Yanqin Bai

Shanghai University, Shanghai, China

Abstract

Inspired by the hot applications of compressed sensing, sparse optimization problems, a new class of nonlinear optimization models with the objective function or constraints of nuclear-norm and low-rank matrix completion have been developed recently.

In this talk, we first introduce the optimization models of sparse optimization, support vector machine and portfolio selection problem with restriction, etc. Then we analyze their properties and optimality conditions. Moreover, the accelerated gradient (AG) algorithms are reviewed and developed to solve the above optimization problems due to its attractiveness for large-scale convex programming (CP) problems by using the fast first-order algorithms. Finally we show some numerical tests to demonstrate the effective of AG algorithms.

Prof. Yanqin Bai

Biography

Prof. Yanqin Bai is a Professor of Shanghai University. Her research interest is optimization theory and algorithms with real life applications. She has published more than fifty journal articles in some important academic journals (SCI) such as SIAM Journal of Optimization, among which two are highly cited papers of ESI. Her research on linear conic programming and interior point methods has been chosen as the representative achievement in operational research area of China. She also received many awards such as the Third Prize of Science and Technology of Shanghai, Baogang Excellent Teacher's Prize, Outstanding Achievements of Shanghai Graduate Student (Tutor), Outstanding Young Teachers of Shanghai, March 8 Red-Banner Groups (Director) and March 8 Red-Banner Holders of Education in Shanghai. She is now the deputy director of Department of Mathematics, the director of the Open Laboratory of Operations Research and Optimization of Shanghai University and the academic leader of Shanghai key discipline (Operations Research and Control). She also has many professional affiliations, such as the vice-chairman in both the Operations Research Society of Shanghai and the Mathematical Programming Branch of OR Society of China, the standing director of OR Society of China, the editor of Journal of Operations Research Society of China, the guest editor of Optimization and the commentators of Mathematical Reviews.

A Simple and Efficient WENO Method for Hyperbolic Conservation Laws

Jianxian Qiu
Xiamen University, Xiamen, China

Abstract

A simple and efficient WENO method for hyperbolic conservation laws Jianxian Qiu School of Mathematical Sciences and Fujian Provincial Key Laboratory of Mathematical Modeling and High-Performance Scientific Computing, Xiamen University E-mail: jxqiu@xmu.edu.cn ABSTRACT In this presentation, a class of new simple fifth order weighted essentially non-oscillatory (WENO) scheme is presented in the finite difference framework for solving the hyperbolic conservation laws. The new WENO scheme is a convex combination of a fourth degree polynomial with two linear polynomials in a traditional WENO fashion. This new fifth order WENO scheme uses the same five-point information as the classical fifth order WENO scheme by Jiang and Shu {G.-S. Jiang and C.-W. Shu, J. Comput. Phys., 126 (1996), 202-228}, could get less absolute truncation errors in L 1 and L ∞ norms, and obtain the same accuracy order in smooth region containing complicated numerical solution structures simultaneously escaping nonphysical oscillations adjacent strong shocks or contact discontinuities. The associated linear weights are artificially set to be any random positive numbers with the only requirement that their sum equals one. New nonlinear weights are proposed for the purpose of sustaining the optimal fifth order accuracy. The new WENO scheme has advantages over the classical WENO scheme by Jiang and Shu { G.-S. Jiang and C.-W. Shu, J. Comput. Phys., 126 (1996), 202-228.} in its simplicity and easy extension to higher dimensions. Some benchmark numerical tests are performed to illustrate the capability of this new fifth order WENO scheme.

Prof. Jianxian Qiu

Biography2010.10-present, Minjiang Scholarship, Chair Professor, Xiamen University

2005.01-2012.06, Professor, Nanjing University

2006.06-2006.08, Senior visiting scholar, ICMSEC, CAS

2003.06-2005.12, Research Fellow, National University of Singapore.

2003.02-2003.06, Visiting Associate Professor, Brown University, USA.

2001.04-2003.03, Postdoc, University of Science and Technology of China.

2001, Ph.D., Nanjing University of Aeronautics and Astronautics.

1988, M.Sc., Nanjing University of Aeronautics and Astronautics.

1982, B.Sc., China Geological University (Wuhan)

A Two-Stage Fourth Order Time-Accurate Discretization for Lax-Wendroff Type Flow Solvers

Jiequan Li
Beijing Normal University, Beijing, China
Beijing Institute of Applied Physics and Computational Mathematics, Beijing, China

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Abstract

In this talk I will present a novel two-stage fourth order time-accurate discretization for time-dependent flow problems, particularly for hyperbolic conservation laws. Different from the classical Runge-Kutta (R-K) temporal discretization for first order Riemann solvers as building blocks, the current approach is solely associated with Lax-Wendroff (L-W) type schemes as the building blocks. As a result, a two-stage procedure can be constructed to achieve a fourth order temporal accuracy, rather than using well-developed four stages for R-K methods. The generalized Riemann problem (GRP) solver is taken as a representative of L-W type schemes for the construction of a two-stage fourth order accurate numerical scheme.

Biography

Prof. Jiequan Li

2011.01-present, Professor, Beijing Normal University

2002.08-2010.12, Professor, Capital Normal University

2004.03-2005.06, Humboldt Research Fellow, Otto von Guericke University, Magdeburg

2001.08-2002.07, Visiting Professor, Institute of Mathematics, Acadamia Sinica

1999.10-2001.08, Lady Davis& Golda Meirr Research Fellow, Hebrew University of Jerusalem, Irsael

1997.03-1998.12, Postdoc, Institute of Applied Mathematics, Academy of Sciences

1994.9-1997.3, Ph.D., Institute of Mathematics, Chinese Academy of Sciences

1991.9-1994.7, M.Sc., Beijing Normal University

Towards pressure-robust mixed methods for the incompressible Navier-Stokes equations

Alexander Linke

Weierstrass Institute for Applied Analysis and Stochastics, 10117, Berlin, Germany

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Abstract

For more than thirty years it was thought that the efficient construction of pressure-robust mixed methods for the incompressible Navier--Stokes equations, whose velocity error is pressure-independent, was practically impossible. However, a novel, quite universal construction approach shows that it is indeed rather easy to construct pressure-robust mixed methods. The approach repairs a certain L2-orthogonality between gradient fields and discretely divergence-free test functions, and works for families of arbitrary-order mixed finite element methods, arbitrary-order discontinuous Galerkin methods, and finite volume methods. Novel benchmarks for the incompressible Navier--Stokes equations show that the approach promises significant speedups in computational practice compared to pure Galerkin discretizations, whenever the continuous pressure is complicated.

Dr. Alexander Linke

Biography

2006-present, Researcher at the WIAS Berlin

2015, Short-time Professorship (W2) at the chair "Numerik partieller Differentialgleichungen" at TU Dresden (substituting Prof. H.-G. Roos)

2003–2006, Researcher at the FU Berlin

2002-2003, Researcher at the Friedrich-Alexander-Universität Erlangen-Nürnberg

On the Weak Solutions to the Mixed Navier-Stokes/Darcy Model

Yanren Hou

Xi'an Jiaotong University, Xi’an, China

Abstract

In this talk, an a priori estimate of weak solutions to the mixed Navier-Stokes-Darcy model with Beaver-Joseph-Saffman's interface condition is established. Based on this result, the existence and global uniqueness of the weak solution is obtained.

Prof. Yanren Hou

Biography

Prof. Yanren Hou received his Bachelor’s， Master’s and Doctor’s degrees from Xi’an Jiaotong University in 1991, 1994 and 1997, respectively. Since 1997, he joined the School of Mathematics and Statistics, Xi’an Jiaotong University. Dr. Hou has been working on the research areas of numerical solutions of PDEs, especially the stable and high performance algorithms in fluid dynamics, which have been supported with NSFC and MOE(Ministry of Education) constantly.

Lattice Boltzmann Method for Complicated Flows

Wu Zhang
Shanghai University, Shanghai, China

Abstract

Different from the classical numerical methods of continuum mechanics, Lattice Boltzmann Method (LBM) is a numerical method of computational fluid dynamics on the basis of molecular dynamics, and considered as a special form of discrete Boltzmann equation. LBM includes these advantages: the simple algorithm; pressure can be solved directly, easy handling of complex boundary conditions and especially suitable for parallel computing. In order to enhance the range of the fluid flow rate, a new equilibrium distribution function derived from successive Maxwell equilibrium distribution functions to the corresponding discrete velocity model by a distribution function was proposed. The equilibrium distribution functions of two-dimensional D2Q9 model and three dimensional D3Q19 model were used respectively, which can be applied to greater fluid flow rate range than before. In addition, in order to accelerate compute and treat complexity, the domain decomposition method and multi-grid were applied to the LBM and the corresponding large-scale parallel algorithm was discussed. By combining LBM with turbulence model of large eddy simulation(LES) , the present method can effectively simulate flow problems of high Reynolds number. The parallelism of LBM+LES was analyzed on the supercomputers with hundreds of thousands cores. The flows around a sphere, wing-body combination and business aircraft are used as the numerical examples in “Ziqiang 4000” supercomputer in Shanghai University and “Sunway Blue Light” supercomputer of National Supercomputing Center.

