

Subhendu Bikash Hazra

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## Curriculum Vitae

### Personal data

Date of birth: 12.08.1966  
Nationality: Indian  
Family status: Married and have two children



### Schooling

07/72 - 06/77 Basic School, Bibarda (W.B.)  
07/77 - 06/80 High School, Bibarda (W.B.)  
07/80 - 06/82 High School, Harmasra (W.B.)  
Qualification: **Secondary**  
07/82 - 06/84 Sammilani College, Bankura (W.B.)  
Qualification: **Higher Secondary**

### Studies

07/84 - 06/87 Mathematics, Physics, Chemistry at Sammilani College, Bankura  
Qualification: **B.Sc. (Mathematics Honours)**  
07/88 - 06/90 Mathematics at Indian Institute of Technology (IIT), Kharagpur  
Qualification: **M.Sc. (Mathematics)**  
Thesis: Design and Implementation of Banking Database Using dBASE III  
Supervisor: Prof. P. Niyogi

### Scientific experience

08/90 - 07/96 Research Scholar at IIT-Kharagpur  
03/97 **Ph.D. (Mathematics)** at IIT-Kharagpur  
Thesis: Shock Capturing in Computation of High Speed Inviscid and Viscous Flow Past Airfoils  
Supervisor: Prof. P. Niyogi  
08/96 - 09/98 DAAD fellow for the Industrial Mathematics Program at TU Kaiserslautern, Germany (group of Prof. Dr. H. Neunzert)

01/99 - 12/99	Postdoctoral Fellow, CSIR Center for Mathematical Modelling and Computer Simulation, Bangalore
01/00 - 10/01	Postdoctoral Fellow (wissenschaftlicher Mitarbeiter), IWR, University of Heidelberg/WIAS, Berlin, Germany
11/01 - 02/02	Postdoctoral Fellow (wissenschaftlicher Mitarbeiter), University of Trier
03/02 - 02/08	Assistant Professor (wissenschaftlicher Assistent, C1), University of Trier
01/08	<b>Habilitation</b> at University of Trier Thesis: Large-Scale PDE-Constrained Optimization in Applications
03/08 - 08/08	Privatdozent, University of Trier
11/08 - 02/10	Research Scientist (wissenschaftlicher Mitarbeiter), TU Darmstadt, Germany
05/09	<b>Umhabilitation</b> at TU Darmstadt
03/10 - 03/14	Senior Scientist (wissenschaftlicher Mitarbeiter) and Head of a Research Group, TU Darmstadt
02/12 - present	Privatdozent, TU Darmstadt
01/15 - 07/15	Modelling Engineer, Unger Ingenieure, Engineering Firm, Darmstadt
08/15 - present	Professor & Head, Dept. of Mathematics, Bnkura University

### Scholarships/Fellowships

08/88 - 07/90	Merit-Cum-Means (MCM) scholarship at IIT-Kharagpur
08/90 - 07/96	Institute scholarship (GATE and CSIR) at IIT-Kharagpur
08/96 - 07/98	DAAD Fellowship (TU Kaiserslautern), Germany
08/03 - 10/03	Visiting Fellowship, Carnegie Mellon University, USA

### Short research stays

09/03 - 10/03	Carnegie Mellon University, USA (group of Prof. O. Ghattas)
09/06	Stanford University, USA (group of Prof. A. Jameson)
09/07	Stanford University, USA (group of Prof. A. Jameson)
20.07.09 - 05.08.09	Stanford University, USA (group of Prof. A. Jameson)
22.09.10 - 01.10.10	Stanford University, USA (group of Prof. A. Jameson)
14.10.13 - 28.10.13	IIT Madras (Chennai), India (group of Prof. Y. V. S. S. Sanyasiraju)

## Research and Teaching

### Scientific Awards and Honours

- 02/02                    **Public Officer (Beamter)** of the state of Rheinland-Pfalz of Germany for 6 years starting from 01.03.2002
- 01/96                    **Young Scientist** award of the Indian Science Congress Association, India
- 07/96                    **Honourable Mention** in the field of Sports and Voluntary Services for the year 1995-96, awarded by the B.C.Roy Hall of residence, IIT, Kharagpur, India

### Additional qualification

- 01/96 - 09/98            **M. Sc. Nat. (Industrial Mathematics)**, TU Kaiserslautern, Germany