Prof. Wu Zhang

Biography

Prof. Wu Zhang is a professor of Shanghai University. He graduated from Nanjing Aeronautical Institute in 1980, obtained his Mater Degree of Computational Mathematics at Xi’an Jiaotong University in 1984 and Ph.D. of Aerodynamics at Northwestern Polytechnic University in 1988. He was postdoctoral research fellow of CFD at Peking University during 1989-1991 and Applied Mathematics at UNC Charlotte, USA, during 1996-1998, respectively. Before he joined the School of Computer Engineering and Science, Shanghai University, in 2002, he worked at Beijing University (1991-1993), Xi’an Jiaotong University (1993-2001), and visited, as associate professor, EE Department of UNC (Charlotte, 1995-1996), and, as professor, CS Department of Illinois Institute of Technology (Chicago, 2000-2001). Professor Zhang has been executive dean of the School of Computer Engineering and Science since 2002, and director of High Performance Computing Center, Shanghai University, since 2007. He has been working on the research areas of Numerical Solutions of PDEs, CFD, Parallel Algorithms and Applications.

Global Existence and Nonexistence of the Initial–boundary value Problem for the Dissipative Boussinesq Equation

Shubin Wang

Zhengzhou University, Zhengzhou, China.

Abstract

A class of multidimensional dissipative Boussinesq equations is considered. Under three different cases of initial energy, we prove the existence and uniqueness of global solutions in the energy space and provide sufficient conditions of finite time blow up solutions. The sharp result is given as $E(0) < d$. Particular attention is paid to initial energy at supercritical initial energy ($E(0) > d$) level which is novel contribution of this paper, and new methods will be introduced and some analysis techniques are needed. In addition, the asymptotic behavior of the global solutions is studied.

Prof. Shubin Wang

Biography

Prof. Shubin Wang obtained his Master Degree in 1987 at Zhengzhou University. Since 1987 he is occupied in Zhengzhou University. His main research in fluid mechanics, water spread and other physical problems of higher order nonlinear partial differential equation of definite solution problems. Now he is working in 《Journal Partial Differential Equations》 as editorial director and 《International Journal Partial Differential Equations》 as editor.

The High Order Positivity-preserving Numerical Method for Compressible Multi-media Flow

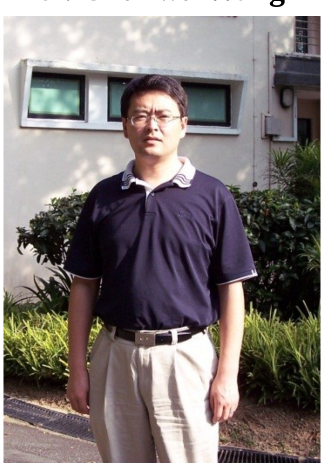
Chunwu Wang[1], Wei Xu[1] and Chi-Wang Shu[2]

1. College of Science, Nanjing University of Aeronautics and Astronautics, Nanjing, China
2. Division of Applied Mathematics, Brown University, USA

Abstract:

In the numerical simulations of the multi-medium flow, the loss of positivity of the physically positive variables may lead to nonlinear instability or blow-ups of the algorithm. In this paper, we construct high order accurate schemes which preserve positivity of density and pressure in the simulation of compressible multi-media flows. The method is based on the positivity-preserving Runge-Kutta discontinuous Galerkin (RKDG) schemes for single medium flows and the real Ghost Fluid method (RGFM) for the interface treating. The schemes are extended to the simulation of multi-media flows and the positivity-preserving limiters for pressure are modified for simplicity. The obtained limiters can keep the property of the original limiter and are cost effective. Furthermore, we develop a positivity preserving Riemann solver in RGFM interface treating method. Several numerical examples are given to test robustness and efficiency of the algorithm. Numerical results show that the obtained method can maintain the positivity of pressure or density and can capture the discontinuities accurately.

Prof. Chunwu Wang



Biography

Prof. Chunwu Wang received his Ph.D degree from Nanjing University of Aeronautics and Astronautics(NUAA) in 2000. After two years working as a post-doc research fellow at Institute of High Performance computing of Singapore, he came back to NUAA as a lecturer and now is a professor in the college of Science. His research interests include numerical methods for CFD and the numerical simulation of muti-medium flow.

High-order numerical methods for the simulation of Richtmyer-Meshkov instability with complicated equations of states

Baolin Tian, Zhiwei He, Yousheng Zhang, Fujie Gao, Li Li

Beijing Institute of Applied Physics and Computational Mathematics, Beijing, China

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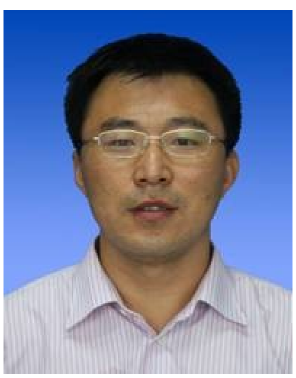
Abstract

This work concerns the application of high-order schemes to Richtmyer-Meshkov instability governed with complicated equations of state, with focus on the effects of high-order schemes. Firstly, a uniform treatment of different equation of state, including ideal EOS, stiffened EOS, van der Waals EOS, Jones-Wilkins-Lee EOS, Chran-Coran EOS and HOM EOS, is given. Based on this uniform treatment and the iso-pressure closure of the five-equation model, the process of mixing is just the volume-fraction-weighted mixture of two newly functions of density. Thus the effective EOS of the numerical diffusion zone which can be mixed from materials of different type EOS can be given explicitly, and this uniform treatment is very convenient for coding. Coupled with the strategies developed for the four-equation model, the final algorithm with different high-order schemes yields feasible results, which demonstrates the effectiveness of the proposed algorithm.

Prof. Baolin Tian



Biography

2004-present, Professor, Beijing Institute of Applied Physics and Computational Mathematics

2000-2004, Ph.D., Institute of Mechanics, Chinese Academy of Sciences

1997-2000, M.Sc., Jilin University

1993-1997, B.Sc., Jilin University

Prof. Baolin Tian’s main research area is computational fluid dynamics, fluid interface instabilities Numerical simulation and analysis.He also do some research in the high-precision, high-resolution compact difference scheme, multi-media methods and ALE and Lagrangian fluid hydrodynamic interface instabilities, etc.

Polynomials-based Model Order Reduction for Input and Output Systems

Yao-Lin Jiang, Zhen-Zhong Qi

Xi'an Jiaotong University, Xi'an, 710049, China

Abstract

Model order reduction (MOR) methods are a class of efficient numerical methods to handle large scale complex systems. In this report, we will introduce a series of model order reduction methods based on polynomials for input and output systems. The contents are summarized as follow:

(a) For linear time-invariant systems, a new MOR method based on general orthogonal polynomials in the time domain is presented. The main idea of such method is to first expand the state variables in the space spanned by general orthogonal polynomials, then calculate the coefficient terms of polynomial expansion through a recurrence formula. The basic procedure is to use the coefficient terms to generate a projection matrix. The reduced system matches the first expansion coefficient terms and preserves the stability and passivity under certain condition.

(b) A structure-preserved algorithm based on general orthogonal polynomials is successfully extended to coupled systems. This algorithm first expands the state variables in each subsystems on the basis of general orthogonal polynomials directly and combines with the coupled relation, then computes the expansion coefficients by a recurrence formula. Thus a reduced system is produced by a diagonal projection transformation constructed by the coefficient terms, which can preserve the coupled structure of the original system. It matches several expansion coefficients of the original output and the stability is kept under certain conditions.

(c) For multi-input-multi-output bilinear systems, a new MOR method based on orthogonal polynomials and multi-order Arnoldi algorithm is presented. This method expands the state variables in the space spanned by orthogonal polynomials, then the expansion coefficients are calculated by a recurrence formula. Finally, a reduced model is obtained by a projection transformation, which is constructed by the multi-order Arnoldi algorithm. The resulting reduced model matches the first finite expansion coefficients of the original system. In addition, the MOR procedure is stable and efficient.

Prof. Yao-Lin Jiang

Biography

Prof. Yao-Lin Jiang was born in October, 1966, Jiangsu Yangzhou. In 1985 he was graduated from the Department of Mathematics in Sichuan University. In 1988 and 1992, he received his Master's and doctoral degrees in Computational Mathematics from Xi'an Jiaotong University respectively. He was promoted as an associate professor of Xi'an Jiaotong University in 1993. He was promoted to professor of Xi'an Jiaotong University in 1998. He had obtained Shanxi Province outstanding returned overseas students reward (1998). He is also a Distinguished Professor of Yangtze River Scholar (Xinjiang University), Ministry of Education of China.

Data-driven Model Reduction for Nonlinear Systems

Athanasios C Antoulas (IEEE Fellow)

Jacobs University, Bremen, Germany

Abstract

The subject of this presentation is data-driven model reduction of bilinear systems.
In particular we will show how the Loewner framework can extended
to this class systems. The main advantage of this framework over existing ones is that the
Loewner pencil introduces a trade-o ff between accuracy and complexity.
Several numerical experiments will illustrate the key features of this approach.

Prof. Athanasios C Antoulas

Biography

Prof. Athanasios C Antoulas was born in Athens, Greece. He studied at the ETH Zürich, where he obtained the Diploma of Electrical Engineering in 1975, the Diploma of Mathematics in 1975, and the Ph.D. Degree in Mathematics in 1980. He was Professor R.E. Kalman's only Ph.D. student in Switzerland.Since 1982 he has been with the Department of Electrical and Computer Engineering, Rice University, where he is currently a Professor. Prof Antoulas was elected Fellow of the IEEE (Institute of Electrical and Electronics Engineers) in 1991 and was awarded the Best Paper Prize of the AIAA (American Institute of Aeronautics and Astronautics) Guidance, Navigation and Control Section, in 1992. In 1995 he was awarded a JSPS (Japan Society for the Promotion of Science) Fellowship. He has served on the Editorial Board of many journals including the IEEE Transactions on Automatic Control, SIAM Journal on Control and Optimization, and Linear Algebra and its Applications. For the past 12 years he has been serving as Editor-in-Chief of Systems and Control Letters. He has held many visiting appointments, including those at the Australian National University, the University of Groningen, the Catholic University of Leuven and Louvain-la-Neuve, the Tokyo Institute of Technology, Kyoto University, etc. Furthermore he has given invited presentations at numerous conferences and workshops. His research interests are in the broad area of dynamical systems and computation including model reduction of large-scale systems. He is the author of a book on the Approximation of Large-Scale Systems, published by SIAM.

Advances in Reduced Order Methods for Viscous Flows: Challenges and Perspectives

Gianluigi Rozza

International School for Advanced Studies (SISSA), Trieste, Italy

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Abstract

In this talk we deal with the state of the art of Reduced Order Methods (ROM) for parametric Partial Differential Equations (PDEs) and we provide some perspectives in their current trends and developments, with a special interest in Computational Fluid Dynamics (CFD) parametric problems. Systems modelled by PDEs are depending by several complex parameters in need of being reduced, even before the computational phase in a pre-processing step. Efficient parametrizations (random inputs, geometry, physics) are very important to be able to properly address an offline-online decoupling of the computational procedures and to allow competitive computational performances.

Current ROM developments include: a better use of high fidelity methods, also spectral element method, enhancing the quality of the reduced model too; more efficient sampling techniques to reduce the number of the basis functions, retained as snapshots, and the dimension of online systems; the improvements of the certification of accuracy based on residual based error bounds and stability factors; for nonlinear system also investigations on bifurcations of parametric solutions is crucial and it may be obtained thanks to a reduced eigenvalue analysis. All the previous aspects are very important in CFD problems in order to be able to study complex industrial and biomedical flow control problems in real time, and to couple viscous flows -velocity, pressure, and also thermal field - with a structural field (FSI) or a porous medium. This last task requires also an efficient reduced parametric treatment of interfaces as well as parametric domain decomposition.

Prof. Gianluigi Rozza

Biography

2014–present, Associate Professor with Tenure of Numerical Analysis and Scientific Computing. SISSA mathLab, Mathematics Area

2012–2014, SISSA Research Excellence Grant for independent research NOFYSAS

2008–2012, Researcher and Lecturer (and external scientific collaborator 2012 – 2015). EPFL – École Polytechnique Fédérale de Lausanne, Switzerland.

2006–2008, Post Doctoral Associate Researcher (and Research Affiliate 2008 – 2014). MIT – Massachusetts Institute of Technology, Boston MA, USA, Department of Mechanical Engineering and Center for Computational Engineering, Prof. A.T. Patera.

2002–2006, Research Assistant, EPFL

2013–present, Editorial Board, SIAM/ASA Journal on Uncertainty Quantification (associate editor)

2016–present, Editorial Board, SIAM SINUM Journal of Numerical Analysis (associate editor)

Reduced Basis ANOVA Methods for Partial Differential Equations with High-Dimensional Random Inputs

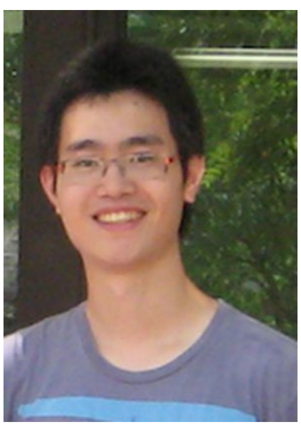
Qifeng Liao

Shanghai Tech University, Shanghai, China

Abstract

We present a reduced basis ANOVA approach for partial deferential equations (PDEs) with random inputs. The ANOVA method combined with stochastic collocation methods provide model reduction in high-dimensional parameter space through decomposing high-dimensional inputs into unions of low-dimensional inputs. In this work, to further reduce the computational cost, we investigate spatial low-rank structures in the ANOVA-collocation method, and develop efficient spatial model reduction techniques using hierarchically generated reduced bases. We present a general mathematical framework of the methodology, validate its accuracy and demonstrate its efficiency with numerical experiments. This is joint work with Prof. Guang Lin of Purdue University.

Prof. Qifeng Liao



Biography

Prof. Qifeng Liao obtained his PhD degree in applied numerical computing from the School of Mathematics of the University of Manchester in December 2010. During January 2011 to June 2012, He was a postdoc at the Department of Computer Science of the University of Maryland, College Park. During July 2012 to February 2015, he was a postdoc at the Department of Aeronautics and Astronautics of Massachusetts Institute of Technology. He joined the faculty of the School of Information Science and Technology at Shanghai Tech University as an assistant professor in March 2015.

Two-level Orthogonal Arnoldi procedure

Yangfeng Su

Fudan University, Shanghai, China

Abstract

The second-order Arnoldi (SOAR) procedure is an algorithm for computing an orthonormal basis of the second-order Krylov subspace. It has found applications in solving quadratic eigenvalue problems and model order reduction of second-order dynamical systems among others. Unfortunately, the SOAR procedure can be numerically unstable. The two-level orthogonal Arnoldi (TOAR) procedure has been proposed as an alternative to SOAR to cure the numerical instability. In this paper, we provide a rigorous stability analysis of the TOAR procedure. We prove that under mild assumptions, the TOAR procedure is backward stable in computing an orthonormal basis of the associated linear Krylov subspace. The benefit of the backward stability of TOAR is demonstrated by its high accuracy in structure-preserving model order reduction of second-order dynamical systems.

Prof. Yangfeng Su

Biography

Prof. Yangfeng Su is a professor in the School of Mathematical Sciences in Fudan University. He received his Ph.D in Mathematics from Fudan University in 1992. His research interests include numerical algebra, methods of linear and nonlinear eigenvalue problems, model reduction and its application. He is also the director of the department of Information & Computing Sciences, School of Mathematical Sciences, Fudan University.

Frequency-dependent Balanced Truncation of Linear Systems over Finite-frequency Ranges

Xin Du

Shanghai University, Shanghai, China

Abstract

Balanced truncation is one of the most common model order reduction schemes. In this paper, we study finite-frequency model order reduction (FF-MOR) problems of linear continuous-time systems within the framework of balanced truncation method. Firstly, we construct a family of parameterized frequency-dependent (PFD) mappings which generate discrete-time PFD mapped systems and continuous-time PFD mapped systems of the given continuous-time system. The relationships between the maximum singular value of the given system over pre-specified frequency ranges and the maximum singular value of the PFD mapped systems over entire frequency range are established. By exploiting the properties of the discrete-time PFD mapped systems, a new parameterized frequency-dependent balanced truncation (PFDBT) method providing finite-frequency type error bound with respect to the maximum singular value of the approximation error systems are developed. Examples are included for illustration.

Dr. Xin Du

Biography

2010.02-present, Lecturer, Department of Automation, Shanghai University, China

2012.04-2012.08, Postdoc, Max-Planck-Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany

2012.12-2013.11, Assistant Director, Science & Technology Office, Shanghai University

2013.12-2015.08, Postdoc, Max-Planck-Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany

2016.02-present, Bureau of International Cooperation, NSFC

2004.09-2010.01, Ph.D., Northeastern University, Shenyang, China

2000.09-2004.07, B.S., University of Science and Technology Beijing, Peking, China

Model Order Reduction of Weakly Nonlinear Systems using Some Special Orthogonal Polynomials

Xiaolong Wang

Northwestern Polytechnical University, Xi'an, China

Abstract

Model order reduction (MOR) is a powerful tool which enables an efficient numerical simulation in many engineering areas, such as the system simulation, control, prediction and optimization. Orthogonal polynomials possess some nice properties and frequently are used in function approximation. In this presentation, we attempt to perform MOR for nonlinear systems in the framework of orthogonal polynomials. Systems are expanded over some special orthogonal polynomials basis and the parameters of systems are then defined properly. Reduced models are constructed to preserve such parameters so as to attain an accurate surrogate. The numerical experiments show that the approach is efficient, which provides an alternative for MOR of nonlinear systems.