### Research interests

- PDE-Constrained Optimization
- Inverse Problems
- Computational Fluid Dynamics (CFD)
- Numerical Methods
- Mathematical Modeling

### Project experience

#### *Fundamental/industrial research*

- 09/97 - 08/98            KSB Pumpen GmbH, Frankenthal, Germany (DM 10000)  
*Numerical Study of Bubble Flow in Pump*  
Partner:
  - TU Kaiserslautern
  - Fraunhofer ITWM, Kaiserslautern
  - KSB Pumpen GmbH, Frankenthal
- 01/00 - 09/01            DFG (DFG-Projekt WI 1037/3-1) (DM 140000)  
*Inverse Modellierung von Strömungs- und Transportvorgängen in heterogenem Untergrund auf der Basis von Mehrgitterverfahren*  
Partner:
  - IWR, University of Heidelberg
  - WIAS Berlin
  - IWS, University of Stuttgart

- 01/03 - 12/07 BMWi (BMW-Projekt MEGADESIGN) (EUR 120000)  
*Aerodynamisches Formoptimierung*  
Partner:  
· University of Trier  
· DLR Braunschweig (among others)
- 11/09 - 07/11 Hessen Agentur (HA-Projekt-Nr. 202/09-32) (EUR 118000)  
*Energie- und verfahrenstechnische Entwicklung einer Geschieberückhaltung für die Abwassertechnik*  
Partner:  
· Institute IWAR, TU Darmstadt  
· VSB Vogelsberger Umwelttechnik GmbH, Vogelsberg  
· Kessler+Luch mbH & Co. KG, Gießen
- 05/11 - 10/11 Rehau-Projekt (EUR 10000)  
*Numerische untersuchung des Einflusses verschiedener Anschlusswinkel von Kanalleitungen auf das Strömungs- und Ablagerungsverhalten*
- 11/11 - 06/12 EnBW-Projekt (EUR 30000)  
*Energetische Optimierungsuntersuchung Wasserbezug und Transportnetz Stuttgart*
- 09/11 - 02/14 Projekt of Fritz und Margot FAUDI-Foundation (EUR 100000)  
*Entwicklung eines numerischen Modells mit Hilfe von Experiment, Simulation und Optimierung zur Untersuchung von Schlämen aus der Siedlungswasserwirtschaft*
- 2013 DAAD (DAAD-IIT Exchange of Faculty) ( EURO 3000)  
*RBF based grid free local scheme for incompressible free surface flows*  
IIT(Madras)-Partner:  
· Prof. Y. V. S. S. Sanyasiraju (Department of Mathematics)
- Other fundings*
- 05/04 DFG Travelgrant  
*AIAA Conference, Albany, NY, USA*
- 01/06 DFG Travelgrant  
*AIAA Conference, Reno, NV, USA*

- 10/09 DFG Conferencegrant  
*Initiation of international cooperation (Indo-German Conference*
- 08/10 DAAD Travelgrant  
*ICM2010 Conference, Hyderabad, India*
- 07/11 DAAD Travelgrant  
*ICIAM2011 Conference, Vancouver, Canada*
- 09/12 DFG Conferencegrant  
*Initiation of international cooperation (Indo-German Conference*
- 07/13 Grant from Indo-German Science and Technology Centre (IGSTC), New Delhi  
*Indo-German Workshop 2014*

### **Organization of Minisymposium/Workshops/conferences**

- Philadelphia/USA **Minisymposium:** *Forward and Inverse Problems in Multiphase Flow through Porous Media*  
Coordination: Dr. S. B. Hazra  
Prof. Dr. V. Schulz  
2002 SIAM Annual Meeting, July 8-12, 2002
- Eindhoven/Netherlands **Minisymposium:** *Forward and Inverse Problems in Multiphase Flow through Porous Media*  
Coordination: Dr. S. B. Hazra  
Prof. Dr. V. Schulz  
ECMI 2004, June 21-25, 2004
- Trier/Germany **Conference:** *PDE, Scientific Computing and Optimization in Applications*  
Coordination: Dr. S. B. Hazra  
Prof. Dr. V. Schulz  
Prof. Dr. A. Adimurthi  
1st Indo-German conference, University of Trier, September 8-10, 2004
- Kanpur/India **Conference:** *PDE, Scientific Computing and Optimization in Applications*  
Coordination: Dr.habil. S. B. Hazra  
Prof. Dr. M. Oberlack  
Prof. Dr. B. Rathish Kumar  
Prof. Dr. D. Bahuguna  
Indo-German conference, IIT-Kanpur, October 7-9, 2009

- Darmstadt/Germany     **Conference:** *Modelling, Simulation and Optimization in Applications*  
Coordination: PD Dr.habil. S. B. Hazra  
   Prof. Dipl.-Ing. Dr.nat.techn. W. Urban  
   Prof. Dr. B. Rathish Kumar  
   Prof. Dr. G. Gowda  
Indo-German conference, Institute IWAR, TU Darmstadt, September 5-7, 2012
- Darmstadt/Germany     **Session in Darmstädter Ingenieurkongress:** *Sanierung und Optimierung in der Wasserversorgung*  
Coordination: PD Dr.habil. S. B. Hazra  
   Prof. Dipl.-Ing. Dr.nat.techn. W. Urban  
   Dr.-Ing. Alexander Sonnenburg  
2.Darmstädter Ingenieurkongress, TU Darmstadt, März 12-13, 2013
- Darmstadt/Germany     **Session in Darmstädter Ingenieurkongress:** *Simulation*  
Coordination: PD Dr.habil. S. B. Hazra  
   Prof. Dipl.-Ing. Dr.nat.techn. W. Urban  
   Dr.-Ing. Peter Mewis  
2.Darmstädter Ingenieurkongress, TU Darmstadt, März 12-13, 2013
- Delhi/India                 **Workshop:** *Water and wastewater management for sustainable development*  
Coordination: PD Dr.habil. S. B. Hazra  
   Prof. Dipl.-Ing. Dr.nat.techn. W. Urban  
   Prof. A. K. Keshari  
Indo-German Workshop, IIT Delhi, January 30-31, 2014

**Teaching activities***Courses taught***TU Darmstadt**

since SS 12	Higher-Order Methods for Flow Simulation and Optimization
WS 12/13	Water Supply Techniques (also in <b>VGU</b> Vietnam since WS 13/14)
since WS 10/11	Modelling and Simulation of Water and Groundwater Flows
SS 10	Higher-Order Methods for Flow Simulation and Optimization
WS 09/10	Technical Mechanics I < <i>Tutorial</i> >
SS 09	Higher-Order Methods for Flow Simulation and Optimization

**University of Trier**

SS 08	Analytical Methods for ODEs
WS 07/08	Analytical Methods for PDEs Operations Research I < <i>Tutorial</i> >
SS 07	Computational Fluid Dynamics Numerical Analysis I < <i>Tutorial</i> >
WS 06/07	Elements of Analysis I < <i>Tutorial</i> >
SS 06	Introduction to Computational Fluid Dynamics Numerical Analysis III < <i>Tutorial</i> >
WS 05/06	Numerical Modeling Numerical Analysis II < <i>Tutorial</i> >
SS 05	Computational Fluid Dynamics Numerical Analysis I < <i>Tutorial</i> >
WS 04/05	Analytical Methods for PDEs Operations Research I < <i>Tutorial</i> >
SS 04	Numerical Analysis III < <i>Tutorial</i> >
WS 03/04	Analytical Methods for PDEs Linear Algebra I < <i>Tutorial</i> >
SS 03	Numerical Analysis I < <i>Tutorial</i> > Elements of Analysis II < <i>Tutorial</i> >
WS 02/03	Analytical Methods for Elliptic and Parabolic PDEs Finite Element Methods for Solution of PDEs < <i>Tutorial</i> >
SS 02	Introduction to Computational Fluid Dynamics Linear Algebra II < <i>Tutorial</i> >
WS 01/02	Linear Algebra I < <i>Tutorial</i> >

**TU Berlin**

WS 00/01	Mathematical Modeling < <i>Tutorial</i> >
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**TU Kaiserslautern**