Dr. Xiaolong Wang

Biography

Dr. Xiaolong Wang is a lecturer in the department of applied mathematics in Northwestern Polytechnical University, working in the group of scientific computing and optimization. He received his BS and PhD degrees in mathematics and applied mathematics from Xi'an Jiaotong University in 2006 and 2012, respectively. His research interests include model order reduction (MOR) of large-scale systems, numerical linear algebra and related issues in system and control theory. He is also interested in the application of MOR in the numerical solution of differential equations.

Reduced Basis Approximation of Coupled Problems

Mladjan Radic, Karsten Urban

Institute of Numerical Mathematics, University of Ulm, 89081, Ulm, Germany.

Abstract

The coupling of two variational problems has many farreaching applications in several fields, such as fluid flow through porous media or chemical reactions in a catalyst or a fuel cell. We study a coupled (time-dependent) convection-dominated problem on a domain *D1* and a diffusion-reaction problem on a domain *D2*, whereby *D1*, *D2* are only connected through an interface. On this interface, the interchange and interference between these two processes is modeled and therefore meaningful boundary conditions have to be established. Different inflow conditions and reaction coefficients serve as parameters. Firstly, we can deduce a saddle-point formulation. However, existence and uniqueness of a solution is not straightforward to prove. To overcome this issue, we will present an alternative approach partly following Maier, Rozza & Haasdonk (2015). Additionally, we apply the Reduced Basis Method on our coupled problem aiming a reduction of computational time. To achieve this goal, we use an offline/online-decomposition and efficient bounds for the arising error. Our approach is a space-time variational formulation of the coupled problem and we utilize amongst others the error estimator developed in Urban & Patera (2013). In this context, we want to discuss the difficulties originating from the interferences on the coupling boundary. We particularly consider the effect on the numerical determination of accurate bounds for the inf-sup and continuity constants, which are crucial for the fast computation of efficient error estimators. We also want to present the implementation of the discontinuous Galerkin method, which was embedded in **rbmatlab** (http://www.ians.uni-stuttgart.de/MoRePaS/software/) and which was used to solve the Helmholtz and wave equation. Especially the wave equation is considered in the space-time variational formulation and a stable implementation is a current research topic.

Mr. Mladjan Radic

Biography

Born in Mostar, Bosnia and Herzegovina, 1988

2013-present, Ph.D. student, University of Ulm, Departement of Numerical Mathematics, Supervisor: **Prof. Karsten Urban**

2010-2012, Master of Science, University of Ulm, field of study: mathematics

Conferences: - ICOSAHOM, 2014, Salt-Lake-City, Utah

- MOREPAS 2015, Trieste Italy

Summer Schools: - Reduced Basis Summer School, 2013, Kopp, Germany

- Reduced Basis Summer School, 2014, Münster, Germany

POD based indoor thermal environment modeling, control and optimization

Kangji Li

Jiangsu University, Zhenjiang, China

Abstract

Precise and efficient control strategies of heating, ventilation, and air conditioning (HVAC) systems need detailed and dynamic indoor environment information, which is hardly acquired satisfying real time and precision requirements simultaneously. A fast simulation method based on existing proper orthogonal decomposition (POD) is proposed for dynamic modeling and control of indoor temperature distributions. The finite volume method (FVM) is used for spatial and temporal discretizations of the indoor temperature distributions. The obtained ordinary differential equations (ODEs) are further order-reduced by POD (Karhunen-Loève)/Galerkin techniques. Snapshot method is used for the reduced-order basis construction. The model predictive control (MPC) strategy is used for the purpose of reference trajectory tracking, within which the proposed POD model is embedded to realtime estimate spacial temperature variation. Also, POD based model reduction technique is applied to develop a numerical optimization that help improve indoor environment quality and energy costs for space heating and cooling simultaneously. The spatial distributions of key environmental parameters such as temperature, airflow, CO2 concentration and predicted mean vote (PMV), are considered in the optimization procedure, which enable to help improve the environment comfort of occupied zones in an office room.

Prof. Kangji Li

Biography

Prof. Kangji Li currently is an associate professor of Jiangsu University. He received Bachelor and M.S degree from School of electrical and information engineering, Jiangsu University in 2002 and 2005, respectively. He obtained Ph.D. in control science and engineering, from Zhejiang University in 2013. His main research interests include modeling/control of distributed parameter systems, model reduction methods and applications, building environment and energy systems.

POD Reduced-order Modeling Applied to 2D and 3D Fluid Flow

Juan Du

Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

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Abstract

The Proper Orthogonal Decomposition (POD) reduced order model is implemented on an unstructured mesh finite element fluid flow model, and is applied to 3D flows. A new scheme for implementing a reduced order model for complex mesh-based numerical models (e.g. finite element unstructured mesh models), is presented. The matrix and source term vector of the full model are projected onto the reduced bases. The reduced order modeling code is simple to implement even with complex governing equations, discretization methods and nonlinear parameterizations. Importantly, the model order reduction code is independent of the implementation details of the full model code. For nonlinear problems, a perturbation approach is used to help accelerate the matrix equation assembly process based on the assumption that the discretized system of equations has a polynomial representation and can thus be created by a summation of pre-formed matrices. The error between the full order finite element solution and the reduced order model POD solution is estimated. The feasibility and accuracy of the reduced order model applied to 3D fluid flows are demonstrated.

Prof. Dr. Juan Du

Biography

Prof. Dr. Juan Du received her Ph.D from School of Computational Mathematics, Beijing Jiaotong University. She had been selected as the “Dr. CSC high-level university students” and spend two years in Florida State University (FSU) for joint training. During 2011-2013, she served as a postdoctoral research fellow in Institute of Atmospheric Physics, Chinese Academy of Sciences, where she currently is an associate professor. She had visited the Imperial College London for several times as a visiting scholar. Her main research interest includes POD based model reduction and atmosphere-ocean data assimilation.

Data Assimilation and Model Reduction Applied a Compressible and Reactive Flow

Julius Reiss

Technical University of Berlin, Berlin, Germany

Abstract

Moving fronts are a challenge for standard model reduction techniques. The shifted POD aims at this problem by decomposing the field into modes in multiple co-moving frames. It works purely data driven and can, thus, be applied to data of various origin. Here, in a first step data is created from a quasi-one-dimensional reactive Euler flow, which is matched to an experiment by adopting the reactive parameters to the measured pressure data. In a second step the shifted POD is used to decompose the flow field describing the different phenomena of the flow. By this a reduced description of an detonation combustor is obtained.

Prof. Julius Reiss

Biography

2016.07-present, visiting professor, TU Berlin

2009.12-2016.06, research assistant (Postdoc), TU Berlin

2008.11-2009.11, research assistant (Postdoc), UNI-BW (university of the german armed forces, Munich)

2006.08-2008.06, Consultant of financial Mathematics

2006.12, Ph.D., physics U Stuttgart (MP-FKF Stuttgart, W. Metzner)

2001, Diploma of physics, RWTH Aachen, (V. Dohm)

Enhanced heat transport in partitioned thermal convection

Quan Zhou

Shanghai University, Shanghai, China

Abstract

Enhancing heat transport across a fluid layer is of fundamental interest as well as of great technological importance. For decades, Rayleigh-Bénard convection has been a paradigm for the study of convective heat transport, and how to improve its overall heat-transfer efficiency is still an open question. Here we report an experimental and numerical study that reveals a novel mechanism that leads to much enhanced heat transport. When vertical partitions are inserted into a convection cell with thin gaps left open between partition walls and the cooling/heating plates, it is found that the convective flow becomes self-organized and more coherent, leading to an unprecedented heat-transport enhancement. In particular, our experiments show that with 6 partition walls inserted the heat flux can be increased by about 30%. Numerical simulations show a remarkable heat-flux enhancement of up to 2.3 times (with 28 partition walls) that without any partitions.

Prof. Quan. Zhou

Biography

The current research of Prof. Quan. Zhou is on the studies of buoyancy-driven turbulence. In recent years, Prof. Zhou has published 10 papers in JFM, 5 papers in PRL, and 4 papers in PoF. Totally, Prof. Zhou has published 28 SCI papers with 268 SCI citations by other researchers. The research achievement was featured in the cover of the PoF, two highly cited papers selected by ESI, and invited to write two perspective or review papers and to give four keynote lectures in the international or nationwide conferences. Prof. Zhou received "Excellent Young Scientist foundation" from NSFC, and "the National Program for Support of Top-notch Young Professionals".

DNS Parallel Direct Solution for Two Dimensional Turbulent Thermal Convection.

Yun Bao, Jiahui Luo

Sun Yat-sen University, Guangzhou, China

Abstract

DNS is one of the important research tool for the turbulent thermal convection with high Ra numbers. A parallel direct methods of DNS (PDM-DNS) for the two-dimensional turbulent thermal convection was created combining the PDD algorithm for the Poisson equation direct solving. DNS calculations of the turbulent convection with high Ra were completed on the "Tianhe-2" supercomputer, and the iteration time steps are over one hundred million. The effect of calculations is surprised. The calculation scale, which was difficult to achieve before, is realized. The turbulent convection results with the high calculation resolution show that the soft and hard turbulent convection flow are completely different, and there are the different scaling relations for the Nu number to Ra number. Research works in this paper provide a valuable method for the massively parallel computing and numerical simulation studies of the turbulent convection with high Ra number.

Prof. Yun Bao

Biography

Professor Yun Bao was graduated from Northwestern Polytechnical University with a major in aerodynamics in 1982. She obtained his Master Degree in aerodynamics in1984 and Doctor Degree in 1988 at Northwestern Polytechnical University. From July 1989 to July 1992, she severed as post-doc research fellow at the Institute of Aerospace Engineering, University of Southern California from August 1992 to June 1999. She was an associate professor in the Department of aircraft system at Northwestern Polytechnical University and has been an associate professor and professor of the Department of mechanics at Sun Yat-sen University since June 1999. She hosted and participated in a number of domestic and international research projects, including the project of National Natural Science Foundation of China, 863, 973 project and so on, more than 10 items. She is mainly engaged in the study of computational fluid dynamics and environmental fluid dynamics. She has engaged in a large number of water power and Environmental Numerical Simulation of the Pearl River Estuary.

Drag Reduction of Airfoils with Structured or Actuated Surfaces

Siegfried Müller

Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH Aachen), Aachen, Germany

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Abstract

Simulations of a flow over a roughness are prohibitively expensive for small scale structures. If the interest is only on some macroscale quantity, e.g., the drag, it will be sufficient to model the influence of the unresolved microscale effects. Such multiscale models rely on an appropriate upscaling strategy. Here the strategy originally developed by Achdou et al. for incompressible flows is extended to compressible high-Reynolds number flow. For proof of concept a laminar flow over a flat plate with partially embedded roughness is simulated. The results are compared with computations on a rough domain recently published in [2].

[1] Y. Achdou, O. Pironneau, F. Valentin, Effective boundary conditions for laminar flows over periodic rough boundaries, *J. Comp. Phys.*, 147, 187--218, 1998.

[2] G. Deolmi, W. Dahmen, S. Müller, Effective boundary conditions for compressible flows over rough boundaries, *Mathematical Models and Methods in Applied Sciences*, 25(7), 1257--1297, 2015

Prof. Siegfried Müller

Biography

2008, Awarding of the title apl. Professor

2004-present, Researcher at RWTH

2000-2004, research assistant, the Collaborative Research Center 401 Modulation of Flow and Fluid-Structure Interaction at Airplane Wings, RWTH Aachen

2002, Friedrich-Wilhelm Award, RWTH Aachen

2001, visiting lecturer, Seminar for Applied Mathematics, ETH Zurich, Switzerland (2 months)

1993-1999, scientific assistant, the Institut für Geometrie und Praktische Mathematik, RWTH Aachen

Scholarships, Awards, and Research Stays:

1999, Researcher, Laboratoire d'Analyse Numerique, Universite Pierre et Marie Curie, Paris (6 months)

Large Eddy Simulation on Cloud Cavitating Flow Near the Free Surface

Yiwei Wang

Institute of Mechanics, Chinese Academy of Sciences, Beijing, China

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Abstract

The influence of free surface on unsteady cloud cavitation is an important issue for high-speed surface vehicles, but significant experimental and numerical works related to this matter are limited in literature. A numerical approach is established by using large eddy simulation and volume-of-fluid methods. Relevant launching experiments are also performed with the presence of free surface. Unsteady evolutions of the cavity and re-entry jet are obtained both in experimental and numerical results, which agree well with each other. Results indicate that the cavity evolution on the upper side of projectile changes remarkably relative to the lower side under the free-surface effect. Moreover, air entrainment occurs when the cavity grows and reaches the free surface. The entrained noncondensable air makes the cavity larger and more stable than the cloud cavity under a similar cavitation number far from the free surface.

Prof. Yiwei Wang

Biography

Prof. Yiwei Wang received his bachelor's degree on Science and Engineering, Department of Mechanics from Peking University in 2005. In 2008, he obtained master's degree at Institute of Technology of Peking University. He received his Ph.D from Institute of Mechanics, Chinese Academy of Sciences in 2013. Then he joined the Institute of Mechanics, Chinese Academy of Sciences, where he now is an associate professor. His main research interest includes high-speed water dynamics, computational fluid dynamics, fluid-structure coupling research. He is a member of the Fluid Mechanics special committee and industrial fluid dynamics committee, Chinese Society of Mechanics. Fluid Mechanics special committee and industrial fluid dynamics committee, Chinese Society of Mechanics.

Dynamics of Patches of Wind Ripples: What Happens After Initial Focussing?

Zhan Wang

Institute of Mechanics, Chinese Academy of Sciences, Beijing, China

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Abstract

Water waves can span scales of hundreds of kilometres to a few millimetres with fascinating and complex behaviours. At small scales, when gravity and surface tension are equally important, water waves exhibit a large variety of phenomena, one of which is the combination of geometric and nonlinear self-interaction focussing of localised disturbances. This phenomenon is very much like strong laser pulses propagating through a Kerr medium. We describe the reasons for this similarity and how the evolutions in the two cases differ past the collapse time, based on a novel numerical scheme for full water-wave equations.

Prof. Zhan Wang

Biography

Prof. Zhan Wang received his Ph.D degree from University of Wisconsin-Madison in 2012, majoring in Applied Mathematics and Fluid Mechanics. After two years as a post-doc research fellow at University College London, he became a lecturer in the Department of Mathematical Sciences at University of Bath. He is now a professor at the Institute of Mechanics of Chinese Academy of Sciences, under the “Recruitment Program for Young Professionals”. Prof. Wang’s research interest includes geophysical fluid mechanics, nonlinear waves, free boundary problems and fluid-structure interactions.

Numerical Solution of General Linear Methods for Neutral Delay Differential Algebraic Equations

Hongjiong Tian

Shanghai Normal University, Shanghai, China

Abstract

This talk is concerned with numerical analysis of general linear methods for a system of linear neutral delay differential-algebraic equations. We first introduce the construction of the general linear methods for the neutral delay differential-algebraic equations by the ϵ-embedding method and study the convergence of the general linear methods for index 1 and 2 problems. We then give a sufficient condition under which the neutral delay differential-algebraic equation is asymptotically stable by studying the roots of corresponding characteristic equation and some practically checkable criteria are given. Based on this result, we obtain a sufficient and necessary condition of the asymptotic stability of the numerical methods. Numerical experiments confirm our theoretical results

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Prof. Hongjiong Tian

Biography

Prof. Hongjiong Tian obtained his Master Degree in Shanghai Normal University in July 1994. From June 1996 to September 1997, he was engaged in the United States, New Jersey Ramapo College as a visiting scholar. From May October 1997 to December 2000,he obtained his Doctor Degree at Manchester University. Between 2004 and October 2001 April, he worked in Shanghai Normal University to do some Post-doc Research work. In 2005 he was promoted to the rank of Professor. Since 2007, he was the tutor of doctoral students in computational mathematics. He is engaged in the research of numerical solution of ordinary differential equations for a long time. He has obtained the second award of science and technology in Heilongjiang Province. He has published more than 50 papers on SIAM J. Sci. Comp., SIAM J. Numer. Anal., BIT, etc.

Efficient Optimization and Control in CFD and CAA

Nicolas R. Gauger

Technical University of Kaiserlautern, Germany

Abstract

For efficient detailed aerodynamic or aeroacoustic designs as well as optimal active flow control, the use of adjoint approaches is an essential ingredient. Using adjoint methods, one is able to compute the gradients needed for sensitivity-based optimization and control methods, with a numerical effort independent from the number of design or control variables. The principal ideas underlying adjoint approaches will be presented, implementation and stability aspects will be discussed, and their efficiency will be demonstrated by several design and control examples in CFD and CAA.

Prof. Nicolas R. Gauger

Biography

Prof. Nicolas R. Gauger received his Master in Mathematics (Dipl.-Math.) from University of Hannover in 1998, and his Ph.D. in Applied Mathematics (Dr.rer.nat.) from TU Braunschweig in 2003. From 1998 to 2010 he was Research Scientist in the field of Numerical Methods for Aerodynamics at German Aerospace Center (DLR) in Braunschweig. Furthermore, he was appointed as Assistant Professor (Jun.-Prof., W1) for Applied Mathematics at the Department of Mathematics of the Humboldt University Berlin from 2005 to 2010. In addition, he was Member of the DFG Research Center MATHEON (Mathematics for Key Technologies) in Berlin from 2006 to 2010. Then, from 2010 to 2014, he was Professor (W2) for Computational Mathematics at the Department of Mathematics and the Center for Computational Engineering Science (CCES) at RWTH Aachen University. Furthermore, from March to August 2014, he was Visiting Professor at the Massachusetts Institute of Technology (MIT) in Cambridge, USA. Since September 2014 he directs now the Chair for Scientific Computing at TU Kaiserslautern, where he is Professor (W3) at the Departement of Mathematics as well asDepartment of Computer Science. Additionally, since February 2015, he is Head of the Computing Center (RHRK) at TU Kaiserslautern. Furthermore, he is since 2010 Principal Investigator at the Aachen Institute for Advanced Study in Computational Engineering Science (AICES), which is a Graduate School funded by the German Excellence Initiative; and since November 2014 he is in addition Principal Investigator at the Center for Mathematical and Computational Modelling (CM)^2 of TU Kaiserslautern.