WS 97/98

Dynamical Systems - Theory and Numerics <*Tutorial*>*Guiding Students*

- Theis T.: Numerische untersuchung des Einflusses verschiedener Anschlusswinkel von Kanalleitungen auf das Strömungs- und Ablagerungsverhalten, *Diplomarbeit, TU Darmstadt*, (02/2012)
- Mosbach, J.: Technische und wirtschaftliche Untersuchung einer Fernwasserleitung in Ganja (Aserbaidshan)-Numerische Simulation zur Energiegewinnung, *Bachelorarbeit, TU Darmstadt*, (04/2013)
- Becker, J.: Wasserbedarfsprognose für einen mitteldeutschen Ballungsraum bis zum Jahr 2030, *Bachelorarbeit, TU Darmstadt*, (07/2013)
- Berger, T.: Nachhaltige Wasser- und Abwasserwirtschaft im Campus des IIT Madras, *Bachelorarbeit, TU Darmstadt (jointly with IIT Madras)*, (07/2013)
- Danzeisen, N.: Entwicklung eines Kennzahlen-Cocpits für einen energetischen Optimierung, *Masterarbeit, TU Darmstadt*, (11/2013)
- Dao Thi Bich Van : The impacts of water-stress in urban communities (a case study in Binh Thanh District, Ho Chi Minh City, Vietnam), *M.Sc. thesis, jointly with TU Darmstadt and VGU Vietnam*, (03/2015)

**Talks at Conferences/Symposium/Workshops**

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|------------------|--|
| Delhi            | Flow simulation and optimization in water supply and wastewater transport systems, ( <i>Invited</i> ) <i>Indo-German workshop on water and wastewater management for sustainable development</i> , IIT-Delhi, 30-31 January, 2014      |
| Doha/Qatar       | Forward and inverse problems in multiphase flow through porous media, ( <i>Invited</i> ) <i>International workshop on enhanced oil recovery and porous media flows</i> , Texas A&M University in Qatar, Doha, 31 July - 1 August, 2013 |
| Darmstadt        | Optimierung in der Wasserversorgung, <i>2.Darmstädter Ingenieurkongress, TU Darmstadt</i> , März 12-13, 2013   |
| Vancouver/Canada | Multigrid one-shot method for state-constrained shape optimization, ( <i>Invited Minisymposium</i> ) <i>7th International Congress on Industrial and Applied Mathematics</i> , 18-22 July, 2011  |
| Hyderabad        | PDE-constrained optimization in application, <i>International Congress of Mathematicians</i> , 19-27 August, 2010  |
| Kanpur           | Numerical methods for simulation based optimization, ( <i>Invited</i> ) <i>Indo-German Conference on PDE, Scientific Computing and Optimization in Applications</i> , IIT-Kanpur, 07-09 October, 2009                                  |



- Boston/USA Multigrid one-shot pseudo-time stepping method for aerodynamic shape optimization, (*Invited Minisymposium*) *SIAM Conference on Optimization*, 10-13 May, 2008
- Burdwan PDE-constrained optimization in applications, (*Invited*) *International Conference on Frontier of Mathematics & Applications*, 16-18 January, 2008
- Zürich/Switzerland One-shot multigrid method for aerodynamic shape optimization, (*Invited Minisymposium*) *ICIAM07*, 16-20 July, 2007
- Reno/USA One-Shot pseudo-time method for aerodynamic shape optimization using the Navier-Stokes equations, *45th AIAA Aerospace Science Meeting and Exhibit*, 08-11 January, 2007
- Reno/USA Reduced Hessian updates in simultaneous pseudo-timestepping for aerodynamic shape optimization, *44th AIAA Aerospace Science Meeting and Exhibit*, 09-12 January, 2006
- Luxemburg Aerodynamic shape optimization using simultaneous pseudo-timestepping, (*Invited, Section S21: Optimization*) *76th Annual Scientific Conference of the Gesellschaft fuer Angewandte Mathematik und Mechanik (GAMM)*, 28 March-01 April, 2005
- Albany/USA An efficient method for aerodynamic shape optimization, *10th AIAA/ ISSMO Multidisciplinary Analysis and Optimization Conference*, 30 August-01 September, 2004
- Eindhoven/The Netherlands Numerical parameter identification in multiphase flow through porous media, (*organized Minisymposium*) *ECMI 2004*, 21-25 June, 2004
- Oberwolfach Simultaneous pseudo-timestepping for aerodynamic shape optimization, (*Invited*) *Mathematisches Forschungsinstitute Oberwolfach, Numerical Techniques for Optimization Problems with PDE Constraints (Seminar)*, 16-22 February, 2003
- Kaiserslautern Numerical parameter identification in multiphase-flow through porous media, (*Invited*) *MACSI-Net Working Group 14 meeting, Fraunhofer ITWM*, 22-23 November, 2002
- Philadelphia/USA Parameter identification in non-isothermal multiphase multicomponent flow through porous media, (*organized Minisymposium*) *SIAM Annual Meeting*, 08-12 July, 2002
- Augsburg Numerical parameter identification in nonisothermal multiphase multicomponent flow through porous media, *GAMM Conference*, 25-28 March, 2002
- San Diego/USA Parameter identification in multiphase groundwater flows, *Fifth SIAM Conference on Control & its Applications*, 11-14 July, 2001
- San Diego/USA Computation of dilute two-phase flow in pump, *SIAM Annual Meeting*

	<i>ting</i> , 09-13 July, 2001
Zürich/Switzerland	Computation of high-speed flow using non-oscillatory schemes, <i>7th International Conference on Hyperbolic Systems- Theory, Numerics and Applications</i> , 09-13 February, 1998
Patiala	Study in non-oscillatory schemes for computational solution of Euler equations, <i>83rd Indian Science Congress</i> , January 3-8, 1996
Calcutta	Solution of 2D Euler equations - experience with a finite volume code, <i>20-th CASAM-CU National Research Symposium</i> , 1995
Kharagpur	Numerical study of transonic integro-differential Equation on Generalized Co-ordinate System, <i>38th congress of ISTAM</i> , 1993
Pantnagar	Numerical computation of transonic integro-differential equation for unsymmetric lifting airfoil, <i>37th congress of ISTAM</i> , 1992
Bombay	Numerical study of transonic integro-differential equation, <i>36th congress of ISTAM</i> , 1991

### Other invited talks

Bangalore	Efficient methods for flow simulation and simulation-based optimization in applications, TIFR (Bangalore), 29 January, 2014
Chennai	Scientific investigation of sediment pits in combined sewer systems with the help of experiment and numerical simulation, Department of Civil Engg., IIT Madras, 24 October, 2013
Chennai	Efficient numerical methods for flow simulation and simulation based optimization, Department of Mathematics, IIT Madras, 24 October, 2013
Hannover/Germany	Numerical methods for flow simulation and optimization, Oberseminar Numerik, Department of Mathematics, University of Hannover, 10 January, 2013
Kanpur	Numerical methods for flow simulation and optimization, Department of Mathematics, IIT, Kanpur, 25 August, 2010
Stanford/USA	Higher-order methods for flow simulations, Aerospace Computing Lab Seminar, 04 August, 2009
Bangalore	Aerodynamic shape optimization, CTFD Division, NAL Bangalore, 31 March, 2004
Bangalore	Parameter identification in multi-phase flow, Department of Civil Engg., IISc (Bangalore), 30 March, 2004
Pittsburg/USA	Parameter identification in multi-phase flow, Carnegie Mellon University, 24 September, 2003
Bangalore	Inverse problems in multi-phase flow, TIFR (Bangalore), 25 September, 2002

**Reviewer activities***International Journals*

- Optimization Methods and Software Journal (since 2005)
- AIAA Journal (since 2006)
- Journal of Applied Numerical Mathematics (since 2006)
- Computers & Fluids Journal (since 2008)
- Mathematical Reviews (since 2009)
- Computer Methods in Applied Mechanics and Engg. Journal (since 2009)
- International Journal for Numerical Methods in Fluids (since 2009)
- Journal of Optimization and Engineering (since 2010)
- International Journal of Computer Mathematics (since 2011)
- International Journal for Engineering Analysis with Boundary Elements (since 2012)

**Membership of scientific/academic societies**

- Life Member of Indian Science Congress Association, Calcutta, India
- Life Member of Indian Society of Theoretical and Applied Mechanics (ISTAM), Kharagpur, India
- Member of Deutscher Hochschul Verband, Germany, since 2010
- Member of IWAR-Vördereverein e.V. of TU Darmstad, Germany, since 2010
- Member of American Institute of Aeronautics and Astronautics (AIAA), USA, 2004 - 2007
- Member of Society of Industrial and Applied Mathematics (SIAM), USA, 2001, 2002, 2008

**Other activities in the University administrations**

- Member of the selection committee for W2-Professor (Mathematics), University of Trier, 2007
- Cashier of the Mathematics Colloquium, Department of Mathematics, IIT, Kharagpur, 1994-95
- Member of the Executive-council of B.C.Roy hall of residence, IIT, Kharagpur, in 1991-92 as G.Sec.(mess)
- Member of the volleyball team of IIT, Kharagpur, during the inter-IIT meet at IIT, Kanpur, in the year 1995
- Participated in Eastern India Science Camp in 1987 and 1988 held at Guwahati and Patna, respectively