Finite element modeling and simulation of ultrasonic trapping capability in fluids

Yanyan Liu, Shiwei Ma

Shanghai University, Shanghai, China

Abstract

Manipulation of small particles, such as collection, transportation, separation, rotation, etc., has potential applications in many fields. This research proposes a theoretical method to calculate the acoustic radiation force acting on a particle in the fluid. An acoustic needle in a flexural vibration mode is used to manipulate small particles in liquids, which is driven by a sandwich type ultrasonic transducer. A 3-dimensional finite element model is developed to simulate the acoustic pressure field and the ultrasonic vibration amplitude near the needle tip. The acoustic radiation force is generated by the difference between the kinetic and potential energy density. Characteristics of trapping, transportation and separation of small particles in liquids are presented. The trapping capability increases with the increase of sound pressure around the tip, and become saturate when the sound pressure is too large. A large viscosity of fluids reduces the trapping capability. The effects of the length and radius of needle on the acoustic trapping capability are investigated.

Prof. Shiwei Ma

Biography

Prof. Shiwei Ma obtained his Bachelor and Master Degree of Electronics at Lanzhou University in 1986 and 1991, and Ph.D of Control Science and Engineering at Shanghai University in 2000. He engaged in postdoctoral research in National Institute of Industrial Safety in Japan from February 2001 to February 2003. He was a visiting scholar in Chalmers University of Technology in Sweden from August to November 2006, and in Jacobs University Bremen in Germany from June to July 2013. At present he is a professor in School of Mechatronics Engineering and Automation in Shanghai University, director of the Department of Automation, vice president of Chinese Association for System Simulation (CASS).

Numerical investigation on the performance of CNT micro-cooler in thermal management of Electronic Devices

Yan Zhang

Shanghai University, Shanghai, China

Abstract

The ever-increasing power density of electronics coupled with the shrinking dimensions makes the thermal management becoming critical in the performance and reliability of electronic products. Micro-scale cooling techniques have been used for heat dissipating. The utilization of carbon nanotube in the micro-cooler provides a new option for effective heat dissipation of high power devices. In the presentation, utilization of carbon nanotubes (CNTs) in micro-cooler with air and liquid coolants is considered. Parameters such as cooler dimension, fluid speed and power density are studied by numerical simulation, and the flow features and temperature distribution are obtained to evaluate the thermal performance of the CNT-based micro-coolers.

Dr. Yan Zhang

Biography

Dr. Yan Zhang obtained her Mater Degree of Fluid Mechanics at Shanghai University in 2001, and Ph.D. of Fluid Mechanics at Shanghai University in 2005. Then she got her Ph.D. of solid Mechanics at Chalmers University of Technology, Sweden in 2007. Now she is a researcher in Shanghai University.

Dr. Zhang’s research fields include electronic packaging and reliability analysis, thermal and mechanical characterization of advanced interconnect materials, multi-scale modelling and simulation of complex interface, application of nano-materials in the thermal management of electronics. She has been the coordinator of various projects including National Science Foundation of Chia, Inter-Governmental S&T Cooperation as well as projects funded by Shanghai Municipality.

Research on Turbulence Models for Engineering Turbulence

Hongxun Chen
Shanghai University, Shanghai, China

Abstract

This research aims to simulate engineering turbulence more accurately. Three effective turbulence models were developed which included rotation correction with extend intrinsic mean spin tensor (EIMST), scalable detached eddy simulation (SDES) and non-linear hybrid RANS/LES. Based on the method developed by A. Hellsten and the mechanism of transportation of Reynolds stress in rotating reference frame, the EIMST was introduced to redefine well known Richardson Number, which could make turbulent models sensitive to the rotation. The SDES was put forward by introducing the von Karman scale, which can automatically detect the RANS and LES regions based on the local flow fields. The shortage of direct dependence on the grid for the traditional DES method in identification simulation regions was improved by the SDES method. The method can also adaptively switch RANS/LES method in the steady or unsteady area. The non-linear eddy viscosity model and the scalable Hybrid RANS/LES strategy were developed to improve the capability of EVM to simulate complex flow featuring separation and unsteady motion. To explore the performance of these three turbulence models, the related cases were carried out and the results showed that these turbulence models provided obvious improvements.

Prof. Hongxun Chen

Biography

Prof. Hongxun Chen graduated from Zhenjiang Institute of Agricultural Machinery in 1982. He obtained his Master Degree in engineering in1986 and Doctor Degree in 1991 at Jiangsu Institute of Technology. From May 1991 to May 1993, he was engaged in Drainage and Irrigation Machinery Research Department of Jiangsu Institute of Technology as a professor assistant, and from June 1993 to March 1998, as the associate professor of Fluid machinery Research Institute of Jiangsu University of Science and Technology, and between April 1998 and August 1999, worked as the professor at Fluid Mechanical Engineering Technology Center of Jiangsu University of Science and Technology.

New actuator disk model for propeller-aircraft computation

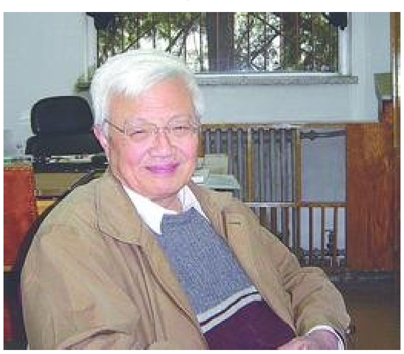
Zhe Jiang, **Yaosong Chen**, Yiran An, **Qifeng Wang**

Peking University, Beijing, China

Abstract

There is a growing interest in propellers for transport aircraft as well as regional airliners from the viewpoint of energy saving. An important consideration for utilizing a propeller propulsion system on aircraft is the aerodynamic interaction between the propeller slipstream and other aerodynamic surfaces. It is therefore necessary to use a simplified but relatively accurate tool for propeller modeling, with the widely used actuator disk model. The advantage of this model is that it is easy to use and inexpensive in terms of computation time required. In addition, it also produces acceptable results. In this study, a new regionalized actuator disk model was utilized in the analysis of propeller slipstream interference effects on a real four-propeller aircraft. The results are compared with the cases of inactive actuator disks, which shows that the propeller slipstream causes an increase in the lift and drag coefficients. An evident yawing effect caused by the rotating slipstream was noticed, which should be taken into account in the design phase. The regionalized actuator disk model is evaluated as a fast and relatively accurate model for propeller preliminary design.

Prof. Yaosong Chen



Biography

Prof. Yaosong Chen graduated from Peking University math department of forceand teachesin 1953. In the mid-1950s, he helped Peiyuan Zhou to create China's first professional mechanics and China's first large-scale low-speed wind tunnel, and actively developing CFD. He engaged in teaching and research work in Peking University nearly 60 years. He advocated computational fluid dynamics and organized protection calculation of the atomic shock wave in 1959 and completed aerodynamic calculation of eight full aircraft in 1976. In the 80's, he served as the Chinese Institute of mechanics computational fluid dynamics team leader and participate in the establishment of 《the water dynamics research and development》 and 《Journal of Hydrodynamics》.He founded 《Communications in Nonlinear Science and Numerical Simulation》 in the 90s, promoted the commercial CFD software group four session of CFD application experience exchange and organized two CFD short-term training organization. After 2000 years, He set up a computational science laboratory under the modern physics research center in Beijing, using numerical simulation to help solve the problem of national construction; he developed LBM general software and organized the RCS calculation of the aircraft.

Linear feedback stabilization of incompressible flow problems

Peter Benner

Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany

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Abstract

Optimizing a trajectory of any unsteady problem in practice requires a feedback strategy in order to attenuate disturbances, e.g., external influences or unmodeled dynamics, that would lead to a deviation from the desired optimized trajectory. In this talk, we consider the unsteady incompressible 2D Navier-Stokes equations and discuss its feedback stabilization using Riccati-type controllers.

Prof. Peter Benner

Biography

Professor Peter Benner received a Diploma in Mathematics from the RWTH Aachen, Germany, in 1993. From 1993 to 1997, he worked on his Ph.D. at the University of Kansas, Lawrence, USA, and the TU Chemnitz–Zwickau, Germany, where he received his Ph.D. 1997. In 2001, he finished his Habilitation in Mathematics at the University of Bremen where he held an assistant professor position from 1997 to 2001. He was a lecturer in Mathematics at TU Berlin from 2001–2003. Since 2003, he is professor for Mathematics in Industry and Technology at Chemnitz University of Technology. In 2010, he was appointed as one of the four directors of the Max Planck Institute for Dynamics of Complex Technical Systems in Magdeburg, where he served as the managing director from 2013-2014. Since 2011, he is also honorary professor at the Otto-von Guericke University of Magdeburg. His research interests are in the area of scientific computing, numerical mathematics, and optimization, and in particular their applications in systems and control theory.