## List of publications

**Monograph (with Citation Index)**

- [1] S. B. Hazra : Large-Scale PDE-Constrained Optimization in Applications - *in the series "Lecture Notes in Applied and Computational Mechanics"*, Vol. 49, Springer-Verlag, Heidelberg, 2010. **(CI 10+2)**

**Book/Edited Volumes**

- [2] S. B. Hazra, G. D. V. Gowda, B. V. R. Kumar, W. Urban (Eds.) : Proceedings of the Indo-German Conference on '*Modelling, Simulation and Optimization in Applications*', September 5-7, 2012, Institute IWAR, TU Darmstadt, special issue in *Int. J. of Numerical Analysis & Modeling, Series B*, Vol. 4(4), 2013.
- [3] A. Adimurthi, S. B. Hazra, V. Schulz (Eds.) : Proceedings of the 1st Indo-German Conference on '*PDE, Scientific Computing and Optimization in Applications*', September 8-10, 2004, Department of Mathematics, University of Trier, special issue in *J. Computational and Applied Mathematics*, Vol.203, Issue 2, 2007.

**Book Chapters (with Citation Index)**

- [4] S. B. Hazra, V. Schulz : '*Simultaneous pseudo-timestepping for state constrained optimization problems in aerodynamics*'- in '*Real-Time PDE-Constrained Optimization*' (Eds.:L. Biegler, O. Ghattas, M. Heinkenschloss, D. Keyes and B. van Bloemen Waanders), SIAM, pp.169-180, 2007. **(CI 9)**
- [5] S. B. Hazra, F. G. Viens : '*Towards Pathwise Stochastic Fast Dynamo in Magneto-Hydrodynamics*'- in '*Numerical Methods and Stochastics*' (Eds: T. J. Lyons and T. S. Salisbury), Fields Institute Communications, Vol.34, pp.75-89, 2002.
- [6] S. B. Hazra : '*Computation of High-speed Flow Using Non-oscillatory Scheme*'- in '*Hyperbolic Problems: Theory, Numerics, Applications*' (Eds.: M. Fey and R. Jeltsch), International Series of Numerical Mathematics (ISNM), Vol.129, pp.465-474, 1999. **(CI 3)**

**Peer-Reviewed Journals (with 5-year Impact Factor) and (Citation Index)**

- [7] A. Sonnenburg, S. B. Hazra, W. Urban: '*Neue Erkenntnisse zu belüfteten Geschichtsböschungen ohne Sammeleinsatz*' - , KA - Korrespondenz Abwasser, Abfall, Jg. 61(12), pp. 1092-1101, Dec. 2014.
- [8] S. B. Hazra : '*Multigrid one-shot method for PDE-constrained optimization problems*' - *J. of Applied Mathematics (Open Access)*, Vol.3, No. 30A (*Special issue on Optimization*), pp. 1565-1571, October, 2012. **(IF 0.834)**
- [9] S. B. Hazra, A. Jameson : '*One-shot pseudo-time method for aerodynamic shape optimization using the Navier-Stokes equations*' - *Int. J. Numer. Meth. Fluids*, 68: 564-581, 2012. **(IF 1.352) (CI 3)**