Research on Plasma Flow Control

Chao Gao

Northwestern Polytechnical University, Xi'an, China

Abstract

Plasma active flow control has received a growing attention in recent years. NO mechanical parts, zero reaction time, broader frequency bandwidths and relatively low energy, so many advantages make it a promising application in the future. PIV (Particle-Image-Velocimetry) experiments and High speed schlieren experiments were conducted to study the flow field induced by SDBD (Single-Dielectric-Barrier-Discharge) actuator in quiescent air. The results showed the velocity is very small. The wind tunnel experiments of SDBD actuator flow control over conical forebody verified the SBDB control was quite limited. A new type of actuator--Bipolar Plasma Actuator (BPA) was designed for flow control over cylinder and airfoil in wind tunnel tests and it worked much better than SDBD actuator. At the same time, numerical simulation based on body force model and Maxwell's equation while the pressure is ignored. A micro pressure measurement system with 0.1Pa resolutions was designed for micro pressure measurement to complete the body force model.

Prof. Chao Gao

Biography

Professor Chao Gao served as director of the Chinese society of air dynamics, China Aerodynamics to low cross supersonic, deputy director of the professional committee members, China Aerodynamics to learn to flow display committee members. He graduated from Northwestern Polytechnical University in July 1982 with a bachelor's degree in aerospace engineering. He received a master's degree in aerodynamic engineering from Northwestern Polytechnical University in April 1995 and a doctorate degree in air dynamics engineering in August 1985.From September 1985 to November 2001, he served as assistant,lecturer and associate professor of the Department of aircraft, Northwestern Polytechnical University. From January 2002 to February 2003, he served as a visiting researcher at the Department of mechanical and aerospace engineering, University of California-Irvine.Since March 2003, he is a professor of Aeronautics and Astronautics, doctoral tutor in Northwestern Polytechnical University

The Funnel Controller

Timo Reis

University of Hamburg, Hamburg, Germany

Abstract

Our aim is to design a simple output feedback law such that the transient as well as the asymptotic behavior of a dynamical system has desired properties. This goal is, for a certain class of input-output system, achieved by the so-called "funnel controller", which is a special nonlinear feedback law for tracking control.

We discuss the class of systems for which funnel control is applicable. This is for instance the case for ODE systems with asymptotically stable zero dynamics and relative degree one. The meaning of these assumptions will also be discussed in the talk. We further show that the funnel controller can be applied to stabilize certain classes of differential-algebraic systems and the heat equation with boundary control.

Prof. Timo Reis

Biography

2011.09-present, Professor (W2), Universität Hamburg

2010.04-2011.08, Interim professor, Technische Universität Hamburg-Harburg

2009.06-2010.03, Technische Universität Berlin

2006.11-2011.08, Member and project head, DFG research center Matheon, Berlin

2005.10-2008.08, Research assistant, Institut für Mathematik, Technische Universität Berlin

2002.11-2005.09, Ph.D., Technische Universität Kaiserslautern

1998.10-2002.09, Diploma, Universität Kaiserslautern

Fault-tolerant Control for a Class of Nonlinear Systems

Guang-Hong Yang

Northeastern University, Shenyang, China

Abstract

This report studies the problem of adaptive tracking control for a class of uncertain nonlinear systems with input quantization, external disturbances and actuator faults. Firstly, an intermediate control law is designed by a modified adaptive backstepping design procedure, where a damping term with the estimate of unknown bounds and a positive time-varying integral function are introduced in the intermediate control law. Then, a novel smooth function is introduced in the control law to eliminate the effect of quantization based on the intermediate control law constructed in the first step. Finally, simulation results demonstrate the efficiency of the proposed algorithm.

Prof. Guang-Hong Yang

Biography

Prof. Guang-Hong Yang received the B.S. and M.S. degrees from the Northeast University of Technology, Liaoning, China, in 1983 and 1986, respectively, and the Ph.D. degree in control engineering from Northeastern University (formerly, Northeast University of Technology), in 1994. He was a Lecturer/Associate Professor with Northeastern University from 1986 to 1995. He joined the Nanyang Technological University, Singapore, in 1996 as a Postdoctoral Fellow. From 2001 to 2005, he was a Research Scientist/Senior Research Scientist with the National University of Singapore. He is currently a Professor with the College of Information Science and Engineering, Northeastern University. His current research interests include fault-tolerant control, fault detection and isolation, non-fragile control systems design, and robust control. Prof. Yang is an Associate Editor for the International Journal of Control, Automation, and Systems (IJCAS), the International Journal of Systems Science (IJSS), the IET Control Theory & Applications, and the IEEE Transactions on Fuzzy Systems.

LQG-Balanced Truncation for Low-Order Controllers for Laminar Flow

Jan Heiland

Max-Planck Institute, Magdeburg, Germany

Abstract

Recent theoretical and simulation results have shown that Riccati based feedback can stabilize flows at moderate Reynolds numbers. We extend this established control setup by the method of *LQG-balanced truncation*. In view of practical implementation, we introduce a controller that bases only on outputs rather than on the full state of the system. Also, we provide a very low dimensional observer so that the control actuation can be computed in an online fashion.

Jan Heiland

Biography

Research Team Leader at Max Planck Institute for Dynamics of Complex Systems in Magdeburg

Oct 09 – Nov 13: Full-time research position at TU Berlin

Jun 07 – Sep 09: Student Employee at Bombardier Transportation

Jul 09 - Diploma of TU Berlin in technical mathematics

Linear-Quadratic Control of DAEs with an Application to Flow Control Problems

Matthias Voigt

TU Berlin, Germany

Abstract

In this talk we discuss new results on the linear-quadratic optimal control problem for differential-algebraic systems. In contrast to previous works we drop certain regularity assumptions on the system and the cost functional under consideration. This leads to the so-called Lur'e equation which is a new generalization of the well-known algebraic Riccati equation. The presented results will be illustrated by an example from flow control.

Dr. Matthias Voigt

Biography

2015-present, Postdoctoral researcher at TU Berlin, Germany

2010-2015, Researcher Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg, Germany

2004-2010, Studies of mathematics at TU Chemnitz, Germany

Scholarships, Awards, and Research Stays:

2013, DAAD fellow for a research stay at New York University

2015, Best PhD award in mathematics, OvGU Magdeburg

List of Participants

Participants from Germany				
Nr.	**Titel**	**Name**	**Affiliation**	**Email**
1	Dr.	Robert Altmann	Technical University of Berlin	
2	Prof.	Athanasios C Antoulas	Jacobs University, Bremen	
3	Prof.	Peter Benner	The Max Planck Institute for Dynamics of Complex Technical Systems	
4	Prof.	Nicolas R. Gauger	Technical University of Kaiserslautern	
5	Dr.	Jan Heiland	The Max Planck Institute for Dynamics of Complex Technical Systems	
6	Dr.	Alexander Linke	Weierstrass Institute for Applied Analysis and Stochastics	
7	Prof.	Siegfried Müller	RWTH Aachen University	
8	Prof.	Timo Reis	University of Hamburg	
9	Prof.	Dmitri Kuzmin	Technical University of Dortmund	
10	Dr.	Matthias Voigt	Technical University of Berlin	
11	Dr.	Yue Qiu	The Max Planck Institute for Dynamics of Complex Technical Systems	
12	Dr.	Julius Reiss	Technical University of Berlin	
13		Mladjan Radic	University of Ulm	

Participant from third Country				
Nr.	**Titel**	**Name**	**Affiliation**	**Email**
1	Prof.	Gianluigi Rozza	International School for Advanced Studies Trieste, Italy	

Participants from China				
Nr.	**Titel**	**Name**	**Affiliation**	**Email**
1	Prof.	Shiwei Ma	Shanghai University	
2	Prof.	Yaosong Chen	Peking University	
3	Prof.	Yaolin Jiang	Xi'an Jiaotong University	
4	Prof.	Yangfeng Su	Fudan University	
5	Prof.	Guang-Hong Yang	Northeastern University	
6	Prof.	Yanren Hou	Xi'an Jiaotong University	
7	Prof.	Chao Gao	Northwestern Polytechnical University	
8	Dr.	Xiaolong Wang	Northwestern Polytechnical University	
9	Prof.	Wu Zhang	Shanghai University	
10	Prof.	Yanqin Bai	Shanghai University	
11	Prof.	Hongxun Chen	Shanghai University	
12	Associate Prof./ Dr.	Yan Zhang	Shanghai University	

13	Prof.	Yun Bao	Sun Yat-sen University	
14	Prof.	Shubin Wang	Zhengzhou University	
15	Dr.	Yongjin Zhang	Henan Polytechnic University	
16	Prof.	Baolin Tian	Beijing Institute of Applied Physics and Computational Mathematics	
17	Prof.	Jiequan Li	Beijing Normal University	
18	Prof./ Dr.	Hongjiong Tian	Shanghai Normal University	
19	Associate Prof./ Dr.	Juan Du	Institute of Atmospheric Physics, Chinese Academy of Sciences	
20	Prof.	Jianxian Qiu	Xiamen University,	
21	Prof.	Quan Zhou	Shanghai University	
22	Prof./ Dr.	Zhan Wang	Institute of Mechanics, Chinese Academy of Sciences	
23	Associate Prof./ Dr	Yiwei Wang	Institute of Mechanics, Chinese Academy of Sciences	
24	Associate Prof./ Dr	Kangji Li	Jiangsu University	
25	Prof./ Dr	Chunwu Wang	Nanjing University of Aeronautics and Astronautics	
26	Prof./Dr	Jianlin Jiang	Nanjing University of Aeronautics and Astronautics	
27	Prof.	Qifeng Liao	Shanghai Tech University	
28	Associate Prof./Dr.	Yuan Yao	National Tsing Hua University, Hsinchu, Taiwan, China	
29	Associate Prof./ Dr.	Jianguo Wang	Shanghai University	
30	Associate Prof./ Dr.	Yanyan Liu	Shanghai University	
31	Dr.	Xin Du	Shanghai University	

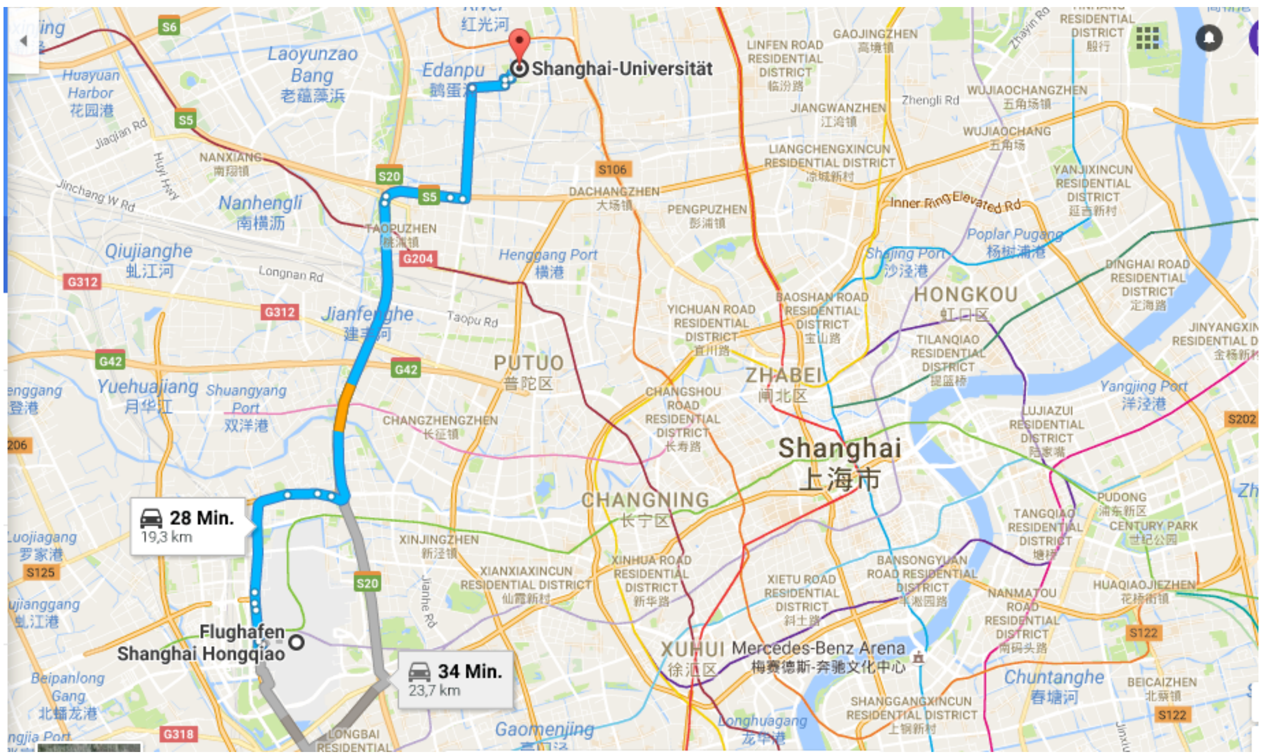
32	Associate Prof./ Dr.	Fei Wang	Shanghai University	
33	Associate Prof./ Dr.	Peng Zhou	Shanghai University	
34	Associate Prof./ Dr.	Yulong Wang	Jiangsu University of Science and Technology	
35	Dr.	Jiahui Luo	Sun Yat-sen University	
36	Dr.	Zhen-Zhong Qi	Xi’an Jiaotong Univeristy	
37	Dr.	Ling Jia	Institute of Mechanics, Chinese Academy of Sciences	
38	Dr.	Qifeng Wang	Commercial Aircraft Corporation of China, Ltd	
39		Fengkai Gao	Northeast Dianli University	

General Information

About New Lehu Hotel

http://www.lhljt.shu.edu.cn/Default.aspx?tabid=31585

1. Shanghai Hongqiao Airport / Shanghai Hongqiao Railway Station

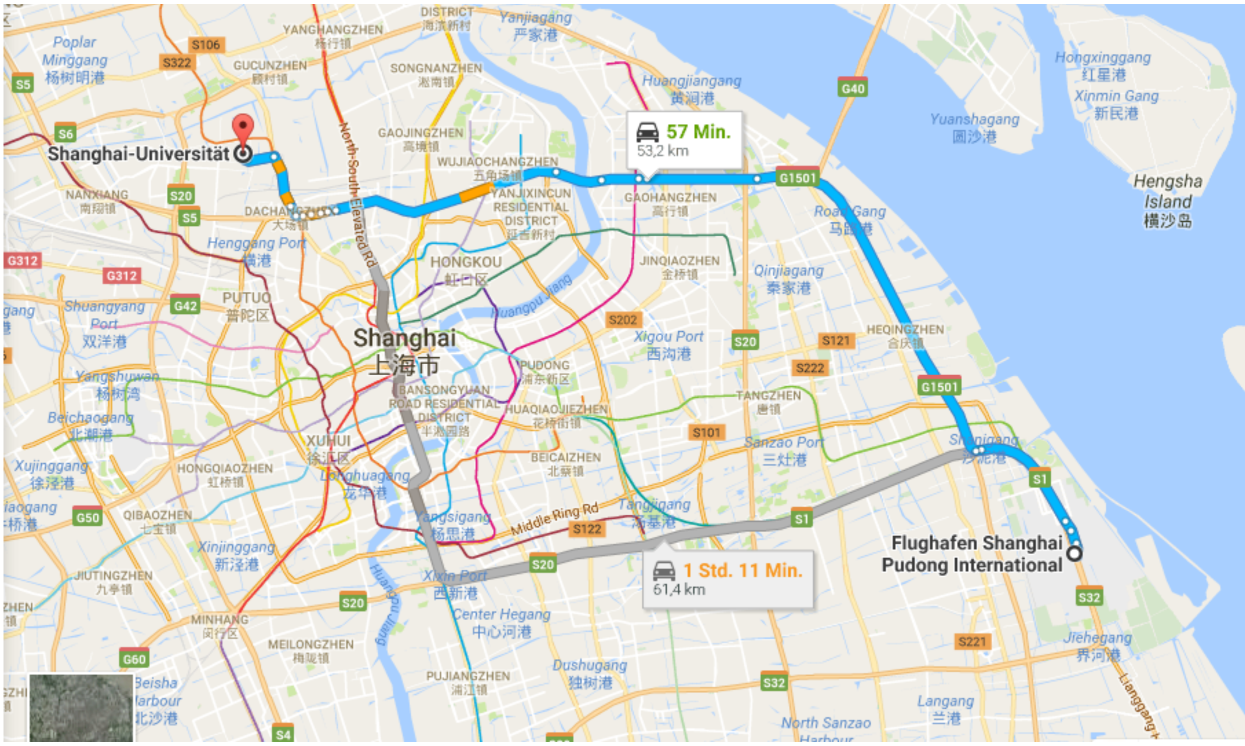


1) By metro
Subway Line 2 (7 stops), change at Jing'An Temple to Line 7 (12 stops), and get off at Shanghai University (exit No. 2).

2) By bus
Bus No. 941 (17 stops), change at Shanghai Railway Station (South Station), walk to Shanghai Railway Station Hengfeng road stop (380 meters), take bus No. 185 or No. 58 (15 stops), and get off at Jinqiu road.

3) By taxi
About 80 RMB

2. Shanghai Pudong International Airport



1) By metro (2 hours)
Subway Line 2 (20 stops), change at Jing'An Temple to Line 7 (12 stops), and get off at Shanghai University (exit No. 2).

2) By airport shuttle bus
Shuttle bus No. 5 (5 stops), change at Shanghai Railway Station, walk to Shanghai Railway Station Hengfeng road stop, take bus No. 185 or No. 58, and get off at Jinqiu road.

3) By taxi
200 RMB


乐乎楼

Introduction of the Sponsor

Das Chinesisch-Deutsche Zentrum für Wissenschaftsförderung (CDZ) ist eine als Joint-Venture gegründete Forschungsförderungseinrichtung der Deutschen Forschungsgemeinschaft (DFG) und der National Natural Science Foundation of China (NSFC) mit Sitz in Peking. Ziel ist die Förderung der wissenschaftlichen Zusammenarbeit zwischen Deutschland und China in den Fachgebieten der Natur-, Lebens-, Management- und Ingenieurwissenschaften.

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