- [10] S. B. Hazra : '*Multigrid one-shot method for state constrained aerodynamic shape optimization*' - SIAM J. Sci. Comput., Vol.30, No.6, pp.3220-3248, 2008. **(IF 2.23)** **(CI 7)**
- [11] S. B. Hazra, V. Schulz, J. Brezillon : '*Simultaneous pseudo-time stepping for 3D aerodynamic shape optimization*'- J. Numer. Math., Vol.16, No.2, pp.139-161, 2008. **(IF 0.710)** **(CI 11)**
- [12] S. B. Hazra : '*Multigrid one-shot method for aerodynamic shape optimization*' - SIAM J. Sci. Comput., Vol.30, No.3, pp.1527-1547, 2008. **(IF 2.23)** **(CI 12)**
- [13] S. B. Hazra : '*Direct treatment of state constraints in aerodynamic shape optimization using simultaneous pseudo-timestepping*' - AIAA Journal, 45(8), pp.1988-1997, 2007. **(IF 1.30)** **(CI 7)**
- [14] S. B. Hazra, K. Steiner : '*Computation of Dilute Two-Phase Flow in a Pump*' - J. Comput. and App. Math., Vol.203, pp.444-460, 2007. **(IF 1.193)** **(CI 10)**
- [15] N. Kroll, N.R. Gauger, J. Brezillon, R. Dwight, A. Fazzolari, D. Vollmer, K. Becker, H. Barnewitz, V. Schulz and S.B. Hazra : '*Flow simulation and shape optimization for aircraft design*' - J. Comput. and App. Math., Vol.203, pp.397-411, 2007. **(IF 1.193)** **(CI 8)**
- [16] S. B. Hazra, V. Schulz : '*Simultaneous pseudo-timestepping for aerodynamic shape optimization problems with state constraints*'-SIAM J. Sci. Comput., Vol.28, No.3, pp.1078-1099, 2006. **(IF 2.23)** **(CI 29)**
- [17] S. B. Hazra, V. Schulz, J. Brezillon, N. R. Gauger : '*Aerodynamic shape optimization using simultaneous pseudo-timestepping*'- J. Comp. Phys., Vol.204, No.1, pp.46-64, 2005. **(IF 2.851)** **(CI 82)**
- [18] S. B. Hazra, V. Schulz : '*Efficient Computation of the Optimization Problem arising in the Inverse Modeling of Non-stationary Multiphase Multicomponent Flow through Porous Media*'- Computational Optimization and Applications, Vol.31, No.1, pp.69-85, 2005. **(IF 1.56)** **(CI 3)**
- [19] S. B. Hazra, H. Class, R. Helmig, V. Schulz : '*Forward and Inverse problems in Modeling of Multiphase Flow and Transport Through Heterogeneous Porous Media*'- Comp. Geosci., Vol.8, No.1, pp.21-47, 2004. **(IF 1.69)** **(CI 10)**
- [20] S. B. Hazra, V. Schulz : '*Simultaneous Pseudo-Timestepping for PDE-model Based Optimization Problems*'- Bit Numerical Mathematics, 44(3): 457-472, August 2004. **(IF 0.977)** **(CI 41)**
- [21] S. B. Hazra, V. Schulz : '*Numerical Parameter Identification in Multiphase Flow*' - Computing and Visualization in Science, Vol.5, pp.107-113, 2002. **(CI 12)**
- [22] S. B. Hazra, S. K. Chakraborty and P. Niyogi : '*Compressible Viscous Flow Past Airfoils Using Non-Oscillatory Finite-Volume Schemes*'- Journal of CFD, Vol.8, No.3, pp.400-409, Oct.1999. **(CI 2)**
- [23] S. B. Hazra, S. K. Chakraborty and P. Niyogi : '*Study in Non-Oscillatory Schemes for Computational Solution of Euler Equations*'- Journal of CFD, Vol.7, No.2, pp.163-176, July 1998.

- [24] S. B. Hazra, A. S. Gupta and P. Niyogi : '*On the Dispersion of a Solute in Oscillating Flow of a Non-Newtonian Fluid in a Channel*'- Heat and Mass Transfer, Vol.32, pp.481-487, 1997. **(IF 1.08) (CI 4)**
- [25] S. B. Hazra, A. S. Gupta and P. Niyogi : '*On the Dispersion of Solute in Oscillating Flow Through a Channel*'- Heat and Mass Transfer Vol.31, pp.249-256, 1996. **(IF 1.08) (CI 11)**

### Proceedings Volumes [International] (with Citation Index)

- [26] S. B. Hazra : '*One-shot multigrid method for aerodynamic shape optimization*' - PAMM (7), pp. 1060801-1060802, 2007.
- [27] S. B. Hazra, A. Jameson : '*One-shot pseudo-time method for aerodynamic shape optimization using the Navier-Stokes equations*' - AIAA 2007-1470, 2007. **(CI 8)**
- [28] S. B. Hazra : '*Reduced Hessian updates in simultaneous pseudo-timestepping for aerodynamic shape optimization*'- AIAA-paper 933, 2006. **(CI 8)**
- [29] S. B. Hazra, V. Schulz : '*How to profit from adjoints in one-shot pseudotime-stepping optimization*'- in '*Evolutionary and Deterministic Methods for Design, Optimization and Control with Applications to Industrial and Societal Problems*' (Eds.: R. Schilling, W. Haase, J. Periaux, H. Baier, G. Bueda), EUROGEN, 2005.
- [30] S. B. Hazra, N. Gauger : '*Simultaneous pseudo-time stepping for aerodynamic shape optimization*'- PAMM, Vol.5(1), pp.743-744, 2005. **(CI 6)**
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